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"LET KNOWLEDGE GROW FROM MORE TO MORE
AND THUS BE HUMAN LIFE ENRICHED."

ENCYCLOPÆDIA BRITANNICA

A New Survey of Universal Knowledge

Volume 3

BALTIMORE to BRAILA



THE UNIVERSITY OF CHICAGO

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Volume 3

BALTIMORE to BRAILA

BALTIMORE, GEORGE CALVERT, 1ST BARON (*c.* 1580–1632), English statesman, whose name is associated with the foundation of Maryland, son of Leonard Calvert, and Alice, daughter of John Crosland of Crosland, was born at Kipling in Yorkshire and educated at Trinity college, Oxford. After travelling on the continent, he entered the public service as secretary to Robert Cecil, afterwards earl of Salisbury. For his various services he received knighthood in 1617, a secretaryship of state in 1619 and a pension of £2,000 a year in 1620. He represented successively Bossiney (1609), Yorkshire (1621) and Oxford university (1624) in the house of commons, where it fell to him in his official capacity to communicate the king's policy and to obtain supplies. He was distrusted by the parliament, and was in favour of the unpopular alliance with Spain and the Spanish marriage. He then declared himself a Roman Catholic, and on Feb. 12, 1625, threw up his office, when he was created Baron Baltimore of Baltimore and received a grant of large estates in Ireland. He had established a small settlement in Newfoundland in 1621, for which under the name of Avalon he procured a charter in 1623, and which he himself visited in 1627. In consequence of disputes and the unsuitable nature of the climate he sailed thence for Virginia, but was forbidden to settle there unless he took the oaths of allegiance and supremacy. He returned home, and died on April 15, 1632, before a new concession was secured, the charter of Maryland passing the great seal on June 20, 1632, in favour of his son Cecilius, second Lord Baltimore, who founded the colony. Baltimore wrote *Carmen funebre in D. Hen. Untonum* (1596); *The Answer to Tom Tell-Troth* . . . (1642) is also attributed to him, and Wood mentions Baltimore as having composed "something concerning Maryland." His letters are to be found in various publications, including Strafford's *Letters, Clarendon State Papers* and the *Calendars of State Papers.*

BIBLIOGRAPHY.—*George and Cecilius Calvert* by William Hand Browne (1890); Wood's *Athenae Oxonienses* (Bliss) ii, 522; Doyle's *The English in America; Discourse on the Life and Character of Sir G. Calvert* by J. P. Kennedy (1845), with the *Review* and the *Reply* to the same; *London Magazine,* June, 1768; "Sir G. Calvert," by L. W. Wilhelm (*Maryland Hist. Soc.,* April 14, 1884); *The Nation,* vol. 70, p. 95; *American Historical Review,* vol. 5, p. 577.

BALTIMORE, the chief town of Maryland, U.S.A., lies at the head of tidewater upon the Patapsco river, one of the many deep-water estuaries of the Chesapeake bay. The river, like most Maryland rivers, divides and re-divides, there being no fewer than four broad stretches of water within the city limits. Curtis bay and creek, Middle branch and Spring gardens, Northwest branch and Colgate creek all cut more or less deeply into the city and carry the atmosphere of the sea to the very heart of the town. Around these tributaries of the Patapsco, the industrial and commercial life of the town has developed. There are more than a hundred miles of water-front, much of it in use for shipping or industrial purposes.

Baltimore is situated not only on deep water, but at the fall line of the Piedmont as well. Within a few hundred yards of the water-front the land begins to rise, and within a mile or two is, in many places, 100 or 200 ft. above the sea level. To the north and west the topography is all but mountainous. There are streams in deep ravines, many of which are parked, and hills, which are the delight of the home-builder but the despair of city-planners and transportation experts.

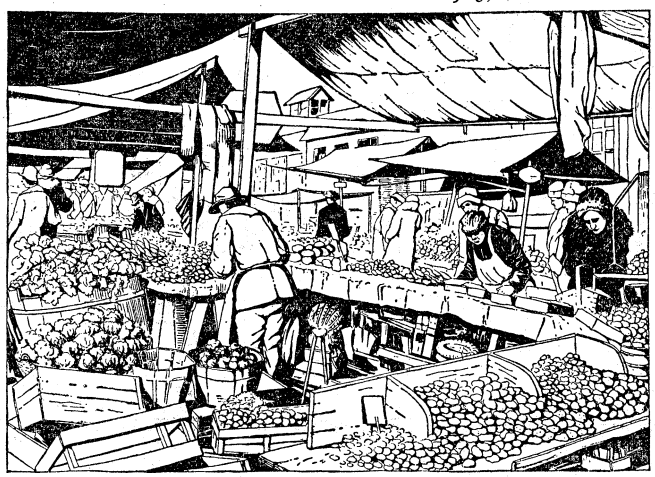
Baltimore is approximately 9 mi. from east to west and 12 mi. from north to south. The area is 85.6 sq.mi., of which 78.7 sq.mi. are land. Within this area lives a population of 859,100 (1940). In 1930 (pop., 804,874) 17.7% of the native stock were Negroes; of the white population the native-born constituted 73.0%.

The city is governed under a grant of power from the state known as the city charter. In theory much authority still remains with the state legislature and the city is not proportionately represented in that body. Although almost half of the residents of Maryland live in Baltimore, less than a third of the members of the legislature are elected by the city vote. In practice, however, the city is almost wholly master of its fiscal affairs. The legislature rarely refuses the requests of its chief municipality and has shown a tendency to be liberal even in the expenditure of funds raised by taxation.

The city government is of moderate simplicity. The chief officials are the mayor, the comptroller and the president of the city council, all elected by popular vote. These three, with the city engineer and the city solicitor, both appointed by the mayor, make up the board of estimates and, with the addition of the city register, the board of awards. The former body makes up the

annual budget and the latter awards contracts. The city council, a unicameral body with 18 members, has broad powers on paper but in practice is little more than a forum where municipal questions are publicly discussed.

The per capita cost of government is relatively low, though it has shown a tendency to grow to a point comparable to that of other cities of the size of Baltimore. In 1915, the cost of the city government was but $27.44 per person. This reached $48.18 in 1925, declined to $35.19 in 1934 and amounted to $59.38 in 1940; municipal expenses increased from $39,607,000 to $51,018,936 in the same period. The most costly services were education, police and fire protection and health and hygiene, which consumed 21·0%, 17·0% and 6·0% of the expenses of 1940 respectively. The net bonded debt of the city increased from $59,614,000 in 1915 to $194,997,982 in 1934; it had dropped to $146,270,063 in 1940. A great part of this sum was expended in school improvement, port development, road and boulevard construction, and similar large scale undertakings.



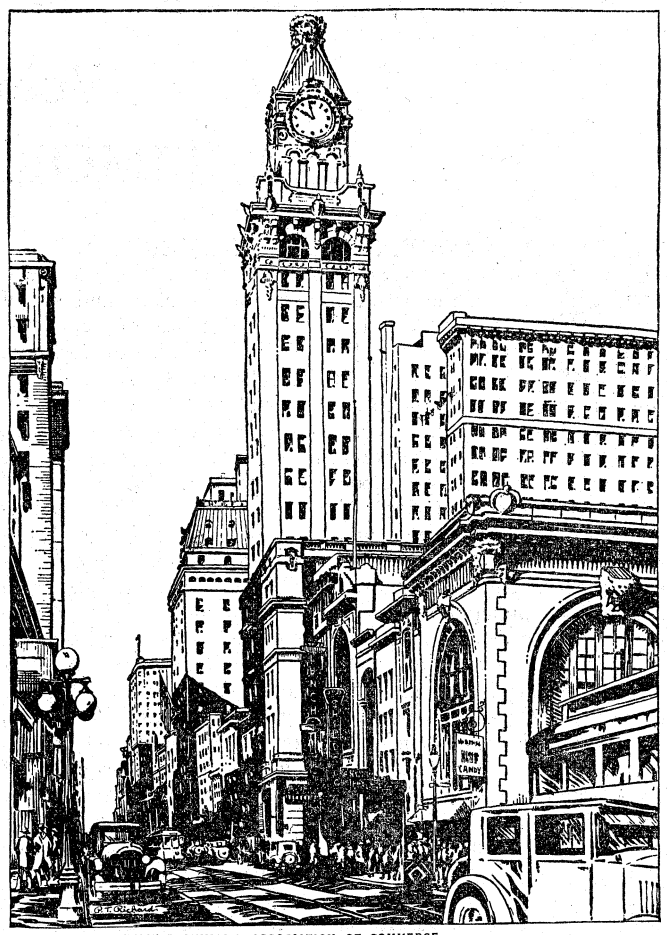
BY COURTESY OF THE BALTIMORE ASSOCIATION OF COMMERCE

A STALL IN THE FAMOUS LEXINGTON MARKET THAT EXTENDS FOR SEVERAL BLOCKS IN THE WESTERN SECTION OF THE CITY

Baltimore has had an unusually high death rate and despite remarkable strides since 1915 it still does not compare favourably in this respect with most northern and western cities. The rate per thousand, in 1940, was 13·1. This high average, however, was almost entirely due to the presence of a large coloured population. The coloured rate, in 1940, was 16·9, while the white rate was only 12·2. The living conditions among the coloured folk have improved, however, and comparative figures show that their emergence from poverty has been reflected in the mortality tables.

History.—It took Baltimore a long time to get under way. From the early days of the colony established on the Chesapeake by the Lords Baltimore, it had been planned to build a city called by their name. Two abortive efforts were made to establish towns and both of them were called Baltimore, but the very site of one is now doubtful and of the other but a single house and a few ruins remain. It was in 1729, finally, that the provincial legislature directed seven commissioners to purchase land on the north shore of the Patapsco river and lay out a township at the point where Jones falls emptied into the river. This choice proved to be a happy one and the town grew with fair rapidity gradually absorbing surrounding villages including especially Jones town, a hamlet on the other side of Jones falls. Even to-day Jones town, which is included in the district known locally as Old Town, has a character and quality of its own, and the names one sees on the shops are not infrequently those of the descendants of the original villagers. Baltimore's site was well chosen because the deep tidal waters on which it lay cut deep into the heart of the rich grain and tobacco lands which lie around the head of the Chesapeake bay. These lands were being rapidly developed by the German immigrants of the time and in the 1750's, or thereabouts, ships began to load grain in Baltimore harbour for British ports. The business thus established has never left the city, though now the field from which the city draws its grain for shipment is the whole Mississippi valley. By the time of the outbreak of the Revolutionary War, Baltimore had a population of 6,755, part of this growth being due to the influx of the Acadians who had been driven out of Nova Scotia by the British. French town is still a remembered section of the city. During the Revolution, the city grew rapidly in importance. It had developed a hardy breed of sea-faring men and many privateers were fitted out and sailed from its harbour to prey upon British shipping. One of the most famous of these adventurers was Joshua Barney, who had the distinction of having commanded a ship on a trans-Atlantic voyage at the age of 14. It was the men trained in this war and in the war of 1812 who developed that type of early American ship known all over the world as the Baltimore clipper. The "Ann McKim" was the most famous of these vessels, and the profits which she helped to bring her owners was the basis of a considerable family fortune.

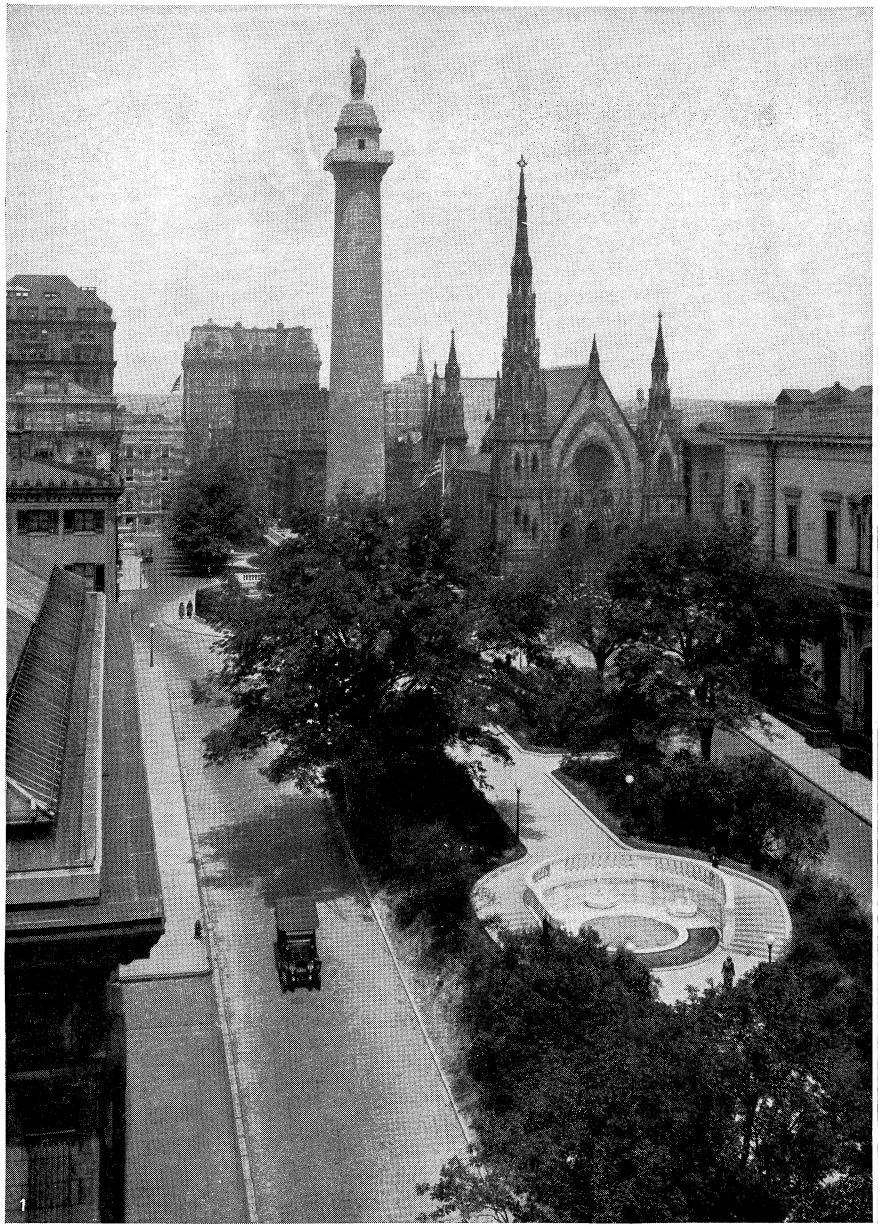
Baltimore's part in the Revolution, however, was not confined to privateering. The city supplied more than its quota of Continental troops and after the capture of Philadelphia by the British in 1776 it was for a time the meeting place of the Continental Congress. During the Revolution also, the first fortifications were erected on the present site of Ft. McHenry, but that place did not acquire fame until it helped to turn back the British fleet which sailed up the Patapsco in 1814 and so inspired Francis Scott Key to write "The Star-Spangled Banner."

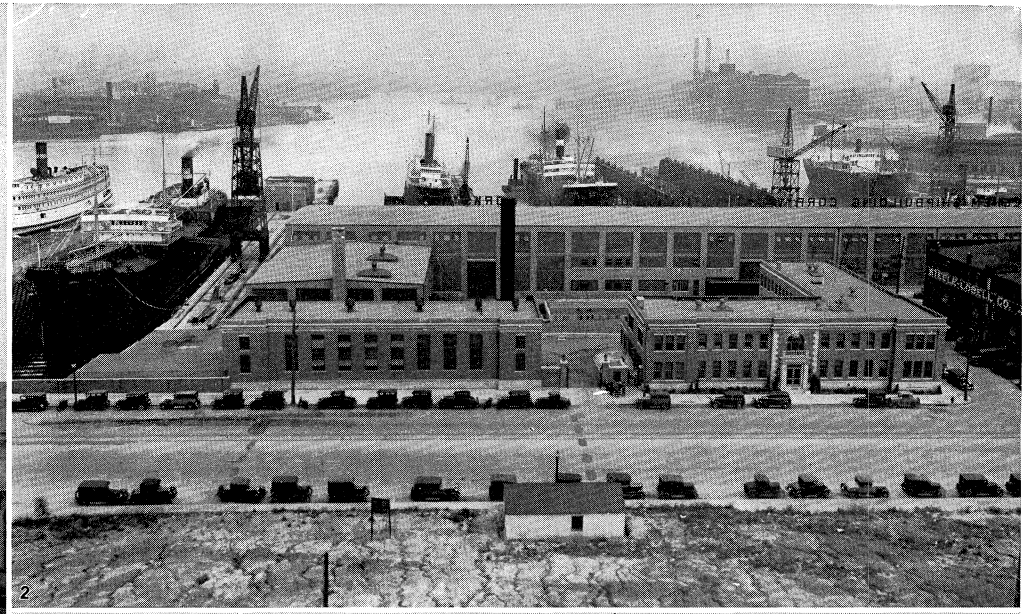


BY COURTESY OF THE BALTIMORE ASSOCIATION OF COMMERCE

BALTIMORE STREET, THE MAIN EAST AND WEST THOROUGHFARE AND ONE OF BALTIMORE'S MOST MODERN BUSINESS STREETS

Baltimore became an incorporated town in 1797, and after taking its part in the war of 1812, settled down to the cultivation of its trade and its industry. Its relations with the South had always been close and it considered itself a Southern city. It became the recognized market place of the planters of Virginia and points even further afield. Perhaps its most interesting period is that lying between the close of the war of 1812 and the outbreak of the Civil War. Trade was thriving. Industry was develop-







BY COURTESY OF THE BALTIMORE ASSOCIATION OF COMMERCE

1. Charles Street at Mount Vernon Place, looking north. 2. General view of inner harbour with upper yard of Bethlehem Shipbuilding Corporation in foreground.
3. Charles Street looking north from Greenway (north residential section)

ing. The political parties held their conventions as a matter of course in the city. The burghers thereof, becoming wealthy, aspired to culture. Their sons and daughters intermarried with the land-owning gentry of the surrounding country and of Virginia. They had courage and initiative. When the building of the Erie canal made their own efforts seem puny and threatened to divert to New York all the produce of the region beyond the Allegheny mountains, they conceived and built the Baltimore and Ohio railroad whose ambition was to cross the mountains and go all the way to the Ohio river. Most of the legends and heroic tales of Baltimore, which are passed on from generation to generation, date from this period. But the political struggles of the '50s cast a blight over the city. Political disorders became rampant. The Know-Nothing Party got a grip on the life of the town. The election of Abraham Lincoln and the outbreak of the Civil War brought the disruption to a climax. There was a period of wild disorder and then military occupation. For five years and more Baltimore was held by the Federal troops and every established routine of life and trade was interrupted or broken. These were Baltimore's darkest days and their effects were felt for decades after the war had been finished.

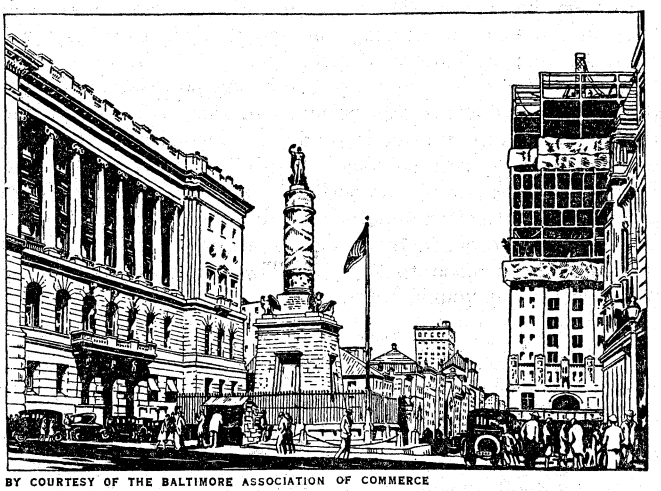
Up to the time of the great fire of 1904, the physical aspect of the town was almost exactly what it had been at the close of the Civil War. There had been growth, but there had been little real development. The streets were paved mostly with cobble stones. There was hardly a sewer in the town worthy of the name. There were cesspools in nearly every back-yard and open drains in every street. The drinking water was contaminated and the typhoid rate was high.

Baltimore had always been a solidly-built town. Nearly every one, rich and poor, lived in a house in a block. The usual house was red brick, with white marble steps. There were miles upon miles of street lined on each side with these little Georgian edifices. Business was largely individual. There were many firms which boasted they had remained in the same premises for nearly a century. The warehouses in which they carried on their operations were simply the brick residential houses on a somewhat larger scale. In those days, while its manufactured products covered a wide range, Baltimore was essentially a commercial rather than an industrial town. Its chief business was jobbing and the South was its chief customer. Southerners came to Baltimore by the various ship lines which ran up and down the Chesapeake bay and the town in aspect, as in behaviour, was essentially Southern.

The great fire broke out on Feb. 7, 1904, and, in the business district, with the exception of one or two so-called "sky-scrapers" and several banks which had been erected with unusual solidity, few buildings survived. Most of the great changes in the city began at that time. Some of its narrow, tortuous streets were widened and, after some delay, sewers were installed and modern paving laid. A few years later, a modern system for the purification of the water supply was installed. Meanwhile, a change had taken place in the architecture of the city. The old red brick Georgian houses disappeared, and with them went a lot of the old charm. Baltimore became a more bustling, more efficient, more strident city than it had ever been before.

For a hundred years, perhaps, the wealth and fashion of the town had promenaded every afternoon along the length of Charles street. Hereon faced the smartest shops, the restaurants, the clubs, the hotels. Here, at its intersection with Monument street rose the tall Doric column which serves as a memorial to George Washington and which gave the city its one-time cognomen of "the Monumental city." On the cross-shaped square about the monument were the houses of the richest and most exclusive residents of the city. This was the very heart of fashionable Baltimore. But the residents have moved to the smart new suburbs to the north of the town. The middle classes have been spreading out in other directions. To the west and north-west are miles and miles of cottage and bungalow "developments." The remaining houses in the centre of the town, bereft of their former owners and their former state, tend to become first lodging houses, then "converted" flats and finally, the abodes of small businesses. Great areas have been taken over by the Negroes, who formerly lived in the alleys behind the larger houses. Occasionally one of the old blocks has been torn down to make room for an apartment house, a department store or an office building.

Industries.—This change in outward aspect reflects a profounder change that has been going on in the economic structure. The old Baltimore was singularly self-contained. It was a port, but its great days as a port had passed with the passing of the Baltimore clipper. The two trunk line railroads which had their terminals there—the Baltimore and Ohio and the Pennsylvania—



BY COURTESY OF THE BALTIMORE ASSOCIATION OF COMMERCE

MONUMENT SQUARE, BALTIMORE, SHOWING THE COURT HOUSE ON THE LEFT AND IN THE CENTRE THE BATTLE MONUMENT ERECTED IN MEMORY OF THOSE WHO FELL IN THE WAR OF 1812

handled for the most part bulk cargo, like coal and grain. The ordinary citizen was hardly conscious of the fact that the town was a seaport, for the big ships rarely came into the inner harbour. It was during the World War of 1914–18 that large-scale manufacturing business became the rule in Baltimore. There are in the city and immediately around it great steel plants, chemical and fertilizer works, copper works and similar heavy industries, each of which has drawn into its orbit great hordes of workers of a type with which the city was hardly familiar in the pre-War days. Many of these industries are not the result of local initiative, but of outside capital, drawn to Baltimore by its location on deep water and its rail facilities and by the fact that it is closer to the West than any other of the great seaports. As a result of these developments Baltimore is in much closer economic relation with the rest of the country and especially with New York, than ever before.

To a greater extent, perhaps, than most people believe, Baltimore is tributary to New York. The only really great industrial enterprise which owes its being to Baltimore initiative and Baltimore capital is the Baltimore and Ohio railroad. That corporation usually has been loyal to the city of its birth and given Baltimore some consideration in all its plans for development. But the Pennsylvania railroad inevitably considers Baltimore as a subsidiary outlet, rather than a prime terminal. The Western Maryland and the Maryland and Pennsylvania, the two other independent steam roads operating out of Baltimore, are more local in character. The last mentioned has not even tide-water terminal facilities.

Other great industries which operate in Baltimore, such as the Bethlehem Steel company and the United States Industrial Alcohol company, are controlled from New York. Exceptions are found in some of the chemical companies, particularly those engaged in the manufacture of fertilizers, but even in this group many that were formerly independent are now units in some national corporation. The centre of gravity of all such undertakings is inevitably found in New York.

Note should be made here of one great exception to the general rule. There is a business, though not an industry, which originated in Baltimore and has always centred there. This is the so-called surety business. One of the original American companies for bonding employees was organized in Baltimore in 1890. Even after

the inevitable combinations, there were in 1936 still three large fidelity and casualty companies in the city doing, in the aggregate, more than $67,000,000 of business a year.

In 1939 the number of manufacturing plants in the Baltimore industrial area was 2,032; the number of employees, 105,737; wages paid, $126,981,059; value of products, $856,967,248.

Among leading industries in 1939 were bread and other bakery products, wholesale meat packing, men's and boys' clothing, chemical products, fertilizers, petroleum and coal products, iron and steel, nonferrous metals and aircraft.

In 1900 the port handled 7,941,580 tons of cargo. In 1926 the figure had reached 22,906,205 tons but declined to 9,271,141 in 1934. In 1939 the figure was 14,768,951.

In 1900 Baltimore was a great shipping port for agricultural products. For obvious reasons much of this business has since disappeared. Corn exported in 1900 was valued at more than $18,000,000. In 1935 corn shipments worth only $308 left the port. During the same period oats declined from $1,300,000 to a negligible figure and cotton exports fell from $8,000,000 to $29,851. Wheat exports dropped too low to be recorded and wheat flour fell from $11,000,000 to $73,741. The ten leading articles of export in 1939 by volume were:

Exports	*Tons*
1 Iron and steel manufactures	550,240
2 Bituminous coal	244,407
3 Iron and steel scrap	195,659
4 Tinplate	184,091
5 Wheat	94,126
6 Corn	84,062
7 Superphosphates	60,291
8 Soybeans	55,993
9 Copper bars and slabs	45,030
10 Industrial machinery	26,054
	1,539,953

As regards imports the figures indicate a port serving a growing industrial territory. Sugar, for instance, hardly appears in the 1900 figures. It headed the list in 1935, its total value being about $6,440,000. The same thing is true of petroleum, which was insignificant in 1900 but totalled about $3,150,000 in 1935. No copper ores or copper manufactures were imported in 1900. In 1935 this commodity was high on the list with a value of $948,208, and coffee had risen from $1,800,000 to $2,504,847. Baltimore's imports during this period shifted largely from manufactured goods to raw materials for her own and the middle western industries. The ten leading items of import were:

Imports	*Tons*
1 Iron ore	2,389,917
2 Crude oil	504,969
3 Manganese ore	461,403
4 Fuel oil	320,933
5 Sugar	278,348
6 Wood pulp	266,953
7 Pyrites	198,054
8 Molasses	170,408
9 Chrome ore	105,063
10 Bananas	100,782
	4,796,830

Total exports were 1,796,127 tons valued at $91,283,097; imports 5,338,360 tons valued at $66,118,268; total foreign trade 7,134,487 tons valued at $157,401,365. Total coastwise and intercoastal trade 7,634,464 tons.

Preliminary reports for 1940 show exports 3,481,523 tons valued at $182,459,338; imports 6,070,113 tons valued at $94,762,255; total 9,551,636 tons valued at $277,221,593.

Education.—First among the educational institutions of Baltimore is the Johns Hopkins university. The two main divisions of this, the city's proudest possession, are the university proper, which lies in a section to the north called Homewood, and the medical school, together with the hospital on Broadway in the eastern part of town. The relations between town and gown have been close ever since the days of Daniel Coit Gilman, the first president of the university, and the members of the faculty have almost invariably played a considerable role in the civic life. The brilliant development of the medical school has brought into the social activities of the city a great number of physicians and research workers.

The University of Maryland, a state-supported institution, whose agricultural and undergraduate departments are situated at College Park, near Washington, maintains in Baltimore its professional departments, the schools of medicine, pharmacology, dentistry and law. Third of the trio of higher educational institutions comes the Peabody institute. As originally endowed by George Peabody, the Boston philanthropist, the institute was in three parts, a library, an art gallery and a conservatory of music. The art gallery has been abandoned; the library, insufficiently endowed, has remained, nevertheless, of considerable dignity and importance, while the conservatory, whose funds have been increased by additional bequests, contained 1,824 students during 1940–41.

Goucher college, formerly the Woman's College of Baltimore, is a well-equipped undergraduate school of high standing for young women with an enrolment of 602 and a staff of 85. Founded (1885) by the Methodist Episcopal church, it is now almost completely nonsectarian and ranks with the better women's colleges in the country. Loyola college (1852) is conducted by the Jesuits for the higher education of Roman Catholic youth. There were 410 students enrolled in 1940–41. For Negroes there is Morgan college (1867), an excellent coeducational institution owned by the state, which has a considerable endowment and a student body of 770.

In addition to the Peabody library the city also possesses the Enoch Pratt free library, and the support of this, the chief public library of the town, has been largely taken over by the city government which appropriated $3,000,000 (1927) for a new central building, formally opened in 1933. The Pratt library maintains 26 branches and several stations in addition to the central building. The Walters Art gallery, one of the striking private collections of the world, was willed to Baltimore in 1931 by Mr. Walters and opened to the public in 1934. The Maryland institute, on the other hand, is one of the oldest art schools in the country, and while it has not sufficient gallery space to display the various collections which have accrued to it by bequest, it holds a series of exhibitions during the year, some of which are of importance.

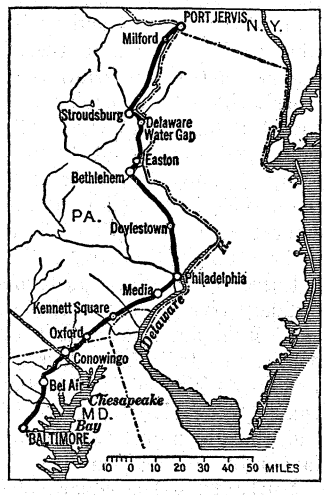
Baltimore is also provided with a thriving municipal art museum. Started when a group of individuals set up a tiny collection in an old house during 1914, the museum is now housed in a handsome building built from municipal funds in 1928. A new wing, constructed with federal funds, was opened in 1938. The museum possesses a library, conducts an educational program and makes loans to Baltimore public schools. (H. Ow.)

BALTIMORE AND OHIO RAILROAD COMPANY, THE, had its inception in a meeting held at the home of George Brown, banker, Baltimore, Md., on Feb. 12, 1827, to consider means of restoring to Baltimore the trade which the recently opened Erie Canal was diverting. A committee was appointed to investigate, recommending on Feb. 19, 1827, that a charter be obtained from the Legislature of Maryland to incorporate a company to construct a "double railroad" from Baltimore to the Ohio river. On Feb. 28, 1827, a charter, under which the railroad still operates, was granted. A company was then organized and on July 4, 1828, the "first stone" was laid by the Grand Lodge of Masons of Maryland, Charles Carroll of Carrollton, the last surviving signer of the Declaration of Independence, participating in the ceremony. On May 24, 1830, the first division of the road was opened to Ellicott Mills, 14m. distant from Baltimore, horses being used for motive power. On Aug. 30, 1830, an experiment with its first steam locomotive, "Tom Thumb," proved successful and steam was then decided upon as the best power for operating the railroad. Washington, D.C., was reached Aug. 25, 1835; Cumberland, Md., Nov. 5, 1842; Wheeling, W.Va., on Dec. 25, 1852; St. Louis in 1857; Chicago in 1874, and Philadelphia in 1886.

The 100th anniversary of its charter was celebrated by an exposition and pageant held in the fall of the year 1927 which was attended by over a million and a quarter people during its continuance of three weeks.

From a road of 14m. in 1830 it has grown to a system of 6,382m. and control of 1,029 additional operated miles in 1939, with an investment of $1,170,082,000 and a capitalization of $992,312,000. Gross earnings in 1939 were $161,030,252. (D. WD.)

BALTIMORE PIKE, a highway running from Port Jervis, New York, to Baltimore, Maryland, is about 220m. long and paved or improved throughout its course. This road passes by Delaware Water Gap, where the Delaware river has hollowed out of solid rock a 1,600ft. gorge, and goes through Media, the home of the oldest court-house in Pennsylvania. It weaves its interesting way through the Brandywine battlefield, over the great hydro-electric power dam at Conowingo on the Susquehanna river and then crosses the Mason and Dixon line into Maryland. Stroudsburg, Bethlehem, Philadelphia and Bel Air are some of the cities through which it passes.



BALTZAR, THOMAS (*c.* 1630–1663), German violinist, was born at Lübeck. He visited England in 1656 and made a great impression on Evelyn and Anthony Wood. In 1661 he was appointed leader of the king's famous band of 24 violins, but his intemperate habits cut short his career within two years. Nothing like his violin-playing had ever been heard in England before, and in all probability the instrumental music of Henry Purcell owes much to its influence.

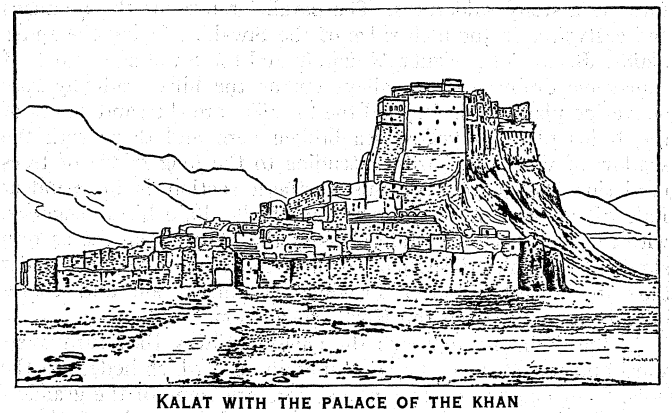
BA-LUBA, a Bantu negroid race of Central Africa with several subdivisions. They live between Lakes Tanganyika, Mweru and Bangweulu in the east and the Kasai in the west. In the east, where there is the greatest racial purity, they founded the States of Katanga, Urua and Uguha; in the west they have intermixed to some extent with the Ba-Kete aborigines. To the western Ba-Luba the name Ba-Shilange has been given. The Ba-Luba are connected with the founders of the great Lunda empire—now divided between Belgian Congo and Angola—under a monarch entitled Muata Yanvo (Jamvo). In 1870 a remarkable politico-religious revolution occurred, the result of which was the establishment of a cult of hemp-smoking, connected with a secret society termed *Bena Riamba;* the members of this abandoned their old fetish worship and adopted a form of communism of which the central idea was the blood-brotherhood of all the members. Towards the east hemp-smoking becomes less common.

The Ba-Luba practise circumcision and scar-tattooing is common; tooth-filing is very frequent in the east, but comparatively rare in the west; the fashion of dressing the hair is very varied and often extremely fantastic. Their houses, which are built by the women, are rectangular; on the Lulua, however, pile-houses, square in shape, are found. They are an agricultural people, but work in the fields is relegated to the women and slaves; the men are admirable craftsmen and are renowned for their wood-carving, cloth-weaving and iron-work. In the west, bows and arrows are the chief weapons, in the east spears principally are used. The old form of religion still obtains in the east, which was untouched by the communistic movement mentioned, and charms of all sorts, as well as carved anthropomorphic figures, are extremely common.

See M. W. Hilton Simpson, *Land and Peoples of the Kasai* (1911).

BALUCHISTAN (bă-loo-chĭ-stahn′), a country within the borders of British India which derives its name from its chief inhabitants. It extends from the Gomal river to the Arabian Sea, and from the borders of Persia and Afghanistan to those of Punjab and Sind. It is divided into two main divisions, British Baluchistan, which is a portion of British India under the chief commissioner, and the foreign territories under the administration of the same officer as agent to the governor-general. The former portion, with an area of 9,096 sq.mi., consists principally of tracts ceded to the British government by Afghanistan under the treaty of Gandamak (1879), and formally declared to be part of British India in 1887. The second class comprises three subdivisions: areas directly administered, native states and tribal areas. Of the directly-administered districts some portions are held on lease from the khan of Kalat, while others are tribal areas in which revenue is taken. They include the whole of the Zhob and Chagai political agencies, the eastern portion of the Quetta tahsil and other tracts, among which may be mentioned the Bolan Pass, comprising 36,401 sq.mi. in all. The whole of the northern boundary, with the north-eastern corner and the railway which traverses Baluchistan through Quetta up to New Chaman on the Afghan-Baluch frontier, is therefore in one form or other under direct British control. The remainder of the territory (80,410 sq.mi.) belongs to the native states of Kalat (including Makran and Kharan) and Las Bela. Tribal areas, in the possession of the Marri and Bugti tribes, cover 7,129 sq.mi. The centre of the country is traversed by a broad gauge railway from the Indus to New Chaman on the Afghan frontier. The main line runs through Sibi at the foot of the Sulimans up to the Quetta plateau via the Mushkaf Valley. An alternative loop runs from Sibi on a north-easterly alinement via Harnai, joining the main line north of Quetta at Bostan. From Spezand, 17 mi. S. of Quetta, a branch runs south-west to Nushki.

Baluchistan as a whole is a sparsely populated country, larger than any Indian province save Madras and Bengal (area 134,002 sq.mi.; pop. [1941] 857,835). Three hundred miles of its mountain walls facing the Indus are south of the railway from the Indus to Quetta, and about 250 mi. are north of it. The great break in the curving mountain lines about Sibi, and its extension in the passes followed by the railway, divide Baluchistan into two distinct parts. To the north, hedged in between Afghanistan and the plains of the Indus, stretch the long ridges of rough highlands which embrace the Suliman system, where vegetation is often alpine. The average breadth of this northern Pathan district is 150 mi., but it narrows to less than 100 mi. on the line of the Gomal. South of the railway lies a square block of territory, measuring about 300 mi. by 300 mi., primarily the home of the Brahui and the Baluch, but with great variety in physical conditions and in inhabitants. In the Jalawan the streams run in deep gorges eastwards into the plains of Sind. South of the Jalawan highlands the rivers either run in long straight lines to the Arabian Sea or, curving westwards parallel with the mountain arcs,



KALAT WITH THE PALACE OF THE KHAN

Nominally all the provinces of this mountainous country, with the exception of British Baluchistan, are under the Khan of Kalat, but so many tribes and nationalities make up the population that whether his suzerainty could be maintained without British help is very doubtful. The Khan's revenue consists partly of agricultural levies and partly of subsidies

disappear into inland swamps. A narrow coastal strip, including Makran, discharges its waters into the Arabian Sea. Between southern Baluchistan and the north-easterly lobe comes the wedge-shaped desert of Kach Gandava (Gandava), which is thrust westwards from the Indus as a deep indentation into the mountains, and, above it, the central uplands of "British Baluchistan." All Baluchistan has now been surveyed.

Northern.—From Domandi, at the junction of the Gomal and Kundar, the boundary on the side of Afghanistan follows the Kundar stream for about 40 mi. to the south-west. It then diverges

northwards for about 100 mi., striking the Kadanai river and turning the northern spurs of the Toba Range to wind through the open plains west of the Kojak Range (Khwaja Amran). It returns to the hills 40 mi. S. of Chaman, and thenceforward is defined by hill ranges southwards to Nushki. The eastern boundary of this northern section of Baluchistan is the "red line" at the foot of the frontier hills, which defines the border of British India. The occupation of a line of posts on the Zhob river, which flanks the Suliman range on the west, places the doors of communication with Afghanistan in British hands.



A CHARACTERISTIC BALUCHI

The central range of the Suliman hills is the dominant feature in the geography of northern Baluchistan. Towards the north of the range occurs a group of peaks, which form an oblong "massif" known as "Kaisargarh" or, more generally, as the "Takht-i-Suliman" (Solomon's throne), from a celebrated shrine of that name near its southern abutment. This high tableland (about 8,000 ft. above sea-level) is formed by a huge cap of coral limestone, estimated to be from 4,000 to 5,000 ft. thick. Deep gorges, with mighty precipices, form the channel of the Draband or "Gat" on the north, and of the Dhana on the south. The higher slopes of the plateau have a fairly thick growth of the chilghosa or "edible" pine and a sprinkling of juniper. It is bounded east and west by high, rugged parallel ridges. The western ridge culminates on the north in the peak of Kaisargarh (11,300 ft.), and the eastern in a block, or detached headland, on the south, where rests the immortal "ziarat" or shrine (11,295 ft.), which attracts thousands of pilgrims (Mohammedans and Hindus) yearly. To the west is the Shingarh Mountain, a geological repetition of the Kaisargarh ridge, black with pines towards the summit. Beyond it are the grey outlines of the close-packed ridges which enclose the lower reaches of the Zhob and the Kundar. The upper parts of the Zhob valley towards the mountain knot north of Quetta are comparatively open and fertile, with flourishing villages, and are bounded by long, sweeping, gentle spurs clothed with wild olive woods. The lower reaches of the Zhob and Kundar are hemmed in by rugged limestone walls, with deep gorges forming a stony wilderness. The parallel ranges of the Sulimans end eastwards in the high ridge of the Siwaliks, facing the Indus plains. Between the Takht Mountain and the Siwaliks is a belt of transverse drainage with valleys cut as the hills gradually rose above the plain level. Beyond the Siwaliks are the sand waves of the Indus plain; a yellow sea broken here and there with the shadow of village orchards, extending to the long fringe of trees bordering the Indus. All this northern section is independent Baluchistan within the jurisdiction of the Baluchistan Agency, with the exception of certain clans of the Sheranis on the eastern slopes of the Takht-i-Suliman north of the Vihowa, who are under the North-West Frontier Province administration and consequently separate from the Northern Section.

As the Sulimans approach the Quetta railway they turn westward and merge in the broad mountain core which hedges in the uplands of Quetta and Pishin, and here are some of the grandest peaks in Baluchistan. Khalifat (11,440 ft.), south of Ziarat, flanking the Harnai loop of the Sind-Pishin railway; Takatu to the north of Quetta; Chahiltan (Chiltan) on the south-west; and the great square-headed Murdar to the south. Lying in the midst of them, on an open plain formed by the high-level tributaries of the Lora, 5,500 ft. above the sea, is Quetta. The southern end of the Suliman system, is occupied by true Baluchis, the Marri and Bugti sections of the great Rind confederation of tribes owning an Arabic origin. There are no Pathans. To the north of them are the Bozdars, another Rind clan; and these Rind tribes form the exception to the general rule of Pathan occupation of northern Baluchistan. Amongst the Pathans, the Kakars and Dumars of Pishin, with the Mando Khel of Zhob, are the most prominent tribal divisions.

Central.—The curved recession of the Suliman Ranges to the north-west leaves a flat alluvial desert to the south, striking deep into the Baluchistan mountain system. The point of this inlet receives the drainage of two local basins, the Bolan and the Nara. Their waters finally disappear in the irrigated flats of the alluvial bay (Kach Gandava), which extends 130 mi. from the Indus to Sibi at the foot of the hills, and which offers (in spite of periodic Indus floods) a unique opportunity for railway approach to Baluchistan. Kach Gandava is a land of dust-storms and ruinous winds; a land where the thermometer never sinks below 100° in summer, and drops below freezing-point in winter.

British.—The irregular block of upland territory known as British Baluchistan includes all the upper Lora tributaries, and the Toba plateau beyond them; resting on the Khwaja Amran (Kojak) Range on the west; reaching south to Nushki; including the basins of the Bolan and Nara as far as Sibi to the southeast; embracing the Thal Chotiali valley on the east, and following the main water-divide between the Zhob and Lora on the north. It is leased from Kalat, and forms a distinctive province, under the ordinary civil administration of British India. Beyond it, north and south, lies independent Baluchistan which is under British political control. The degree of independence enjoyed by the various districts of Baluchistan increases with the distance from Quetta. The climate of British Baluchistan is dry and bracing and, though subject to extremes of temperature, is on the whole favourable to European life.

Southern.—The square block of Southern Baluchistan, with its mountain folds opening fanwise from the Kalat plateau, naturally drains south and west, either to the Arabian sea or to the central swamps of Lora and Mashkel. The Hab river, which forms the boundary west of Karachi; the Purali (the ancient *Arabus*), draining the low-lying flats of Las Bela; the Hingol (the ancient *Tomerus*) and the Dasht in Makran, are all considerable streams, draining into the Arabian sea and forming important arteries in the network of internal communication. An exception to the general rule is found in the Mula, which carries the floods of the Kalat highlands through magnificent gorges into the Gandava basin and forms one of the most important of the ancient highways from the Indus plains to Kandahar. The fortress of Kalat (6,800 ft.) is situated between the sources of the Bolan and the Mula, near a small tributary of the Lora on the western edge of a cultivated plain in the very midst of hills (*see* KALAT). To the north are the long sweeping lines of the Sarawan ridges, enclosing narrow fertile valleys, and passing south-west to the edge of the Kharan desert. Some streams drain northwards as affluents of the southern Lora; but the Lora drains also the Pishin valley on the north, the two systems uniting in Shorawak, to lose themselves in the desert and swamps to the west of Nushki, on the road to Seistan. Sixty miles south of Kalat begins the remarkable hydrographic system which includes all southern and south-western Baluchistan. To the west lies the Kharan desert, with intermittent river channels often lost in the sand-waves ere they reach the Mashkel swamps on the far borders of Persia. To the south-west are the long sweeping valleys of Rakshan and Panjgur, which, curving northwards, likewise discharge into the Mashkel. Directly south come the meridional arteries, the Hab, the Purali and the Hingol, which end in the Arabian Sea, leaving the mountainous seaboard (Makran) south of the Panjgur and west of the Hingol poorly watered by the long lateral Kej river and several smaller mountain streams. The eastern frontier of southern Baluchistan over against the desert of Sind follows the foot of the Kirthar range, whose limestone walls rise sheer for thousands of feet.



FROM OLIVER, "ACROSS THE BORDER," BY COURTESY OF MESSRS. CHAPMAN AND HALL

A WAYSIDE COBBLER OF BALUCHISTAN

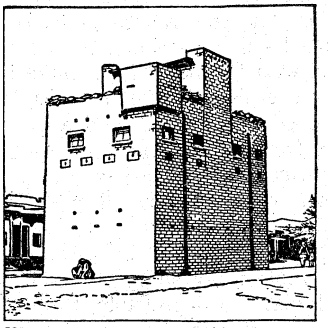
The stony hill-roads of Baluchistan make the business of the cobbler lucrative

Western Boundary.—The boundary between Baluchistan and Afghanistan runs westwards from near Nushki across the Lora Hamun, leaving the frontier post of Chagai to Baluchistan; and from this point to the Koh-i-Malik Sia it is based partly on the central water-divide of the Chagai Hills and partly runs in straight lines through the desert south of the salt swamps of the Gaud-i-Zirreh. It thus passes 50 mi. to the south of the Helmand, entirely shutting off from Baluchistan the approach to Seistan north of the Gaud-i-Zirreh. The route to Seistan from Nushki thus runs south of the Chagai Hills. Towards the end of World War I, when the North Persian Cordon was established to Meshed, to keep Turks from Afghanistan, and to connect with the Anti-Bolshevik element in Russian Turkestan, the rail was extended along this line to Duzdap (439 mi. beyond Nushki and 52 mi. into Persia) but was pulled up later.

Geology.—The mountain ranges of Baluchistan are formed of Cretaceous and Tertiary beds, and constitute part of an extensive system of Tertiary (Alpine-Himalayan) date arranged as if in a festoon hanging southwards between Peshawar and Mount Ararat, with the outer folds looped up at Sibi so as to form the subsidiary festoon of the Suliman and Bugti hills. Outside the folds lie the horizontal deposits of Makran, and within them lies the stony desert of north-western Baluchistan. Besides the Cretaceous and Tertiary beds, Jurassic rocks occupy considerable areas in British Baluchistan. Triassic beds lie along the south side of the upper Zhob, and *Fusulina* limestone has also been found there. With the exception of the later Tertiary beds the deposits are mostly marine. But in the upper Cretaceous and lower Tertiary, especially in north-western Baluchistan, there is an extensive development of volcanic tuffs and conglomerates, probably contemporaneous with the Deccan Traps of India. Great masses of syenite and diorite were intruded during the Tertiary period, and within the curve of the folded belt a line of recent volcanic cones stretches from western Baluchistan into eastern Persia.

So far as is known, the mineral wealth of Baluchistan is inconsiderable. Coal has been worked in the Tertiary beds along the Harnai route to Quetta, but the seams are thin and the quality poor. A somewhat thick and viscid form of mineral oil is met with at Khattan in the Marri country; and petroleum of excellent quality occurs in the Sherani hills. Traces of oil have been found at various spots, without any sign of accessible large supplies. Sulphur has long been worked on a small scale in the Koh-i-Sultan, the largest of the volcanoes of western Baluchistan. Chrome is profitably worked near Pishin and a light line from Khanai to Hindubagh was laid in 1916 for the chrome traffic.

Races.—Baluchistan presents a remarkable field for the ethnographer. In the desert are to be found scattered tribes of nomads, called Rekis (or desert people), the Muhammadani being the most numerous. They are probably of Arab origin. This central desert is the Kir, Kej, Katz or Kash Kaian of Arabic mediaeval geography, and a part of the ancient Kaiani kingdom; the prefix Kej or Kash denoting low-level flats or valleys. The Muhammadani nomads occupy the central mountain region, to the south of which lie the Mashkel and Kharan deserts, inhabited by a people of quite different origin, who possess something approaching to historical records. These are the Naushirwanis, a purely Persian group who passed into Baluchistan within historic times. They appear to be identical with the Tahuki or Tahukani who are found in Perso-Baluchistan, and are a fine manly stock. Between the Naushirwanis and the fish-eating population of the coast, enclosed in the narrow valleys of the Rakshan and Kej tributaries, or about the sources of the Hingol are innumerable tribes some of which are of long-standing, while others may be traced in the records of recent immigration. Almost everywhere recognizable is the underlying Persian population (Tajik), which is sometimes represented by a locally dominant tribe, but more frequently by the agricultural bondsman. Such are the Dehwars or Dehkans, and the Durzadas who extend all through Makran. The Arabs have naturally left their mark on the ethnography of Baluchistan. As they occupied all southern Baluchistan and Seistan from a very early date, and finally spread through the Sind valley, where they remained till the 12th century, their genealogical records have become much obscured. Makran contains numerous relics of their irrigation works constructed in times when the climatic conditions of Baluchistan must have been very different from what they are now. Lower Sind also contains a great wealth of architectural remains to the west of the Indus as well as in the delta. One tribe (the Kalmats), who left their name on the Makran coast and subsequently dominated Bela and Sind, west of the Indus, exhibit great power of artistic design in their sepulchral monuments. The Dravidians (Brahuis), who are chiefly represented by the Kambaranis and Mingals or Mongals (the latter doubtless of Tatar origin), spread through southern Baluchistan as well as the eastern hills, and are scattered throughout the mountain tracts south of Kharan. The Bolédi, who are mentioned by very early writers, were once the ruling race of southern Baluchistan, which was originally called Boledistan, and it seems possible that this may be the real origin of the much-disputed name of the country. The fast-diminishing Sajidis (Sajittae) and Saka (Sacae) are others of the more ancient races of Baluchistan easily recognizable in classical geography. Most recent of all are the Gitchkis, who derive from a Rajput adventurer of the early 17th century. They are now the dominant race in Panjgur and Kej, whence they ousted the Boledis. An interesting group are the Gadaras of Makran, who once gave the name Gadrosia to Southern Baluchistan. They are now mostly represented by Sidi half-castes, well known in the mercantile marine as stokers and firemen. It seems unlikely that this modern admixture of Asiatic and African blood represents the "Asiatic Ethiopian" of Herodotus which was more probably a direct connection of the Himyaritic Arab builders of "bunds" and revetments who spread eastwards from Arabia.



WATCH TOWER NEAR THE KHOJAK PASS, BALUCHISTAN
Built in the village street to protect the community against marauders

Peoples of Arab extraction intermixed with peoples of Dravidian and Persian stock are all designated by the general term Baluch. The Marri and Bugti tribes, who occupy the most southern buttresses of the Suliman Mountains, are Rind Baluchis, almost certainly of Arab extraction and claim to be Qoraish. They came to Sind either with the Arab conquerors or after them, and remained there mixed up with the original Hindu inhabitants. The Arab type of Baluch extends through the whole country at intervals and has some fine traits. The Baluch is easier to deal with and to control than the Pathan owing to his tribal organization and his freedom from bigoted fanaticism. He is an expert rider; horse-racing is his national amusement, and the Baluch breed of horses is celebrated throughout northern India.

The strategical position of Great Britain in Baluchistan is a very important factor in the problem of maintaining order and good administration in the country. The ever-restless Pathan tribes of the Suliman hills are held in check by the occupation of the Zhob valley; whilst the central dominant position at Quetta safeguards the peace and security of Kalat and bars the way to an advance upon India by way of Kandahar.

Climate.—Extensive changes have taken place in the climatic condition of the country, as is shown by the remains of forests in districts now entirely desiccated. Wanton destruction of forests may have been a factor but the widespread desiccation of large areas of the Baluch highlands, where evidences of Arab irrigation works and of cultivation attest to a once flourishing civilization, suggests secular climatic variations. There is ample proof throughout the country of alterations of level within recent geologic periods, and there have even been compressions resulting in a relative rise of the ground, over the crests of anticlinal folds, within historic record.

Population.—The population of Baluchistan (857,835 [1941]) is largely nomadic. The fact that so many as 15,000 camels have been counted in the Bolan Pass during one month of the annual

Brahui migration indicates the size of the movement. The prevailing religion is Mohammedan. Holders of this faith, mainly of the Sunni sect, numbered 785,181 in 1941. Hindus numbered 54,394; Christians, 6,056; Sikhs, 12,044; others 160. The chief languages spoken are vernaculars of Baluchistan, Pushtu, Panjabi, Urdu and Sindhi. The Baluchi language belongs to the Iranian branch of the Aryan sub-family of the Indo-European family. It is divided into two distinct main dialects, separated by the belt of Brahui and Sindhi speakers who occupy the Sarawan and Jalawan hills, and Las Bela. Makran was for many generations under the rule of the Persian kings, and the Baluchi spoken on the west of the province is largely impregnated with Persian words. There is no indigenous literature, but many specimens of poetry exist in which heroes and brave deeds are commemorated, and a good many of these have been collected from time to time. Brahui is one of the Dravidian group of languages. It is remarkable to find in Baluchistan a Dravidian tongue, surrounded on all sides by Aryan languages, and with the next nearest branch of the same family located so far away as the Gond hills of central India; and this is said to be evidence for the route followed by the prehistoric Dravidian intrusions into India, most probably through Makran. There are thirteen indigenous tribes of Pathan origin of which the Kakars (*q.v.*) are by far the most important. They are to be found in the largest numbers in Zhob, Quetta, Pishin and Thal-Chotiali, but there are a few of them in Kalat and Chagai also. The most important Baluch tribes are the Marris, the Bughtis, the Boledis, the Domkis, the Magassis and the Rinds.

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HISTORY

The earliest mention of the country now called Baluchistan, apart from a reference in the Avesta to Vara Peshin-Anha or the Peshin Valley, is in the pages of Herodotus, who states that the Mykians—the Maka of the Behistun inscription—were included in the fourteenth satrapy of the Persian empire, as it was organized by Darius in the 6th century B.C. Makran, the name for the coastal province of Baluchistan and of neighbouring Persian Baluchistan, probably signifies "the land of the Maka." There were legends that mythical Semiramis and historical Cyrus the Great, the founder of the Persian empire, had lost armies in its deserts, but the country was not explored in any sense until the appearance of Alexander the Great, who, after his victories in India, was returning to Persia, in 325 B.C. Makran was traversed from east to west by the main body under Alexander himself, while his admiral Nearchus coasted along its shores to the Persian Gulf and kept such an accurate log that many of the ports and headlands mentioned can be identified to-day. Craterus, who had been placed in charge of the invalids and elephants, had left Alexander in the Indus delta and marched through Quetta and northern Baluchistan, rejoining Alexander in the valley of the Halil Rud, where Nearchus also reported the safe arrival of the fleet at Harmozia (the mediaeval Hormuz), to the east of modern Bandar Abbas. Arrian describes with striking accuracy the desert nature of the country, the scanty population of Ichthyophagi or "Fish-eaters" and the lack of supplies; he also refers to the aromatic plants. After the death of Alexander, his kingdom broke up and Baluchistan formed part of the kingdom of Bactria.

Baluchistan is occasionally mentioned in Persian history, after the rise of the Sasanian dynasty. For instance, Bahram Gur, who reigned in the 5th century A.D. made an expedition to India and occupied Makran. He is believed to have brought back with him some thousands of dancers who were the ancestors of the gipsies. The province undoubtedly formed part of the Persian empire at this period and in the following century. In the 7th century, the Arabs, inspired by the teachings of Mohammed, attacked and overthrew the Persian empire, and gradually annexed its outlying provinces. We read that some Makran towns were occupied in 664 and, in 707, Mohammed bin Kasim undertook his celebrated campaign. He captured various strongholds in Makran, and after making good his position in that country, he advanced into Sind



BALUCHI NATIVE HOME IN THE QUETTA DISTRICT

and established the Muslim power in the valley of the Indus. The Arabs ruled Baluchistan from Khuzdur in Jhalawan until the 10th century.

When Persia regained her independence upon the gradual weakening of the Caliphate, Baluchistan was included in the empire, but her chiefs were practically free to rule as they liked, so long as they furnished military contingents when called upon to do so. It is, however, to be noted that from 1595 to 1638 the province formed part of the Mogul empire. The Baluchis, who have given their name to the country, are comparatively new comers. Of Aryan stock, they apparently entered it as a tribe of invaders in the eleventh and twelfth centuries, being driven out of Persia by the Seljuks. They conquered Western Makran, but failed to seize the uplands of Kalat. They therefore passed them by and half of the tribe gradually seized districts in the Indus valley. The tribesmen who remained formed a race of hereditary chiefs, quite distinct from the peasantry, especially owing to their fair complexions.

Their rivals, the Brahuis, who occupy the highlands of Kalat, are of Dravidian stock. They rose to power in the 17th century under their chief Kambar, who overthrew the dynasty of Hindu rajahs and seized the country and, since this period, Muslims have been dominant throughout Baluchistan. Kambar's descendant, Abdulla Khan, conquered the fertile district of Kach Gandavar. He was a contemporary of Nadir Shah who at this period was avenging the Afghan invasion of Persia and captured Kandahar after a long siege. Baluchistan at this period was subject to Kandahar, and Abdulla submitted to the Shah, but was killed in a battle with the Nawabs of Sind shortly afterwards. His successor was incapable and was put to death by his brother Nasir Khan, who had served Nadir in his Indian campaign. He was appointed first *Beglerbegi* or "Chief Beg" of Baluchistan by his master in 1739; and thus began the long reign of the greatest ruler of this desert country, whose rule finally included several districts of Sind and what is now Persian Baluchistan. Upon the assassination of Nadir Shah in 1747, Ahmad Shah founded the kingdom of Afghanistan. Nasir Khan at first acknowledged his overlordship,

but, in 1758, he rebelled. He was defeated by Ahmad Shah in the field, but the Afghan was unable to capture Kalat and a treaty was negotiated, by the terms of which Nasir Khan agreed to furnish troops for expeditions, but was exempted from the payment of tribute. This treaty was faithfully observed, and Nasir Khan distinguished himself in many engagements, the victory of Ahmad Shah in Khorasan being mainly due to the valour and capacity of the Baluch Khan. He died at an advanced age in 1795.

At the beginning of the 19th century, the English traveller Pottinger travelled through Baluchistan and thus inaugurated British connection with it. The First Afghan War, the object of which was to restore Shah Shuja, a refugee amir, to the throne of Afghanistan, suddenly made the attitude of Kalat of some importance. British troops marched from the Indus through the Bolan pass to Kandahar, and negotiations were opened with Mehrab Khan of Kalat, mainly with a view to protect the supply columns of the army. Intrigues led the authorities to believe that the khan was guilty of attacking the British convoys, and a force was sent against him with orders to capture Kalat. The main gate was blown in by gun fire, the fort was stormed and Mehrab Khan, with 400 of his men fell fighting. Too late it was discovered that the Vizier had arranged the attacks on the convoys with the object of discrediting the unfortunate khan. Nasir, the son of the khan, was set aside at first, but the chiefs rallied to him and he was finally acknowledged by the British in 1841; they evacuated the country a few months later. The steady advance of the frontiers of British India in Sind made it desirable to have closer relations with Kalat, if only to put an end to the raids on the newly conquered territories. Consequently, in 1854, General Jacob, the commandant of the Sind frontier, was deputed to make a treaty with the khan. This was successfully negotiated, as the position of the khan had been shaken by rebellions, and he was anxious both for support and for money. The terms bound the khan "to act in subordinate co-operation with the British Government and to enter into no negotiations with other states without its consent." On condition of a faithful performance of his duties, he was granted an annual subsidy of Rs. 50,000.

Nasir Khan died in 1856 and, under his successor Khudadad Khan, a boy of twelve, there was a rebellion of the turbulent chiefs who, dissatisfied with the presents they had received on his succession, attempted to depose him. The British Government, although the Indian Mutiny was at its height at the time, deputed a British officer to reside at Kalat in 1857. The khan was wounded by his cousin, who seized Kalat and ruled for a year, when he was assassinated. The chiefs then reinstated Khudadad, who ruled precariously and was unable to control his subjects or prevent them from raiding British territory. So bad was the state of affairs that it became evident that further intervention in the affairs of the state was imperative.

In 1875, Captain Sandeman was deputed on a mission to Kalat and he succeeded in arranging the disputes between the khan and his unruly chiefs. By a treaty, negotiated in 1876, the British Government became the referee between the khan and his chiefs and thus was inaugurated the famous Sandeman system of the administration of the tribes through their own chiefs and in accordance with tribal custom, but under British supervision.

In furtherance of the defence of India, the position at the head of the Bolan pass, which included Quetta and the surrounding country, was occupied and, in 1879, by the Treaty of Gandamak, Sibi and Peshin were annexed. In 1891, Sir Robert Sandeman extended British authority over the Zhob valley, situated between Peshin and the old frontier of India. Ultimately Baluchistan was incorporated in the British empire, and its boundaries with Persia and Afghanistan were fixed by a series of commissions, the three states meeting at the peak termed Kuh-i-Malik-i-Siah, situated some sixty miles to the south of Sistan.

In 1893, the outrageous behaviour of the khan, who ill-treated his officials, necessitated his deposition and he was succeeded by his son. Some years later, it was decided to open up a trade route to Sistan and the district of Nushki was ceded by the khan, who received an annuity on this account as also for the Quetta district. The caravan route to Sistan was opened up in the face of great physical difficulties, which included lack of drinkable water and of supplies, a predatory population and similar conditions on the Persian side of the frontier. However, thanks to British energy, a trade route was opened, which not only developed commerce, but quieted the wild tribesmen. During World War I, the railway line, which had been extended to Nushki, was continued to the Persian frontier. (P. M. S.)

WORLD WAR I

The frontiers of Baluchistan may be considered to be international. To the north runs the border of Afghanistan for 720 mi. and, to the west, that of Persia for 520 mi. To the south, there are 470 mi. of coastline on the Arabian Sea. On the east, there is a frontier 900 mi. in length with the Indian provinces of Sind, the Punjab, the north-west frontier, and, last but not least, the 40 mi. of border with Waziristan, a source of constant trouble.

An attack on India by a Turkish army, led by German superior officers, figured prominently in the Asiatic program of the German Government. To prepare the way for it, German missions, supported by a force, were dispatched to Persia which, after driving out British officials, missionaries and business representatives from central and southern Persia by the end of 1915, used every means to promote risings and the assassination of British officials in Baluchistan. The fall of Kut in April 1916 constituted a terrible blow to British prestige, and it appeared probable that a wave of fanaticism would sweep across Baluchistan to India. Actually two British officers were assassinated in Makran, it is believed through German instigation.

On the outbreak of World War I, the chiefs, following the lead of the Khan of Kalat and the Jam of Las Bela, offered their resources in support of the British Raj. The Baluch and Brahui chiefs alike rendered willing service.

Owing to the disappearance of Persian authority in Persian Baluchistan, the Germans found it an excellent field for propaganda and for the organization of raids, although, of course, Kabul was their main objective. Professor Zugmeyer, German consul at Kerman, worked actively for this object.

To meet this danger missions were dispatched in 1916 under Brig.-Gen. Sir Percy Sykes to South Persia and under Maj. T. H. Keyes (afterwards Brig.-Gen. Sir Terence Keyes) into Persian Baluchistan. A cordon was also created along eastern Persia and a punitive expedition was sent under Brig.-Gen. R. E. Dyer against the Damanis of Sarhad. These measures proved successful in preserving the security of the frontier.

Internally, small expeditions were sent against rebellious tribes in Jhalawan in 1915 and 1916, and in February 1918 an open rebellion of the Marri tribe had to be suppressed by force of arms. Elsewhere the province remained loyal throughout the war, thus proving the soundness of the Sandeman system.

The assassination of King Habibulla of Afghanistan in February 1919 and the resultant outbreak of the Third Afghan War in May led to the breakdown of the militia system on the north-west frontier and Fort Sandeman, in the Zhob valley, was besieged by a mixed force of Waziris, Mahsuds and local tribesmen. The bazaar was sacked but the fort was stoutly held until relieved. Elsewhere raids along the Afghan border were numerous and caused intense anxiety but had no serious consequences.

After World War I the political history of Baluchistan was uneventful. Following the advice of the Simon Commission the British Government decided to leave the Province outside the orbit of the reformed Constitution of India, and the Sandeman system, to which Baluchistan owes all the security, prosperity and happiness of its recent history, remains in force.

Mention must be made of the earthquakes in 1931 and 1935. The former, while doing great material damage, caused comparatively little loss of life. The latter, which occurred at 3 a.m. on May 31, was a disaster of the first magnitude in both respects. It had its epicentre in or near Quetta and the town was completely destroyed with an estimated loss of 20,000 lives. A remarkable feature was that the adjoining cantonment of 10,000 troops, though severely shaken, was little damaged and there was no loss of life except in the R.A.F. lines where over 200 personnel

were killed. Mastung, the administrative headquarters of the Kalat state, was destroyed with a loss of 3,000 persons, and the historic fort of Kalat, 90 miles N.W. of Quetta, which had stood for 200 years, was reduced to ruins. At this point the earthquake had spent its main force, but practically every village between Quetta and Kalat was destroyed.

Owing to its geological formation Baluchistan has long been thought to be an oil-bearing country of great possibilities. In recent years prospecting licences have been granted over wide areas, but little work has been done and the existence of oil in payable quantities is still to be proved. (A. B. D.; X.)

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BALUCHISTAN (PERSIAN), the southern and eastern portion of the Persian province of Kirman consisting of the western part of Baluchistan (*q.v.*), in its wider sense. Persian Baluchistan covers an area of about 60,000sq.m. and lying along the northern shore of the Gulf of Oman, is bounded on the east by British Baluchistan, the frontier of which was finally demarcated in 1895–96; while on the north it extends towards Seistan, and westward runs with the provinces of Fars and Kerman. It originally formed part of the khanat of Kalat, but was gradually conquered by Persia after the rise of the Kajar dynasty, and is strictly speaking the western portion of Makran and shares its physical characteristics. The country has little water and only a very small part of it is under cultivation, the remainder being composed of arid plains, deserts and a labyrinth of mountains which in places attain an elevation of 6,000ft. The rivers flowing into the sea are unimportant and dry during part of the year. It is sparsely inhabited, but the limits of the region are too vague for any precise estimate to be made of its population. The district enjoyed a quasi-independence until, in the reign of Mohammed Shah (1834–44), a chief of Bampur attempted a raid into Kerman and was overcome. In 1849 a rising again took place, when Bampur itself was taken and since that time has been held by Persia. The principal ports are Charbar and Jask; the principal towns, Bam (*q.v.*), Bampur (*q.v.*), Bint, Fanoch and Kaih.

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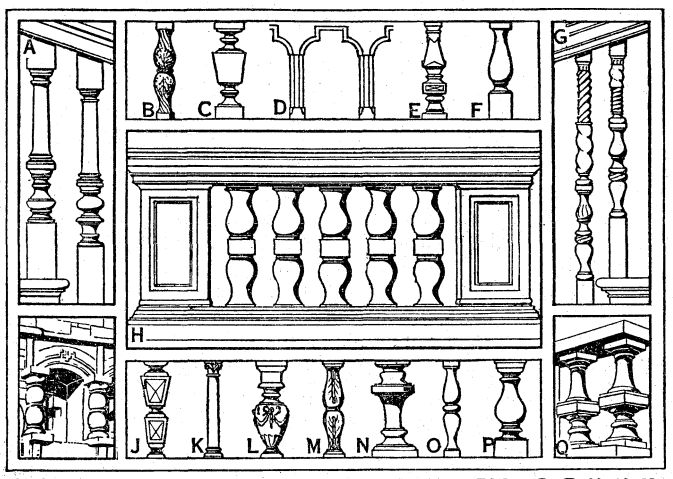
BALUE, JEAN (*c.* 1421–1491), French cardinal and minister of Louis XI, was born of very humble parentage at Angle in Poitou. He became almoner to Louis XI, in 1465 bishop of Evreux, and in 1467 cardinal. About that time Balue was compromised in the king's humiliation by Charles the Bold at Péronne and excluded from the council. He then intrigued with Charles against his master; their secret correspondence was intercepted, and on April 23 1469, Balue was thrown into prison, where he remained eleven years, but not, as has been alleged, in an iron cage. In 1480, through the intervention of Pope Sixtus IV., he was set at liberty, and from that time lived at the court of Rome. He received the bishopric of Albano and afterwards that of Palestrina. In 1484 he was even sent to France as legate *a latere*. He died at Ancona in 1491.

See Henri Forgeot, "Jean Balue, cardinal d'Angers" (1895), in the *Bibliothèque de l'école des hautes études.*

BALUSTER (sometimes incorrectly written "banister"), one of a series of small posts supporting the coping or hand-rail of a parapet or railing. Colonnettes are shown as balusters in Assyrian palaces by contemporary bas-reliefs and are similarly used in many railings of the Gothic period. Although no Greek or Roman example of the baluster is known, the Italian Renaissance designers made great use of it, employing, instead of the mediaeval colonnette, forms richly moulded and usually round. The Renaissance balusters generally had a capital, a base and a vase-shaped form between. In early Renaissance work a form similar to two vases set base to base is frequent. The later Renaissance architects codified balusters into orders like columns, and those of the Baroque went to the other extreme of fantasy in baluster form. The term baluster shaft is used of any similar vertical shaft such as those which are to be found dividing the windows in Saxon work.



A, G: Georgian Colonial (G, Hancock House, Boston, 1737). B, F, H, K, M, O, P: Italian Renaissance (H, Library of St. Mark's, Venice, *c.* 1550). C, E, N: modern baroque variations. D: French Gothic, Chartres Cathedral (13th century). I: Saxon Romanesque. J, L: Italian baroque. Q: modern French

BALUSTRADE, a parapet or railing (often merely decorative), consisting of a coping or rail supported by balusters (*q.v.*). In Renaissance balustrades the balusters are usually divided into groups by the interposition of a large square post or pedestal. The word is incorrectly used for any masonry rail.

BALUZE, ÉTIENNE (1630–1718), French scholar, was born at Tulle on Nov. 24, 1630, and died in Paris on July 28, 1718. The works which place him in the first rank of the scholars of his time are the *Capitularia Regum Francorum* (1674; new edition enlarged and corrected in 1780); the *Nova Collectio Conciliorum* (1677); the *Miscellanea* (1678–1715; new edition revised by Mansi, 1761–64); the *Letters of Pope Innocent III.* (1682); and, finally, the *Vitae Paparum Avenionensium, 1305-94* (1693).

But he was unfortunate enough to take up the history of Auvergne just at the time when the Cardinal de Bouillon, inheritor of the rights, and above all of the ambitious pretensions of the La Tour family, was endeavouring to prove the descent of that house in the direct line from the ancient hereditary counts of Auvergne of the 9th century. The documents forged to support the cardinal's claim by Jean le Bar deceived many great scholars, but were declared spurious by the courts in 1704. Nevertheless, in two works published in 1705 and in 1709 Baluze made use of the forged documents. Baluze was deprived of his appointments and compelled to leave Paris, though he was allowed eventually to return.

The history of the forgeries committed in the interests of the house of Bouillon forms a curious and instructive episode in the history of French scholarship in the time of Louis XIV. It is to be found in the *Manuel de diplomatique* by A. Giry; and above all in a note to the *Oeuvres de Saint-Simon* by M. de Boislisle (vol. xiv. pp. 533–558). The bibliography of Baluze's researches has been made by M. René Fage (1882, 1884) and his *Life* told by M. Émile Fage (1899). To these we must add an amusing book by G. Clément-Simon, *La Gaieté de Baluze; documents biographiques et littéraires* (1888). Baluze's will has been published by M. Léopold Delisle (*Bibliothèque de l'École de Chartes*, 1872); his papers are now in the Bibliothèque Nationale in Paris, and in the Bibliothèque de l'Arsenal (*Revue historique*, t. xcviii. p. 309). *See* also the article by Arthur de Boislisle in the *Revue des questions historiques* for Oct. 1908. (C. BEM.)

BALZAC, HONORÉ DE (1799–1850), French novelist, was born at Tours on the 20th of May 1799. His father, Bernard François, never called himself *de* Balzac and Honoré only assumed the particle after 1830. But the father had equally little right to the name of Balzac at all, for his birth-certificate has been discovered. The true name was "Balssa," and this in various forms ("Balsa," "Balsas") has been traced for more than a century before the novelist's birth as that of a family of day-labourers or very small peasant proprietors in the parish of Canezac, department of the Tarn. It is probable that the novelist

himself was not aware of this, and his father appears to have practised some mystification as to his own professional career. In and after the Revolution, however, he actually attained positions of some importance in the commissariat and hospital departments of the army, and he married in 1797 Anne Charlotte Laure Sallambier, who was a beauty, an heiress and a woman of considerable faculty. She survived her son; the father died in 1829. There were two sisters (the elder, Laure, afterwards Madame Surville, was her brother's favourite and later his biographer), and a younger brother, Henri, of whom we hear little and that little not very favourable.

Honoré was put out to nurse till he was four years old, and in 1806, when he was seven, was sent to the *collège* (grammar school) of Vendôme, where he remained till April 1813 as a strict boarder without any holidays. From this he passed as a day-boy to the *Collège* of Tours. His father's official work was transferred to Paris the year after, and Balzac came under the teaching of a royalist private schoolmaster, M. Lepitre, and others. He left school altogether in 1816, being then between seventeen and eighteen. His experiences at Vendôme served as base for much of *Louis Lambert,* and he seems to have been frequently in disgrace. Later, his teachers appear to have found him remarkable neither for good nor for evil. He was indeed never a scholar; but he must have read a good deal, and as he certainly had no time for it later, much of this reading must have been done early.

The profession which Balzac's father chose for him was the law; and he not only passed through the schools thereof, and duly obtained his *licence,* but had three years' practical experience in the offices of a notary and a solicitor (*avoué*), for the latter of whom, M. Guillonnet-Merville, he seems to have had a sincere respect. But though no man of letters has ever had, in some ways, such a fancy for business, no man of business could ever come out of such a born man of letters. And when in 1820 (the *licence* having been obtained and M. Balzac, senior, having had some losses) the father wished the son to become a practising lawyer in one or another branch, Honoré revolted. His family had left Paris, and they tried to starve him into submission by establishing him in a garret with a very small allowance. Here he began to write tragedies, corresponded (in letters which have fortunately been preserved) with his sister Laure, and, most important of all, attempted something in prose fiction. The tragedy *Cromwell* was actually completed and read to friends if not to others; nay more, the manuscript exists in the hands of M. Spoelberch de Lovenjoul, the great authority on Balzac's life and bibliography; but it has never been published.[1] The novels, *Cocqsigrue* and *Stella,* proved abortions, but were only the first of many attempts at his true way until he found it. Drama he never abandoned; but for him it was always an error.

The garret-period from 1820 to 1822 was succeeded by another of equal length at home, but before it had finished (1821) he found his way into print with the first of the singular productions which (and that not entirely or finally) have taken a sort of outside place in his works under the title of *Oeuvres de jeunesse.* The *incunabula* of Balzac were *Les Deux Hector, ou Les Deux Familles bretonnes,* and *Charles Pointel, ou Mon Cousin de la main gauche.* They were followed next year by six others:—*L'Héritière de Birague; Jean Louis, ou La Fille trouvée; Clotilde de Lusignan, ou Le Beau Juif; Le Centenaire, ou Les Deux Beringheld; Le Vicaire des Ardennes; Le Tartare, ou Le Retour de l'exilé.* And these were again followed up in 1823 by three more: *La Dernière Fée, ou La Nouvelle Lampe merveilleuse; Michel et Christine et la suite; L'Anonyme, ou Ni père ni mère.* In 1824 came *Annette et le criminel,* a continuation of the *Vicaire;* in 1825, *Wann-Chlore,* which afterwards took the less extravagant title of *Jane la pâle.* These novels, which filled some two score volumes originally, were published under divers pseudonyms ("Lord R'hoone," an anagram of "Honoré," "Horace de Saint Aubin" etc.), and in actual collaboration with two or three other writers. But though there is not yet in them anything more than the faintest dawn of the true Balzac, though no one of them is good as a whole, and very few parts deserve that word except with much qualification, they deserve far more study than they have usually received, and it is difficult to apprehend the true Balzac until they have been studied. They ceased for a time, not because of the author's conviction of their badness (though he entertained no serious delusions on this subject), nor because they failed of a certain success in actual money return, but because he had taken to the earliest, the most prolonged, and the most disastrous of his dabblings in business—this time as a publisher to some extent and still more as a printer and type-founder. Not very much was known about his experiences in this way (except their general failure, and the result in hampering him with a load of debt directly for some ten years and indirectly for the whole of his life) till in 1903 MM. Hanotaux and Vicaire published the results of their inquiries into the actual accounts of the concern. There seems to have been no reason why it should not have succeeded, and there has been claimed for it first, that it provided Balzac with a great amount of actual detail which he utilized directly in the novels, and secondly, that it gave him at whatever cost a still more valuable experience of practical life—the experience which has so often been wanting to men of letters. Anyhow, from 1825 to 1828, the future author of the *Comédie humaine* was a publisher, printer and type-founder; and in the last year he had to abscond, or something like it, under pressure of debts which were never fully settled till 1838, and then by a further obligation of ninety thousand francs, chiefly furnished by his mother and never repaid to her.

It was Balzac's habit throughout his life to relieve the double pressure of debt and of work by frequent excursions into the country and abroad. On this occasion he fled to Brittany with an introduction to a M. and Mme. de Pommereul, who received him hospitably in their château near Fougères. Here he obtained some of the direct material, and most of the scenery and atmosphere, for what he himself recognized as his first serious attempt in novel-writing, *Les Chouans,* or, as it was at first called, *Le Dernier Chouan.* This book (obviously written in direct following of Scott, of whom Balzac was a lifelong admirer) has been very variously judged—those who lay most stress on his realism thinking little of it, while those who maintain that he was always a romantic "with a difference" place it higher. It has at any rate brilliant colouring, some very vivid scenes, and almost more passion as well as "curtain" at its ending than any other of his books. Though not without a touch of melodrama it differs utterly from the confused and tedious imitations of Mrs. Radcliffe, M. G. Lewis and C. R. Maturin which fill most of the *Oeuvres de jeunesse.* At the same time Balzac was engaged on a very different work, the analytic-satirical sketches which compose the *Physiologie du mariage,* and which illustrate his other and non-romantic side, again with some crudity, but again also with a vast advance on his earlier productions. Both were published in the year 1829, from which his real literary career unquestionably starts. It had exactly twenty-one years to run.

The history of these twenty-one years, though (in consequence mainly of the diligence and luck as a collector of the above-named M. de Lovenjoul) the materials for it are large and constantly accumulating, has never been arranged in a really standard biography, and there seems to be an increasing habit of concentrating the attention on parts of it. It divides itself under three heads mainly, the history of Balzac's business affairs, that of his loves and friendships and that of his actual work. The first has some small resemblance to Scott's similar experiences, though in Balzac's case there was no great crash but a lifelong pressure; on the other hand, his debts were brought upon him by a long course not so much of extravagance in actual expenditure (though there was something of this) as of financial irregularities of almost every description,—anticipations of earnings, costly methods of production (he practically wrote his novels on a succession of printed revises), speculations, travel, and lastly the collection of curiosities. As regards the second, although his fashion of life made him by terms a hermit and a vagrant, he was on good terms with most of the famous men of letters of his day from Hugo

[1] Since this article was written for the 11th edition of the *Encyclopædia Britannica* a facsimile edition of *Cromwell* has been published, with introduction etc. by W. S. Hastings (Princeton, 1925).

downwards, and seems never to have quarrelled with any man, except with some of his editors and publishers, by his own fault. Balzac was indeed, in no belittling sense of the word, one of the most good-natured of men of genius. But his friendships with the other sex are of much more importance, and not in the least matters of mere gossip. His sister Laure, as has been said, and a school-friend of hers, Mme. Zulma Carraud, played important and not questionable parts as his correspondents. But at least three ladies, all of a rank higher than his own, figure as his "Egerias" to such an extent that it is hardly extravagant to say that Balzac would not have been Balzac without them. These are Madame de Berny, a lady connected with the court of the *ancien régime,* much older than himself and the mother of nine children, to whom he was introduced in 1821, who became to him *La dilecta,* who was the original of Mme. de Mortsauf in *Le Lys dans la vallée,* and who seems to have exercised an excellent influence on him in matters of taste till her death in 1836; the marquise de Castries, who took him up for a time and dropped him, and who has been supposed to have been his model for his less impeccable ladies of fashion; and lastly, the Polish-Russian countess Evelina Hanska, who after addressing, as *l'Étrangère,* a letter to him as early as 1832, became his idol, rarely seen but constantly corresponded with, for the last eighteen years, and his wife for the last few months of his life. Some of his letters to her have long been known, but the bulk of them constituted the greatest recent addition to our knowledge of him as given in the two volumes of *Lettres à l'étrangère.* Of hers we have practically none and it is exceedingly hard to form any clear idea of her, but his devotion is absolutely beyond question.

Business, friendship and love, not to speak of other things, were in Balzac's case always connected with and on the whole quite secondary to work. He would even sometimes resist the commands by which at long intervals Mme. Hanska would summon him to see her, and abstract the greater part of his actual visits to her in order to serve this still more absorbing mistress. He had, as we have seen, worked pretty hard, even before 1829, and his work had partly taken forms not yet mentioned—political pamphlets and miscellaneous articles which are now accessible in the *Édition définitive* of his works, and hardly one of which is irrelevant to a just conception of him. Nor did he by any means abandon these by-works after 1829; indeed, he at one time started and almost entirely wrote, a periodical called the *Revue parisienne.* He wrote some dramas and planned many more, though the few which reached the stage left it again promptly. Balzac's dramas, as they appear in his works, consist of *Vautrin, Les Ressources de Quinola, Paméla Giraud* (arranged for the stage by others), *La Marâtre* and *Mercadet le faiseur,* the last of which has, since his death, been not unsuccessful. But on the whole he did devote himself to his true vocation, with a furious energy beside which even Scott's, except in his sadder and later days, becomes leisurely. Balzac generally wrote (dining early and lightly, and sleeping for some hours immediately after dinner) from midnight till any hour in the following day—stretches of sixteen hours being not unknown, and the process being often continued for days and weeks. Besides his habit of correcting a small printed original into a long novel on the proofs, he was always altering and re-shaping his work, even before, in 1842, he carried out the idea of building it all into one huge structure—the *Comédie humaine* with its subdivisions of *Scènes de la vie parisienne, Études philosophiques, etc.* Much pains have been spent upon this title and Balzac's intentions in selecting it. But the "Human Comedy," as a description for mere studies of life such as his, will explain itself at once or else can never be explained.

Of its constituents, however, some account must be given, and this can be best done through an exact and complete list of the whole work by years, with such abbreviated notes on the chief constituents as may lead up to a general critical summary. Of the two capital works of 1829, we have spoken. 1830, the epoch year, saw part (it was not fully published till the next) of *La Peau de chagrin,* one of the crudest, but according to some estimates, one of the greatest of the works, full of romantic extravagance and surplusage, but with an engrossing central idea—the Nemesis of accomplished desire—powerfully worked out; *La Maison du chat qui pelote,* a triumph of observation and nature, together with a crowd of things less in bulk but sometimes of the first excellence —*El Verdugo, Étude de femme, La Paix du ménage, Le Bal de sceaux, La Vendetta, Gobseck, Une Double Famille, Les Deux Rêves, Adieu, L'Élixir de longue vie, Sarrazine, Une Passion dans le désert* and *Un Épisode sous la Terreur.* In 1831, *La Peau de chagrin* appeared complete, accompanied by *Le Réquisitionnaire, Les Proscrits, Le Chef-d'oeuvre inconnu* (a masterpiece fortunately not unrecognized), *Jésus Christ en Flandre* and *Maître Cornélius.* 1832 gave *Madame Firmiani, Le Message, Le Colonel Chabert* and *Le Curé de Tours* (two stories of contrasted but extraordinary excellence), *La Bourse, La Femme abandonnée, Louis Lambert* (autobiographical and philosophic), *La Grenadière* and *Les Marana* (a great favourite with the author). In 1833 appeared *Ferragus chef des dévorants,* the first part of *L'Histoire des treize* (a collection in the more extravagant romantic manner, very popular at the time, and since a favourite with some, but few, good judges), *Le Médecin de campagne* (another pet of the author's, and a kind of intended document of his ability to support the cause of virtue, but, despite certain great things, especially a wonderful popular "legend of Napoleon," a little heavy as a whole), the universally admitted masterpiece of *Eugénie Grandet,* and *L'Illustre Gaudissart* (very amusing). 1833 also saw the beginning of a remarkable and never finished work—out of his usual scope but exceedingly powerful in parts—the *Contes drolatiques,* a series of tales of Old France in Old (or at least Rabelaisian) French, which were to have been a hundred in number but never got beyond the third batch of ten. They often borrow the licence of their 15th and 16th century models; but in *La Succube* and others there is undoubted genius and not a little art. 1834 continued the *Treize* with *La Duchesse de Langeais* and added *La Recherche de l'absolu* (one of Balzac's great studies of monomania, and thought by some to be the greatest, though others prefer *Le Chef-d'oeuvre inconnu*), *La Femme de trente ans* (the chief example of the author's caprice for re-handling, and very differently judged as a whole), with yet another of the acknowledged triumphs, *Le Père Goriot.* On the whole, this year's work, though not the author's largest, is perhaps his most unique. Next year (1835) followed *Melmoth réconcilié* (a tribute to the great influence which Maturin exercised, not over Balzac only, at this time in France), *Un Drame au bord de la mer,* the brilliant, if questionable, conclusion of *Les Treize, La Fille aux yeux d'or, Le Contrat de mariage* and *Séraphita.* This last, a Swedenborgian rhapsody of great beauty in parts, has divided critics almost more than anything else of its writer's, some seeing in it (with excuse) nothing but the short description given above in three words, the others (with justice) reckoning it his greatest triumph of style and his nearest attempt to reach poetry through prose. 1836 furnished *La Messe de l'athée, Interdiction, Facino Cane, Le Lys dans la vallée* (already referred to and of a somewhat sickly sweetness), *L'Enfant maudit, La Vieille Fille* and *Le Secret des Ruggieri* (connected with the earlier *Les deux Rêves* under the general title, *Sur Cathérine de Médicis,* and said to have been turned out by Balzac in a single night, which is hardly possible). In 1837 were published *Les Deux Poètes,* destined to form part of *Illusions perdues, Les Employés, Gambara* and another capital work, *Histoire de la grandeur et de la décadence de César Birotteau,* where Balzac's own unlucky experiences in trade are made thoroughly matter of art. 1838 was less fruitful, contributing only *Le Cabinet des antiques,* which had made an earlier partial appearance, *La Maison Nucingen* and *Une Fille d'Ève.* But 1839 made amends with the second part of *Illusions perdues, Un Grand Homme de province à Paris* (one of Balzac's minor diplomapieces), *Le Curé de village* (a very considerable thing), and two smaller stories, *Les Secrets de la princesse de Cadignan* and *Massimilla Doni. Pierrette, Z. Marcas, Un Prince de la Bohème* and *Pierre Grassou* followed in 1840, and in 1841 *Une Ténébreuse Affaire* (one of his most remarkable workings-up of the minor facts of actual history), *Le Martyr Calviniste* (the conclusion of *Sur Cathérine de Médicis*), *Ursule Mirouet* (an admirable story), *La Fausse Maîtresse* and *Mémoires de deux jeunes ma-*

riées, on which again there have been very different opinions. 1842 supplied *Albert Savarus* (autobiographical largely), *Un Début dans la vie,* the very variously named and often rehandled *Rabouilleuse* (which, since Taine's exaltation of it, has often been taken as a Balzacian quintessence), and *Autre étude de femme,* yet another rehandling of earlier work. In 1843 came the introduction of the completed *Sur Cathérine de Médicis, Honorine* and *La Muse du Département* (almost as often reconstructed as *La Femme de trente ans*), with *Comment aiment les jeunes filles* (a similar rehandling intended to start the collected *Splendeurs et misères des courtisanes*), and a further instalment of *Illusions perdues, Les Souffrances d'un inventeur.* Three out of the next four years were astonishingly fruitful. 1844 gave *Modeste Mignon* (a book with a place to itself, and said to be founded on a story actually written by Madame Hanska), *Gaudissart II., A combien l'amour revient aux vieillards* (a second part of the *Splendeurs*), *Béatrix* (one of the most powerful if not of the most agreeable), and the first and very promising part of *Les Paysans.* Only *Un Homme d'affaires* came out in 1845, but this was made up in 1846 by *Les Comédiens sans le savoir* (sketched earlier), another part of the *Splendeurs, Où mènent les mauvais chemins,* the first part of *Les Parents pauvres, La Cousine Bette* (sometimes considered the topmost achievement of Balzac's genius), and the final form of a work first issued fifteen years earlier and often retouched, *Petites misères de la vie conjugale.* 1847 was even richer, with *Le Cousin Pons* (the second part of *Les Parents pauvres,* and again a masterpiece), the conclusion of the *Splendeurs, La Dernière Incarnation de Vautrin, L'Envers de l'histoire contemporaine* (which had been on and off the stocks for five years), and the unfinished *Député d'Arcis.* This was the last scene of the comedy that appeared in the life of its author. The conclusion of the *Député d'Arcis,* published in 1853, and those of *Les Paysans* and *Les Petits Bourgeois* which appeared, the first in this year, the second wholly in 1855, are believed or known to be by Balzac's friend, Charles Rabou (1803–1871).

This immense and varied total stands to its author in a somewhat different relation from that of any other work to any other writer. It has been well said that the whole of Balzac's production was always in his head together; and this is the main justification for his syllabus of it as the "Comedy." Some part never came out of his head into print; we have numerous titles of work (sometimes spoken of in his letters as more or less finished) of which no trace remains, or only fragmentary ms. sketches. One apparently considerable book, *La Bataille,* which was to be devoted to the battle of Essling, and for which he actually visited the ground, is frequently referred to as in progress from the time of his early letters to Madame Hanska onwards; but it has never been found. Another result of this relation was the constant altering, re-shaping, re-connecting of the different parts. That if Balzac had lived as long as Hugo, and had preserved his faculties as well, he could never have finished the *Comédie,* is of course obvious: the life of Methuselah, with the powers of Shakespeare, would not suffice for that. But that he never *would*—even if by some impossibility he *could*—is almost equally certain. Whether there is any mark of decline in his latest work has been disputed, but there could hardly have been farther advance, and the character of the whole, not easy to define, is much less hard to comprehend, if prejudice be kept out of the way. That character was put early, but finally, by Victor Hugo in his funeral discourse on Balzac, whose work he declared, with unusual terseness, among other phrases of more or less gorgeous rhetoric, to be "observation *and* imagination." It may be doubted whether all the volumes written on Balzac (a reasoned catalogue of the best of which will be found below) have ever said more than these three words, or have ever said it more truly if the due stress be laid upon the "and." On the other side, most of the mistakes about him have arisen from laying undue stress on one of the two qualities, or from considering them separately rather than as inextricably mixed and blended. It is this blending which gives him his unique position. He is an observer of the most exact, the most minute, the most elaborate; but he suffuses this observation with so strange and constant an imaginative quality that he is, to some careful and experienced critics, never quite "real"—or almost always something more than real. He seems accustomed to create in a fashion which is not so much of the actual world as of some other, possible but not actual—no matter whether he deals with money or with love, with Paris or with the provinces, with old times or with new. A further puzzle has arisen from the fact that though Balzac has virtuous characters, he sees humanity on the whole "in black"; and that, whether he actually prefers the delineation of vice, misfortune, failure, or not, he produces as a rule in his readers the sensation familiarly described as "uncomfortable." His morality has been fiercely attacked and valiantly defended, but it is absolutely certain that he wrote with no immoral intention, and with no indifference to morality. In the same way there has been much discussion of his style, which seldom achieves beauty, and sometimes falls short of correctness, but which still more seldom lacks force and adequacy to his own purpose. On the whole, to write with the shorthand necessary here, it is idle to claim for Balzac an absolute supremacy in the novel, while it may be questioned whether any single book of his, or any scene of a book, or even any single character or situation, is among the very greatest books, scenes, characters, situations in literature. But no novelist has created on the same scale, with the same range; none has such a cosmos of his own, pervaded with such a sense of the originality and power of its creator.

Bálzac's life during these twenty years of strenuous production has, as regards the production itself, been already outlined, but its outward events, its distractions or avocations—apart from that almost weekly process of "raising the wind," of settling old debts by contracting new ones, which seems to have taken up no small part of it—must now be shortly dealt with. Besides constant visits to the Margonne family at Saché in Touraine, and to the Carrauds at Frapesle in Berry, he travelled frequently in France. He went in 1833 to Neuchâtel for his first meeting with Madame Hanska, to Geneva later for his second, and to Vienna in 1835 for his third. He took at least two flights to Italy, in more or less curious circumstances. In 1838, he went on a journey to Sardinia to make his fortune by melting the silver out of the slag-heaps of Roman mines—a project, it seems, actually feasible and actually accomplished, but in which he was anticipated. The year before, tired of Paris apartments, he had bought ground at Ville d'Avray, and there constructed, certainly at great, though perhaps exaggerated expense, his villa of Les Jardies, which figures largely in the Balzacian legend. His rash and complicated literary engagements, and (it must be added) his disregard of them when the whim took him, brought him into frequent legal difficulties, the most serious of which was a law-suit with the *Revue de Paris* in 1836. In 1831, and again in 1834, he had thought of standing for election as Deputy, and in the latter year he actually did so both at Cambrai and Angoulême; but it is not certain that he received any votes. He also more than once took steps to become a candidate for the Academy, but retired on several occasions before the voting, and when at last, in 1849, he actually stood, he only obtained two votes.

As early as the Genevan meeting of 1833, Madame Hanska had formally promised to marry Balzac in the case of her husband's death, and this occurred at the end of 1841. She would not, however, allow him even to visit her till the next year had expired, and then, though he travelled to St. Petersburg and the engagement was renewed after a fashion, its fulfilment was indefinitely postponed. For some years Balzac met his beloved at Baden, Wiesbaden, Brussels, Paris, Rome and elsewhere. Only in September 1847 was he invited on the definite footing of her future husband to her estate of Wierzschovnia in the Ukraine; and even then the visit, interrupted by one excursion to Paris and back, was prolonged for more than two years before (on the 14th of March 1850) the wedding actually took place. But Balzac's own *Peau de chagrin* was now reduced to its last morsel. His health, weakened by his enormous labours, had been ruined by the Russian cold and his journeyings across Europe. The pair reached the house at Paris in the rue Fortunée, which Balzac had bought for his wife and filled with his collections, at the end of May. On Sunday, the 17th of August, Victor Hugo found Balzac dying,

attended by his mother, but not by his wife. He actually died at half-past eleven that night and was buried on the 20th, the pall-bearers being Hugo himself, Dumas, Sainte-Beuve (an enemy, but in this case a generous one) and the statesman Baroche, in Père Lachaise, where Hugo delivered the speech cited above.

(G. SA.)

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BALZAC, JEAN LOUIS GUEZ DE (1594–1654), French author, was born at Angoulême. At the age of 18 he travelled in Holland with Théophile de Viaud, with whom he later exchanged bitter recriminations. He was early befriended by the duc d'Épernon and his son Louis, cardinal de la Valette, who took him to Rome. His letters written to his acquaintances, and to many who held high positions at the French court, gained for him a great reputation. Compliments were showered upon him, and he became an habitué of the Hôtel de Rambouillet. Richelieu was lavish of praise and promises, but never offered Balzac the preferment he expected. In 1624 a collection of his *Lettres* was published, and was received with great favour. From the château of Balzac, whither he had retired, he continued to correspond with Jean Chapelain, Valentin Conrart and others. In 1634 he was elected to the Academy. His fame rests chiefly upon the *Lettres,* a second collection of which appeared in 1636. *Recueil de nouvelles lettres* was printed in the next year. His letters, though empty and affected in matter, show a real mastery of style, introducing a new clearness and precision into French prose and encouraging the development of the language on national lines by emphasizing its most idiomatic elements. Balzac has thus the credit of executing in French prose a reform parallel to Malherbe's in verse.

In 1631 Balzac published a eulogy of Louis XIII, entitled *Le Prince;* in 1652 the *Socrate chrétien,* the best of his longer works; *Aristippe ou de la Cour* in 1658; and several dissertations on style.

His *Oeuvres* were collected in 1665 by Valentin Conrart. There are numerous English translations from Balzac, dating from the 17th century.

BAM, a town of Iran in the province of Kerman, situated about 120 mi. southeast of Kerman on the western edge of the great salt desert, Dasht-i-Lut, at an elevation of 3,600 ft. Population *c.* 10,000.

The modern town, which may be described as an agglomeration of houses and extensive gardens and date groves with post and telegraph offices, stands on both banks of the river Bam, and is unfortified. In the middle ages the great trade routes from Tiz, Siraf and Hormuz converged at Bam, where the caravans rested before they attempted the passage of the desert tract which intervened before they could reach the fertile lands of the Helmund.

Outside the town stands the famous fortified citadel which owed its strength to the Afghans who took Bam in 1719 and were not finally expelled until 1801. Almost all the henna used in Iran is grown in this district.

See also BALUCHISTAN (Persian).

BAMAKO (12° 42′ N., 7° 58′ W.), capital of French Sudan colony and the most populous inland centre of French West Africa (21,000 Africans and 1,000 Europeans, official est. 1936). Located immediately above the rapids that separate the Upper Niger river from the Great Bend (or Middle Niger), it is the focus of transportation in western Sudan, comprising: (1) an airfield on which an air force squadron is based; (2) radiating, all-weather roads, both local and inter-colonial; (3) the terminus of through trains from Dakar, Senegal; (4) boat service from the foot of navigation on the Upper Niger to Kouroussa, head of navigation, where a rail line connects with Conakry, French Guinea; (5) connection via 36 mi. of rail with the navigable Middle Niger. Ferry service crosses the river. During the dry season, a motor road with short bridges over channels winds across the rocks that cause the rapids; high water of the rainy season submerges this road.

An African settlement at the head of the rapids may have been an early capital of Sudanese empires. In 1883, a battle fought there brought French authority to the Nigerian Sudan. A fort then erected became the base for conquest of the Great Bend region; and a telegraph line from Kayes, head of navigation on the Senegal river and previous base of operations, pioneered the railroad, which was begun soon afterward and completed to the Atlantic in 1924.

The commercial core of the modern city has grown around the railroad station. European stores, public and semipublic services, and residences of a good many European inhabitants are intermingled. On the downstream side, a wide street of "Syrian" shops and homes separates the central town from the main African quarter, the ancient settlement. Upstream the European centre is flanked by another settlement of Africans. All three lie along the edge of the valley, being separated from the river by a belt of gardens that occupies land subject to flood during the wet season. The heavy rains are drained off the flat townsite by ditches bordering the main streets, some being as much as 10 ft. deep.

The villas of European residents, government house, and other administrative buildings, stand on a breezy red sandstone "plateau," a few score feet above the rest of the city. Several public and commercial buildings are made of this stone, but construction is generally of adobe, with the flat roofs characteristic of Sudanese architecture. Government services include water and electricity, a hospital and the headquarters for research on animal diseases in French West Africa. In 1929 the Sotuba canal, taking off above the rapids, began the irrigation of the initial reclamation project of the Great Bend region, furnishing electric power to Bamako, the trade centre for the newly developing farmlands. The city is also the clearinghouse for an ancient placer gold mining district about 100 mi. up the Niger, worked during the dry season by migrant cultivators from all that part of the Sudan.

(D. WH.)

BAMBERG, a town and archiepiscopal see of Germany, in the *Land* of Bavaria. Pop. (1939) 59,284. It lies on an open plain on the river Regnitz, 2 mi. above its junction with the Main, and 39 mi. north of Nuernberg. Bamberg, first mentioned in 902, grew up by the castle (Babenberch) which gave its name to the Babenberg (*q.v.*) family. On their extinction it passed to the Saxon house, and in 1007 the emperor Henry II founded the see. From the middle of the 13th century onward the bishops were princes of the empire. The see was secularized in 1802 and in 1803 assigned to Bavaria. The cathedral, a late Romanesque building with four imposing towers, founded in 1004 by the emperor Henry II, was later partially burned, and rebuilt in the 13th century. It contains the magnificent marble tomb of the founder and his wife, the empress Cunigunde, the work of Riemenschneider (*c.* 1500). Other noteworthy churches are the Jakobskirche, an 11th-century Romanesque basilica; St. Martinskirche; and Marienkirche (1320–87). The Michaelskirche, 12th-century Romanesque (restored) on the Michaelsberg, was formerly the church of a Benedictine monastery secularized in 1803. The most interesting bridge leading to the lower town is the *Obere Brücke* (1455), in the middle of which, on an artificial island, is the Rathaus (rebuilt 1744–56). The picturesque Old Palace (*Alte Residenz*) was built in 1591 on the site of an old residence of the counts of Babenberg. The New Palace (1698–1704) was formerly occupied by the prince-bishops. The schools include the lyceum for philosophy and Catholic theology (a survival of the university suppressed in 1803). The industries of the town include cotton spinning and weaving, silk spinning, the manufacture of shoes, calico and ropes. The market gardens of the neighbourhood are famous, and there is a considerable shipping trade by the river and the Ludwigskanal.

BAMBERGER, LUDWIG (1823–1899), German economist and politician, was born of Jewish parents at Mainz. After studying at Giessen, Heidelberg, and Göttingen, he entered on the practice of the law. When the revolution of 1848 broke out he took an active part as one of the leaders of the republican party in his native city, both as popular orator and as editor of one of the local papers. In 1849 he took part in the republican rising in the Palatinate and Baden; he was condemned to death, but escaped to Switzerland. The next years he spent in exile, at first in London, then in Holland; in 1852 he went to Paris, where he entered the bank of Bischoffheim and Goldschmidt, of which he became managing director, a post which he held till 1866, when the amnesty enabled him to return to Germany. He was elected a member of the Reichstag, where he joined the National Liberal party. In 1870, owing to his intimate acquaintance with France and with finance, he was summoned by Bismarck to Versailles to help in the discussion of terms of peace. In the German Reichstag he was the leading authority on matters of finance and economics, as well as a clear and persuasive speaker, and it was chiefly owing to him that a gold currency was adopted and that the German Imperial Bank was constituted; in his later years he wrote and spoke strongly against bimetallism. He was a free trader, and after 1878 refused to follow Bismarck in his new policy of protection, state socialism, and colonial development; in a celebrated speech he declared that the day on which it was introduced was a *dies nefastus* for Germany. He and a number of followers left the National Liberal party and formed the so-called "Secession" in 1880. He was one of the few prominent politicians who consistently maintained the struggle against state socialism on the one hand and democratic socialism on the other. In 1892 he retired from political life. Bamberger's most important works are those on the currency, on the French war-indemnity, his criticism of socialism and his apology for the Secession.

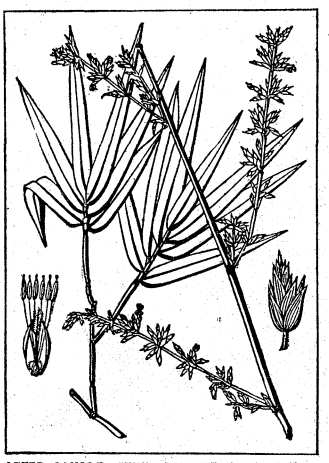
An edition of his collected works (including a French life of Bismarck in French, written as propaganda) was published in 1894. After his death appeared a volume of reminiscences, *Erinnerungen* . . . ed. P. Nathan (1899), which, though it does not extend beyond 1866, gives an interesting picture of his share in the revolution of 1848, and of his life in Paris. *See* also L. Hartwig, *Ludwig Bamberger, Eine biographische Skizze* (1900).

BAMBINO, IL (Ital. for "the Babe"), the name given in art to the image of the infant Jesus in swaddling clothes common in Roman Catholic churches.

BAMBOO, the popular name for members of the *Bambuseae,* a tribe of the grass-family (*Gramineae*). They are large, often tree-like, with woody stems. The stems spring from an underground root-stock and are often crowded to form dense clumps; the largest species reach 120ft. in height. The slender stem is hollow, and, as generally in grasses, has well-marked joints or nodes, at which the cavity is closed by a strong diaphragm. The branches are numerous and in some species spiny; the narrow, often short, leaf-blade is usually jointed at the base and has a short stalk, by which it is attached to the long sheath. The spikelets are usually many-flowered and variously arranged in racemes or panicles. The flower differs from that of the majority of grasses in having usually three lodicules and six stamens. Many species bloom annually, but others only at intervals sometimes of many years, when the individuals of one and the same species are found in bloom over large areas. Thus on the west coast of India the simultaneous blooming of *Bambusa arundinacea,* one of the largest species, has been observed at intervals of 32 years. After ripening of the seed, the leafless flowering culms always die down. The bamboo appears to be the most rapid growing of the higher plants. *Dendrocalamus giganteus* has been observed to grow 16in. in a day in Ceylon.

The *Bambuseae* contain numerous genera and occur throughout the tropical zone, but very unevenly distributed; they also extend into the sub-tropical and even into the temperate zone. Tropical Asia is richest in species; in Africa there are very few. In Asia they extend into Japan and to 10,000ft. or more on the Himalayas; and in the Andes of South America they reach the snow-line.

The fruit in *Bambusa, Arundinaria,* and other genera resembles the grain generally characteristic of grasses, but in *Dendrocalamus* and others it is a nut, while rarely, as in *Melocanna,* it is fleshy and suggests an apple in size and appearance. The uses to which all the parts and products of the bamboo are applied in Oriental countries are almost endless. The soft and succulent shoots, when just beginning to spring, are cut off and served up at table like asparagus. Like that vegetable, also, they are earthed over to keep them longer fit for consumption; and they afford a continuous supply during the whole year, though it is more abundant in autumn. They are also salted and eaten with rice, prepared in the form of pickles or candied and preserved in sugar. As the plant grows older, a species of fluid is secreted in the hollow joints, in which a concrete substance once highly valued in the East for its medicinal qualities, called *tabashir* or bamboo manna, is gradually developed. This substance, which is a purely siliceous concretion, is possessed of peculiar optical properties.



AFTER GAMBLE, "THE BAMBUSEAE OF BRITISH INDIA" FROM ANNALS OF THE ROYAL BOTANIC GARDENS, CALCUTTA

FIG. 1.—AN INDIAN BAMBOO, (BAMBUSA ARUNDINACEA) Narrow leaves and branch with inflorescence, shown in small figures

The grains of the bamboo are also used as food by the Chinese, and the Hindus eat it mixed with honey as a delicacy. It is, however, the stem of the bamboo which is applied to the greatest variety of uses. Joints of sufficient size form water buckets; smaller ones are used as bottles, and among the Dyaks of Borneo they are employed as cooking vessels. Bamboo is extensively used as a timber wood, and houses are frequently made entirely out of the products of the plant; complete sections of the stem form posts or columns; split up, it serves for floors or rafters; and, interwoven in lattice-work, it is employed for the sides of rooms, admitting light and air. The roof is sometimes of bamboo solely, and when split, which is accomplished with the greatest ease, it can be formed into laths or planks. It is employed in shipping of all kinds; some of the strongest plants are selected for masts of boats of moderate size, and the masts of larger vessels are sometimes formed by several joined bamboos.

The bamboo is employed in the construction of all kinds of agricultural and domestic implements and in the materials and implements required in fishery. Bows are made of it by the union of two pieces with many bands; and, the septa being bored out and the lengths joined together, it is employed in transmitting water to reservoirs or gardens. A joint forms a holder for papers or pens, and it was in a joint of bamboo that silk-worm eggs were carried from China to Constantinople during the reign of Justinian. The outer cuticle of Oriental species is so hard that it forms a sharp and durable cutting edge, and it is so siliceous that it can be used as a whetstone. This outer cuticle, cut into thin strips, is one of the most durable and beautiful materials for basket-making, and both in China and Japan it is largely so employed. Strips are also woven into cages, chairs, beds, and other articles of furniture, Oriental wickerwork in bamboo being unequalled for beauty and neatness of workmanship. In China, the interior portions of the stem are beaten into a pulp and used for the manufacture of the finer varieties of paper. Bamboos are imported to a considerable extent into Europe for the use of basket-makers, and for umbrella and walking-sticks. In short, the purposes to which the bamboo is applicable are almost endless, and well justify that "it is one of the most wonderful and most beautiful productions of the tropics, and one of Nature's most valuable gifts to uncivilized man." (A. R. Wallace, *The Malay Archipelago.*)

A number of species of bamboo are hardy under cultivation in the British Isles. A useful and interesting account of these and

their cultivation will be found in *The Bamboo Garden,* by A. B. Freeman-Mitford. They are mostly natives of China and Japan and belong to the genera *Arundinaria, Bambusa,* and *Phyllostachys,* but include a few Himalayan species of *Arundinaria.* They may be propagated by seed (though owing to the rare occurrence of fruit, this method is seldom applicable), by division, and by cuttings. They are described as hungry plants which well repay



THE BAMBOO, A TROPICAL GRASS OF WIDE AND VARYING USEFULNESS. BESIDES ITS EMPLOYMENT IN THE BUILDING OF HOUSES AND BRIDGES, THE STEM IS USED TO MAKE PAPER, FISHING RODS, WICKERWORK, ETC. THE YOUNG SHOOTS AND SEEDS ARE EATEN AS FOOD
Left, Stem of Bamboo showing external structure
Centre, Bamboo (*Bambusa vulgaris*)
Right, Detail of plant

generous treatment, and will flourish in a rich, not too stiff loam, and for the first year or two should be well mulched. They should be sheltered from winds and well watered during the growing period. When being transplanted the roots must be disturbed as little as possible.

Two species of bamboo, constituting the disappearing "canebrakes" of the Southern States, are native to the United States, and a number of others have been introduced. Because of danger from pests the introduction of living bamboos and bamboo seed from foreign countries has been forbidden since 1919, except importations made by the United States Department of Agriculture for experimental work. Bamboos thrive best in the cotton States and the west coast valleys of southern California. American uses for bamboo include fences, crates and other farm articles; raw material for commercial manufactures, including furniture, phonograph needles and various receptacles; and landscape ornamentation. Clump bamboos stand up against hurricanes much better than most other plants and trees. The shoots of the edible bamboo are being increasingly used for food, especially in spring salads.

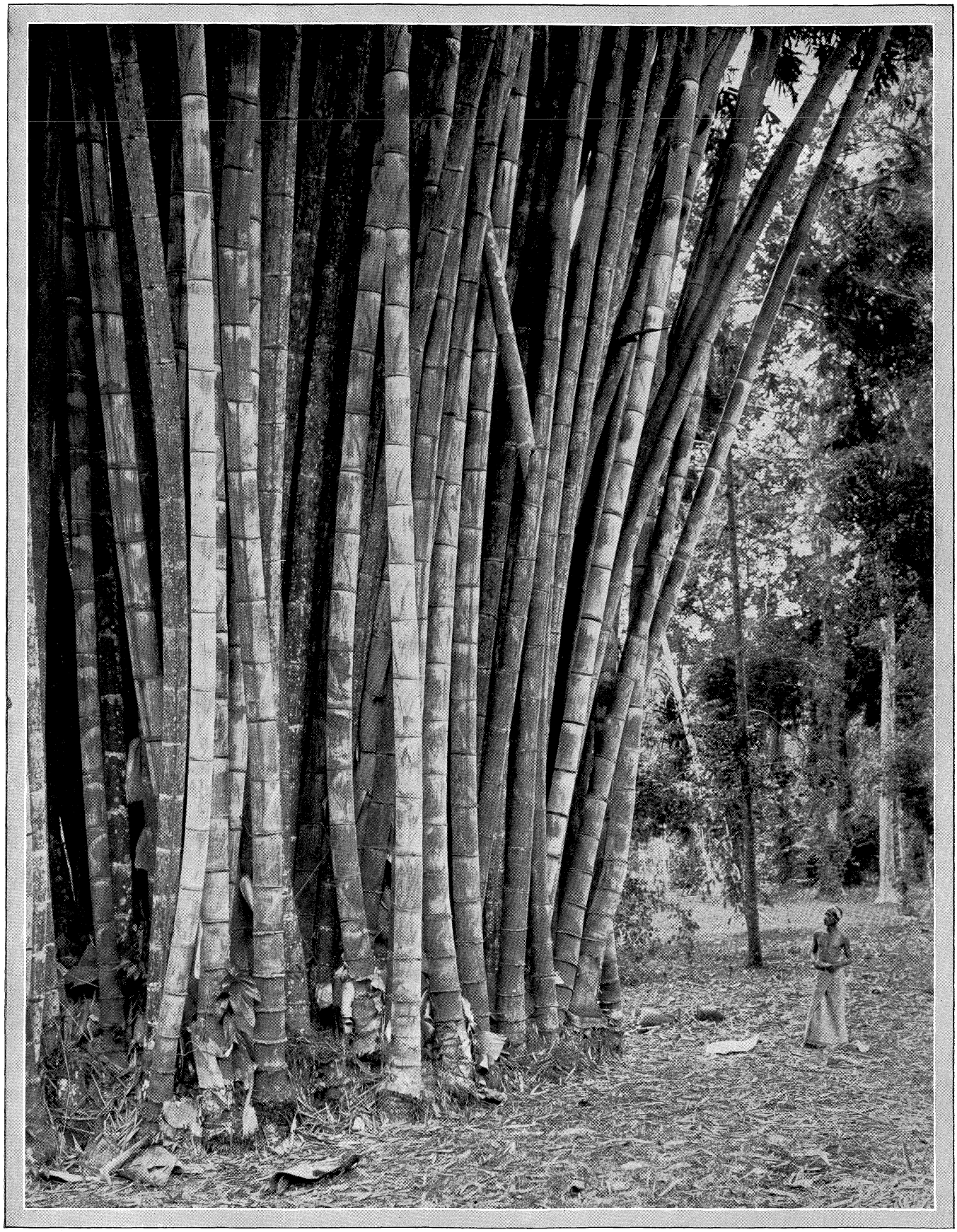
BAMBURGH or **BAMBOROUGH,** coastal village of Northumberland, England, 5m. E. of Belford, with coastguard and lifeboat stations. Pop. of parish (1931) 438. The ancient castle, now restored, occupies a magnificent site near the sea, on a rock 150ft. high, accessible only on the south-east side. The buildings are of various dates from the Norman period; but the first erection is ascribed by the Saxon chronicles to King Ida of Northumberland. The town which grew around the castle seems to have been a royal borough from the time of the Conquest; and thereafter its fate varied with that of the castle. It suffered severely both in the internal struggles and in the Scottish wars down to the 15th century. From this time on there is no further mention of burgesses or their privileges, which had included the grants of a gild merchant, markets and fairs. Lord Neville received licence to dig for sea-coals here in 1384, and during the later middle ages mines of coal and lead were worked in the neighbourhood. The village was the birthplace of Grace Darling (*q.v.*) in 1815. The Longstone Lighthouse with which her name is connected occupies an outer rock of the Farne Islands, which stretch north-east for 6m. from the coast at Bamburgh.

BAMBUTE (sometimes incorrectly called BATWA), a race of pygmies of the Semliki Forest, on the western borders of Uganda between Albert Nyanza and Albert Edward Nyanza. They probably form merely a branch of the pygmy race of Equatorial Africa. Their complexion varies from reddish-yellow to brownish-black, with head-hair often of a russet-brown, and body-hair, black and bristly on upper lip, chin, chest, axillae and pubes, yellowish and fleecy on cheeks, back and limbs. Their average height is 4ft. 9ins. Even when forced to keep clean, their skins give out a rancid odour, something (Sir H. H. Johnston says) between the smell of a monkey and a negro. Their faces are remarkable for the long upper lip, and the bridgeless nose with enormour alae (the cartilage of the nose above the nostrils). They are nomad hunters, building only huts of sticks and leaves, and living in the forest, where they hunt the largest game with no weapon but a tiny bow from which they shoot poisoned arrows. They have a good idea of drawing, and with a sharpened stick can sketch in sand or mud the beasts and birds known to them. They do not tattoo or scar and wear no ear-rings, necklets, anklets, etc. The upper incisors and canines are sharpened to a point. In the forests they go quite naked. They speak a corrupted form of the dialects of their negro neighbours. They have a peculiar way of singing their words. Their voices are low and musical and the pronunciation is singularly staccato, every syllable being separately uttered. They show no trace of spirit or ancestor worship, but have some idea that thunder, lightning and rain are manifestations of an Evil Power, and that the dead are reincarnated in the red bush-pig. They have no tribal government, accepting as temporary lawgiver some adept hunter. Marriage is by purchase; polygamy seems to exist, but the domestic affections are strong. The dead are buried in dug graves, and food, tobacco and weapons are often placed with the corpse. The Bambute are very musical, though they are uninventive as regards instruments. They have many songs which they sing well and they dance with spirit.

See A. de Quatrefages, *The Pygmies* (Eng. ed. 1895); Sir H. H. Johnston, *Uganda Protectorate* (1902).

BAMFORD, SAMUEL (1788–1872), English labour politician, was born at Miston, near Middleton, Lancashire, on Feb. 28, 1788. He was a working weaver and reformer who earned great respect in northern circles; but he was timid in policy and jealous of rivals. Through attending and speaking at the meeting (1819) at Peterloo, Manchester (*q.v.*), which was intended to be a peaceful gathering to petition for parliamentary reform and a repeal of the Corn laws, but ended in a massacre, he was arrested for a breach of the law and sentenced to 12 months' imprisonment. He was the author of several widely popular poems (principally in the Lancashire dialect) showing sympathy with the conditions of his class, and his *Passages in the Life of a Radical* (1840–44) is a very valuable indication of the condition of the working classes, marred sometimes by personal prejudices. He died at Harpurhey on April 13, 1872, and was accorded a public funeral, attended by thousands.

BAMIAN, a once renowned city of Afghanistan, about 80 m. N.W. of Kabul, in a valley of the Hazara country, on the chief road from Kabul towards Turkistan, and immediately at the northern foot of that prolongation of the Indian Caucasus now called Koh-i-Baba. The passes on the Kabul side are not less than 11,000 and 12,000 ft. in absolute height, and those immediately to the north but little inferior. The height of the valley was fixed at about 8,500 ft., and the surrounding country surveyed in Nov. 1885. The river draining the valley is one of the chief sources of the Sarkhab (Surkhab) or Aksarai, an important tributary of the upper Oxus. The prominences of the cliffs which line the valley



PHOTOGRAPH BY COURTESY OF HERBERT G. PONTING, F.R.P.S.

THE BAMBOO PLANT OF THE TROPICS

Bamboo, a hollow-stemmed plant, grows very rapidly, and in Ceylon, where it is native, has been known to increase sixteen inches in a day, and to attain a height of 120 feet. The plants grow in dense and almost impenetrable masses. The stems are used in the East for structural purposes as well as for many small articles of manufacture

BAMBOO



PHOTOGRAPH, UNDERWOOD AND UNDERWOOD

CHINESE BAMBOO FOREST

Forest of bamboos near Nanking, China, showing the large woody stems composed of sections that are used in the construction of many types of domestic and agricultural implements in the Orient

are crowned by the remains of numerous massive towers, whilst their precipitous faces are for 6 or 7 mi. pierced by numerous ancient cave-dwellings, some still occupied. The most famous remains at Bamian are two colossal standing idols, carved in the cliffs on the north side of the valley. They are 173 ft. and 120 ft. high respectively. These images, much injured apparently by cannon-shot, are cut in niches in the rock, and both images and niches have been coated with stucco. There is an inscription, not yet interpreted, over the greater idol, and on each side of its niche are staircases leading to a chamber near the head, which shows traces of elaborate ornamentation in azure and gilding. These chambers were used by the Afghan government as store-houses for grain. The surface of the niches also has been painted with figures. In one of the branch valleys is a similar colossus, somewhat inferior in size to the second of these two; and there are indications of other niches and idols. At Haibak there is a very perfect excavation called the Takht-i-Rustam (a general name for all incomprehensible constructions among the modern inhabitants of Afghan Turkistan), which consists of an annular ditch enclosing a platform, with a small house about 21 ft. square above it, all cut out of the solid rock. There are hundreds of caves in this neighbourhood, all pointing to a line of Buddhist occupation connecting Balkh with Kabul.

That the idols of Bamian, about which so many conjectures have been uttered, were Buddhist figures, is ascertained from the narrative of the Chinese pilgrim, Hsüan-Tsang, who saw them in their splendour in A.D. 630, and was verified by the officers above named, who discovered other Buddhist caves and excavations in the valleys of the Balkhab and Sarikol. Still vaster than these was a recumbent figure, 2 m. east of Bamian, representing Sakya Buddha entering *Nirvāna, i.e.,* in act of death. This was "about 1,000 ft. in length." No traces of this are alluded to by modern travellers, but in all likelihood it was only formed of rubble plastered (as is the case still with such *Nirvāna* figures in Indo-China) and of no durability. For a city so notable Bamian has a very obscure history. In the time of Hsüang Tsang it was the head of one of the small states into which the empire of the White Huns had broken up. Bamian was (*c.* 1164–1214 A.D.) the seat of a branch of the Ghori dynasty, ruling over Tokharistan, or the basin of the upper Oxus. The place was long besieged, and finally annihilated (1222) by Jenghiz Khan, whose wrath was exasperated at the death of a favourite grandson by an arrow from its walls. In 1840, during the British occupation of Kabul, Col. William H. Dennie routed Dost Mahommed Khan, and a number of Uzbeg chiefs at Bamian.

See Hon. M. G. Talbot, "The Rock-cut Caves and Statues of Bamian," *Journal R. Asiatic, Soc.* vol. xviii.; and J. A. Gray, *At the Court of the Amir* (1895). (G. MA.)

BAMPTON, JOHN (1690?–1751), English divine, Trinity college, Oxford, M.A. in 1712, became canon of Salisbury, and died on June 2, 1751. His will directs that eight lectures shall be delivered annually at Oxford in the university church on Sunday mornings in full term, "between the commencement of the last month in Lent term and the end of the third week in Act term." The lecturer is to be at least a master of arts of Oxford or Cambridge, chosen by the heads of colleges; no one can be chosen twice. The series began in 1780, though since 1895 elections are only made in alternate years through the depreciation of the fund. The lecturer is paid £120; and the lectures are to be printed and published within two months of their delivery. A complete list, down to and including those of 1900, is given in the *Oxford Historical Register* (1900). The lectures as a whole form a historically interesting collection of apologetic literature; some of the subjects treated have been open to criticism as being outside the terms of the trust: the arguments of some of the series have led to sharp controversies; *e.g.,* the very first, White's in 1780, on the Muslim religion; and in more recent days Mansel's (1858) and Gore's (1891) arousing memorable contentions.

BAMPUR, a town and an ancient capital of Persian Baluchistan, in 27° 12′ N., 60° 24′ E., situated at an elevation of about 1,900ft. It stands on the Bampur river which, flowing from east to west, empties itself into a depression called the Jaz Murian, and consists of a camp of some 200 mud houses and huts rather than a town. The river valley is covered with gardens and date groves belonging to Baluchis which present a striking contrast to the barren plain of Bampur. The place is a point of some strategic importance as many roads from the coast and the interior converge here. The climate is unhealthy. The old citadel having fallen into ruins, Bampur has become less important since the construction of the fort at Fahruj or Pahura, some 16m. to the east, in 1892. The district is the richest in Persian Baluchistan, and were the water-supply to be adequately used could support a population ten times as great.

See also BALUCHISTAN (Persian).

BAN, a word taken from the root of a verb common to many Teutonic languages and meaning originally "to proclaim" or "to announce." The Late Latin form of the word is *bannum.*

In the laws of the Franks and kindred tribes the word had three main uses: first in the general sense of a proclamation; secondly, for the fine incurred for disobeying such proclamation, and thirdly for the district over which proclamations were issued. It was the frequent use of proclamations or bans, commanding or forbidding certain actions under a threat of punishment, which caused the second of these uses to arise out of the first, as the idea of wrong-doing became associated with the proclamation or ban. This *bannum dominicum,* as it was called, was employed by all feudal lords, from the king downwards, against offenders, and played an important part in the administration of justice. It usually took the form of an order to make some amend for wrong-doing, which, if not complied with, was followed by outlawry.

After the break-up of the Carolingian empire another use of the word arose in France. "Ban" had occasionally been used for the summons calling out the host; thus it came in France to be used of the vassals summoned to the host by the king, while the sub-vassals summoned by the vassals were known as the *arrière-ban* (*retro-bannum*). The ban and arrière-ban were last summoned in 1758. In the mediaeval empire the word ban (Ger. *Acht*) retained the special sense of punishment.

The execution of the ban of the empire (*Reichsacht*) was usually entrusted by the emperor or German king to some prince or noble, who was often rewarded with a portion of the outlaw's lands. At first this sentence was the act of the emperor or king himself, but in later times it was entrusted to the imperial aulic council (*Reichshofrat*), and to the imperial court of justice or imperial chamber (*Reichskammergericht*). These courts were deprived of this power in 1711, retaining only the right of suggesting its use. The imperial ban had, however, been used for the last time in 1706, when Maximilian Emanuel, elector of Bavaria, was placed under it.

In France this punitive sense of the word "ban" survived in its application to the penalty of exile whether from the country or to a particular district in it; it survives in the legal designation *rupture de ban* for the escape of a criminal from the place assigned to him as a residence. From this use of the term comes the word "banish" (Fr. *bannir,* Ger. *bannen*). The word "ban" is also used in English as a synonym for excommunication (Ger. *Bann*). It has thus come to have a sense of combined exclusion and moral reprobation, as when we talk of this or that being under the ban of public opinion. In English the word survives in its original sense of a proclamation only in the "banns of marriage" (*q.v.*).

BAN, a title formerly used in south-eastern Europe, especially southern Hungary, to denote the governors of military districts known as *banats.* It is a Persian word meaning "lord" or "master" and was first introduced into Europe by the Avars. The last functionary to bear this title was the governor of Croatia, who was known as the ban of Croatia, Slavonia and Dalmatia. He was appointed by the king of Hungary and sat in the Hungarian house of magnates. His functions were civil. With the collapse of the Habsburg monarchy in 1918 the office and title came to an end.

BANANA. One of the world's most important fruits, the banana is consumed extensively throughout the tropics where grown, and in the temperate zone, where its popularity is due to

its flavour, its food value and its availability at all times of the year.

The plant is a gigantic herb, springing from an underground stem or rhizome to form a false trunk 10 to 20 ft. high, composed of the leaf sheaths and crowned with a rosette of 10 to 20 oblong to elliptic leaves which sometimes attain a length of 10 to 12 ft. and a breadth of 2 ft. The large flower spike, carrying numerous yellowish flowers in half-whorl-like clusters, emerges at the top of the false trunk and bends downward to become the bunch of 50 to 150 individual fruits or "fingers" which are grouped in clusters or "hands" of 10 to 20. Once the plants have fruited they die, and are replaced by others ("suckers") which arise from the underground stem. The life of one stool or clump thus continues for many years.

Bananas belong to the genus *Musa,* of the family Musaceae, but the botany of the cultivated forms is confused. Tall-growing varieties of which the fruit is eaten uncooked are commonly listed as forms of *M. sapientum;* the dwarf or Cavendish variety as *M. cavendishi;* and the plantains or forms eaten only when cooked as *M. paradisiaca.* However, as Prof. E. E. Cheesman points out (*Memoirs of the Imperial College of Tropical Agriculture,* Trinidad, 1934) *M. paradisiaca* is viewed by some botanists as a subspecies of *M. sapientum,* while others hold the opposite to be the case. There has further been a tendency on the part of modern investigators to consider that many commercial bananas, including the all-important Gros Michel, are not derived from either of these, but wholly or in part from the species *M. acuminata.*

There are 100 or more varieties of the banana in cultivation; confusion exists because of diverse names applied to one and the same variety in different parts of the world. As regards the origin and early history of this fruit, Alphonse de Candolle writes (*Origin of Cultivated Plants,* published by Kegan Paul, Trench, Trubner & Co., Ltd., London, 1909): "The antiquity and wild character of the banana in Asia are incontestable facts. There are several Sanskrit names. The Greeks, Latins, and Arabs have mentioned it as a remarkable fruit tree. Pliny speaks of it distinctly. He says the Greeks of the expedition of Alexander saw it in India, and he quotes the name *pala* which still persists in Malabar. Sages reposed beneath its shade and ate of its fruit. Hence the botanical name *Musa sapientum.* Musa is from the Arabic *mouz* or *mawoz,* which we find as early as the 13th century in Eba Baithar. . . . There is an immense number of varieties of the banana in the south of Asia, both on the islands and on the continent; the cultivation of these varieties dates in India, in China, and in the Archipelago from an epoch impossible to realize; it even spread formerly into the Islands of the Pacific and to the west coast of Africa; lastly, the varieties bore distinct names in the most separate Asiatic languages, such as Chinese, Sanskrit, and Malay. All this indicates great antiquity of culture, consequently a primitive existence in Asia, and a diffusion contemporary with or even anterior to that of the human race."



COURTESY OF UNITED FRUIT COMPANY

Mature Green Bunch of Bananas (Gros Michel) Ready for Harvesting, with the floral axis, from which the flowers have fallen, below

Shortly after the conquest, the banana (an African name) was brought from the Canaries to the new world, where it was first established in Hispaniola but soon spread to other islands and the mainland. Its cultivation increased until it became one of the staple foodstuffs in many regions; then in the early part of the 19th century it commenced to appear in the markets of the United States. Between 1870 and 1880 the banana industry began to develop, mainly through the efforts of two men—Captain Lorenzo D. Baker and Minor C. Keith.

Banana production for export expanded rapidly around the turn of the century, and by 1939 had attained tremendous proportions.

Banana Exports in 1939

	Bunches		Bunches
Jamaica	18,800,000	British Honduras	500,000
Honduras	12,200,000	Windward Islands	300,000
Mexico	13,600,000	Puerto Rico	—
Colombia	7,100,000		
Panamá	5,300,000	Sub-total	85,600,000
Cuba	4,800,000		
Guatemala	10,100,000	Dominican Republic	800,000
Guadeloupe	5,900,000	Brazil	1,700,000
Nicaragua	1,600,000	Ecuador	700,000
Costa Rica	3,400,000		
Haiti	2,000,000	Total	88,800,000

More than half went to the United States; Great Britain and continental Europe consumed some 42,000,000 bunches, part of which came from Brazil, Africa and the Canary Islands. The Hawaiian Islands shipped about 100,000 bunches to San Francisco. These were of the Cavendish or dwarf variety, as were also those grown in the Canaries, Brazil, and some of those from Africa. The industry in the Caribbean region is based almost wholly on the Gros Michel variety which, in terms of quantity and of cash value of the crop, is one of the world's most important fruits.

The origin of this banana is probably Asiatic, but it first came to the attention of agriculturists in tropical America through the efforts of Jean Pouyat of Martinique. Jamaica was one of the first countries to undertake its cultivation on an extensive scale; Costa Rica was not far behind. Major centres of production have shifted from time to time, Honduras having been the most important one during the 1920s, while Costa Rica declined as an exporting country. Shipments from the Canary Islands to Europe also declined, while production for European markets increased in Brazil and in West Africa.

The cultivation of the Gros Michel banana formed the major agricultural industry in Jamaica and several of the Central American republics. It has not been without its vicissitudes: in many regions large areas had to be abandoned because of Panama disease, caused by a fungous organism (*Fusarium*) which infests the soil and destroys the plants. During the period 1935–1940 the whole industry had to be reorganized to cope with the attacks of Sigatoka disease (*Cercospora musae*), a fungus which destroys the leaves but can be controlled by spraying with copper compounds.

Bananas thrive naturally on deep, loose, well drained soils in humid tropical climates, but are grown successfully under irrigation in semi-arid regions such as the south side of Jamaica. For the export trade they cannot profitably be cultivated where temperatures often fall below 50° F.; such temperatures result in "chilling" of the fruit, preventing its proper ripening; but for home use they are grown successfully in cooler regions, including the southernmost part of Florida. Suckers and divisions of the pseudobulb are used as planting material; the first crop ripens within 10 to 15 months, and thereafter production is more or less continuous. Frequent pruning is required to remove surplus growth and prevent crowding in the clump or "mat." Mechanical tillage is customary in semi-arid regions, but in many countries this is not practised: weedy growth is controlled by the shade of the banana plants and through occasional cleaning with the machete. Nitrogenous fertilizers, such as nitrate of soda, are often used to increase quantity and quality of production.

A good commercial bunch of bananas consists of nine "hands" or more and weighs from 50 to 125 lb. Three hundred or more such bunches may be produced annually on an acre of land, if the soil is good and cultural attention adequate. When ripe, the fruit contains as much as 22% of carbohydrate, mainly sugar; it is high in ash and a good source of vitamins A, B, C and G. Thus it is an unusually valuable source of human food.

Cooking varieties (plantains) which differ from other bananas in that the ripe fruit is starchy rather than sweet are extensively cultivated and used in tropical regions, but rarely appear in the markets of the temperate zone. (W. Po.)

BANAS or **BUNAS,** the name of three rivers of India: (1) a river of Rajputana, which rises in the Aravalli range in Udaipur, drains the Udaipur valley, and after a course of 300 mi. flows into the Chambal; (2) a river of the Shahabad district of Bengal, which forms the drainage channel between the Arrah canal and the Sone canals system, and finally falls into the Gangi nadi; (3) a river of Chota Nagpur in Bengal, which rises in the state of Chang Bhakar and falls into the Sone near Rampur.

BANAT. This name, which means "frontier province," was given to a region southeast of the present Hungarian frontiers which was enclosed by the Danube on the south, the Maros on the north, the Theiss on the west and the Transylvanian Alps on the east. It has ceased to exist as a unity within these boundaries since nearly a third of the original province (namely that part of it on the west between the Theiss and the city of Temesvar) has by the peace treaties been given to Jugoslavia. The remainder lies in Rumania.

In the 9th and 10th centuries the Banat was occupied by the invading Magyars who in the 13th century were largely displaced by the Tatar invasions. In the 14th century great bodies of Serbian refugees settled in the part later incorporated in Jugoslavia. They were the result of the defeat of the Serbs at the battle of Kosovopolye. These refugees were granted charters by successive kings of Hungary which had now weathered the Tatar storms. In 1552 during the great campaign of Suliman the Magnificent, the whole of the Banat fell into Turkish hands, and only in 1718 after the peace of Passarowitz did it come into the Habsburg empire. During the Turkish occupation it had fallen from being one of the most fertile provinces of Hungary into complete neglect. Count Claudius Mercy, who was its governor in 1720, commenced a scheme of reclamation which laid the basis of its subsequent prosperity. Under Maria Theresa immigrants from western Europe were encouraged and a fine body of colonists came from the Rhine provinces, from Bavaria and from Alsace. This stock remains the most prosperous and industrious element in the province and jealously retains its nationality. French and German are still the languages of the northern and northwestern part of the province. In 1779 the province was incorporated with Hungary, but in 1849 it was made an Austrian crown land. In 1860 it reverted again to Hungary. The German inhabitants are peaceable and have no particular preference either for Hungary or for Rumania. Commercially the change of suzerainty has left them unhappily placed since Budapest, which was their chief market, is no longer accessible. They have to sell their produce to the towns of Transylvania which are not such good markets.

The means of communication in their province are good since both the Maros and the Theiss are navigable while much traffic passes along the Danube. One main railway line only passes through the province, namely that from Orsova to Temesvar and Szegedin. Wine and corn constitute the principal produce and tobacco is grown. Tin, lead and zinc are found. In the mountainous region on the east of the province, which is largely populated by Rumanians, there are important coal mines at Anina and in the Szekul valley which produce coal that resembles Welsh coal. Iron and steel works have developed in the coal regions. Timber is also produced in large quantities in the eastern regions, and the general prosperity of the whole province is remarkable. It escaped most of the ravages of World War I.

BANBRIDGE, urban district, Co. Down, N. Ireland, 23 mi. S.W. of Belfast on a branch of the Great Northern railway. Pop. (1937) 5,640. Area, 1.2 sq.mi. To mitigate a steep ascent, a central carriage-way, 200 yd. long was cut along the main street to a depth of 15 ft., the opposite terraces being connected by a bridge. Banbridge is the principal seat of the linen trade in the county, and has extensive cloth and thread factories, bleachfields and chemical works. There is a weekly market for grass seed. A memorial in Church square commemorates Captain Francis Crozier of the Franklin North-West Passage expedition.

BANBURY, municipal borough, Oxfordshire, England, on the river Cherwell, 86 mi. N.W. of London by the northern line of the Great Western railway. Population of municipal borough containing also Grimsbury and Neithrop parishes (1938) 15,500. There was an early settlement on the site, a battle being fought here in 556 between Cynric and Ceawlin and the British. It was assessed at 50 hides in the Domesday survey, when it was held by the bishop of Lincoln. There are slight traces of a castle built in 1125. From about the same time there are records of a market. The first charter of incorporation (1553) instituted a council, a court of record, one justice of the peace, a Thursday market, and two annual fairs. A new charter (1718) held until the Municipal Corporations act of 1835. During the 17th century the inhabitants of Banbury seem to have been zealous Puritans, and are frequently satirized by contemporary dramatists. To them is due the destruction of the ancient Banbury Cross, celebrated in nursery rhyme. A magnificent Gothic church was destroyed in 1790 to make way for a new building, but the town retains some fine timbered houses. It is the centre of a rich agricultural district, and has a large aluminum works and a brewery. Furniture, corsets, woollen goods and electrical apparatus are made. Agricultural implement making is an important trade. The cattle market is held in the main street. The name of the town is celebrated as that of a species of currant pastry said to have a reputation of three centuries standing. Banbury is an important rail junction. It is governed by a mayor, 6 aldermen and 18 councillors, and forms part of the Banbury parliamentary county division. Area 7.9 sq.mi. after borough extension in 1932.

BANCA D'ITALIA, since June 1926 the sole bank of issue of the kingdom of Italy, with a capital of 300,000,000 lire. Founded in 1893, it is of comparatively recent growth, but it can claim a long line of descent, tracing back to the famous Genoese bank, the *Casa San Giorgio* (*see* GENOA; CORSICA).

The amalgamation in 1849 of the *Banca di Sconti, depositi e conti correnti* of Genoa with the *Banca di Torino,* both operating in the kingdom of Sardinia, gave rise to the *Banca Nazionale,* which on the constitution of the kingdom of Italy in 1859 shared the note issue privilege with the *Banca Nazionale Toscana,* the *Banca Toscana di Credito,* the *Banca Romana,* the *Banco di Napoli* and the *Banco di Sicilia,* all operating prior to Italian unity as banks of issue in their respective states. By a law enacted in 1893 the *Banca Romana* was liquidated while the *Banca Nazionale Toscana* and the *Banca Toscana di Credito* amalgamated with the *Banca Nazionale* to form the *Banca d'Italia,* which thus became the third bank of issue and so remained until the decree-law of July 1, 1926, conferred on it the sole right to issue notes.

Until then the codified Act of 1910 regulating the three banks of issue (*Italia, Napoli* and *Sicilia*) had unified their monetary policy. The fundamental principles of that act provided for notes issued on "trade account" a cover of not less than 40% in gold or equivalent valuta, and for those issued to make advances to the treasury a cover of 33%. A fixed ratio of this cover formed the "irreducible reserve" on which a privileged credit was inscribed in favour of the bank's note-bearers.

In Italy as elsewhere, World War I began a period of inflation for the banks of issue. They had to lend freely to the government and to issue notes against these loans, and their note circulation rose from 2,283,300 lire in 1913 to 18,551,600 in 1919 of which 2,270,300 were issued on behalf of the treasury.

To meet the industrial situation created by the war a consortium for subsidies on industrial securities was established in 1914, with the right to rediscount a percentage of its bills with the banks of issue. Postwar financial and industrial inflation further aggravated the situation, and in March 1922 an "autonomous" section of this consortium, placed under separate management, was opened to facilitate the liquidation of the frozen credits which caused the banking crisis of 1921. As a result of these operations the currency circulation was further inflated by notes representing active transactions of the "ordinary" section of the consortium and by others representing the assets which the "autonomous" section was seeking to realize. In the early months of 1925 the value of the bills thus discounted by the bank had risen to over 4,000,000,000 lire and represented a serious source of inflation.

In 1926 the "autonomous" section of the consortium was closed down and a Liquidating institute took over the assets of

the former body. In 1933 it was in turn replaced by the Institute of Industrial Reconstruction, which was formed to finance long-term loans to Italian industries. In 1938 the debt of this Institute to the bank was 4,708,000,000 lire.

With the beginning of the war with Ethiopia in 1935, a law required the sale of all Italian-held foreign credits to the National Institute of Exchange, whose capital the bank held, and the exchange of all Italian-held foreign securities for Italian treasury bonds. Although these measures were partly offset by the League of Nations' sanctions against Italy, applied by 52 countries which refused to purchase Italian goods because of the Italian attack on Ethiopia, the legislation probably saved Italy's money and banking structure from collapse. In the two months from October to December 1935, the gold reserve of the *Banca d'Italia* declined still further, from 3,936,000,000 lire to 3,027,000,000, but it has been estimated that the treasury received more than three times the difference through its purchase of the foreign securities held by the Italian people. By Dec. 1936, the total gold reserve had risen to 4,022,000,000 lire and the crisis was temporarily past.

In 1936 a law was passed which changed the status of the *Banca d'Italia* to something resembling the federal reserve system of the United States. It became a public institution, the *Istituto di Diritto Pubblico*. The capital of the bank, previously held by private shareholders, was repaid to them, and the shares were re-issued to banks and insurance companies, which subscribed the full 300,000,000 lire capital. The same law made the governor of the *Banca d'Italia* head of an office of inspection, created to supervise the activities of the banks of Italy.

The last statement issued by the bank in 1939 revealed that the gold reserve had sunk to 3,131,000,000 lire, the lowest in many years, especially considering the fact that the lira was devalued by 40.94% of its 1927 value in 1936. After Italy entered World War II, the bank issued no statement of its condition.

BANCHIERI, ADRIANO (*c.* 1557–1634), Bolognese composer for church and stage, organist, writer on music and poet. He founded the Accademia Florida of Bologna. Like Orazio Vecchi he was interested in converting the madrigal to dramatic purposes. He disapproved of the monodists with their revolutionary harmonic tendencies, about which he expressed himself in his *Moderna Practica Musicale* published at Venice in 1613, while systematizing the use of the monodic art of thorough bass.

BANCROFT, EDGAR ADDISON (1857–1925), American lawyer and diplomat, was born in Galesburg, Ill., Nov. 20, 1857. He graduated in 1880 at Columbia Law school, and was a prominent lawyer in Chicago until 1924. He had great oratorical talent and made many public addresses, especially during and immediately following World War I. In 1919 he was chairman of a committee appointed by Gov. Lowden to report on the July 1919 race riot in Chicago (*The Negro in Chicago; a Study of Race Relations and a Race Riot,* 1922). In 1923 the Comité France-Amérique of Paris, an organization formed to strengthen relations between France and the nations of America, invited a group of distinguished Americans, including Bancroft, to visit the French-African provinces of Morocco and Algiers. In July 1924 Secretary of State Charles E. Hughes asked Bancroft to accept the post as ambassador to Japan. This was soon after the Exclusion act was passed, and relations between the U.S. and Japan were not harmonious. He accepted out of a deep sense of duty, although his health was bad. His great personal charm, deep sympathy and skilful diplomacy soon gained him popularity with the Japanese people, and helped to restore good relations. The strain of diplomatic life soon completed the breakdown of his health, however, and he died July 28, 1925. Japan paid him unusual honours at his funeral, and sent his body to the U.S. in a Japanese battleship.

BANCROFT, GEORGE (1800–1891), American historian and statesman, was born in Worcester, Mass., on Oct. 3, 1800. His family had been in America since 1632, and his father, Aaron Bancroft was distinguished as a revolutionary soldier, clergyman and author. The son was educated at Phillips academy, Exeter, at Harvard university, at Heidelberg, Göttingen and Berlin. At Göttingen he studied Plato with Heeren, New Testament Greek with Eichhorn and natural science with Blumenbach. His heart was in the work of Heeren, easily the greatest of historical critics then living, and the forerunner of the modern school; it was from this master that Bancroft caught his enthusiasm for minute painstaking erudition. Bancroft's father was a Unitarian, and he had devoted his son to the work of the ministry; but the young man's first experiments at preaching, shortly after his return from Europe in 1822, were unsatisfactory. His first position was that of tutor in Harvard. Instinctively a humanist, he had little patience with the narrow curriculum of Harvard in his day and the rather pedantic spirit with which classical studies were there pursued. He found the conventional atmosphere of Cambridge uncongenial, and with a friend he established the Round Hill school at Northampton, Massachusetts. This was the first serious effort made in the United States to elevate secondary education to its rightful plane.



HOME OF AARON BANCROFT AT WORCESTER, MASSACHUSETTS, WHERE GEORGE BANCROFT, AMERICAN HISTORIAN AND STATESMAN, WAS BORN ON OCT. 3, 1800

Although born into a Whig family, yet Bancroft's studies carried him irresistibly into the Democratic party. While a teacher in his own school he was elected to the state legislature as a Democrat, but refused to serve. In 1831 he likewise declined the nomination of the Massachusetts Democrats for secretary of state. By this time he was influential in the councils of his party, and President Van Buren appointed him collector of the port of Boston, a position which he filled with success. Two of his appointees were Orestes Brownson and Nathaniel Hawthorne. In 1844 he was the Democratic candidate for the governorship, but he was defeated. In 1845 he entered Polk's cabinet as secretary of the navy, serving until 1846, when for a month he was acting secretary of war. During this short period in the cabinet he established the naval academy at Annapolis, gave the orders which led to the occupation of California, and sent Zachary Taylor into the debatable land between Texas and Mexico. He also continued his pleadings for the annexation of Texas, as extending "the area of freedom," and though a Democrat, took high moral ground as to slavery; he likewise made himself the authority on the North-Western Boundary question. In 1846 he was sent as minister to London, where he lived in constant companionship with Macaulay and Hallam. On his return in 1849 he withdrew from public life, residing in New York. In 1867 he was appointed minister to Berlin, where he remained until his resignation in 1874. Thenceforward he lived in Washington and Newport, dying at Washington on Jan. 17, 1891. His latest official achievements were the greatest. In the San Juan arbitration he displayed great versatility and skill, winning his case before Emperor William I. of Germany, who acted as arbitrator, with brilliant ease. The naturalization treaties which he negotiated successively with Prussia and the other north German states were the first international recognition of the right of expatriation, a principle since incorporated in the law of nations.

In spite of the exacting routine of the Round Hill school, Bancroft contributed frequently to the *North American Review* and to Walsh's *American Quarterly;* he also made a translation of Heeren's work on *The Politics of Ancient Greece.* In 1834 appeared the first volume of the *History of the United States.* The second followed in 1837, and others as the exigencies of public life permitted. Supplementary to the first volume was an article published by him in the *North American Review* for 1835 on "The Documentary History of the Revolution." This article not merely brought the new method to the notice of the reading public, but revealed to it the wealth of material available. The nature and extent of his studies, the solidity of his work, and the philosophic spirit which animates both, explain the enthusiasm with which the earlier volumes of Bancroft were received. Their sale at home

was very large; they were reprinted in England and translated immediately into Danish, Italian, German and French. The latest volumes were considered by all competent judges quite as important as their predecessors.

As Heeren's pupil, he laid enormous stress on the importance of original authorities. In dealing with documentary evidence he sought to apply very stringent rules:—(1) Carefully distinguish between original authority and historical memorials or aids; for example, between a fact recorded at first- or second-hand knowledge, and a decision of principle by authority. (2) Represent every man from his own standpoint; judge him from your own. His collections of original materials were vast; beginning with his residence in England, he brought together at enormous pains and expense the authenticated copies of archives, family papers, and personal journals written by historic personages, which now constitute an invaluable treasure in the New York public library. They are from every land and from every people with which American origins are connected.

Bancroft's imagination and enthusiasm were alike exuberant. His pages abound in fine and acute insight. His generalizations are vivid and enlightening. He spared no pains to acquire true style, frequently rewriting his chapters, and sometimes testing passages of philosophy and description in eight different forms. Yet to a certain extent he lacked the representative power and often failed to conceal his art, many pages ringing with artificial tones. But, after making all allowances, it remains true that he had a perfect sense of proportion, sound maxims and thorough common sense. He was of that greatest human type: a man of the present, valuing justly the past and no dreamer. In the nature and extent of his studies, in the solidity of his work, and in the philosophic spirit which animated his life he ranks as the foremost historian of the United States, and as an American historian second to none of his European contemporaries in the same line. He displayed the heroic, epic value of American history, its unity with the great central stream, and dispelled for ever the extravagant conceptions of a sentimental world just emerging from the visionary philosophy of the 18th century.

See M. A. de Wolfe Howe, *The Life and Letters of George Bancroft* (1908); John Spencer Bassett, *The Middle Group of American Historians* (1917); John Spencer Bassett (Ed.), "Correspondence of George Bancroft and Jared Sparks," in *Smith College Studies in History,* vol. ii. No. 2 (1917); John T. Faris, *Men Who Conquered* (1922). (W. M. Sl.)

BANCROFT, HUBERT HOWE (1832–1918), American historical writer, was born at Granville (O.), May 5, 1832. As a bookseller in San Francisco (1852–68) he accumulated a great library of historical material, and at last gave up business in order to devote himself to the publication of his *Native Races of the Pacific States* (5 vols., 1874–76), his many volumes on the western States, and other works. For the collection of data and for the writing in parts, he relied upon the labours of a corps of assistants, and the publications named represent, properly speaking, an encyclopaedia rather than a unified history; but as a storehouse of material their value is great. In 1905 Bancroft's vast collection was acquired by the University of California. An account of his methods of work is given in his *Literary Industries* (1890) and *Retrospection, Political and Personal* (1912). He died at Walnut Creek (Calif.), March 2, 1918.

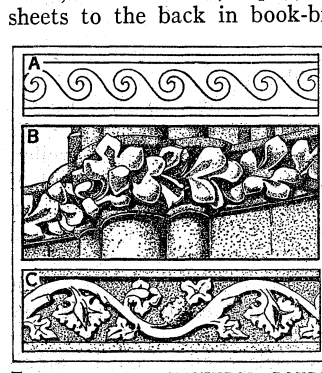
See *Oregon Historical Quarterly,* vol. iv., pp. 287–364 for indentification of Bancroft's literary assistants.

BANCROFT, RICHARD (1544–1610), archbishop of Canterbury, was born at Farnworth, in Lancashire. He was educated at Cambridge. He received important preferments and came into prominence through a passionate sermon against the Puritans preached at Paul's Cross on Feb. 9, 1589. He was chaplain successively to Lord Chancellor Hatton and Archbishop Whitgift. In June 1597 he was consecrated bishop of London; and from this time, in consequence of the age of Archbishop Whitgift, he was virtually invested with the power of primate. Among the more noteworthy cases which fell under his direction were the proceedings against "Martin Mar-Prelate," Thomas Cartwright and his friends, and John Penry, whose "seditious writings" he caused to be intercepted and given up to the lord keeper. In 1600 he was sent on an embassy to Embden, for the purpose of settling certain matters in dispute between the English and the Danes. He took a prominent part in the famous conference of prelates and Presbyterian divines held at Hampton Court in 1604. By the king's desire he undertook the vindication of the practices of confirmation, absolution, private baptism and lay excommunication; he urged, but in vain, the reinforcement of an ancient canon, "that schismatics are not to be heard against bishops." In March 1604 Bancroft, on Whitgift's death, was appointed president of convocation then assembled; and in the following November he was elected successor to Whitgift in the see of Canterbury. In 1608 he was chosen chancellor of the university of Oxford. Bancroft was "the chief overseer" of the authorized version of the Bible.

BANCROFT, SIR SQUIRE (1841–1926), English actor and manager, first appeared in 1861 at Birmingham, and played in the provinces for several years. His first London appearance was in 1865 in Wooler's *A Winning Hazard* at the Prince of Wales's theatre, under the management of Effie Marie Wilton (b. 1840), whom he married in 1868. Mr. and Mrs. Bancroft were associated in the production of all the Robertson comedies (*see* ROBERTSON, THOMAS WILLIAM):—*Society* (1865), *Ours* (1866), *Caste* (1867), *Play* (1868), *School* (1869), and *M.P.* (1870), and, after Robertson's death, in revivals of the old comedies, Lytton's *Money* (1872), Boucicault's *London Assurance* (1877), and *Diplomacy,* an adaptation of Sardou's *Dora,* were among their productions. The Bancroft management at the Prince of Wales's theatre had the effect of reviving the London interest in modern drama. In 1879 they moved to the Haymarket, where Sardou's *Odette* (for which they engaged Madame Modjeska) and *Fédora,* W. S. Gilbert's *Sweethearts* and Pinero's *Lords and Commons* were produced. They retired in 1885, but Mr. Bancroft (who was knighted in 1897) joined Sir Henry Irving in 1889 to play the abbé Latour in a revival of Watts Phillips's *Dead Heart.* Lady Bancroft died in 1921; Sir Squire Bancroft died on April 19, 1926.

See *Mr. and Mrs. Bancroft, on and off the Stage* (1888), and *The Bancrofts: Recollections of Sixty Years* (1909), by themselves; also *Empty Chairs* (1925), a volume of reminiscences, by Sir Squire Bancroft.

BAND, something which "binds" or fastens one thing to another, hence a cord, rope or tie, *e.g.,* the straps fastening the sheets to the back in book-binding. The word is a variant of "bond." From the same source comes "bend," properly to fasten the string to the bow, so as to constrain and curve it, hence to make into the shape of a "bent" bow, to curve. In the sense of "strap", a flat strip of material, properly for fastening anything, the word is ultimately of the same origin.



TYPES OF ARCHITECTURAL BANDS
A. Classic band decoration known as the "Vitruvian" or wave scroll; B. French Gothic, Amiens Cathedral (13th century); C. English perpendicular Gothic, St. Mary's, Oxford (15th–16th centuries)

In architecture the term is applied to a sort of flat frieze or fascia running horizontally round a tower or other parts of a building. When a band is used horizontally to subdivide the outside face of a building, it is known as a band or string course.

The two small strips of linen, worn at the neck as part of legal, clerical and academic dress, are known as "bands"; they are the survival of the falling collar of the 17th century. The light cardboard boxes now used to carry millinery were formerly made to carry the neckbands, whence the name of "band-box."

Military bands constitute an essential feature of all armies, each regiment having its own as a rule. In earlier days there was no uniform practice in the matter at all, the regiments so equipped being quite exceptional at first, while the few bands which did exist were of very modest dimensions. Thus in the latter part of the 18th century the Coldstream Guards were con-

tent with one of eight players only. In due course, however. their usefulness and necessity became more and more generally recognized while the bands themselves increased steadily in size. But even today not every regiment possesses one, though the finest of those that do have them, a considerable majority, such as those of the Guards, the Royal Artillery and the Royal Air Force, are of magnificent quality.

The training of bandmasters for the British service is carried out at Kneller Hall, Hounslow, an institution founded in 1857 and placed under direct control of the war office in 1867. The instruments composing an average British military band number nowadays 30 or more, including piccolo, flutes, clarinets, oboes, bassoons, saxophones, horns, cornets, trumpets, trombones, euphoniums and drums. Of Scottish regiments the peculiar instrument is the bagpipes. Cavalry and artillery corps in the various armies have small bands. In the navies of various countries bands are maintained on board flag-ships and sometimes on board other large ships. (*See* BRASS BAND MOVEMENT.)

BANDA, a town and district of British India, in the Jhansi division of the United Provinces. The town is near the right bank of the river Ken, 95 mi. S.W. of Allahabad. The population in 1941 was 27,070.

The district contains an area of 2,913 sq.mi. Irregular uplands with outcrops of rock intermingle with marshy lowlands, frequently under water in the rainy season. The Jumna skirts the district for 125 mi., and has a fringe of destructive and extending ravines. To the south-east the Vindhya chain of hills begins in a low range not above 500 ft. in height, forming a natural boundary of the district in that direction. In 1941 the population was 722,-568. The black soil of the district yields crops of millet, other food-grains, pulse, rice, cotton and oil-seeds; but the land is arid, rainfall precarious and serious drought recurring. The peasantry are for the most part impoverished and indebted.

Banda has often been the battle-ground of successive races who have struggled for the sovereignty of India. Kalinjar town, then the capital, was unsuccessfully besieged by Mahmud of Ghazni in A.D. 1023; in 1196 it was taken by Kutabud-din, the general of Mohammed Ghori; in 1545 by Sher Shah, who, however, fell mortally wounded in the assault. About the year 1735 the rajah of Kalinjar's territory, including the present district of Banda, was bequeathed to Baji Rao, the Mahratta peshwa; and from the Mahrattas it passed by the treaties of 1802–1803 to the East India company.

BANDAGES AND BANDAGING. A bandage is a strip or piece of woven material used to bind up wounds. Its general use is to retain dressings or splints in position; to give support to a part of the body; and to exert pressure to stop or prevent bleeding. There are four kinds of bandages; the triangle, roller, four-tailed and many tailed. In medical usage each method of bandage application is given a distinctive name. For example, a roller bandage applied in spiral form to cover each finger and the hand is called a *gauntlet.*

The triangle is the most useful bandage for emergencies as it fulfils every need in bandaging; because it is easily made, is easy to apply, will stay on, will cover any part of the body, and little danger of injury to flesh or blood vessels results from its application. The triangle bandage is usually made by cutting diagonally muslin or gauze 36 to 40in. square. As an open triangle it is used as a sling for the arm, as a bandage to cover the head, the hand or the foot. It is folded to make various widths in order to adapt it best for use on the various parts of the body. When folded repeatedly it becomes the "cravat" bandage in which form it may be used for a sling, or to cover the palm of the hand, the eyes or the ears. When made of surgical gauze and kept sterile it is suitable to use directly on a wound the same as any surgical dressing, either with or without the addition of solutions or ointments. The cotton or muslin bandage is stronger and therefore more suitable for the application of pressure or to give support.

Another common type of bandage is the roller bandage, from 1 to 5in. or more in width, averaging 10yds. in length, and rolled longitudinally. It is usually applied spirally. The material of this bandage is usually muslin, flannel, gauze or cheese-cloth, gauze or cheese-cloth being preferred for elasticity. The four-tailed bandage, for which 5 to 8in. wide x 2 to 3ft. long is a representative size, is useful for injuries of the lower jaw and head, elbow and knee. The many tailed bandage is an elaboration of the four tailed bandage and its uses are similar.

Bandaging.—Bandages applied to meet various needs and positions of the body are given special names by the medical profession, etc. Among them are: Esmarck's "figure-of-eight" bandage, in which the turns cross each other like a figure 8; the circular bandage applied to a part in circular turns; the gauntlet and demi-gauntlet hand bandages; Desault's bandage for a fractured clavicle; the oblique, pressure, suspensory, reversed, spiral and spiral reverse bandages; the T-bandage; the Spica, which is a spiral folded regularly on itself like the letter V for use at the junction of a limb to the body. Some bandages are made of special materials to meet specific needs, *e.g.,* the roller bandage of crinoline filled with plaster of Paris or splints; starch, silica and dextrin bandages for stiff and immobile dressings; the india-rubber bandage for flexible support as in varicose veins, and numerous other highly specialized bandages. (W. R. R.)

BANDA ISLANDS, in the Banda sea, Dutch East Indies, 130m. south-east of Amboina, and 60m. south of Ceram, in the Residency of Amboina. The ten islands cover only 20 sq.m. The three largest are Lontor, or Great Banda (7½m. long), Banda Neira, and Gunong Api, grouped around an inland sea which forms the Banda harbour; Lontor, sickle-shaped, lies south and east, Banda Neira to the north, with Gunong Api to the west. The arrangement is comparable with that of Santorin in the Aegean sea, and undoubtedly these three islands form part of the rim of a crater. West and south-west of Gunong Api are Wai and Run, and north and north-west, Pisang and Suwangi. Channels on either side in the south of Banda harbour enable vessels to enter with safety during either monsoon, while a northern passage, between Gunong Api and Banda Neira, is navigable for small vessels. Lontor has coral rock to a height of 400 ft., with lava and basalt above, and is certainly volcanic, while Gunong Api (1,858 ft.) is an active volcano which caused destruction in 1820 and 1852. It is covered with bushes to within 700 ft. of the summit, which exhibits various shallow and extinct crater-basins and a hot, smoking plain, sending forth sulphurous vapours and covered with split lava-blocks. The volcanic soil, however, is admirably adapted to the growth of the nutmeg, which is indigenous. The amount of nutmegs and mace produced on the Banda Islands in 1939 was 792,000 lb. and 125,400 lb., respectively, being the bulk of the Netherlands Indies' production. Other products are cloves, coco-nuts, tapioca and various tropical fruits and vegetables. The population of the islands is 10,364, of whom 6,000 live in Banda Neira, the capital, on the island of that name, the port for the group.

The people are a mixed race, mostly descendants of Javanese, Macassarese, and people from neighbouring islands brought in by the Dutch as slaves to work the nutmeg plantations in the place of the Bandanese, who refused to do so, and were either killed or banished; there exists still a colony of exiled Bandanese on one of the neighbouring Ké group, who, alone, use the old Bandanese language. On Gunong Api there is a small colony of Butonese. On Banda Neira there are many Arab and Chinese traders, and some Malays, with a few Europeans and Eurasians, officials and persons engaged in business. (The Dutch Government is represented by a Contrôleur.) Agriculture and fishing are the occupations of the natives, many of whom are Christian.

Trade is in Chinese and Arab hands. The Royal Mail Packet Company provides communication with Amboina. There are roads sufficient for the needs of the population, and a wireless station. The approach, especially from the north, is very beautiful, likewise the scenery about the inland sea, while the marine gardens beneath this are probably unrivalled.

The Banda islands were discovered and annexed by the Portuguese Antonio d'Abreu in 1512, but in the beginning of the 17th century the Dutch expelled the Portuguese and established themselves, in spite of native opposition, on Banda Neira and built

a fort there. An English expedition under Captain Keeling arrived at Banda about this time and endeavoured unsuccessfully to establish a footing on Banda Neira, and about a year later Captain Middleton also failed. A small English settlement left on Wai was raided and destroyed by the Dutch as soon as the protecting English vessel had left, but, Dutch hostility notwithstanding, English influence made headway on Lontor, Run and Wai, and in 1621 the Dutch, anxious to make an end of native rule, proposed a joint Anglo-Dutch conquest of the islands. The English declined to co-operate, whereupon the Dutch crushed Bandanese resistance and ruled the islands under a governor, soon eliminating the English element. It was alleged English participation against the Dutch in a native revolt on the island of Run which led to the Amboina Massacre, as a result of which, in 1654, under pressure from Cromwell (*see* AMBOINA), Run was awarded to the descendants of those who perished in Amboina. It was held until the reign of Charles II. (1664), when the Dutch captured it. In 1796 the islands were taken by a British naval force, restored to the Dutch in 1800, retaken during the Napoleonic War, and restored finally by the Treaty of Paris of 1814. Japan occupied the islands in World War II.

BANDANA or **BANDANNA,** a word probably derived from the Hindustani *bāndhnū,* which signified a primitive method of obtaining an effect in dyeing by tying up cloth in different places to prevent the particular parts from receiving the dye. The name was given to richly coloured silk handkerchiefs produced by this process. Bandanas are now commonly made of cotton and produced in Lancashire, whence they are exported. The effect is also produced by a regular process in calico printing, in which the pattern is made by discharging the colour. In the United States, bandanas enjoyed popularity on western cattle ranches, and among the negro population of the southern states.

BANDAR ABBAS, a port of Iran on the Strait of Ormuz, 27° 11′ N. and 56° 17′ E., being one of the gulf ports which form an administrative division of the Iranian province of Fars and Southern Ports. The town is the seat of the Iranian deputy governor who is subordinate to the governor of the gulf ports whose headquarters are at Bushire. Estimated population about 10,000. It stands on the beach with a frontage of 1¼ mi. and is a place of considerable trade, being the entrepôt for goods destined for the southeastern part of Iran the two chief towns of which are Kerman and Yazd, to which former place four caravan routes lead. The shallow roadstead is not well sheltered from the south-east winds, and large vessels have to lie as much as four miles out. The principal articles of export are carpets, fresh and dried fruits, raw cotton, wool, gum and asafoetida.

The vessels of the British Indian Steam Navigation company's subsidiary mail service between Bombay and Basra call weekly on their passages both up and down the gulf; and there is an occasional service by other lines.

A British consulate has been established there since 1902. Bandar Abbas has telegraphic communication by cable, but there is no land line, messages for places in the interior being sent through Bushire.

There is telephonic communication with Hanjam Island, where a radio station has been erected to maintain communication with ships. The climate though hot is not unhealthful and from October to April is pleasant. Improved road connections with the interior promise a revival of the port's importance.

Bandar Abbas (the port of Abbas) was founded by Shah Abbas I., who gave this name to the village of Gumrun or Gombrun, and planned to make his foundation the centre of a foreign trade which was to be gradually developed. As the successor of Hormuz (*q.v.*)—which was abandoned after that island was wrested from the Portuguese and the town destroyed in 1622—Bandar Abbas inherited and filled for over a century the rôle of premier maritime city of Persia. The English were permitted to build a factory there and about 1620 the Dutch obtained a like privilege. But a rival arose in the port of Bushire, called into being by Nadir Shah, which soon obtained the commercial supremacy of the Persian gulf. In 1759 the English factory was destroyed by the French and eventually the trading activities of the East India company were transferred to Basra and then to Bushire. During a period from about 1780 the town and surrounding district were in the hands of the rulers of Muscat but, in 1868, the then sultan was expelled by a successful revolt and the Iranian government has retained complete possession of the place ever since.

See G. N. Curzon, *Persia and the Persian Question* (1892); P. M. Sykes, *10,000 miles in Persia* (1902); A. T. Wilson, *The Persian Gulf, An Historical Sketch* (1928).

BANDARAWELA, a hill-station of Ceylon, situated 80m. almost due east of Colombo, 4,036ft. above sea-level, on the Kandy-Badulla railway. It possesses a good hotel, surrounded by numerous private bungalows. It enjoys a delightful climate, which is cool and bracing but warmer than that of Nuwara Eliya. Population in 1931 was 1,792.

BANDELIER, ADOLPH FRANCIS ALPHONSE (1840–1914), American archaeologist, was born in Berne, Switzerland, on Aug. 6, 1840. When a youth he emigrated to the United States. After 1880 he devoted himself to archaeological and ethnological work among the Indians of the south-western United States, Mexico and South America. He studied in Sonora (Mexico), Arizona and New Mexico, and became one of the leading authorities on the prehistoric civilization of this region. In 1892 he abandoned this field for Ecuador, Bolivia and Peru, where he continued ethnological, archaeological and historical investigations. Bandelier showed the falsity of various historical myths, notably in his conclusions respecting the Inca civilization of Peru.

His publications include three studies "On the Art of War and Mode of Warfare of the Ancient Mexicans," "On the Distribution and Tenure of Lands and the Customs with respect to Inheritance among the Ancient Mexicans" and "On the Social Organization and Mode of Government of the Ancient Mexicans" (Harvard university, Peabody Museum of American Archaeology and Ethnology, *Annual Reports,* 1877, 1878, 1879); *Historical Introduction to Studies among the Sedentary Indians of New Mexico, and Report on the Ruins of the Pueblo of Pecos* (1881); *Final Report of Investigations among the Indians of the South-western United States* (1890–92); *Contributions to the History of the South-western Portion of the United States carried on mainly in the years from 1880 to 1885* (1890)—all these in the *Papers* of the Archaeological Institute of America, American series, constituting vols. i.–v.; *The Gilded Man (El Dorado) and other pictures of the Spanish Occupancy of America* (1893). He also edited *The Journey of Alvar Nuñez Cabeza de Vaca . . . from Florida to the Pacific, 1528–1536* (1905), translated into English by his wife. He died in Madrid on March 19, 1914. His last published works were *The Islands of Titicaca and Koati* (1910) and *The Ruins of Tiahuanaco* (1912).

See C. F. Loomis, *Adolph Francis Alphonse Bandelier* (1914); also Waterman, *Bandelier's Contribution to the Study of Ancient Mexican Social Organization* (1917).

BANDELIER NATIONAL MONUMENT, a tract embracing about 34 sq. m. in the north central part of New Mexico, U.S.A. It became a Government reservation in 1916 and is administered by the department of agriculture. It is the site of a great number of prehistoric artificial caves, immense cliff dwellings, stone sculptures and other evidences of the vanished civilization of the American South-west.

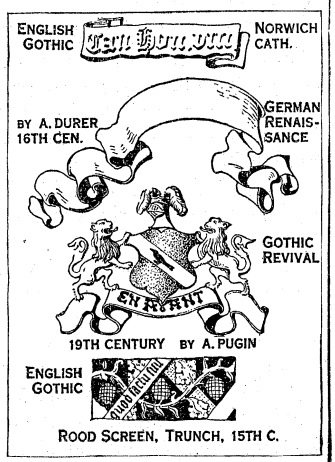
BANDELLO, MATTEO (*c.* 1480–1562), Italian novelist, was born at Castelnuovo, near Tortona. He received a very careful education, and entered the church, though he does not seem to have prosecuted his theological course with great zeal. For many years he resided at Mantua, and superintended the education of the celebrated Lucrezia Gonzaga, in whose honour he composed a long poem. The decisive battle of Pavia, which gave Lombardy into the hands of the emperor, compelled Bandello to fly; his house at Milan was burnt and his property confiscated. He took refuge with Cesare Fregoso, an Italian general in the French service, whom he accompanied into France. In 1550 he was raised to the bishopric of Agen, a town in which he resided for many years. Bandello wrote a number of poems, but his fame rests entirely upon his collection of *Novelle,* or tales (1554, 1573), which

belong to that species of literature of which Boccaccio's *Decameron* is the best known example. Their principal source is to be found in the old French *fabliaux,* though some well-known tales are evidently Eastern, and others classical.

Historically, Bandello's tales are of interest for the insight they afford into the social life of the period and for the important influence they exercised on the Elizabethan drama.

The plots of many Elizabethan plays were derived from Bandello, probably through Belleforest or Paynter.

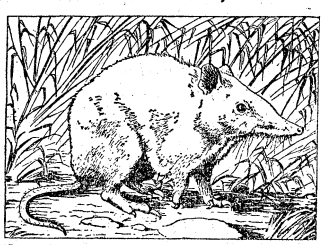
BANDEROLE, a small flag or streamer carried on the lance of a knight, or flying from the mast-head of a ship, etc.; in architecture, a band used in sculpture of the Renaissance period for bearing an inscription, etc.



BANDEROLE
Gothic and Renaissance examples of decorative or inscribed banderoles

BANDICOOT, any animal of the marsupial family Peramelidae. The species, about 12 in number, are widely distributed over Australia, and the adjacent islands. They vary in size from that of a mouse to that of a cat. Most species make burrows in which they live by day, coming out to feed at night. Though feeding largely on worms and insects they ravage gardens and fields, and are detested by the colonists.

BANDICOOT-RAT, a large rat (*Nesokia bandicota*), inhabiting India and Ceylon, which measures from 12 to 15 in. to the root of the tail, while the tail itself measures from 11 to 13 in. It differs from typical rats by its broader incisors, and the less distinct cusps on the molars. Other species of the genus are found from Palestine to Formosa, as well as in Central Asia. *See* RODENTIA.



A COMMON BANDICOOT (PERAMELES), AN INSECT-EATING MARSUPIAL, NATIVE TO AUSTRALIA

BANDIERA, ATTILIO (1811–1844) and **EMILIO** (1819–1844, Italian patriots. The brothers Bandiera, sons of Baron Bandiera, an admiral in the Austrian navy, were themselves members of that service, but they were won over to the ideas of Italian freedom and unity, and corresponded with Giuseppe Mazzini and other members of the *Giovane Italia* (Young Italy). The Bandieras began to make propaganda among the officers and men of the Austrian navy, nearly all Italians, and actually planned to seize a warship and bombard Messina. But having been betrayed they fled to Corfu early in 1844. Rumours reached them there of agitation in the Neapolitan kingdom, where the people were represented as ready to rise *en masse* at the first appearance of a leader; the Bandieras consequently determined to make a raid on the Calabrian coast. They got together a band of 19 men ready to sacrifice their lives for an idea, and set sail on their desperate venture on June 12, 1844. Four days later they landed near Cotrone, intending to go to Cosenza, liberate the political prisoners and issue their proclamations. But they did not find the insurgent band which they had been told awaited them, and were betrayed by one of their party, the Corsican Boccheciampe, and by some peasants who believed them to be Turkish pirates. On July 23 the two Bandieras and seven of their companions were executed; they cried *Viva l'Italia!* as they fell. The moral effect of their execution was enormous throughout Italy, the action of the authorities was universally condemned, and the martyrdom of the Bandieras bore fruit in subsequent revolutions.

See G. Ricciardi, *Storia dei Fratelli Bandiera* (Florence, 1863); F. Venosta, *I Fratelli Bandiera* (Milan, 1863); and Carlo Tivaroni, *L'Italia durante il dominio austriaco,* vol. iii., p. 149 (Turin, 1894).

BANDINELLI, BARTOLOMMEO or **BACCIO** (1493–1560), Florentine sculptor.

He was early placed under Rustici, a sculptor, and a friend of Leonardo da Vinci.

Among his best works are the *bassi-rilievi* in the choir of the cathedral of Florence; his copy of the Laocoön; and the figures of Christ and Nicodemus on his own tomb.

BAND OF FREQUENCIES, a continuous range of frequencies extending between two definite frequencies. In radio communication, frequency bands of various widths are allocated or assigned by international agreement for use by certain services such as broadcasting, transoceanic and ship-to-shore communication.

The width of the frequency band required for use by a given radio station depends upon the type of transmission—for example, whether high or low-speed telegraphy, telephony, facsimile or television.

BANDOLIER or **BANDOLEER** (a little band), a belt worn over the shoulder by soldiers to carry cartridges. In the 17th century wooden cases were hung to the belt to contain powder charges.

The modern bandolier carries the cartridges either in loops sewn to the belt or in small pouches, similarly attached, containing strips of several cartridges. In recent times it has been used mainly by mounted troops.

BANDON or **BANDONBRIDGE,** town, County Cork, Eire, situated in a broad, open valley on both sides of the river Bandon. Pop. (1936) 2,839. It is 20 mi. S.W. of the city of Cork by the Great Southern railway.

It is an important agricultural centre and there are distilleries, breweries and flour mills. Two miles below Bandon on the river is Innishannon, the head of navigation. Bandon was founded early in the 17th century by Richard Boyle, earl of Cork, and was incorporated by James I.

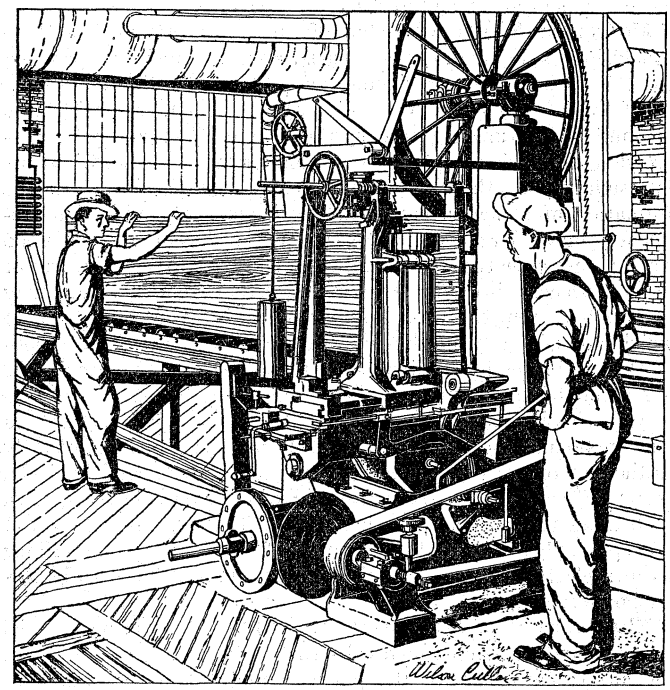
It returned two members to the Irish parliament and thereafter one to the imperial parliament until 1885. After the destruction of the walls by the Irish in 1689, Bandon long resisted the admission of Catholic inhabitants.

BAND-PASS ELECTRICAL WAVE-FILTER, a device designed to transmit or pass electric currents of frequencies within a continuous frequency band. Currents having frequencies beyond the critical or cut-off frequencies of this band are attenuated or are not transmitted.

BAND SAWS, wood saws consisting of a continuous band of steel carrying saw teeth on either or both edges and mounted on two wheels arranged above and below or at either side of a work-table. Power is applied to one of the wheels, moving the band at a high rate of speed, the other wheel being so mounted as to permit it to be moved away from the power wheel to insure tightness of the band during the cut. One of the first applications of the band saw principle is recorded in the British patent office, in connection with a patent issued to William Newberry in 1808. The development at first was slow due to the greater cost of manufacture in comparison to the circular saw. As the need of conserving lumber became more apparent the great saving, as much as 60% in favour of the band saw, hastened its development and adoption.

There are several forms of the band saw. The scroll saw, a simpler form, has an adjustable table for sawing bevels, and has the wheel bearings mounted on a column. Blades as narrow as $\frac{1}{8}$in. are used and it is possible to turn the work as it is being cut so that intricate designs of small radius may be obtained. The band *rip* saw is equipped with a wider blade suitable for ripping any length of stock at high speed, and with feed rolls which grip the stock above and below. A variation of this type has an endless feeding chain in the table and with feed rolls above insures ripping on a straight line. The band re-saw has only a very narrow work-table, and thick planks are fed through to be cut into thinner boards. A variation of the re-saw consists of two blades offset so as to cut a plank into three boards at one passage. The largest form is the band *mill* saw which is used in the first cutting of timber into planks. The size of the wheels are often as much as

10ft. in diameter and the blades as wide as 14 inches. The carriage upon which the log is mounted moves the timber sideways after each cut, an amount equal to the thickness of boards being cut, and draws it away from the band after the cut to prevent the band being pushed off the wheel. Some mills are made with teeth on both edges of the blade and a cut is made on both the forward and return movement. (W. S. W.)



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A BAND RE-SAW IN ACTION

BAND SPECTRUM. A spectrum consists of lines showing certain definite regularities of arrangement. The so-called "line spectra" are attributable to atoms, and band spectra are due to molecules. Many of the features characteristic of band spectra may be seen in the Plate. All comprise a very large number of lines, which in places may be so closely packed as to be separately indistinguishable. In cases where analysis is possible the lines are found to close up in a perfectly regular manner, giving an appearance resembling that of a fluted column (*see* No. 5). Such a series appears to terminate abruptly at the point where the separation of the lines is least; this is called the head of the band, and is a prominent feature of most band spectra (*see* Nos. 4, 5, 6, 7, 10, 11). Such heads frequently occur in groups (*see* 7 and 10), and since a long series of lines is associated with each head there is apt to be considerable overlapping of series and consequent difficulty in analysis (*see* 5 and 13). Further, there is commonly a number of associated groups of heads forming what is known as a band system (*see* 10), and finally the totality of systems originating from a particular compound is termed the band spectrum of that compound. Thus, for example, cyanogen gives rise to one system (*see* 5) stretching from the blue into the ultraviolet, and another (*see* 6), very different in many respects, lying in the red, yellow and green.

Still further complexity, due to the double or triple character of the component lines, is quite common (*see* 4, 3, 8, 9). Again, a series may fade out before the head is reached (*see* 3), in which case the band structure is not always evident. It may be extremely difficult to recognize if there are numerous overlapping bands of this headless variety, each comprising few lines with relatively large spacing. The secondary hydrogen spectrum (*see* 1) is of this nature; the helium band spectrum (*see* 2) is of a character intermediate between this and the more usual type of band spectrum.

The spacing of the lines is roughly inversely proportional to the moment of inertia of the molecule. An extreme instance is seen when comparing the case of helium (*see* 2), for which the moment of inertia is about $3{\cdot}6\times10^{-40}$gm.cm.^{2} and the spacing about 10Å.U., with that of iodine (*see* 13), of moment of inertia 740×10^{-40} and spacing about $\frac{1}{20}$Å.U.

Classification and Origin of Band Spectra.—Band spectra may be classified in various ways; *e.g.*, according to the process which gives rise to them (emission, absorption, fluorescence), to the nature of the energy change involved (electronic, vibrational, rotational), or to the type of molecule (diatomic, polyatomic, polar, symmetrical). On account of the complexity of the subject a general survey is given in the first part of this article, the second part being devoted to a somewhat more detailed treatment of the class which has been most extensively studied. As in the case of line spectra, the emission or absorption of a band line is a consequence of a transition from one to another of a set of stationary states and the frequency of the line is proportional to the difference of energy in the two states. A particular state is only found to combine in this way with a limited number of other states, but the number of possible states of a molecule is so great that in spite of this limitation the spectrum is usually exceedingly rich in lines.

The energy of molecules may differ in any or all of three respects:—(*a*) The electron configuration, which appears to resemble that characteristic of atoms, in that it can be classified in groups or sequences having a particular quantum number in common. (*b*) The vibration of the atomic nuclei. In the case of a diatomic molecule this consists of a to and fro motion along the line joining them. Its precise nature is determined by the force called into play when the nuclei are displaced from their equilibrium positions, but the energy, and therefore also the amplitude, of the vibration can only assume certain definite values. (*c*) The rotation of the molecule as a whole, which again is quantized, so that only certain definite speeds of rotation occur.

Rotation and Vibration Bands.—The contribution of (*a*) to the total energy is usually larger than that of (*b*), which again exceeds that of (*c*). Since also the change in the rotational quantum number is limited to one unit the bands which are due solely to rotation changes are of very low frequency, lying far out in the infra-red towards 100μ (1,000μ=1mm.), where experimental difficulties are very great. Nevertheless, sufficient data have been secured (*e.g.*, for HCl, H_2O, CO_2, NH_3 in absorption) to confirm the general validity of the quantum predictions. In the case of diatomic molecules the spectrum consists of a series of almost equally spaced lines, as predicted by theory; but for polyatomic molecules the structure is more complex.

Bands due to a change of vibrational energy, with which a rotation change may also be associated, are of higher frequency and lie in the nearer infra-red, usually between 1μ and 10μ. Even here

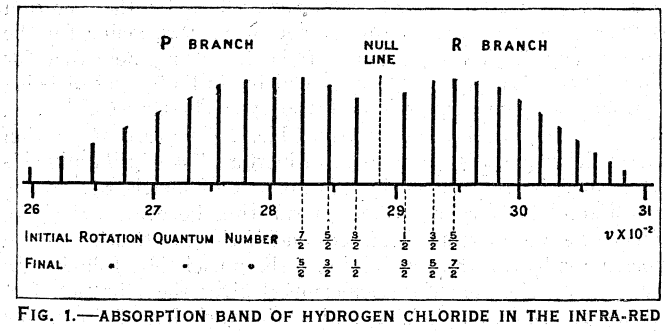


FIG. 1.—ABSORPTION BAND OF HYDROGEN CHLORIDE IN THE INFRA-RED REGION

Heights of ordinates represent percentage of absorption

the experimental difficulties are still considerable, and adequate resolving power has only been obtainable in a very few cases (for diatomic molecules such as HCl). The kind of structure which is typical of this class of band is shown in fig. 1. The band as a whole originates in the absorption by non-vibrating molecules of sufficient energy to set up a one-quantum vibration. The structure is due to the fact that the molecules, originally in various rotation states, pass over to others simultaneously with the vibration change. The right-hand branch (known as the *R* branch) corresponds to an increase of unity in the rotational

quantum number and the left-hand (P) branch to a decrease of one unit in the rotational quantum. The number of lines in each branch thus indicates the number of different rotational states of the molecules, and the intensity distribution of the lines corresponds to the distribution of rotational energy among the molecules. Both characteristics vary with the temperature in accordance with the requirements of the kinetic theory of gases.

An important characteristic of such bands is the absence of a line at the centre, concerning which there has been a certain amount of controversy. This phenomenon is also found in the rotation structure of electronic bands, and is well illustrated in the Plate, No. 12, where the location of the missing ("null") line is indicated. It now appears that such a line, if it existed, would belong to another branch altogether and therefore could not occur without the other members. The branch in question, designated Q, corresponds to zero change of rotational quantum number, and is frequently absent, not only in vibration bands but also in the electronic type. The exact location of a vibration band, and also its intensity, is dependent upon the particular vibration transition concerned *e.g.*, $0\rightarrow1$, $0\rightarrow2$, $.1\rightarrow2$, etc. The first is much the strongest under ordinary conditions, and it is very significant that the relation between the frequencies is not exactly integral, as it would be if the classical theory applied. The actual expression for the frequency of the *nth* harmonic is approximately of the form $n\omega\,(1-nx)$, where x is a small constant depending upon the law of force between the nuclei. It is to be noted that up to the present vibration and rotation bands have been observed only in absorption spectra.

Electronic Bands.—Turning now to electronic bands, which lie mainly in the visible and ultra-violet regions, we find a much greater complexity of structure, but on the other hand the experimental technique available is much more highly developed, so that a great wealth of data has been accumulated, the interpretation of which has reached a fairly advanced stage. We have here to do with a simultaneous change in electronic, vibrational and rotational energy, and each makes its own individual and characteristic contribution to the structure of the spectrum. The electronic contribution is the largest and determines, broadly speaking, the location of the band system. It may be represented as the difference of two terms to which the designations S, P, D, etc., may be attached, and which may have multiple values, just as for atomic spectral terms. The chief difference between the two cases appears to be that transitions such as $S\rightarrow S$ and $P\rightarrow P$, which are "forbidden" for atoms, may occur in molecules. But the total number of electron transitions which actually occur is fortunately much less than in atoms.

With a given electron transition is associated a variety of vibration and rotation changes, which are reflected in the spectrum as a coarse and a fine structure respectively. Postponing for the moment any detailed description of these, we may note that for diatomic molecules the structure is capable in both cases of being represented by an expression of the type $A+Bn+Cn^2+\ldots$ the higher terms being usually negligible. In the case of rotation the coefficient B gives the moment of inertia ($B=h/4\pi^2I$) and C is determined by the change in the moment of inertia due to the transition. The moment of inertia can thus be evaluated if the values of n are correctly assigned, and if the constitution of the molecule is known the separation of the nuclei then follows. In the case of vibration the coefficient B gives the vibration frequency for small amplitudes, and C the variation of frequency with amplitude. If the vibrations were simple harmonic, B would give the force per unit displacement and C would be zero. This is never the case however, nor, indeed, is it to be expected on any obvious molecular model, but from the values of B and C it is possible to determine the amplitude of the vibrations and the law of force, that is to say, the manner in which the force varies with the nuclear separation, in the neighbourhood of the equilibrium position. A typical example of vibration structure is represented in fig. 2, which shows on a scale of wave-numbers the arrangement of the chief band heads of the violet cyanogen system. It will be seen that they group themselves in sequences for each of which the change Δn of vibrational quantum number is the same. As each band comprises a large number of lines (several hundred in this case) there is a great deal of overlapping in one sequence. The larger the moment of inertia the more numerous and closely packed are the lines of one band, so that it eventually becomes impossible to analyse the structure. Nevertheless, the analysis has been carried out more or less completely for more than a hundred band systems already, and various general conclusions of interest have emerged.

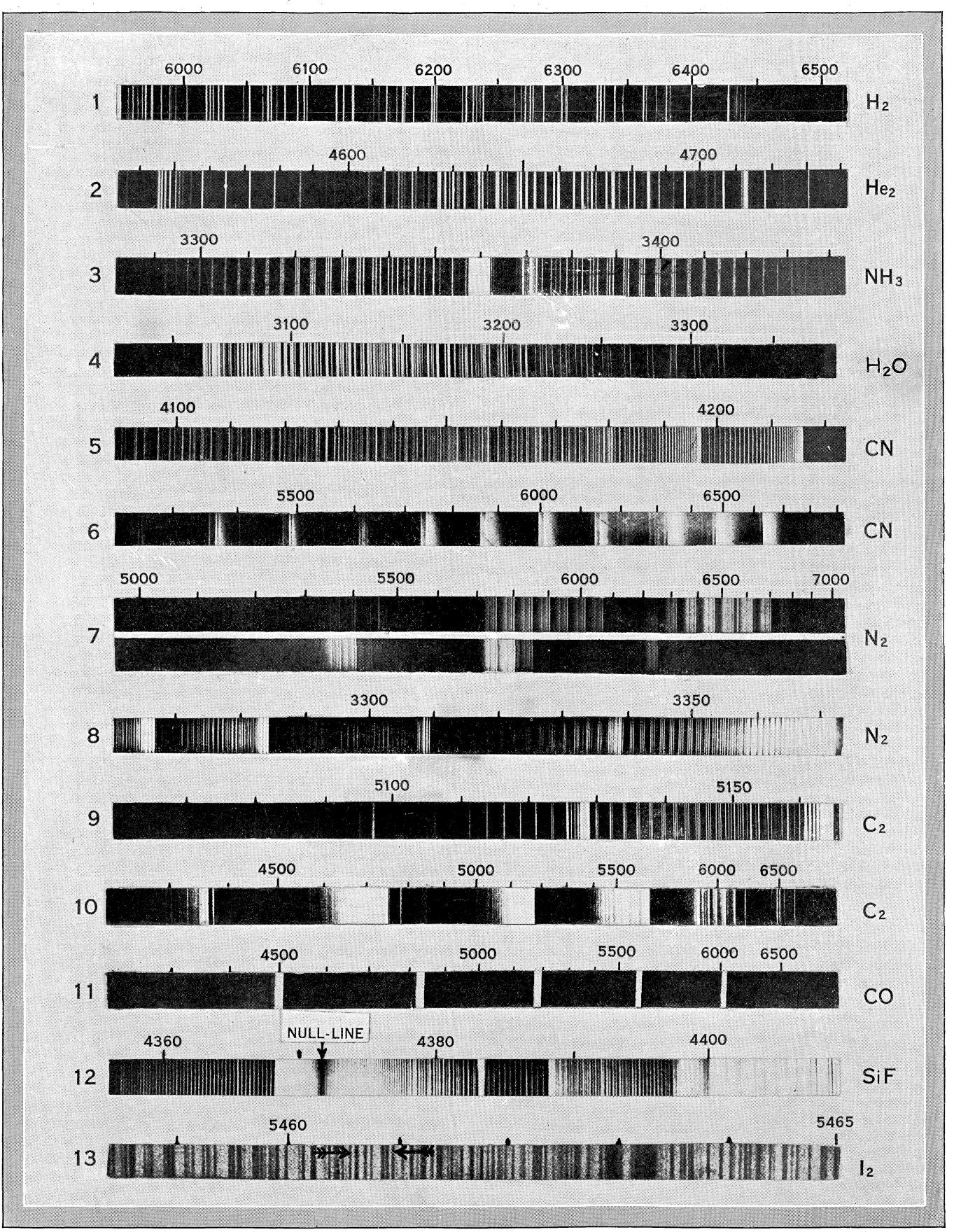
Molecular Structure.—One of the most striking of these conclusions is the small range of variation in the nuclear separation for the 60 or so diatomic molecules concerned. For practically all of them it lies between 1 and 2Å.U.(10^{-8}cm.). For molecules of similar structure, *e.g.*, the hydrides, it exhibits a regular progression, decreasing as the atomic number increases, and increasing suddenly at the beginning of each new period, when the formation of a new electron shell is begun. The vibration frequency shows larger variations (of the order of 100 to 4,000 cm.$^{-1}$ [in practice the wave-number in cm.$^{-1}$, *i.e.*, the reciprocal of the wave-length, is used instead of the actual frequency, this may be obtained from the wave-number by multiplying by 3×10^{10}]) which are generally in the inverse sense. By considering both of these features in relation to an assumed force function some indication of the nature of the binding can be deduced. This may be classified as:—(1) polar, in which two oppositely charged ions are bound by electro-static attraction varying nearly inversely as the square of their distance apart (*e.g.*, HCl, OH, CuH, ZnH, etc.); (2) due to electron sharing, in which some electrons from each atom form a common shell (*e.g.*, CO, NO, CN, etc.); (3) due (probably) to mutual polarization of the atoms, each retaining its own electron system (*e.g.*, I_2 and perhaps some other elementary molecules).

Fluorescence of Molecular Vapours.—There is one special case of band emission which calls for notice, both on account of the interesting nature of the phenomenon and of the simplicity of the theoretical explanation. This is the fluorescence of certain elements in the state of vapour (*e.g.*, S, Se, Te, I) as excited by monochromatic radiation. If iodine vapour, for example, is excited by a wave-length corresponding to one of the lines in its very complex absorption spectrum (*see* Plate), it is found that the fluorescent light emitted consists of a regular series of doublets, the origin of which may be indicated most conveniently by an actual example. The mercury line λ 5461 happens to coincide with an iodine absorption line due to the transition (0, 34) to (26, 35), where the first figure in the bracket refers to the vibration and the second to the rotation state. There is an electron transition as well, but this need not be considered for our present purpose. The excited molecule (26, 35) then emits radiation, but does not necessarily re-emit in one process the whole of the energy previously absorbed. If it should do so it will of course emit the original line, but it may alternatively return to the state (0, 36), giving out a line of slightly different wave-length. There are many other final states possible, such as (1, 34) or (1, 36), (2, 34) or (2, 36), and so on. Each pair gives rise to a doublet, and the doublets themselves form a series of approximately constant wave-number interval. Further, the comparison of accurate wave-length data with the theoretical expressions permits an evaluation of the molecular constants, thus evading the difficulty, hitherto insurmountable, of completely analysing the absorption spectrum. (*See* FLUORESCENCE AND PHOSPHORESCENCE.)

Rotation Structure of Bands.—We proceed now to the more detailed consideration of electronic bands due to emission by diatomic molecules. A single band of this type arises from a variety of rotation changes associated with a particular electron and vibration transition. The contribution of these to the radiated frequency may thus be regarded as constant, ν_0 say. By applying the usual quantum restriction to the rotational motion and making use of Bohr's Correspondence Principle, we find that a molecule in the m'th rotational state is capable of emitting one of three different frequencies, namely:

due to $m\rightarrow m-1$, $\nu=\nu_0-B/2+Bm+Cm^2$
" " $m\rightarrow m$, $\nu=\nu_0+Cm^2$
" " $m\rightarrow m+1$, $\nu=\nu_0-B/2-Bm+Cm^2$

BAND SPECTRUM



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BAND SPECTRA OF VARIOUS CLASSIFICATIONS

WAVE-LENGTH SCALES ARE IN ÅNGSTRÖM UNITS (1 A.U. = 10^{-10} METRE). THE MOLECULES TO WHICH THE SPECTRA ARE ATTRIBUTED ARE INDICATED ON THE RIGHT

1. H_2, secondary spectrum of hydrogen. 2. He_2, band spectrum of helium. 3. NH_3, the "ammonia" band. 4. H_2O, the "water-vapour" band. 5. CN, part of violet band system of cyanogen. 6. CN, part of red band system of cyanogen. 7. N_2, "first positive" system of nitrogen bands. Spectrum of "active nitrogen." 8. N_2, "second positive" system of nitrogen. 9. C_2, "Swan" band of carbon or hydrocarbon. 10. C_2, "Swan" spectrum. 11. CO, "Angstrom" bands of carbon monoxide. 12. SiF, bands of silicon fluoride. 13. I_2, absorption spectrum of iodine

These are designated $R(m-1)$, $Q(m)$ and $P(m+1)$ in the notation which is most commonly used at present. The appearance of such a band is represented diagrammatically in fig. 3, but it should be noted that m has been given half-integral values since this is most frequently the case in practice. The Q branch is often absent.

Either the P or the R branch may run to a head, according to whether C is positive or negative. The former is the case when the moment of inertia increases as a result of emission, and vice versa. But the position, or even the existence of a head, is of no immediate physical significance, for it is simply determined by the relative values of B and C. The band may fade out before the head is reached, as in He_2, or the head may be so close to ν_0 that it is not recognizable by the crowding together of the lines, so that the band appears to be headless, as in I_2.

The rotation terms, from which the molecular constants are calculated, are evaluated as follows. For brevity we may write:

$$\left.\begin{aligned} P(m) &= \nu_0 + F'(m-1) - F''(m) \\ Q(m) &= \nu_0 + F'(m) - F''(m) \\ R(m) &= \nu_0 + F'(m+1) - F''(m) \end{aligned}\right\}$$ where F' refers to the state of higher electronic excitation and F'' to the lower,

whence $Q(m)-P(m)=R(m-1)-Q(m-1)=F'(m)-F'(m-1)$ and $Q(m)-P(m+1)=R(m)-Q(m+1)=F''(m+1)-F''(m)$. These relations serve at once to fix the relative numeration of the branches and to isolate the initial and final term differences, from which the actual term values can readily be obtained. A similar procedure can be followed even if the Q branch is absent.

The intensity distribution in all three branches is similar, showing an increase with m up to a maximum and then a more gradual decrease to zero. The position of the maximum shifts to higher m values with increasing temperature in agreement with the Maxwell-Boltzmann law of distribution of rotational energy amongst the molecules. In practice it rarely happens that the branches are single; doublets are quite common, and higher multiplicities, up to fivefold, have been recorded. Nor are the simple expressions given above usually adequate for the accurate representation of band branches. It is necessary to modify them on account of several disturbing factors, *e.g.*, the distortion of the molecule due to rotation and vibration. Further terms, in m^4 and m^6, must be introduced in the rotation term values, and the value of B adjusted according to the particular state of vibration. With such a corrected formula a very accurate representation can usually be achieved, and it is then possible to calculate the vibration frequency solely from observations of the rotation structure.

Vibration Structure of Bands.—In order to account for the vibration structure it is necessary to express the vibrational energy in terms of the quantum number n; the expression which is usually employed is $an-bn^2$, where a is the vibration frequency for negligibly small amplitudes and b expresses the departure from simple harmonic motion. The vibration structure is then determined by the range of possible values for n', n'' and $n'-n''$ (n' and n'' refer to the upper and lower electronic levels respectively). This varies greatly in different molecules; in some (*e.g.*, CaH, He_2) vibration is almost, if not entirely, precluded owing to instability of the molecule, whilst in others a fairly long series of vibration states is developed (*e.g.*, I_2, with n' up to 59). The observed vibration transitions, $n'-n''$, show a correspondence with the change in the moment of inertia, $I'-I''$, that is to say, relatively high values of the two tend to occur together. Franck has pointed out that this is to be expected, since a sudden change of size of the molecule must disturb the equilibrium of the nuclei and set up a vibration which is more intense the greater the change. We find a particularly clear example of this in the absorption spectra of I_2, Br_2 and Cl_2 in the visible region. In all three cases $I'-I''$ is exceptionally large compared with other molecules. In the case of the non-vibrating molecule of I_2 the electron transition sets up a vibration of at least 18 units, and the earlier portion of the $n''=0$ progression, for which $n'<18$, is therefore entirely absent. Br_2 shows a similar peculiarity, whilst in the case of Cl_2 the change is apparently so great that dissociation occurs, giving continuous instead of banded absorption, and the first observed absorption band therefore corresponds to $n''=1$ instead of $n''=0$ as in the other two cases. Incidentally, this explains why the banded absorption is relatively so weak in Cl_2, for at ordinary temperatures the majority of the molecules are in the vibrationless state and so give rise only to continuous absorption. The appearance of the spectrum is also much influenced by the relative values of a' and a''. If they do not differ much the bands forming a sequence, for which $(n'-n'')=$constant, lie fairly close together, as in CN (*see* fig. 2 also Plate, Nos. 5 and 10), but if $a'-a''$ is large, as in the halogens, the sequences are widely spaced and frequently are intermingled with one another, so that the vibrational structure is much less apparent. (*See* Plate, No. 13.)

Since the molecular vibration frequency is directly dependent upon the masses of the nuclei we should expect the vibration

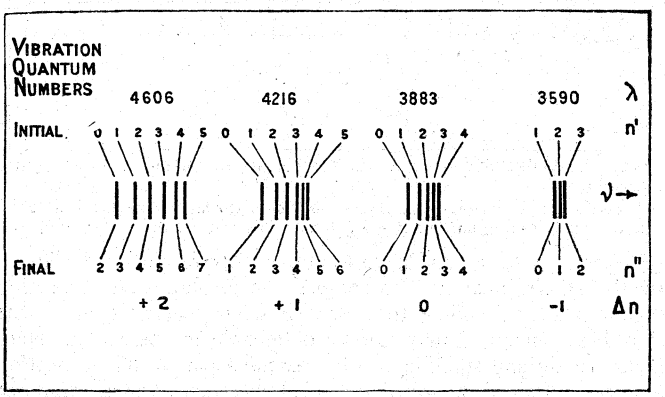


FIG. 2.—ILLUSTRATING VIBRATION STRUCTURE IN AN ELECTRONIC BAND SPECTRUM

Arrangement of heads of violet band system of cyanogen. See also No. 5 on Plate for actual appearance of λ4216 group.

structure to furnish evidence as to the existence of isotopes (*q.v.*), and this is, in fact, the case. The matter has been thoroughly investigated, both theoretically and experimentally, by Mulliken, with completely satisfactory results. It is found that the bands due to the different isotopic combinations are separated by an amount proportional to their distance from the origin of the system, and accurate measurements of the effect have proved of service in resolving uncertainties as to the identity of the emitting molecule. It is quite possible that intensity measurements might be utilized to determine the relative abundance of the isotopes.

Electronic Configuration of Molecules.—There remains to be considered the electronic energy change involved in the emission or absorption of a band spectrum. As already mentioned, the electronic terms are generally similar to those of atoms, but only in H_2 and He_2 has the existence of well-developed Rydberg sequences been established. Some striking similarities, as regards multiplicities and term values, have, however, been recognized between certain molecular electronic levels and those of "corresponding" atoms. For example, the electron levels of the molecules BeF, BO, CO^+, N_2^+ and CN, which all have nine outer electrons if it is assumed that the K shells of the constituent atoms remain intact, exhibit a certain similarity to those of Na, which also has nine electrons outside the K ring. This suggests that, as in Na, there is one electron less firmly bound than the other eight, and the analogy is supported by the resemblance which is traceable between CO, N_2 and Mg (ten outer electrons) and between O_2^+, NO and Al (11 outer electrons). The matter must still be regarded as *sub judice*, however, as Mecke has brought forward evidence which appears to conflict with the above view. It seems clear, in any case, that in these molecules there must be some sort of common shell, which is concerned with the binding of the nuclei but not directly with the emission. There are also molecules (Cu halides, He_2) in which the radiating electron appears to be linked with one of the constituent atoms instead of with the molecule as a whole. (*See* fig. 3.)

Absorption Band Spectra.—Although emission band spectra have been much more extensively studied, band spectra which can be obtained in absorption are of particular interest and importance, for several reasons. The identity of the absorbing molecule is definitely known, whereas in emission there is frequently

much uncertainty, which can thus be removed if any of the same levels can be recognized in both spectra. Further, absorption spectra are in general much less complex than emission, since the only initial levels are those normally present in the unexcited vapour, whereas in emission the initial levels refer to excited states and are therefore much more numerous. These absorption spectra, however, lie mostly, apart from the halogens, in the far ultraviolet

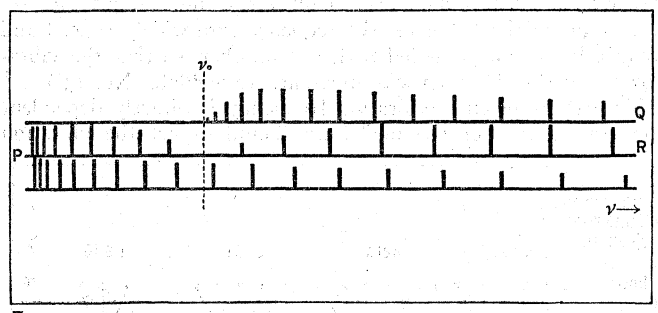


FIG. 3.—ILLUSTRATING ROTATION STRUCTURE IN AN ELECTRONIC BAND SPECTRUM
Heights of ordinates represent intensities. Both Q and P branches run to a head. The returning portion of the P branch is shown on the lowest line

(Schumann) region, and have therefore only recently been investigated. Unfortunately it is not possible to obtain an absorption spectrum corresponding to every emission spectrum, since the substance concerned may not be obtainable in the vapour state under conditions suitable for the examination of its absorption spectrum. Indeed, many of the band spectra to which reference has here been made are due to very unstable molecules (OH, He_2, the metallic hydrides) which have only a transitory existence under the special conditions obtaining in a discharge tube. The spectra of even the common chemical molecules consisting of more than two atoms are practically unknown. (*See* also SPECTROSCOPY; OPTICS; LIGHT; QUANTUM MECHANICS.) (W. E. CU.)

See E. C. C. Baly, *Spectroscopy* (3rd ed., vol. iii, 1927); "Molecular Spectra in Gases," *Bulletin No. 57 of the Nat'l Research Council*, 1927).

BANDUNG, capital of the Priangan residency, Java, Netherlands Indies, the third largest city in Netherlands India. Population 166,815 (19,650 Europeans and Eurasians, 130,028 natives and 17,137 foreign Asiatics, including Chinese). In 1906 it had less than 50,000 inhabitants. It is on a plateau in Priangan, 2,346 ft. above sea, surrounded by heights of 5,000 to 7,500 ft., and has a delightfully cool, healthful, malaria-free climate. It has cheap electric light and power, a telephone system, hard-surfaced, wide, tree-lined streets and roads; and shops, business premises, banks, official buildings and private residences the equal of many in Europe, together with several churches, and first-class hotels, clubs, two hospitals, restaurants, markets, three parks, a theatre, several cinemas, and a racecourse. Distant from Batavia (109 mi.), by rail just under three hours, it has recently become headquarters of the departments of war, public works, and public industries, including post, telegraph and telephone services, mines service, salt monopoly, state rail and tramways, electricity and water power. Bandung has a technical and several other colleges, including one for the sons of nobles, a government vaccination institution and a Pasteur institute, a hospital for eye diseases and an institute for the blind, a training school for native teachers, also one for training native officials, the largest quinine factory in Java, state railway workshops, several large factories, and an extensive artillery construction establishment. The resident's house is a handsome building, also the official residence of the native regent, and president of the regency council. There is a fine large mosque, and in the Lembang highlands, not far away, an astronomical observatory, the Bosscha observatory. An excellent airfield is west of the city. On the neighbouring Pengalengan plateau the Malabar radio station—formerly the most powerful wireless station in the world—stands at a height of 4,400 ft.

Founded, practically, by Marshal Daendels, in 1810, Bandung was little more than a large village until, in 1884, the government railway was brought to it—from Buitenzorg, over Sukabumi and Chandjur. It was then looked upon as the capital of the whole of the Sundanese country, as a health resort for the coastal people, and, during race week, the centre of fashion, when European and native (particularly Sundanese) life could be seen at its gayest. In the neighbourhood of Bandung there is charming mountain scenery, including several waterfalls, the most beautiful those of the Chi Burum, amid the luxuriant jungle of Pengalengan, the Chi Sarua, and the Chi Tarum, where the water rushes through a narrow gully to dash down from the Bandung plateau.

Bandung, centrally located, is connected by rail with practically all Java. It was of great strategic value during the Japanese invasion of World War II, and its fall on March 7, 1942, practically sealed the fate of Java. (E. E. L.; X.)

BANDURRIA, a Spanish musical instrument of the guitar family having from three to six strings plucked by a plectrum. The bandurria is not to be confused with the pandura, an ancient oriental instrument of the lute type, from which, as also from the mandoline, it differs essentially inasmuch as its back is flat, not vaulted. In England the bandurria, or a very similar instrument, was known as a bandoer or bandora.

BANEBERRY or **HERB CHRISTOPHER,** popular names for *Actaea spicata* (family *Ranunculaceae*) a poisonous herb with long-stalked compound leaves, small white flowers, and black berries, found wild in copses in limestone districts in the north of England. It is widely distributed in the north temperate zone. *Actaea alba,* with white fruits, and *A. rubra,* with red fruits, are common in eastern and midwestern North America.

BANÉR (BANNER, BANIER), **JOHAN** (1596–1641), Swedish general in the Thirty Years' War, was born at Djursholm castle on June 23, 1596. As one of the chief subordinates of Gustavus Adolphus, Banér served in the campaign of north Germany (1630), and at the first battle of Breitenfeld he led the right wing of Swedish horse. When Gustavus marched towards Lützen, his general was left in command in the west, where he was opposed to the imperial general Aldringer. In 1634, as a Swedish field marshal, Banér, with 16,000 men, entered Bohemia, and, combined with the Saxon army, marched on Prague. But the complete defeat of Bernhard of Saxe-Weimar in the first battle of Nördlingen stopped his victorious advance. After this event the peace of Prague placed the Swedish army in a very precarious position, but the victories won by the united forces of Banér, Wrangel and Torstensson, at Kyritz and Wittstock Oct. 4, 1636, restored the paramount influence of Sweden in central Germany. Even the three combined armies, however, were decidedly inferior in force to those they defeated, and in 1637 Banér was completely unable to make headway against the enemy. Rescuing with great difficulty the beleaguered garrison of Torgau, he retreated beyond the Oder into Pomerania. In 1639, however, he again overran northern Germany, defeated the Saxons at Chemnitz and invaded Bohemia itself. The winter of 1640–41 Banér spent in the west. His last achievement was an audacious *coup de main* on the Danube. Breaking camp in midwinter (a very rare event in the 17th century) he united with the French under the comte de Guébriant and surprised Regensburg, where the diet was sitting. Only the break-up of the ice prevented the capture of the place. Banér thereupon had to retreat to Halberstadt. Here, on May 10, 1641, he died, after designating Torstensson as his successor. He was much beloved by his men, who bore his body with them on the field of Wölfenbuttel. Banér was regarded as the best of Gustavus's generals, and tempting offers (which he refused) were made him by the emperor to induce him to enter his service. *See* also THIRTY YEARS' WAR.

See Lundblad, *Johan Banér* (1823); Ardwisson, *Trittioariga Krigets maerkvaerdigaste personer* (1861); B. P. von Chemnitz, *Königlichen Schwedscher in Deutschland geführten Kriegs;* Martin Veibull, *Sveriges Storhedsted* (1881); *Banérs Bref till Axel Oxenstjerna* (1893).

BANERJEA, SIR SURENDRANATH (1848–1925), Indian (Brahman) politician and journalist. Passing for the Indian civil service at the open competition of 1870, he retired after two years' service, and opened a small school in Calcutta, which expanded into Ripon college. In 1876 he founded the Calcutta Indian association, and three years later he became editor

of the *Bengalee* newspaper. He was one of those who established the Indian National congress in 1883; he presided over the Poona session of 1895 and again at the meeting at Ahmadabad in 1902.

In 1893 Banerjea was elected to represent the Calcutta corporation on the Bengal Legislative council, and was twice returned to the central legislature as member for Bengal. Vehemently opposing the administrative partition of Bengal effected by Lord Curzon in 1905, he supported the boycott of foreign goods. But he preferred constitutional methods, and welcomed the Montagu-Chelmsford reforms. Severing his association with the congress, which had passed under "extremist" control, he formed an "Indian Liberal" organization, and accepted office as minister for local government and sanitation in Bengal. A knighthood was conferred upon him in January 1921, and in 1924 he retired into private life. Shortly before his death he published his autobiography, *A Nation in Making*.

BANFF, a popular mountain resort in the southwestern part of Alberta, Canada. Its population according to the census of 1941 was 2,187. Situated on the main line of the Canadian Pacific railway, it is the principal station for the Rocky Mountain park of Canada, which has an area of 2,585 square miles. The town stands at an altitude of about 4,538 feet, 84 mi. W. of Calgary and 40 mi. E. of Lake Louise, with which it shares a large tourists' patronage. Besides the marvelous scenic beauty of the region the town's chief attractions are its two government controlled hot sulphur springs. It offers excellent hotel accommodation and camping grounds and has a large sanatorium. In recent years also its annual winter sports carnival has drawn many visitors from the whole of the upper prairie country.

BANFF, royal and small burgh, seaport and capital of Banffshire, Scotland. Pop. (1938) 3,306. It is beautifully situated on high ground, on the left bank of the mouth of the Deveron, 50 mi. northwest of Aberdeen by the L.N.E. railway. Its first charter was granted by Malcolm IV in 1163, and further privileges were conferred by Robert Bruce in 1324 and Robert II in 1372. A castle was built (1750) on the site of an old one near the sea where Archbishop Sharp was born. Leather, rope and sails are made, and there are a distillery, an iron foundry and timber-yards, besides some shipbuilding. The fishing trade is also important. The burgh is under provost and council. Alexander Cassie of London, a native of Banff, left £20,000 to the poor of the town. Duff House, immediately adjoining the town, was a seat of the duke of Fife. It was built in 1740–45, after designs by Robert Adam, at a cost of £70,000. The house, which contains a fine collection of pictures and an interesting armoury, with about 140 acres of park, was presented to the towns of Banff and Macduff (on the opposite side of the Deveron) by the duke of Fife in 1906. It is used as a hotel.

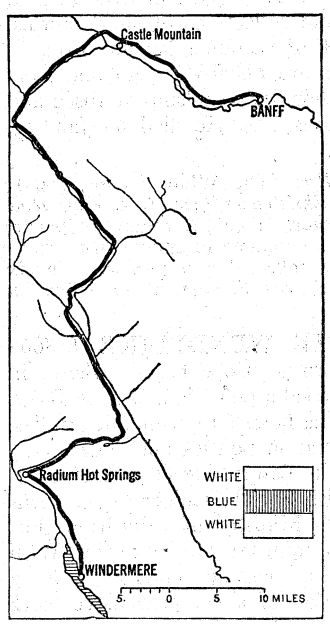
BANFFSHIRE, northeast county of Scotland, bounded on the north by Moray firth, on the east and south by Aberdeenshire, and on the west by Elgin and Inverness. Its land area is 403,053 ac., or about 629.8 sq.mi. The northern half is mostly fine, open and undulating, with rich, highly cultivated soil. The south is mountainous with extensive farms in fertile glens. Some mountains are forested, some present rock and copse, others brown heath. The highest is Cairngorm, on the confines of Banff and Inverness (4,084 ft.), famous for amber-coloured quartz crystals, the "cairngorms" of Scottish jewellery. This and other summits belong to the most extensive of several masses of granite found, with other igneous intrusions, among the crystalline schists of sedimentary origin of the eastern highland sequence which cover most of the county. These sedimentary rocks form belts trending generally northeast and southwest, and include slates and black schists, the main limestone and the quartzites. The last, probably the highest members of the series, form ridges owing to more rapid erosions of softer rocks between them. No great rivers belong wholly to Banffshire. For a considerable part of their course the Spey forms the western and the Deveron the eastern boundary. The short Banffshire streams are Avon (or Aven), Fiddich, Isla, Buckie, Deckford (with a series of cascades), and Livet. Most of them are stocked with trout, and the Spey and Deveron are famous for their salmon. The fine glens include Glen Aven, Glen Barry, Glen Fiddich, Glen Isla, Glen Livet and Glen Rinnes. The largest lochs are in the extreme south.

Cairns are found in the districts of Rothiemay, Ballindalloch, Boharm, Glen Livet and elsewhere. "Cairn" also occurs in many place names. Many conflicts took place between Norse invaders and the Scots. Near Cullen a fierce encounter occurred in 960, and a sculptured stone at Mortlach is said to commemorate a victory gained by Malcolm II over the Norsemen in 1010. The shire was the scene of much strife after the Reformation. In Glen Livet the Roman Catholics under the marquess of Huntly worsted the Protestants under the earl of Argyll. From 1624 to 1645 was a period of almost incessant struggle; covenanting troubles combined with the frequent conflicts of the clans; but the Jacobite risings of 1715 and 1745 left the county comparatively untouched, and thereafter it became settled.

Pop. (1938) 53,567. In 1931 there were 159 persons speaking Gaelic and English. Chief burghs are Banff (pop., est. 1938, 3,306), Buckie (8,481), Keith (4,440) and Macduff (3,283). Banffshire, with Aberdeen and Kincardine shires, forms a sheriffdom, and there is a resident sheriff-substitute at Banff, who sits also at Keith and Buckie. There are 6 county districts and 11 small burghs, Banff and Cullen being royal burghs. The county returns one member to parliament. A notable incident in the history of education in Banffshire was the bequest of James Dick (1743–1828), a West Indian merchant, who left over £110,000 to promote the higher learning of the schoolmasters of this county, Aberdeenshire and Elginshire, the income to be distributed among dominies qualified by examination to become beneficiaries.

The soil is in general rich and productive. Oats are the predominant crop, with 40,000 ac. in 1938, but the demands of distillers keep up the barley acreage (8,176 ac.). Of green crops, turnips and swedes at 17,141 ac. are by far the most important. Cattle and stock form the staple agricultural industry. There is also a considerable amount of dairy farming. Among landlords who did much to encourage agricultural enterprise and so to plant and reclaim lands were the earls of Fife and the earls of Findlater, afterwards earls of Seafield. It was a Seafield who, in 1846, received the honorary gold medal of the Highland and Agricultural Society of Scotland, for his immense and thriving plantations of useful trees, amounting in the preceding 35 years to nearly 32,000,000, in the counties of Banff, Moray and Nairn. Of 2,855 holdings in 1938, nearly one-half were less than 30 ac.

Distilleries are numerous and famed. A fishing and miscellaneous trade is done at the harbours of Banff, Macduff, Buckie, Gardenstown, Portsoy, Cullen and Port Gordon. The cod and herring fisheries are specially important at Buckie. The fishery districts centre in Banff and Buckie. A good deal of boat-building is carried on at coast stations. The main limestone has been extensively quarried, as at Fordyce, near Grange, and at Keith and Dufftown; lime-burning is carried on, and the slates (for roofing) and the granite have also been worked.



The systems of the L.N.E. and the L.M.S. railways serve the chief towns of the county and provide communication in one direction with Aberdeen, and in another with Elgin, Nairn and Inverness.

BANFF-WINDERMERE HIGHWAY extends from Banff, Alberta, Canada, to Windermere in British Columbia, and is about 150 mi. in length. Opened in 1923, it was the first motor route built across the central Rockies, through magnificent scenery. It forms a part of the

Trans-Canada highway which extends south to Cranbrook and connects with Spokane, Washington, U.S.A., and its course through Vermilion and Sinclair Passes is highly picturesque. Castle Mountain and Radium Hot Springs, which lie in its path, add to its scenic interest.

BÁNFFY, DEZSÖ (DESIDERIUS), BARON (1843–1911), Hungarian statesman, was born at Klausenburg on Oct. 28, 1843, and died in Budapest on May 24, 1911. As lord lieutenant of the county of Belsö-Szolnok, chief captain of Kövár and curator of the Calvinistic church of Transylvania, Bánffy exercised influence outside parliament from 1875 onwards; but his public career may be said to have begun in 1892 when he became speaker of the house of deputies. As speaker he continued, however, to be a party-man (he had always been a member of the left-centre or government party) and materially assisted the government by his rulings. He was a stringent adversary of the radicals, and absented himself from the capital on the occasion of Kossuth's funeral on April 1, 1894. On Jan. 14, 1895, the king, after the fall of the Széll ministry, entrusted him with the formation of a cabinet. His programme, in brief, was the carrying through of the church reform laws with all due regard to clerical susceptibilities, and the maintenance of the Composition of 1867, whilst fully guaranteeing the predominance of Hungary. He succeeded in carrying the remaining ecclesiastical bills through the Upper House, a triumph which brought about the fall of Kalnóky, the minister for foreign affairs. In the ensuing elections of 1896 the government won a gigantic majority. The corrupt practices at this election were the pretext for the fierce opposition in the House which he henceforth had to encounter, though the measures which he now introduced (the Honved Officers' Schools Bill) would, in normal circumstances, have been received with general enthusiasm. Bánffy weathered these storms, and his subsequent negotiations with Austria as to the quota and commercial treaties, to the considerable political advantage of Hungary, even enabled him for a time to live at peace with the opposition. But in 1898 the opposition secured the dismissal of Bánffy, and passion ran so high that on Jan. 3, 1899, Bánffy fought a duel with his most bitter opponent, Horánszky. On Feb. 26 Bánffy resigned, to save the country from its "ex-lex," or unconstitutional situation; subsequently he contributed to overthrow the Stephen Tisza administration, and in May 1905 joined the Kossuth ministry.

See article, "Bánffy," by H. Marczali, in *Pallas Nagy Lexikona*, Köt 17.

BANG, HERMANN JOACHIM (1858–1912), Danish author, was born of a noble family in the island of Zealand. When he was 20 he published two volumes of critical essays on the realistic movement. In 1880 he published his novel *Haablöse Slaegter* ("Families without hope"). He settled in Copenhagen, and produced a series of novels and collections of short stories, which placed him in the front rank of Scandinavian novelists.

Among his more famous stories are *Faedra* (1883) and *Tine* (1889). The latter won for its author the friendship of Ibsen and the enthusiastic admiration of Jonas Lie. He died on Jan. 29, 1912.

His works include: *Det hvide Hus* (The White House, 1898), *Excentriske Noveller* (1885), *Stille Eksistenzer* (1886), *Liv og Dod* (Life and Death, 1899), *Englen Michael* (1902), a volume of poems (1889), recollections (*Ti Aar*, 1891), a volume of essays, *Masker og Mennesker* (1910). His works were collected and published in six volumes (Copenhagen and Oslo, 1912). *See* F. Poppenberg, *Hermann Bang* (1904).

BANG, NINA HENRIETTE WENDELINE (1866–1928), Danish politician, was born at Copenhagen, where, in 1894, she graduated M.A. She married a politician, Gustav Bang, who died in the year 1915. Devoting herself to economic studies, she was active as a Social Democrat in politics and journalism, and in 1918 became a member of the Landsthing (Upper House). In 1924 she joined the first Danish Social Democratic Government under Theodore Stauning as Minister of Education thus becoming the first woman cabinet minister in the world. With the support of Danish and foreign scientific funds Mrs. Bang commenced, in 1906, the publication of a comprehensive work about the dues on the Sound, *Tables of Shipping and Goods Transport on the Sound, 1497–1660* (1906–22). She died in Copenhagen March 25, 1928.

BANGALORE, a city of India, the capital of the Indian State of Mysore, and the largest British cantonment in the south of India. It is 3,113 ft. above sea-level, and 219 mi. W. of Madras by rail. Pop. (1941) 248,334, was nearly triple that of 1911. This rapid increase is due to the development of industry and commerce. The foundation of the present fort was laid by a husbandman who, probably in the 16th century, left his native village and settled a few miles to the north of Bangalore, which he conquered. Later, Bangalore was in the possession of Shahji, father of Sivaji, the founder of the Mahratta sway, and then of his son, who sold it to the raja of Mysore in 1687. In 1758 Bangalore was granted as a *jagir* or fief to Hyder Ali, afterwards usurper of Mysore, who greatly enlarged and strengthened the fort, which on his expulsion from Seringapatam in 1760, served as his refuge.

In 1791 the fort was stormed by a British army commanded by Lord Cornwallis, and in 1799 the district was included by the Treaty of Seringapatam within the territory of the restored raja of Mysore. It formed the headquarters of the British administration of Mysore from 1831 to 1881. When the State of Mysore was restored to its raja in 1881, the civil and military station of Bangalore was permanently reserved under British jurisdiction as an "assigned tract." It has an area of 12 sq.mi. Bangalore is the headquarters of a military district, its elevation rendering it healthful for British troops. A considerable number of European pensioners reside here, and there are many visitors in the season. There is a modern palace for the maharaja and a fine Indian institute of science. Bangalore is an important railway centre. There are oil, cotton, wool and silk mills, brick and iron works, a distillery and a tobacco factory. Suburbs have been built recently outside the city, owing to the prevalence of plague, but the poorer quarters are overcrowded. There is a good water supply, drainage and electric light.

The District of Bangalore borders on the Madras district of Salem. The main portion consists of the valley of the Arkavati river, which joins the Cauvery on the southern frontier. Its area is 2,922 sq.mi. Pop. (1931) 908,056.

BANGANAPALLE, a State of southern India, surrounded by the Madras district of Kurnool. Area, 259 sq.mi.; pop. (1941) 44,592; no tribute and no army. The late nawab was temporarily removed from his position in 1905 owing to the inefficiency and excessive expenditure of the administration. The present nawab is Meer Fazle Ali Khan Badahur. The town of Banganapalle is 17 mi. from the branch of the Southern Mahratta railway from Guntakal to Bezwada. There are diamond mines near the town, and ghee, fruit, lacquer and skins are exported.

BANGASH, a Pathan tribe in the Kohat district of the North-West Frontier Province of India.

See H. A. Rose, *Tribes and Castes of the Punjab and North-West Frontier Province* (1911).

BANGKOK, chief city and port of Thailand, on the east bank of the Menam Chao Phya river, 25 miles above the head of the Gulf of Siam. Population (1937) 684,994 in Bangkok proper, 205,459 in Thonburi, on the opposite bank of the river. Bangkok became the Thai capital in 1769, after Ayuthia (*q.v.*) was destroyed. In 1943 the Japanese-sponsored regime moved the capital to Petchaboon, possibly to avoid danger from military action. Chinese outnumber Thai and carry on most of Bangkok's trade, in spite of restrictions.

Prior to the age of motor vehicles the *klongs* or canals were the chief thoroughfares, and they still carry considerable traffic. Modern streets accommodate a medley of motor vehicles, carts, bicycles and "trishaws." Fine residences house many officials and wealthy merchants, but typical oriental squalor is also in evidence. The royal palace, in a bend of the river, is colourful and typically Thai, but imposing government office buildings are in western style. A strong municipal government administers Bangkok, police, public health and education being better provided than elsewhere in Thailand. There are two modern electric plants

and a good waterworks, one of the banks of which occupies a hill dominating the heart of the city. The 1937–38 birth-rate and death-rate were 38.2 and 18.1 respectively.

About 70% of Thailand's foreign trade passes through Bangkok harbour, which consists of 3 miles of river above the Grand palace and 6 miles below that point, the heaviest traffic being two to four miles south of the palace, where wharves, godowns, the port authority offices and branches of the leading trading companies crowd both banks of the river. In 1941 a new port was opened at Klong Toi, about 12 miles below the palace, outside Bangkok proper. A bar at the river's mouth prevents large vessels from entering, and makes transshipment in lighters essential. About 1,000 ships per year call, 1937 tonnage being 1,345,275.

Geography makes Bangkok the inevitable entrepôt of Thailand. The Menam Chao Phya valley is one of the world's great rice exporting areas, and a network of streams and canals brings almost all the export surplus to Bangkok for milling and shipment. The Thai State railways have their chief workshops at Bangkok, and lines run to Chiengmai (*q.v.*) in northern Thailand, to the Korat plateau to the northeast, to Pnom Penh (*q.v.*) in Indo-China and to Singapore. After 1936 a road-building program connected Bangkok with several points on the Indo-China border, both east and northeast, and with Singapore. The Don Muang airport is one of the largest and best equipped in southeast Asia, and in peace time large airliners on frequent schedules connect Bangkok with Europe, Singapore, Indo-China and Japan.

The highest annual "mean maximum" temperature officially recorded between 1905 and 1938 was 95° F. in 1906, but practically every year temperatures of over 100° F. are recorded which, with a rather high humidity, makes Bangkok uncomfortable for Europeans. Rainfall, mostly from the southwest monsoon of May to October, exceeds 50 inches.

The banks of the Menam Chao Phya are lined with 70 to 80 large rice mills, whose product is largely exported, and places Thailand third among world rice exporters. Large sawmills prepare teakwood for export. An arsenal was reportedly well equipped for producing shells, bombs, etc. Several match, soap and other factories making consumption goods added to the economic importance of Bangkok. Several of the mills and factories are government-owned. Exports of rice, teak, hides, rubber and other commodities averaged about $65,000,000, 1925–39, against about $50,000,000 worth of imports of textiles, machinery, petroleum and miscellaneous manufactured goods. This trade was financed chiefly through British and other exchange banks with total liabilities in 1939–40 of about $30,000,000. More than half the exports went to Singapore, Penang and Hongkong, while Japan, Hongkong, the United Kingdom and Singapore were the chief sources of Bangkok's imports.

There were two government-sponsored universities—Chulalongkon, with 1,124 students in 1939, and the University of Moral and Political Science, with 6,413. Both institutions had pre-university departments in addition. The great majority of students enrolled in arts courses; medicine, engineering and science were undertaken by a few hundred only. Bangkok was a small fort and agricultural village before Phra Chao Tak used it as a base of attack on the Burmese army which had burned Ayuthia. He made it his capital when he was crowned king, so the city is rather modern, with no important archaeological remains.

Wat Arun is the most picturesque pagoda. Phra Chao Tak and four succeeding kings made additions to this beautiful structure, whose tower is 243 feet high and gives visitors a fine view of Bangkok and the river. Caryatids of angels, giants, monkeys, etc., support the series of basements upon which this tower rests. In the lower terrace four small pavilions represent the Buddha in the four episodes of his life: birth, enlightenment, victory and death. The god Indra on his white elephant is prominent, while the square surrounding the tower has smaller towers at its four corners, being somewhat similar to the upper terrace of Angkor Wat. Thousands of pieces of coloured chinaware were inserted in the plaster covering the brick foundation.

Wat Phra Keo or Chapel of the Emerald Buddha is within the palace walls and is Bangkok's most interesting temple. Built in 1785, it is the king's place of worship, and is more elaborate than any other Thai temple. The central feature is the image of the Buddha, made of jasper. The great King Mongkut claimed that it was made at least 500 years ago, and was moved from Chiengrai to Lampang, to Chiengmai, to Lau, to Vien Chan, to Dhanapuri, and finally placed on its gorgeous throne in Bangkok in 1784. Images of the Buddha which also represent two kings of the present dynasty flank the main image. Golden ornaments and jewels are changed thrice yearly. (J. R. A.)

BANGOR, municipal borough of Co. Down, Northern Ireland, on the south side of Belfast lough, 12 mi. E.N.E. of Belfast, on a branch of the Belfast and County Down railway. Pop. (1937) 15,769. Area, 2.9 sq.mi. It owes its rise to its favourable position as a summer resort, especially for the people of Belfast. A town planning scheme, under which the whole sea front was remodelled, was placed in operation. Slight remains are to be seen of an abbey of Canons Regular, founded in the middle of the 6th century by St. Comgall, and rebuilt by St. Malachy O'Morgair in the 12th century. Bangor returned two members to the Irish parliament. It is the headquarters of the Royal Ulster Yacht club.

BANGOR (formerly Bangor Fawr, as distinguished from several other towns of this name in Wales, Ireland and Brittany), cathedral city and municipal borough of Caernarvonshire, Wales, pop. (est. 1938) 12,530. Area, 2.8 sq.mi. It is at the northern entrance to the Menai strait, at the junction of the coast road with ways from Nant Ffrancon and Llanberis. Settlement in the neighbourhood is indicated by a British camp of supposed Roman date on a height overlooking the town. Roman connections are slight, but there are traditions of its religious and educational fame in the days of Celtic Christianity. The cathedral dedicated to St. Deiniol seems to have associations with this period. During the middle ages the building suffered severely from raids from the hills around, notably at the hands of Glyn Dwr (Glendower, *q.v.*) in 1404, and it remained in a poor state of repair until the 19th century. Slight traces of a Norman motte and bailey castle exist on the summit of a steep rock opposite Friars school. A free grammar school was established in 1557 on the site of a convent of White Friars and is still known as the Friars school. The town showed marked conservative tendencies during the Civil Wars and the 18th century, but the influence of the quarry workers of the neighbourhood during the 19th century made the town a centre of the national, religious and educational movements of the period. The University College of North Wales was founded in Bangor in 1884, and in 1893 it became a constituent college of the University of Wales. Its permanent buildings, finely situated on a hill, were opened in 1911 and have received large additions opened in 1926 as a north Wales memorial to those who gave their lives in World War I. The city already possessed a North Wales Counties' Training college which had an unusually distinguished succession of students in its early days. There is also a Training college connected with the Episcopal church and a Theological college associated with the Baptist and Independent churches. The town has grown in somewhat distinct parts; that near the straits, that near the cathedral and that on the height near the University college. Port Penrhyn nearby exports the slates of the Bethesda and Penrhyn slate quarries in the valleys of Snowdonia. Bangor was made a municipal borough in 1883 and is one of the boroughs of Caernarvonshire for purposes of parliamentary representation.

BANGOR, a city of Maine, U.S.A., on the west bank of the Penobscot river, at the mouth of the Kenduskeag and the head of navigation, 60 mi. from the ocean and 75 mi. northeast of the state capital, Augusta; a port of entry both for ships and aircraft and the county seat of Penobscot county. It is on the Atlantic highway, and is served by the Maine Central and the Bangor and Aroostook railways. It has a council-manager form of government under a charter of 1931. Pop. (1940) 29,822.

Bangor is the financial and commercial centre of a large agricultural and industrial region, in which wood pulp, paper, textile, cheese and canoe manufacturing and vegetable, sardine and blueberry canning are the leading industries. Bangor and its neighbouring city Brewer together have more than 75 diversified indus-

tries. Hydro-electric power is available from the Penobscot, Union, and Machias rivers, and the site of the unfinished tidal power project at Passamaquoddy bay is only 135m. away.

Bangor is also the cultural and medical centre of eastern Maine. It supports a symphony orchestra and an annual music festival, and its public library has 212,193 volumes. The Bangor theological seminary (Congregational; incorporated 1814) was established here in 1819. At Orono, 7m. up the river, is the State university (founded 1865), which has an annual enrolment of more than 2,500. Bangor has a state hospital for mental diseases and a community general hospital, and a tuberculosis sanatorium.

In 1604 Samuel de Champlain ascended the Penobscot to the site of Bangor, in search of the legendary city of Norumbega, but found there only an important rendezvous of the Indians. The first permanent settler, Jacob Buswell, came from Salisbury, Mass., in 1769. Originally called Kenduskeag, or Conduskeag, the place was incorporated a town in 1791; the name Bangor, being substituted for the newly chosen Sunbury by the Rev. Seth Noble after a favourite hymn, when he was sent to Boston in 1791 to petition for incorporation. The first saw mill was built in 1772; the first vessel in 1791; and the first bridge across the Penobscot to Brewer in 1832. Bangor was incorporated a city in 1834. In 1779 it was the site of the ill-fated Penobscot expedition. In 1814 it was occupied by the British.

After 1820 began the golden age of lumbering and shipbuilding when fortunes were amassed and fine homes were built. Some of the streets on the east side of the city were laid out by Charles Bulfinch, the leading architect of Boston. By 1870 Bangor was one of the foremost lumber markets, and shipyards, a mile in extent, built vessels which carried Maine pine to all parts of the world. In the next period the ice-cutter was the characteristic industrial figure, and it has been superseded in turn by the maker of pulp and paper.

BANGOR, a borough of Northampton county, Pa., U.S.A., 14m. N. of Easton; on the Lackawanna and the Lehigh and New England railways. The population in 1940 was 5,687. There are numerous slate quarries in the vicinity, and the borough manufactures structural slate, silk, gloves, hosiery and clothing.

BANGORIAN CONTROVERSY, a theological dispute which originated in 1716 with the posthumous publication of George Hickes's (bishop of Thetford) *Constitution of the Christian Church, and the Nature and Consequences of Schism,* in which he excommunicated all but the non-juring churchmen. Benjamin Hoadly (*q.v.*), the newly-appointed bishop of Bangor, scented the opportunity and wrote a speedy and able reply, *Preservative Against the Principles and Practices of Non-Jurors,* in which his own Erastian position was defended. This was followed by his famous sermon, preached before George I. on March 31, 1717, on *The Nature of the Kingdom or Church of Christ,* in which he identified the Church with the Kingdom of Heaven—it was therefore "not of this world," and Christ had not delegated His authority to any representatives. Both book and sermon were reported on by a committee appointed by the Lower House of Convocation in May, and steps would have been taken by the archbishop and bishops had not the government stepped in and prorogued Convocation till November. Hoadly was shrewd enough not to answer the most brilliant, though comparatively unknown, of his antagonists, William Law. The most important result of the controversy was the silencing of Convocation, for that body, though it had just "seemed to be settling down to its proper work in dealing with the real exigencies of the Church" when the Hoadly dispute arose, did not meet again for the despatch of business for nearly a century and a half. (*See* CONVOCATION.)

BANGUED, a municipality (with administrative centre and 17 barrios or districts) and capital of the mountainous province of Abra, Luzon, Philippine Islands, located somewhat over a mile from the Abra river and not far from the sea.

Population (1939) was 15,287, of whom 7,355 were males, and 13 whites. The region round about produces mainly rice. Corn, tobacco, sugar, coffee, coconuts and fruits are also produced in the municipality.

The natives are chiefly Ilocanos.

BANGWEULU, a shallow lake of British Central Africa, formed by the head streams of the Congo. It lies between 10° 38′ and 11° 31′ S. and is cut by 30° E. Bangweulu occupies the north-west part of a central basin in an extensive plateau, and is about 3,700 ft. above the sea. The land slopes gently to the depression from the south, east and north, and into it drain a considerable number of streams, turning the greater part into a morass of reeds and papyrus. The greatest extent of open water is about 60 m. N. to S. and 40 m. E. to W. There are several islands in the lake, the largest being Kirui, Kisi and Mbawali. South of Bangweulu the swamp extends to 12° 10′ S. Into this swamp on its east side flows the Chambezi, the most remote head stream of the Congo. Without entering the lake the Chambezi mingles its waters in the swamp with those of the Luapula. The Luapula, which leaves Bangweulu at its most southern point, is about a mile wide at the outflow, but soon narrows to 300 or so yd. West of the Luapula and near its outflow lies Lake Kampolombo, 20 m. long and 8 broad at its southern end (*see* CONGO). The flood waters of the Chambezi and other streams, which deposit large quantities of alluvium, are gradually solidifying the swamp, while the Luapula is believed to be, though very slowly, draining Bangweulu. The waters of the lake do not appear to be anywhere more than 15 ft. deep.

Though heard of by the Portuguese traveller, Francisco de Lacerda, in 1798, Bangweulu was first reached in 1868 by David Livingstone, who died six years later among the swamps to the south. It was partially surveyed in 1883 by the French traveller, Victor Giraud, and first circumnavigated by Poulett Weatherley in 1896.

See P. Weatherley in *Geog. Journ.* vol. xii. (1898) and vol. xiv. p. 561 (1899); L. A. Wallace in *Geog. Journ.,* vol. xxix. (1907), with map by O. L. Beringer. Giraud's *Les Lacs de l'Afrique équatoriale* (Paris, 1890) and Livingstone's *Last Journals* (1874) may also be consulted.

BANIAS: *see* CASTE.

BANIM, JOHN (1798–1842), Irish novelist, sometimes called the "Scott of Ireland," was born in Kilkenny on April 3 1798. Banim taught drawing in Kilkenny and had an unhappy love affair with one of his pupils. The parents forbade the girl's marriage. She died, and Banim was much shaken by his sorrow. In 1820 he settled in Dublin. His *Damon and Pythias* was performed at Covent Garden in 1821. During a short visit to Kilkenny he married, and in 1822 planned, in conjunction with his elder brother MICHAEL (1796–1874), a series of tales, illustrative of Irish life, which should be for Ireland what the Waverley Novels were for Scotland. He then set out for London and supported himself by writing for magazines and for the stage. A volume of miscellaneous essays was published anonymously in 1824, called *Revelations of the Dead Alive.* In April 1825 appeared the first series of *Tales of the O'Hara Family.* One of the most powerful of them, *Crohoore of the Bill Hook,* was by Michael Banim. In 1826 a second series was published, containing that excellent Irish novel, *The Nowlans.* John's health had given way, and the next effort of the "O'Hara Family" was almost entirely the production of his brother Michael. *The Croppy, a Tale of 1798* (1828) is hardly equal to the earlier tales, though it contains some vigorous passages. *The Denounced, The Mayor of Windgap, The Ghost Hunter* (by Michael Banim), and *The Smuggler* followed in quick succession and were received with considerable favour. John Banim, meanwhile, had become very poor. In 1829, during his absence in France, a subscription was raised to meet his necessities. With this and a Government pension of £150, he returned to Ireland in 1835 and settled in Windgap Cottage, a short distance from Kilkenny; and there, a complete invalid, he passed the remainder of his life, dying on Aug. 13 1842. Michael Banim had acquired a considerable fortune, which he lost in 1840. After this disaster he wrote *Father Connell* (1842), *Clough Fionn* (1852), *The Town of the Cascades* (1862). Michael Banim died at Booterstown on Aug. 30 1874.

The true place of the Banims in literature is to be estimated from the merits of the *O'Hara Tales,* which are masterpieces of faithful delineation of Irish peasant character. The incidents are sometimes horrible, and the authors have been accused of strain-

ing after melodramatic effect. The lighter, more joyous side of Irish character received little attention from the Banims.

See P. J. Murray, *Life of John Banim* (1857).

BANISTER, JOHN (1630–1679), English violinist, was sent to France by Charles II. to study, and on his return was made leader of the king's band in succession to Baltzar. On Dec. 30, 1672, he gave the first of a series of concerts at his own house, and may be said to have been the first giver of concerts on a financial basis in London (*see* CONCERT). Many songs of his and some short pieces for strings are preserved. His son, JOHN BANISTER (d. 1735), was, like his father, principal violin in the Italian opera at Drury Lane, and contributed to Henry Playford's *Division Violin* (1685).

BANJALUKA (Banialuka), the capital of the banovina of Vrbaska in Bosnia, Yugoslavia. Pop. (1931) 22,165. In 1941 the province was made a part of the axis-created kingdom of Croatia. It lies on the river Vrbas at the head of a defile, at the military railway terminus for Prejedor.

The citadel and barracks, with the 16th century Ferhadiya Jamia (largest and most beautiful of the 40 mosques in the town) stand between the river and a small tributary. There is a Roman Catholic and also an Orthodox bishop. The Roman baths are in ruins, except one massive domed building, dating from the 6th century and still in use, although modern baths are also open, for the development of the hot springs. Other buildings are the Franciscan and Trappist monasteries, technical school, military academy, and Turkish Bazaar. Anthracite, iron, silver and other minerals are found in the adjoining hills: and the city possesses a Government tobacco factory, a brewery, gunpowder mills, a model farm, and many corn mills, worked by the two rapid rivers, the best wheat in Yugoslavia being grown here. There is an important annual stock and produce fair, at which horse racing by civil and military is a popular feature.

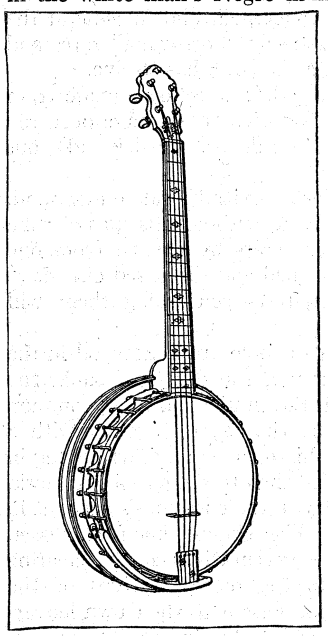
Banjaluka is probably the Roman fort, Castra of the *Tabula Peutingeriana,* on the river Urbanus and the road from Salona on the Adriatic to Servitium in Pannonia. Its later name, "Baths of St. Luke," is unexplained. In the 15th century the fall of Jajce, a rival stronghold 42 mi. south, led to the rapid rise of Banjaluka, thenceforward the scene of many encounters between Austrians and Turks, notably in 1527, 1688 and 1737. It had great importance in the last half of the 18th century. In 1831 Hussein Aga Borberli, the "Dragon of Bosnia," set forth from Banjaluka on his holy war against the Sultan Mahmud II.

BANJERMASIN or **BANDJARMASIN,** the chief town on the southern side of the island of Borneo, on the river Matapura, near its junction with the Barito, situated some 24 mi. from the mouth in the Java sea, in S. lat. 3°32′ and E. longitude 114°38′. The meaning of the word is "saline garden." It was formerly a principality under the sultan of Banjermasin with an area of some 4,840 sq.mi. The town, with a population (1930) of 65,698 inhabitants of many races, is the seat of the Dutch Resident of Southeastern Borneo. Its buildings stand on either bank of the river, but most of the inhabitants occupy houses either floating on rafts or built on piles along the water's edge. Since large vessels can sail right up to the town, it is an important centre for the districts watered by the Barito and other large rivers. The jungle products are rattans, benzoin, wax, gutta-percha; there is some mining of gold, coal and diamonds. But the dominant note in economic life is rubber, grown by both natives and Europeans. Pepper is also exported. The value (1939) of the imports was 2,900,000, of the exports 18,900,000 guilders; 366 steamships and 1,872 sailing vessels called at the port.

History.—The sovereignty of Banjermasin in olden times extended over the whole of the south-eastern portion of Borneo. Tradition assigns the foundation of the State to Ampu-Jatmika, son of Mangkunbumi, a Coromandel merchant. Ampu-Jatmika went from India to Borneo, giving the country the name of Nagara-dipa and settled on a river still called Nagara. Here are still to be seen the remains of stone edifices said to have been the residence of the first princes. The date of settlement is uncertain but may be about A.D. 1200. In the third generation the only descendant of the founder was a princess, who married a prince of Majapahit, in Java, who took the title of Raden Suryanata. From his time to the overthrow of Majapahit in the year 1478, Banjermasin continued tributary to that Javanese State, which assisted it in extending its dominions eastward, until they embraced the States of Kuti and Pasir.

The people professed a rude Hinduism, similar to that of Java, but about the beginning of the 16th century they became Mohammedans, having been converted by the State of Damak in Java immediately after the subversion of the Hindu State of Majapahit, at about the time of the first appearance of the Portuguese in the Archipelago. In 1700 the East India Company established a factory in Banjermasin, but the place was found to be unhealthy, and the Company's servants were finally attacked by the natives, whom they repulsed with great difficulty. The settlement was abandoned. The English again seized Banjermasin in 1811, but restored it in 1817. Of the commercial community the Chinese are a very important portion, and there is also a considerable number of Arabs. The district of Banjermasin was incorporated by the Dutch in consequence of the war of 1860 in regard to the succession in the sultanate, which had been under their protection since 1787. The town of Matapura was the seat of the sultan from 1771. The inland portion of the district is covered with forest. Japanese troops conquered Banjermasin Feb. 12, 1942, during World War II. (C. H.; E. S.; X.)

BANJO, an American musical instrument remotely related to the guitar family and first played by American Negroes toward the close of the 18th century but popularized and developed in the white man's Negro minstrel show. A long thin neck fastened to a tambourine minus its "jingles" fairly describes the original banjo, which carried four stoppable strings extending from the top of the neck to the bottom of the drumhead. The open or unstopped shorter fifth string was struck only with the thumb. The early players wore on the first finger of the right hand a metal "thimble" with which the third and second strings and sometimes the first were struck, not plucked. Weston, a celebrated Negro banjoist of the late '80s and '90s, employed the thimble. Farland, who in the '80s and '90s had the impertinence to play and play well on the banjo sonatas that Bach had composed for the unaccompanied violin, plucked the strings guitar-fashion on a banjo neck fretted like that of the guitar. He was the last of the five-string virtuosi. The generation following Farland played, with "picks," either the four-string "plectrum" banjo of Peabody or the "tenor" banjo of Pingatore, which are standard in such dance bands as are still faithful to what has been not ineptly described as "America's only national instrument." (A. Ss.)



BY COURTESY OF CARL FISHER, INC.

THE BANJO. FIRST PLAYED BY AMERICAN NEGROES AND DEVELOPED IN THE WHITE MAN'S NEGRO MINSTREL SHOW

BANK, known also as "POLISH BANK" and "RUSSIAN BANK," a card-game. An ordinary pack is used. Five or six players is a convenient number. Each contributes an arranged stake to the pool. The dealer gives three cards to each player and turns up another; if this is not lower than an eight (ace is lowest) he goes on till such a card is exposed. The player on the dealer's left, without touching or looking at his cards, can bet the amount of the pool, or any part of it, that among his cards is one that is higher (of the same suit) than the turn-up. If he wins, he takes the amount from the pool; if he loses, he pays it to the pool. Each player does the same in turn, the dealer last. Whenever the pool

is exhausted, a fresh stake is put into the pool. After a round is over the deal passes. No player may touch his cards until he has made his bet; the penalty is a fine to the pool of twice the stake, and the loss of his right to bet during that round. (For the commercial "bank" *see* the following article.)

BANK. This article deals with the relation of the public to the banks. The other branches of the subject will be found under BANKING AND CREDIT; BANKS, HISTORY OF, etc. The public's relations with the banks take three main forms. Firstly, when the public is lender, and the bank the borrower; secondly, when the public is the borrower and the bank the lender; and thirdly, when the bank acts as the public's agent, or servant, in one of many capacities.

Deposits.—The public's loans to the banks take two main forms: (1) money lodged on deposit account; (2) money lodged on current account.

The first point for the public to appreciate is that their "cash at the bank" is in reality their loans to the bank, and that the bulk of this money is re-lent to the public. This last point will be considered later, but meanwhile it may be pointed out that just as when a lender forces money on a borrower, the borrower need not accept the loan at all or need not take farthings or five-pound notes, so can the bank exercise a similar discretion. A manager who refuses to open an account, or a cashier who rejects farthings or who insists on the customer signing his name on a banknote, is within his legal rights.

A deposit account is subject to withdrawals at, as a rule, a week's notice, and the bank adjusts its own lending policy in accordance with this rule. Interest is payable at two points below bank rate in so far as London is concerned, and in general the bank must maintain a margin between its "borrowing" rates and its "lending" rates, as on this margin the bank has to live.

Very often, a manager will allow withdrawals to be made from deposit account at less than a week's notice (cases have occurred where money has been withdrawn from deposit on demand), but this is a concession.

A current account is always subject to withdrawals on demand, and in the vast majority of cases these withdrawals do not take the form of cash, but consist of transfers by cheque from one account to another. Cheques are defined and discussed elsewhere (*see* CHEQUE), but one or two matters concerning them will here be relevant.

Cheques.—As a rule, four sets of people are concerned in the payment of every cheque—the drawer, the drawee's bank, the payer and the payee's bank. This is the simple and most common case. The cheque is first handed by the payee, together with a "paying-in" slip, to the cashier at his own bank. The paying-in slip is passed to the ledger-keeper and then to the pass-book clerk, who makes the necessary credit entry in the customer's account in the ledger and in his pass-book. The cheque itself is passed through ultimately to the bank's representatives at the clearing house. Here it is handed over to the representatives of the drawer's bank, who return with it and pass it to their own ledger-keeper. He in his turn makes the debit entry in the drawer's account, and then sends the cheque to the pass-book clerk to be entered in the drawer's pass-book and kept for return to the drawer.

Now the first and essential point is that this cheque is but one of thousands. A highly complex system of listing and sorting is necessary at the payee's bank to ensure that each cheque paid in finds its way to the bank on which it is drawn. In London, for example, cheques on other branches of the bank need one kind of segregation, cheques for the clearing house need another, for "walks" another, and for the Bank of England yet one more. The procedure here is to list together all cheques drawn on any one bank; thus bank A would make separate bundles of cheques drawn on bank B, bank C and so on. When all these cheques reach the clearing house, each bundle can go direct to the representative of the bank concerned and it may be added here that it is at the clearing house that the inter-bank transfers of money take place. At the end of the clearing, each bank "owes" for all the cheques drawn on it, and is "owed" for all the cheques paid into it. A balance is struck of "owes" against "owed," and the bank's own account at the Bank of England debited or credited according as the final balance is minus or plus.

The customer can help materially towards the successful operation of the clearing system.

(1) The afternoon clearing occurs after banking hours. When agitating for an extension of banking hours, he will do well to remember that a bank has about two hours' work to do after it has closed its doors.

(2) Sorting takes place at top speed, and the sorter gets to know instinctively the "look" of each cheque. Hence the man who draws cheques on plain paper is a nuisance.

(3) Banks undertake definite responsibilities to meet any losses due to forgery, fraud, etc. In return, they are entitled to take various precautions. That is why endorsements to cheques must be meticulously correct, why alterations must be signed by the drawer and *not* initialled, and why the payee must conform to the rules, etc., of crossed cheques. The receiving cashier at the payee's bank is for the purpose of that cheque the representative of his own bank, the drawer's bank and the drawer himself, and is serving the interests of all three.

(4) In England the customer should learn the meaning of the letters T, M and C in the bottom left-hand corner of every cheque. T means "town," *i.e.,* cheques drawn on banks within a few minutes' walk of the clearing house in Lombard street. These are cleared in the town clearing, which takes place twice a day. M means "metropolitan," *i.e.,* cheques drawn on banks within half-an-hour of the clearing house. These cheques are only cleared once a day. C means "country," *i.e.,* cheques drawn on all banks outside the Metropolitan radius. The country clearing is held once a day, but it obviously takes a double post to transmit a country cheque to the drawer's bank and to receive the assurance that all is in order.

Every day a certain number of "returns" or "unpaids" come to every bank through the clearing. These refer to cheques, which, when they reach the drawer's bank, are rejected, either because the drawer's account is overdrawn, or because of some irregularity in the cheque. As, for convenience's sake, the payee has originally been credited, he is now debited and the unpaid cheque returned to him for suitable action.

In the case of a country unpaid cheque, two days must clearly elapse before it is returned to the payee. During this time, the payee's bank reserves the right to refuse to let the payee draw against the proceeds of this cheque.

(5) Certain banks have special paying-in forms for country cheques. The use of these facilitates sorting.

(6) Every cheque costs the banks a certain amount of money for its clearance. The cost is the same whether the cheque is for one shilling or £1,000,000. The ideal customer is he who keeps a big balance and draws one cheque a year. A customer who draws a cheque every time he has a few odd shillings to pay is a nuisance. Also a customer who keeps only a small balance, may have to pay a charge to the bank to compensate it for the work done in clearing his cheques.

It may be added that whereas a bank will receive cash or cheques for the credit of an account without question or identification, and at any of its branches, it obviously will not *pay out* cash unless it is satisfied that all is in order and unless the would-be recipient can establish his identity and title.

The Bank as Lender.—The bank's loans to the public also take various forms: (1) short loans; (2) discounts; (3) time loans of a definite amount; (4) overdrafts and running loans. Short loans concern the *money market* and the *Stock Exchange,* and the reader is referred to articles under these headings.

Bills.—As regards discounts, the reader should read the article on BILL OF EXCHANGE, and his acquaintance with this article is assumed. In general, every branch of a bank is prepared to discount approved bills for its customers, but certain rules and limitations must be remembered.

(*a*) A bank only has a limited, though large, fund of money at its disposal, and has to meet many demands for accommodation. That is why head office has to ration branches and apportion fairly the funds available.

(*b*) The bank manager must know that his customer is of good repute and an "honest trader."

(*c*) The bill must explain itself and represent genuine business. If Mr. Smith tries to discount a bill drawn on Mr. Jones at three months in respect of a sale of cotton shirts, and if Mr. Smith is a shirt manufacturer and Mr. Jones a draper, and if the bill states that it represents a sale of cotton shirts, then Mr. Smith will have no difficulty. On the other hand, if Mr. Smith and Mr. Jones are impecunious gentlemen of no apparent occupation and proceed to draw bills on each other, and then seek to discount them at their bankers, they will meet with no success. Certain reputable firms, especially those engaged in international trade and finance, do draw "finance bills" upon each other, and these the banks are prepared to discount, even though they represent no trading transaction, but are only a means of transferring funds from where there is a temporary surplus to where they can fill a deficit.

In short, when seeking to discount a bill, tell the manager the full facts of your position, and see that the bill is in order and self-explanatory. The rate at which a bank discounts naturally varies, both with the general course of money rates and also with the class of bill; the rule being "the greater the risk, the higher the rate." The lowest rate is for bills endorsed by a bank, but "fine trade bills," or those bearing the names of sound, reputable traders, can be discounted at rates which are not much higher.

Overdrafts and Time Loans.—Time loans and overdrafts are best considered together. The essential point is that the money the bank is lending belongs to its customers and is repayable on demand. Hence any loan a bank makes must be a sound loan and must have a definite time limit to it. As a rule, a bank will not lend for more than six months. It will not lend money to finance new buildings, the installation of new machinery, or the purchase of other "fixed assets." The trader who needs money for such purposes must issue shares or debentures to the public or borrow elsewhere. The most the bank will do is to make a temporary loan, pending a debenture issue or other permanent borrowing, and even here a prudent banker will assure himself that preparations for the debenture issue are in hand, and that the customer is definitely committed to making it.

A bank is always ready to lend money, to help a customer round a corner and to earn profits for itself, provided it is told the full facts of the customer's position. A trader should submit a balance sheet and profit and loss account, and bear in mind a banker's complaint that "Mr. Jones showed one profit and loss account to me when he wanted a loan, and another to the surveyor of income tax over the road." He should further consult with his bank manager over the proposition he makes, and if the proposition has to go from the branch to head office, he should co-operate with the manager in "licking it into shape." Above all, he must make it clear that he intends to and can repay the loan at the end of the time limit fixed by the bank.

This is a suitable opportunity to differentiate between a definite loan and an overdraft. A loan for a definite amount and for a definite time is charged interest in full, whether or not the whole amount is immediately drawn upon; though it is possible that the customer can negotiate for some relaxation of this rule. An overdraft is only charged on the amount actually outstanding, even though an upper limit may have been arranged. Against this concession, the bank has the right to ask for an overdraft to be paid off at once. It is hardly necessary to add that an account cannot, of right, be overdrawn without the previous consent of the bank. The rate of interest charged on loans and overdrafts depends on the going bank rate, being usually one point above bank rate and on general conditions of trade and industry and the money market.

Collateral.—Finally comes the question of collateral. In many cases a bank requires none. Loans to farmers are often unsecured, for the bank manager knows all about the farm, and knows that the farmer cannot pack up his farm and quit. Loans to manufacturers and traders are often secured by a debenture or mortgage on the plant, and loans are permitted up to the limit of this debenture. The best collateral is sound, readily marketable stocks and shares. The usual procedure is for the borrower to transfer these to "the bank's nominees." The borrower continues to draw his dividends, but in case of need the bank can sell them over the borrower's head, handing him the difference between the net proceeds of the sale and the amount of his debt.

As the bank receives the proceeds of the sale on the next Stock Exchange settling day, it knows that if it has to realise the collateral, it will have to wait for its money only a fortnight. A loan of this kind, therefore, is "liquid" from the bank's standpoint.

If the professional man needs temporary accommodation and does not wish to realise his securities, the above procedure is far and away the best. If he lodges securities whose current market value is £500, and asks for an overdraft up to a limit of say £400, the bank is unlikely to object. He can then run his account up and down within that limit almost indefinitely. The bank knows it can always close down on him within a fortnight. The only danger-point is a fall in the market value of the collateral. If this occurs, the bank will either reduce the limit of the overdraft, or else call for further security.

Branch Banks and Head Office.—Whether he is borrowing or depositing money, a customer will find it assists him greatly in his dealings with a branch bank, if he appreciates the branch's relations with head office. Many lament the disappearance of the country banker, whose word was law in his own bank or small group of banks, and many complain that the modern branch manager is circumscribed as to the accommodation he can grant. In these days of "big business," such laments are vain, and if the modern branch bank has lost the independence of its predecessor it has also lost its insecurity. To-day money banked at any one of 1,000 branches is guaranteed by the resources of all the 1,000.

The modern big bank has "to lend to live," just the same as the small country bank. Out of the margin between its deposit rate and its loan rates it has to pay all its expenses and dividends. It is not true that a branch manager is discouraged from lending, but on the contrary he is judged by his superiors partly on his success in winning sound, profitable business for his branch. At the same time, the advance department at the head office has to ration out the money the bank has to lend, and it is for this reason that all applications for loans beyond a certain limit have to be referred by the branches to head office. Again, it is obvious that the advance department wants all applications to be reduced as far as possible to "a common form," as otherwise the task of discrimination would rapidly become an impossible one. It is as important for the customer to realise this as the branch manager, and this is why the customer is advised to co-operate with the branch manager in drawing up his application.

Banks' Services to Their Customers.—Space does not permit of more than the bare enumeration of the multitudinous services performed by a modern bank for its customer, many of them free of charge.

(1) The custody of stocks and shares and other valuables. This means more than bare safe-keeping. It includes the cutting and collection of coupons, the direct collection of dividends, and also a continuous watch on the drawing of bonds, the payment of coupons in arrears, and other matters affecting vitally the interests of the customer. The bank will also buy and sell stocks and shares on behalf of the customer, though in many ways it is better for the customer to deal direct with a recognized broker.

It may be added that far the most convenient way of holding stock is in the form of bearer bonds permanently kept and administered by the bank. The risk of loss is non-existent, and the convenience of handling is considerable.

(2) The financing of trade. A bank is prepared to undertake the collection and payment of bills of exchange for its customers, crediting or debiting them accordingly. In approved cases, it will accept or endorse bills on behalf of its customers and open credits for its customers under the usual conditions and terms. It will handle all documents and in general do all it can to assist its customers. Services such as these are, of course, subject to small charges, and the customer is advised to consult his own manager as to details, and as to what in his case the bank is prepared to do.

(3) The bank will issue letters of credit or traveller's cheques to customers wishing to travel abroad. Full information can be obtained from any branch.

(4) The bank will buy or sell foreign exchange, spot or forward, for its customers, under approved conditions.

(5) The bank will obtain passports for its customers, and also deal with their in-coming letters.

(6) The bank will act on behalf of its customers in income tax negotiations.

(7) The bank will make periodical payments, such as rent, subscriptions, etc., on instructions from its customers.

(8) Finally, the bank will act as a trustee, and as an executor of a customer's will. (N. E. C.)

BANKA (BANGKA), island of the Netherlands Indies, off E. coast of Sumatra, across Banka Strait, at narrowest point 9 mi. wide. On the east, Gaspar Strait, wider, and island-studded, separates Banka from Billiton. Banka with its dependencies forms a residency of Sumatra. It is 138m. in length, 62 wide, and its area, with a few adjacent islands (Lepau, 128sq.m.), is 4,460sq.m. The soil is somewhat dry and stony, but the greater part of the surface is covered with tropical vegetation, though the virgin forest has almost disappeared, owing to mining and agricultural operations. The hills, of which Maras, in the north, is the highest (2,760ft.), are covered with vegetation to their summits. Banka resembles the Malay peninsula geologically, with formations of granite, Silurian and Devonian slate, frequently covered with sandstone, laterite (of small fertility), and alluvium. The granite runs from W.N.W. to S.S.E., in short, irregular hill-chains. These are generally near the east coast; hence the rivers of the west coast are the longer. There are no volcanoes, the coast is difficult, and the number of anchorages small. The rivers run in deep valleys and in their upper courses, and some in their lower courses, form extensive marshes. Nevertheless many are navigable for nearly 20m., owing to the fact that they were once inlets of the sea, and are tidal for some distance. They are used for transport of tin. The Sungei Selan and the Jarin are the largest. Banka is one of the chief tin-producing centres of the world. Tin-mining is a Government monopoly. The ore is found in many river-alluvial deposits, and in the alluvial strata on the slopes of small hills, and is worked exclusively in open cuts. Some deposits, however, extend into the sea, and workings are continued beyond the coast. The labour ordinarily is supplied by some 15,000 contract coolies, mainly Chinese, who work under government supervision; and electrical power is used very largely. In 1939 production was 16,975 metric tons, a little over half the total tin production of the Netherlands Indies. The tin is smelted in Banka. The climate is hot, especially from May to August (S.E. monsoon), but at night, in the hills, it is quite cool. The average mean annual rainfall is 118 in., and the average number of rainy days 159. The wet, and cooler, season is from November to February (N.W. monsoon). Pop. 205,363, including 96,608 foreign Asiatics, mostly Chinese. The natives (Mohammedans), are composed, mainly, of immigrant Malayan peoples, the aborigines being represented by a few rude hill-tribes, probably of mixed Malay origin, and akin to the Bataks of Sumatra: they live by hunting, fishing, and the collection of forest products: there are also *Orang laut*. Rice, pepper, (grown by Chinese), gambier, coffee, and coco-nut palms are cultivated. There are over 1,000 mi. of roads fit for wheeled traffic, but no railways. The island has cable connection with Sumatra and very frequent and regular steamship communication with Java and Sumatra, and with Singapore and Penang. The chief town is Pangkal Pinang (pop. 11,970), on the east coast, and the chief port is Muntok (pop. 15,708) at the north end of Banka strait. The sultan of Palembang, in Sumatra, ceded Banka to the British in 1810, but in 1814 it was exchanged for Cochin in India, and after that time it remained Dutch. Japan occupied Banka in 1942.

See H. Zondervan, *Banka en Zijne Bewoners* (1895); Handbook of the Dutch East Indies, Batavia 1931. (E. E. L.)

BANK ACCEPTANCES, bills of exchange or drafts drawn by individuals, firms, corporations, or other bankers for varying periods after date or after sight, and accepted by banks or bankers. The U.S. Federal Reserve Board officially defines the bank acceptance as "a draft or bill of exchange, whether payable in the United States or abroad and whether payable in dollars or other money, of which the acceptor is a bank or trust company, a firm, person, company or corporation engaged generally in the business of granting bankers' acceptance credits." Bank acceptances are used primarily as a means of financing importing and exporting operations, but are also used in domestic transactions, being drawn against warehoused commodities or against the domestic shipment of goods.

In operation the bank acceptance is simple and effective. The buyer or receiver of goods, usually an importer, arranges with his bank to permit the seller or shipper of the goods, usually an exporter, to draw on the institution for the price of the goods, payable at a specified future time. Upon receipt of the draft or bill of exchange the bank accepts it by stamping on the face the word, "Accepted," together with the due date, the place of payment and the bank's signature. The acceptance is then returned to the seller of the goods and may be held by him till due and then collected, or may be discounted at any time. Foreign trade transactions are thus greatly facilitated because a bank of recognized standing substitutes its credit for that of the buyer or importer of goods and gives the seller "Grade A" paper which is available for immediate conversion into cash through discount. The accepting bank, of course, requires the buyer of goods to put it in funds to pay the acceptance upon maturity, which requirement is in the United States governed by the following rules observed by most banks: "The accepting bank shall require from its clients that it be placed in funds to meet acceptances on the day of maturity either by (1) the deposit of clearing house funds one day prior to maturity, or (2) the deposit of cash or check on the Federal Reserve Bank of New York on the day of maturity, or (3) debit to the account of the bank's client on day of maturity against funds cleared on, or prior to, such date." The contractual liability of an accepting bank is, according to opinion of counsel of the Federal Reserve Board, practically the same as that of the maker of a note. Hence, the holder of a bank acceptance has substantially the same rights against the bank as has the holder of a promissory note against the maker. To offset this primary liability, however, the bank has not only the assurance of the purchaser of the goods that he will put the bank in funds to meet the acceptance at maturity, but also may hold title to the goods themselves through the shipping or warehouse documents.

United States national banks are permitted by law to accept up to only 50% of their capital and surplus, but with the permission of the Federal Reserve Board may accept up to 100%; in no case, however, can the amount growing out of domestic transactions exceed 50%. The law further provides that a bank shall not accept for any one person, company, firm, or corporation, at any one time an amount exceeding 10% of its paid-up and unimpaired capital stock and surplus. (*See* BANKING AND CREDIT.)

BANK ACCOUNT, an account representing funds in the shape of cash, cheques, notes, drafts and coupons placed in a bank by an individual or an organization as a general deposit. Such deposits become the property of the bank. Thus the bank becomes a debtor to the depositor and the latter becomes a creditor of the bank and has a claim against it for the amount of the deposit and the right to demand the payment of all or any part of it. Bank accounts are usually either commercial accounts or savings accounts. Commercial accounts generally represent demand deposits, that is, deposits which may be drawn out by cheque without notice; but sometimes there are commercial time deposits, that is, funds placed in a bank subject to withdrawal only after a specified time or only after a certain notice to the bank of the intention to withdraw. Time accounts usually draw interest, but demand accounts seldom do in most countries, payment being prohibited by law in the U.S.A. Savings accounts represent funds placed with a bank for the purpose of accumulation. They are a species of time deposit in that while they are subject to withdrawal, banks almost invariably reserve the right to require 30 days' notice before a withdrawal is made. Savings accounts draw interest, which is added to the principal and cumulated. Such cumulation

is usually quarterly, semi-annually or annually. Savings banks are banks specially chartered for handling savings accounts, though numbers of commercial banks have savings departments. (*See* BANKING AND CREDIT.)

BANK BALANCE, a banking term which carries two significations: (*a*) the actual amount of a depositor's account at a bank at any specified time; (*b*) the difference between the debits and credits of a bank at the clearing house. If credits exceed debits, there is a credit bank balance; if the reverse condition obtains, there is a debit bank balance.

BANK CHARTER ACT. This act (passed on July 19 1844, as 7 & 8 Vict. cap. 32) is the basis of the present organization of the Bank of England, embodying the practical maxims of the so-called "currency school." To effect this, the act lays down three main principles.

(a) Limitation of the volume of uncovered issue, that is, notes not covered by bullion,

(b) Centralization of issue, and

(c) Separation, in the case of the Bank of England, of the business of banking and the business of note issue.

The *first* principle is given effect to by sections II. and X.–XVII. of the act, which restrict the uncovered notes of the Bank of England to £14,000,000; enact that after the passing of the act no new bank of issue shall be permitted "in any part of the United Kingdom"; restrict the business of note issue to such banks and bankers as then lawfully issued notes (though allowing such banks, if amalgamating, to issue an amount equal to their aggregate circulation), depriving bankers once ceasing to issue notes from resuming such issue, and, finally, limiting the note issue of such bankers to the average of their circulation for a twelve-weekly period before May 6 1844.

The *second* principle is given effect to by the fifth and twelfth sections of the act. These provide that the Bank of England may increase its uncovered issue of notes by a sum equal to two-thirds of the notes previously issued by any banker, who ceases issue by agreement with the bank, or who discontinues issuing in consequence of bankruptcy or liquidation of the business, or on any other ground.

Separation of "Issue" and "Banking."—The *third* principle is given effect to by the second section of the act, which provides, in effect, that there shall be an issue department and a banking department at the Bank of England. Notes were to be freely issued if gold were tendered to the issue department at the rate of £3.17s.9d. in notes per ounce of standard gold (section IV.): but it was not the intention of the Act to force the issue department to hold *only* securities and gold; for by section III. the issue department was allowed to hold at any one time an amount of silver bullion not exceeding one-quarter of the gold coin and bullion in the issue department. Since 1853, however, except for a short period in 1860–61, the bank has ceased to hold silver in the issue department.

In addition to thus regulating the note issue, the act provided for a payment of £180,000 by the bank to the Government (section VIII.); exempted the notes of the bank from stamp duty (section VII.); provided that the profits from any increase in the uncovered circulation should go to the public (section IX.); provided—a most important section—for a weekly account of the state of the bank in prescribed form (section VI.), and for returns from other issuing bankers (section XVIII.).

For further details, *see* BANK OF ENGLAND and BANKING AND CREDIT.

(T. E. G.)

BANKER, a dealer in credit; one who operates a bank or banking house through the use of the credit and funds of both himself and others. The term is often used in a very broad and loose sense to apply to capitalists, financiers, investment bankers, commercial paper bankers, stock brokers, and even the officials and higher employees of banks. Strictly, however, it should apply only to the credit merchant when he uses the credit and funds of others. If he uses only his own credit and funds he is a capitalist; if he engages in the organization and financing of businesses and the handling of their securities he may be a financier, promoter, or broker (*q.v.*); if he is president, cashier, or other official of a bank he is a bank officer. In most States the word "banker" legally means a private bank as distinguished from an incorporated bank, to which the legal term "bank" is applied. (*See* BANKING AND CREDIT.)

BANKER AND CUSTOMER. In Great Britain, with the exception of some few statutory provisions affording qualified protection to bankers paying or collecting on behalf of their customers certain classes of cheques, orders and drafts (where, but for such protection, forged or unauthorized indorsements might involve the banker in liability) there is no special law affecting the relation of banker and customer. Nor is there any satisfactory or exhaustive legal definition of the terms "bank," "banker," "customer." In the acts containing the statutory provisions referred to, *e.g.*, the Bills of Exchange Act, 1882, ss. 60, 79, 80 and 82; the Stamp Act, 1853, s. 19; the Revenue Act, 1883, s. 17, the two last of these terms are employed and therefore call for definition. There is no attempted statutory definition of "customer" at all. The term "banker," however, is defined both in the Bills of Exchange Act and the Moneylenders Act 1900 (excluding bankers from the purview of that act) as a person or body of persons corporate or incorporate carrying on "the business of banking"—not a very helpful definition—and what that business is has been treated by the courts as mainly a question of fact; the limits of that business cannot be laid down as mere matter of law but must depend on evidence to be adduced in any particular case (*Banbury* v. *Bank of Montreal,* 1918, A.C. at pp. 652–3). Modern banks perform, in conjunction with what is distinctive and characteristic banking business, other functions and services such as dealings in stocks and shares, trusteeships and executorships, etc., and in respect of these other services may incur liabilities. Questions may arise as to whether a bank is liable for the acts, defaults and representations of its servants or officials as being in the course of their employment. For instance, in Banbury's case, cited above, it was held on the evidence there adduced that advising on investments was not part of the ordinary business of the bank concerned, although it may be suggested that in other cases—as where a bank shares a broker's commission or acts as broker—evidence might establish the contrary. As to the distinctive tests to ascertain the meaning of "banker" and "banking business" as employed in the statutes referred to, decided cases have given some guide. In the Birkbeck Building Society case it was held that the Society had, *ultra vires,* carried on a banking business and Buckley L. J. in that case, 1912, 2 Ch. at p. 227, indicates the characteristic features of such a business. Reviewing this and other cases Sir John Paget K.C. in *The Law of Banking* (3rd ed., p. 6) usefully deduces that no one can be a banker who does not take deposit and current accounts, issue cheque forms, pay cheques drawn on himself and collect cheques crossed and uncrossed for his customers.

The term "customer" is without any formal definition. At one time it was thought that a single transaction, or the mere opening of an account, without more, did not constitute a customer, such term implying some course or habit of dealing. Later cases do not take that view and hold that duration or course of dealing is not of the essence of the definition (per Lord Dunedin, 1920, A.C. at p. 68), and that a customer is created immediately the banker has accepted and opened his account and has agreed to render to him the performance of banking duties whether it be a first transaction or not (*Ladbroke* v. *Todd,* 30 T.L.R. 433; *Commissioners of Eng. Scot. and Australian Bank,* 1920, A.C. 683). This is in contradistinction to casual services rendered by a banker to persons who have opened no account with him. One bank may be the customer of another bank for the purposes of s. 82 of the Bills of Exchange Act, as where a foreign or non-clearing bank has an account with a clearing bank that collects cheques for it (*Importers Co. Ltd.* v. *Westminster Bank,* 1927, 2 K.B. 297).

Relationship of Banker and Customer.—Of necessity bankers and their customers enter into special contracts expressly or gathered by implication from course of dealing. Familiar examples are the deposit account and terms of withdrawal, keep-

ing of separate accounts, terms of loan or overdraft, discounting or collection of bills, letters of credit. Quite apart, however, from any special circumstances, the mere opening of an account current with a banker and the banker's acceptance thereof involve contractual relationship by implication. In 1848 the House of Lords in *Foley* v. *Hill* (L.R. 2 H.L. 28) declared that relationship to be one of debtor and creditor; that is to say, the moneys paid in by the customer are lent by the customer to the banker who is under obligation to repay an equivalent amount. The banker does not hold such moneys as trustee or mere depositee but they are his to do as he will with subject only to the obligation to repay. The old statement was that the banker was debtor to the customer of any credit balance with the "super-added" obligation to honour his customer's cheques drawn upon such balance in so far as the same was sufficient and available. This was not quite a complete statement in that one has to add that the obligation to repay arises only upon demand made by the customer. This exact point fell for decision in *Joachimson* v. *Swiss Bank Corporation,* 1921, 3 K.B. 110. Moreover in that case Atkin L. J. (now Lord Atkin) proffered a useful summary of the one and indivisible contract created by the account current in the following words:

"The bank undertakes to receive money and to collect bills for its customer's account. The proceeds so received are not to be held in trust for the customer, but the bank borrows the proceeds and undertakes to repay them. The promise to repay is to repay at the branch of the bank where the account is kept, and during banking hours. It includes a promise to repay any part of the amount due against the written order of the customer addressed to the bank at the branch, and as such written orders may be outstanding in the ordinary course of business for two or three days, it is a term of the contract that the bank will not cease to do business with the customer except upon reasonable notice. The customer on his part undertakes to exercise reasonable care in executing his written orders so as not to mislead the bank or to facilitate forgery. I think it is necessarily a term of such contract that the bank is not liable to pay the customer the full amount of his balance until he demands payment from the bank at the branch at which the current account is kept. Whether he must demand it in writing it is not necessary now to determine."

The above does not purport to be an exhaustive statement of all the terms of the implied contract. Indeed a little later the same court of appeal (in the case *Tournier* v. *National Provincial Bank,* 1924, 1 K.B. 461) declared a further term to be implied in the contract between banker and customer, whenever and however that relationship was constituted; namely, an obligation that the banker should not disclose to third parties any matter affecting the customer's account or any information coming to him in his character as the customer's banker except (*a*) by the express or implied consent of the customer himself (*e.g.,* a trade reference invited by the customer), (*b*) under compulsion by law (*e.g.,* an order under the Banker's Books Evidence Act), (*c*) under a public duty to disclose (*e.g.,* danger or treason to the State), (*d*) where the interests of the bank legally require disclosure (*e.g.,* action against the customer for money due). This obligation persists even after closing of the account. Bankers have of course always acted honourably upon the principle of treating their customers' affairs in confidence and only disclosing in exceptional and justifiable circumstances, but *Tournier's case* has for the first time put the obligation as a legal incident of the implied contract. Where a customer gives to one with whom he is dealing a banker's reference, one has an example of express assent to such disclosure as is reasonably necessary to accord with the terms of the reference. But there is also a well-recognized practice as between bankers themselves, described as "a common courtesy," whereby a bank desiring information (*e.g.,* as to the credit of a proposed guarantor or surety, or of an acceptor of a bill under discount, or of a bill accepted payable by the customer of another bank) inquires of the other banker. Information given in response to such inquiries is given confidentially and is framed with great care so as to disclose no more than the general position of the customer. Such cases are, it is presumed, supported as permissible by reason of the implied consent of the customer derived from evidence of a well-known practice among bankers and the circumstances giving rise to the inquiry. A banker, his officials and servants are, as to any claims for defamation or for fraudulent misrepresentation, in the same position as any other member of the community. As regards the application of Lord Tenterden's act to bankers it has been held, however, that the signature of a manager to any representation on which fraud is based is not a sufficient signature to support an action against the bank for any false representation as to the credit or financial ability of another person.

The Account.—Reverting to the matters affecting the account as between banker and customer it should be noted that where there are several accounts any special agreement as to appropriation of payments into specific accounts must be observed: but if the customer makes no specific appropriation the right of application may devolve on the banker. As regards a banking account that is worked as an unbroken running account, however, in the absence of any special agreement the rule in *Clayton's case* applies as in all unbroken accounts where moneys are from time to time paid in and paid out by the customer. The rule is that presumably it is the sum first paid in that is first drawn out—the first item on the debit side is discharged or reduced by the first item on the credit side. The appropriation is, without express agreement to the contrary, naturally made by the dates in order as they come, so that the balance is struck at the foot of the account and the earlier credits go to discharge the earlier debits in order as they are entered. This is the main presumption of appropriation as regards an unbroken running account. Its importance in banking practice is obvious especially where the interests of third parties are involved. Thus the operation of this rule taken in conjunction with the rule in *Hopkinson* v. *Holt,* 1861, 9 H.L.C. 514 may deprive a banker of the benefit of priority for a security in respect of advances after he has received notice of a subsequent charge on the same property, if he continues the account after such notice as an unbroken account. His obvious course is to rule off the account upon such notice and make the necessary rearrangement with his customer (*London and County Banking Co.* v. *Ratcliffe,* 1881, 6 App. Cas. 722; *Deeley* v. *Lloyds Bank,* 1912, A.C. 756). Where there are several accounts the banker has the right to combine them against the customer in order to ascertain the available balance or the debit as the case may be, provided always that the accounts are the customer's own accounts and also that there is no special agreement express or implied that they are to be kept separate A banker could not of course combine with an account or accounts held by the customer personally accounts known to be held by the customer in a fiduciary capacity. Although, subject to the above, a banker may combine accounts held by the customer in his own right, he must do so where "the ultimate balance" must be determined to fix the liability of a third party and securities have been lodged to cover the general balance (*Mutton* v. *Peat,* 1900, 2 Ch. 79).

Third parties may sometimes have a claim upon a credit balance standing in the name of a customer: as for instance where money is paid into the account by a third party under mistake of fact (*Admiralty Commissioners* v. *National Provincial Bank,* 38 T.L.R. 492; *Kerrison* v. *Glyn Mills and Currie,* 1911, 17 Com. Cas. 411) or in breach of trust (*In re Hallett's Estate* 13 Ch. D. 696) or as the fruits of fraud (*Banque Belge* v. *Hambrouck,* 1921, 1 K.B. 321). Moneys thus paid into the mixed account of a customer, and not being his own moneys, may be followed, in so far as a credit balance remains, as to that balance, and, in so far as securities have been purchased with such moneys, as to those securities, if traceable (see *Hallett's Estate supra* and *Sinclair* v. *Brougham,* 1914, A.C. 398 as to "tracing orders"). As has been judicially said, the older common law may have halted outside the banker's door but in 1879 (*Hallett's Estate*) "equity had the courage to lift the latch, walk in and examine the books." The same case made it clear that where a person holding money as a trustee or in a fiduciary character pays it into his account at his banker's and mixes it with his own money and afterwards draws out sums by cheques in the ordinary manner, the rule in

Clayton's case attributing the first drawings out to the first payments in does not apply, and the drawer must be taken to have drawn out his own money in preference to the trust money so that any remaining credit balance is subject to the charge of the defrauded or wronged party. In this class of case the banker usually takes up the neutral position as a quasi-stakeholder, leaving the customer and the claimant to contest between themselves the right to the credit balance. It is a false position to argue (as has been done) that the moment money is paid in to a customer's account the debtor and creditor relation between banker and customer and the merging of the money into mixed account obliges the banker to disregard the claims of a third party arising from alleged mistake, breach of trust or fraud. (*See Admiralty Commissioners* v. *National Provincial Bank supra.*) Of course all drawings out of the account honoured by the banker in the ordinary course of business without knowledge of any such claim as above or of any breach of fiduciary duty or any fraud on the part of the customer so drawing involve the banker in no liability even if it afterwards turns out that such drawings were in fraud or breach of trust.

Nor does the law impose upon the banker any duty to pry into his customer's affairs. Generally speaking, a banker is not bound or expected to make inquiries as to the source from which moneys paid in by a customer are derived or the purposes for which cheques are drawn by him (*Thomson* v. *Clydesdale Bank,* 1893, A.C. 287; *Bank of N.S.W.* v. *Goulburn etc. Co.,* 1902, A.C. 543). But a banker may be liable as privy to a breach of trust if he permits an agent or a trustee or a person in any fiduciary character (as for instance a director of a company) to misapply his principal's money where, from the circumstances, the banker knew, or must be taken to have known, that such money was being misapplied; nor is benefit to the banker an essential to his liability, although it is a circumstance which may strengthen the inference that he was privy to the breach of trust (*Gray* v. *Johnston,* 1868, L.R. 3 H.L. 1; *Foxton* v. *Manchester and Liverpool Banking Co.* 44 L.T. 406; *British Elevator Co.* v. *Bank of Brit. N. America,* 1916, A.C. 658). The heading of an account may show that it is in fact a fiduciary account, but any circumstances that indicate a fiduciary character may be adduced to affect the banker with notice of a trust.

Duty to Pay and Determination of Authority.—While the payment of a customer's cheques drawn on his account current is part of the recognized and implied relationship, it is different in the case of the payment of bills or other drafts or orders which are a matter of special agreement. That agreement may be expressed, or may be implied from the course of dealing obtaining between the parties. As to cheques, however, the obligation of the banker arises on the opening of the account. In the case of partnership, companies, administrative bodies or other bodies, a particular form of signature or signatures is agreed upon as the banker's authority to pay. But once the signature of his customer appears upon a cheque regular in form, it is the banker's duty to honour it, provided that there is a sufficient credit balance, that such balance is available to the customer, and that there has been no countermand or other determination of authority. If the banker wrongfully refuses to pay a cheque, he is liable in damages to his customer. If the customer is a trader or a business man, those damages may be substantial; if he is an ordinary private individual, the courts require some special grounds showing actual damage to credit before upholding any substantial claim (*Marzetti* v. *Williams* 1 B. and Ad. 415; *Rolin* v. *Stewart* 23 L.J.C.P. 148; *Evans* v. *London and Provincial Bank, Times* March 1, 1917; *Cox* v. *Cox and Co., Times* March 18, 1921). In cases where the bank has by mistake represented to a customer in his pass book that a certain balance exists and the customer in good faith acts upon that assumption and draws cheques accordingly, the banker may be estopped from setting up the true facts, although it would have been open to correct the error before the customer, in good faith, acted upon it (*Holland* v. *Manchester & Liverpool District Bank,* 25 T.L.R. 386; *Skyring* v. *Greenwood* 4 B. and C. 289; *Holt* v. *Marnham,* 1923, 1 K.B. 504). It should be added that the customer's pass book, even when returned by him, does not, without more, constitute a settled account between banker and customer. Hence the practice of some banks to request periodical signed statements by customers as to correctness of the account. Where forged or unauthorized signatures are the ground of repudiation of a cheque, the mere fact that the customer had had his pass book for examination is not, generally speaking, a bar to his claim (*Kepitigalla Rubber Co.* v. *National Bank of India* 25 T.L.R. 402) except in very special circumstances (*Morison* v. *Westminster Bank,* 1914, 3 K.B. 356). While a banker is bound to honour the customer's cheque in business hours at the branch on which it is drawn, there is an obligation upon the part of the customer to give his mandate in a clear and unambiguous form, so as not to mislead. Nor must he, by his own fault, so draw the cheque as to afford facilities for fraud. "Raised" cheques as they are often called (*i.e.,* cheques drawn for one sum but fraudulently by some dishonest servant or outsider raised to a greater sum) have often been paid by bankers. Obviously if the alteration is apparent, or so marked as would be apparent to an ordinary careful business man, or if there are evidences of alteration not initialled by the customer, the bankers should not pay without inquiry. But if the alteration be so well done as to escape reasonable detection, then if it has been rendered directly possible by the carelessness of the customer, as in leaving spaces facilitating alteration, the loss falls on the customer himself (*Young* v. *Grote,* 1827, 4 Bing. 253, finally vindicated and approved, after much intervening criticism in *Macmillan's case,* 1918, A.C. 777).

The holder of a cheque has no claim against the drawer's banker for non-payment, since a cheque is not in English law an assignment of funds in the banker's hands (Bills of Ex. Act 1882 s. 53). (It is otherwise in Scotland.) And an English banker would not pay a cheque in part when there is an available balance insufficient for the whole sum. But in the case of cheques presented simultaneously, in total exceeding the available balance, he should pay so many of the cheques as the balance will cover. The "marking" of cheques by bankers does not amount to an "acceptance" by the banker as against the holder of the cheque, who still has no remedy against the banker for non-payment, although, as between bankers themselves, "marking" may be recognized in practice as a binding representation that the cheque will be met. If such marking be done at request of the drawer, he cannot, generally speaking, afterwards revoke authority to pay.

By s. 75 of the Bills of Exchange Act the banker's authority to pay a cheque is revoked by countermand of payment by the customer himself or by the death of the customer. A credit balance, although sufficient in amount, may also become unavailable to meet cheques on the bankruptcy of a customer (or liquidation, if a company), or notice by the banker of an available act of bankruptcy, or insanity of the customer, or by attachment of the credit balance by process of court as by a garnishee order attaching the balance. As to garnishee proceedings, it is important to note that the order binds the whole balance attached, irrespective of the amount of the judgment debt in respect of which it is made (*Rogers* v. *Whiteley,* 1892, A.C. 118). As to current account, although there is no debt due until demand made by the customer, *Joachimson's case* (*supra*) expressly reserved the application of garnishee proceedings to accounts current. As to deposit accounts, the terms of withdrawal or repayment, usually evidenced by the deposit receipt or note, have to be looked to in order to ascertain whether there is then a debt due or accruing due that is garnishable. Determination of the banker's authority to pay by the customer's countermand, generally called "stopping a cheque," requires consideration. For if the banker pays after such countermand he is liable to the customer for having paid contrary to his mandate or authority, and cannot charge him with the payment. Such countermand, however, to be effective must have actually reached the banker and must be unequivocal and free from ambiguity both in its terms and method of communication; *e.g.,* a banker is not bound to act upon an unconfirmed telegram but in case of doubt is justified in reserving payment for such reasonable time as in the circumstances allow of enquiry (*Curtice* v. *London City and Midland Bank,* 1908, 1 K.B. 293). In the

case of an authenticated telegram wherein the customer erroneously gives the wrong number of the cheque he desires stopped, the court regards the number as the one certain means of identification, and will not lightly put upon the banker the fault by reason of other circumstances alleged to be such as to put him upon inquiry (*Hilton* v. *Westminster Bank,* 1926, W.W. 332. House of Lords; 43 T.L.R. 124). A banker is not bound to cash a cheque out of the advertised business hours, but, were he to do so, would he be liable to the drawer who had stopped the cheque on the re-opening of business hours next day? This question was raised, but not decided, in *Baines* v. *National Provincial Bank,* 32 Com. Cas. 216, where it was held that the payment, having been made within five minutes after closing time, was within such a reasonable margin as to constitute it a payment within business hours.

Conversion and Statutory Protections.—In the varied operations connected with banking business a banker is liable for any loss to the customer arising directly out of negligence, *i.e.,* some act or omission which is contrary to the ordinary reasonable practice obtaining among business men and which is a breach of duty owing to his customer. But however careful a banker and his servants may be, there is always the risk of what is called conversion of a bill or cheque either in payment or collection thereof. That is to say the person tendering for payment or collection a cheque or bill may prove to have either no title or a defective title, and in such case a banker paying or collecting, however innocent of the true state of things existing, may be liable to the true owner for "conversion" or for "money had and received." It is conversion so to deal with a thing adversely to the true owner's rights of possession without his assent, and ignorance of the facts is no defence. As to bills and many other securities there is no statutory protection, but as to cheques and certain other orders there is limited statutory provision. As to the paying banker, we have s. 60 of the Bills of Exchange Act protecting a banker paying "bills drawn on a banker payable on demand" (*i.e.,* cheques) in the ordinary course of business notwithstanding forged or unauthorized indorsements. This covers only true cheques and would not apply to those "cheques" frequently used by local bodies or other corporations attaching some condition to payment such as signing a receipt, etc. But s. 19 of the Stamp Act, 1853, accords a similar protection to any draft or order payable to order drawn upon a banker; and s. 17 of the Revenue Act, 1883, applies to such irregular "cheques" the benefit of the crossed cheques sections of the Bills of Exchange Act, 1882. The paying banker obtains protection when paying crossed cheques in accordance with their ostensible tenor (s. 80 and the proviso to s. 79).

With regard to the collecting banker, qualified protection against the perils of conversion is afforded by s. 82. Without such protection the customer's want of title may render the banker liable, since by collecting on an instrument to which the customer has no title or a defective title he is assisting in conversion of the true owner's property (*Arnold* v. *Cheque Bank,* 1876, 1 C.P.D. 578; *Fine Art Society* v. *Nina Bank of London,* 1886, 17 Q.B.D. 705). S. 82 enacts that "where a banker in good faith and without negligence receives payment for a customer of a cheque crossed generally or specially to himself and the customer has no title or a defective title thereto, the banker shall not incur any liability to the true owner of the cheque by reason only of having received such payment." In *Gordon* v. *Capital and Counties Bank,* 1903, A.C.240 it was held by the House of Lords that a banker is not, within this section, "receiving payment for" the customer if he had credited the cheque as cash and allowed or agreed to allow the customer to draw against it before clearance, since he thereby becomes holder for value and collects for himself. Hence by an amending act of 1906 it was enacted that a banker should be within s. 82 "notwithstanding that he credits his customer's account with the amount of the cheque before receiving payment thereof." The protection thus accorded is strictly qualified by the holder of proof upon the banker that he acted "without negligence" (*Sonchette* v. *London County Westminster and Parrs Bank,* 1920, 36 T.L.R. 195) in every stage of the process of collection, from the taking of the cheque to the receipt and disposition of the money. And on the other hand it is not merely the receipt of the proceeds of the cheque that is protected but "every step taken in the ordinary course of business and intended to lead to that result" (per Lord Macnaghten in *Gordon's case,* cited above, at p. 244). The test of negligence is whether the transaction of paying in any given cheque (coupled with the circumstances antecedent and present) is so out of the ordinary course that it ought to arouse doubts in the banker's mind such as to throw on him the duty of making inquiry. Instances of negligence familiar in decided cases, which are numerous, are: failure to detect an obvious non-correspondence of indorsement with the name of the payee (1900, 1 Q.B. 270); indorsement on the cheques payable to different persons being in the same handwriting; a company's cheque sent home for amendment alteration not initialled by both the directors who draw it (*Sonchette's case* above); omission to make inquiries as to a customer opening an account and paying in a stolen cheque (*St. John Hampstead* v. *Barclay's Bank,* 1923, 39 T.L.R. 229; *Ladbroke* v. *Todd,* 1914, 19 Com. Cas. 256); cheque payable to order of a public official endorsed and paid into his private account (*Ross* v. *London County Westminster and Parrs Bank,* 1919, 1 K.B. 678); cheque payable to a company indorsed and paid into a director's or secretary's private account, the company's account being kept elsewhere (*Hannan's Lake View* v. *Armstrong,* 1900, 16 T.L.R. 236; *Underwood* v. *Barclay's Bank,* 1924, 1 K.B. 775); cheque marked "account payee" where the circumstances raise a doubt as to whether the proceeds are being placed to that account—the words being a direction to the collecting bank so to place them (*Bevan* v. *National Bank Ltd.,* 23 T.L.R. 65; and see *Importers Co. Ltd.* v. *Westminster Bank,* 1927, K.B., as to clearing bank acting for collecting bank). For cheques not crossed and bills there is no protection against the risk of innocent conversion in collection. The damages in conversion, by collecting cheques to which customer has no title, may be mitigated by proof that the proceeds of cheques have been in some part applied to the proper purposes of the true owner (*Underwood's case, Sonchette's case, supra*), and an inquiry may be ordered accordingly.

If a banker can show that he holds a cheque as holder in due course, as having given value for it without notice of any defect in title, he of course needs no protection, for it is then his own property. If, for instance, a banker has credited his customer with the cheque on an agreement express or implied that he may draw against it before clearance, he may, if there is nothing to impute to him notice of any defect in title, be in such a position. Mere crediting in the books without such an agreement will not suffice (*A. L. Underwood and Co.* v. *Barclay's Bank supra*). And no forged endorsement must intervene, for forged signature confers no title at all.

In cases not covered by statutory authority where forgery or fraud intervene the banker has to rely on general legal principles. He cannot charge his customer with payments made on a forgery of the customer's signature; but if the customer has adopted the forgery or, having knowledge or reasonable ground for belief that it has been committed, has failed to warn the banker, the customer may be estopped from disputing the banker's right to debit him (*Vagliano* v. *Bank of England,* 1891, A.C. 107; *McKenzie* v. *British Linen Co.,* 1881, App. Cas. 82). *Bona fide* payment on a forgery to an innocent holder is payment under mistake of fact, but in case of negotiable instruments it is open to debate whether recovery back of the money so paid is permissible in any circumstances, having regard to the strict rule applied to negotiable instruments as stated and applied in *London River Plate Bank* v. *Bank of Liverpool,* 1896, 1 Q.B. 7 and referred to by Lord Cave L.C. in *Jones* v. *Waring and Gillow,* 1926, A.C. at p. 684; but see *Imperial Bank of Canada* v. *Bank of Hamilton,* 1903, A.C. 49, where the strictness of the rule was questioned.

Bankers' Lien and Securities.—As far back as the middle of the 19th century it was judicially decided that "bankers most undoubtedly have a general lien on all securities deposited with them *as* bankers by a customer unless there be an express contract or circumstances that show an implied contract inconsistent with

lien" (*Brandao* v. *Barnett*, 1846, 12 C. and F. 787). Where money is concerned, "set-off" is the appropriate term rather than lien. The above statement of banker's lien excludes documents or securities deposited for safe custody or deposited for any special purpose inconsistent with lien. And the implied general lien for balance of account is not needed where securities are specifically deposited as cover for amounts owing. There is in such cases a specific charge of the securities. But if securities so deposited are left in the banker's hands after the amount secured is cleared off, these securities may become subject to the general lien, as the customer, by leaving them, may be taken to have re-deposited them. And upon sale of securities to meet specific advances, if a surplus remains, the banker may have a right to set-off such surplus as against further sums due on general account. In the case of bills, notes and cheques, the banker has the right of a holder for value to the extent of his lien (Bills of Ex. Act s. 27 [3]). In the case of other securities the banker has, presumably, the right of a pledgee, and after default, if notice to realise has been given, can sell the security and reimburse himself so far as possible. (*See* also MORTGAGE.)

Quite distinct from this implied general lien is the case of charges taken by banks to secure advances. Where the banker affords accommodation to his customer by fixed loan or overdraft, or both, he usually requires securities to be lodged. The large banks have well recognized common forms printed for mortgages and charges upon property of all kinds. Memoranda of general charge, together with deposit of deeds, securities, share certificates, policies and so on, are also provided, both where the customer himself provides the security and also where securities belonging to other persons are charged. In all cases the forms in use are so worded as to give the banker the fullest right over the property free from conflicting rights of sureties. In all cases of continuing accounts upon which advances are from time to time made by way of overdraft care has to be taken to observe the rule that notice of a subsequent charge on the same security by another person calls for the ruling off of the account, as, after notice, such subsequent charge ranks in priority as regards any future advances. (*See* above as to rule in *Hopkinson* v. *Holt* and rule in *Clayton's case*.)

The contract of personal guarantee is a characteristic, though ancillary or supplementary, security frequently taken by a banker. The common form is what is called a "continuing" guarantee; that is to say, not a guarantee of a fixed sum there and then advanced, but a guarantee of all sums then or thereafter from time to time advanced, and of all amounts in account between banker and customer from time to time outstanding against the customer. The contract of guarantee is a form of suretyship, the guarantor engaging to pay (usually on demand and up to a specified limit) any and all amounts at any time outstanding to the debit of the customer in the event of the customer's default. But in practice it would be a poor security were the banker, as creditor, to be subjected to the ordinary law relating to principal and surety, such as a claim for release by the surety in the event of the banker (the creditor), without the assent of the guarantor, granting time or indulgence to the customer (the principal debtor) or exchanging, releasing or surrendering other concurrent securities for the same debt. Moreover the banker requires to be in a position to prove in bankruptcy, or to accept compositions in respect of, the whole amount due and owing without competition by the guarantor. Hence the common forms of printed guarantee in use in the banks are so framed as to allow the banker to operate the account and deal with securities and their realization as he may think fit, and to prove and take compositions and act with complete freedom so as to get as near his 20s. in the £ as possible without endangering his remedy against the guarantor up to the agreed limit. It is quite usual to provide for a determination of the guarantee by the guarantor's giving of a fixed written notice—usually three or six months. This is a useful provision as without it a guarantor could at any time in case of a "continuing" guarantee give instant notice of determination, with the result that arrangements of the customer and banker might be considerably disturbed, for each cheque drawn on the overdrawn account is a fresh advance. Notice of determination on the part of the guarantor does not affect liability accrued up to expiry of term of notice, but thereafter no advances can be made in reliance on the guarantee.

Bankers generally consent to receive for safe custody customers' property such as plate, securities and other valuable things. It has been debated whether a banker in such cases is a gratuitory bailee or a bailee for reward; in the former case he is liable only for neglect of such precautions as "a reasonably prudent and careful man may fairly be expected to take of his own property of the like description" (*Giblin* v. *McMullen*, 1868, L.R. 2 P.C. 317), whereas a bailee for reward is bound to provide at his own expense all appliances and safeguards possible. In view, however, of the well-known fact that bankers already have provided strong rooms, safes, etc., which are available, the test in both cases might be regarded as very much the same in practical effect.

See M. D. Chalmers, *A Digest of the Law of Bills of Exchange* (1879, 9th ed., 1927); H. L. Hart, *The Law of Banking* (3rd ed., 1914); Sir J. R. Paget, *Law of Banking* (3rd ed., 1922); J. Grant, *A Treatise on the Law relating to Bankers and Banking* (7th ed., 1923); Institute of Bankers (London), *Questions on Banking Practice*.

(B. C.)

UNITED STATES

Generally speaking, in the United States, according to charter, there are two types of banks, national and State; the former being chartered by the Federal comptroller of the currency and the latter by the banking departments of the respective States. Under State charters, there are State banks and trust companies. The banking functions of the national banks, trust companies and State banks, with the exception of trustee or so-called mutual savings banks, are essentially similar. In a few States, mutual savings banks have been chartered. These banks have no capital stock, and the earnings, beyond that which is paid as dividends to the depositors, are placed in the guarantee fund. National banks which have the right to act in a fiduciary capacity are governed in that capacity by the laws of the State in which they are located. All national banks must be members of the Federal Reserve System; membership is optional with State banks, with the exception of the mutual savings banks which, under the Federal Reserve Act, are ineligible for membership.

Savings Banks and Accounts.—The Federal Reserve Act defines savings accounts as those governed by the following conditions: (1) The pass-book, certificate or other form of receipt must be presented to the bank when a deposit or withdrawal is made. (2) The depositor may be required to give notice of not less than 30 days of intended withdrawals. The definition of savings accounts, as given by the Federal Reserve Act, is accepted by banks whether they are members of the Federal Reserve System or not.

In the State of New York the State statute provides that only mutual savings banks may use the word "savings"; other banks, having in effect savings departments, call them special interest departments or thrift departments. In mutual savings banks, the investment of savings deposits is carefully regulated by law. Mutual savings banks have one kind of deposits only, viz., savings. In these banks the agreement between the bank and the customer is specific: to return the funds to the depositor upon his written order and the presentation of his pass-book. This pass-book is a contract between the bank and its depositor, while a checking account pass-book in other types of banks is merely a memorandum of the deposits. In some States a part of the capital and surplus of the banks is segregated for the savings department, and the savings deposits are segregated and invested in accordance with specific legislation. A 30 day notice governing withdrawals of savings deposits is made especially desirable by the fact that under the Federal Reserve Act and under some State statutes considerably less reserves are required if this provision is used. Under ordinary conditions this advance notice of withdrawal is seldom required. In time of stress, however, strict conformity with the requirement would be exacted, in order that the bank might not be embarrassed by lack of money. A stockholder in a national bank, and in most cases in a State bank, is liable in the event of the bank's failure to an amount equal to the par value of his stock

This provision is for the further protection of the bank's customers.

Customers' Deposits.—Since very little actual money is handled in financial transactions in the United States, the customer's initial deposit in a checking account is likely to be in cheques as well as in cash. After a signature card has been filed, cheques may be drawn at once against the cash on deposit. On a cheque immediately drawn against a deposited cheque, payment would probably be refused, since the deposited cheque might be irregular, the drawer might have died or failed, or the account might be short. When collection has been made on the deposited cheque, cheques will be honoured against the account. A bank is bound to honour cheques drawn on it by a depositor if it has sufficient funds belonging to the customer when the cheque is presented. Where the customer does not keep a balance sufficiently large to compensate the bank for the expense of his account, a service charge is made by many banks. If the customer is a corporation, a partnership, or a fiduciary, the bank will insist on having a certified copy of the resolution or by-law enabling the officers to transact the business of the corporation, or of the partnership agreement, or of the court orders and other legal papers. If a cheque deposited by a customer and credited to his account is not paid upon presentation, the amount is charged back against the customer's account.

When making deposits, the customer should have (*a*) his bank pass-book, (*b*) the deposit-slip made out identically with the pass-book, (*c*) the items arranged in the same order as they are listed on the deposit-slip, (*d*) the proper certificates relative to income-tax attached to the bond coupons, (*e*) the cheques properly indorsed. If the customer is an officer of a corporation and presents for deposit to his own account a cheque drawn by him to his own order, many banks will not accept it unless they have the written authorization of the corporation to do so. Some banks make a practice of accepting such deposits and protect themselves by insurance.

To secure payment on a cheque, it must be indorsed by the depositor in one of several ways, by writing on the back of the cheque: (*a*) In blank, "John Smith." An indorsement in blank is dangerous to the depositor unless he presents it at once at the bank. If it is lost or stolen, the holder can readily cash it. Under no circumstances should a cheque having this indorsement be sent by post; (*b*) "Pay to the order of Blank National Bank, John Smith." Under this indorsement, if the cheque is lost or stolen, it cannot be negotiated, except through forgery. The customer is fully protected. This is the best indorsement. A cheque having it can be safely sent by post; (*c*) "Without recourse, John Smith"; (*d*) "Pay John Jones only, John Smith"; (*e*) "Pay Blank National bank, for account of John Jones, John Smith." The "third party indorsement" is used widely by partnerships, corporations and associations, in depositing cheques to the account of employés, who may be travelling or away from home, or who for any reason are not in a position to indorse the cheques personally.

Under the law, the holder of cheques is required to deposit them within a "reasonable time"; otherwise, there is danger of the release of indorsers. Furthermore, the cheque holder will be the loser if the bank fails after such "reasonable time." Cheques should be deposited not later than on the first business day succeeding that on which they are received. The customer's money, upon deposit, becomes the property of the bank. The bank admits that it owes the customer that amount, and, in the case of a savings deposit, promises to repay the customer in accordance with the rules in the pass-book in which the customer's deposit is recorded. In the case of a checking account, the bank promises to repay the money immediately upon the presentation of a cheque. In accepting this arrangement, the customer, by implication, agrees to prepare his cheques with care, *i.e.*, to date them, to begin filling in the cheque at the extreme left, and to draw a heavy wave-like line through unused space, to make the figures plainly and close up to the dollar mark, to write clearly, using plenty of ink, and to use either a cheque form prepared by the bank or else a blank cheque. A cheque form of another bank should never be utilized. These safeguards will make fraudulent alteration difficult.

Under the standard form of collection agreement recommended by the American Bankers' Association, when the customer deposits cheques or drafts in a bank on another bank, these cheques or drafts remain the property of the customer until they are collected by the customer's bank, and the customer cannot draw against them until collection has been made. If the cheques or drafts are lost or destroyed, or the bank on which they are drawn fails before they are paid, the customer loses, although he may recover from the person originally drawing the cheques or making the drafts. It is the customer's right to have his cheque cashed in legal tender only, without specifying the kind of money he shall accept. However, the bank is usually willing to pay the customer in whatever kind of money the customer desires, though at times it may decline to pay in gold coin.

At stated intervals, or upon request, the bank returns to the customer his cancelled cheques, together with a statement of his account. If a forged cheque is included, the customer should immediately notify the bank of the forgery and return the cheque to the bank, and the bank is bound to credit the customer's account. If the bank pays a cheque which has been "raised," the bank can charge the customer only the original amount of the cheque, unless it was so carelessly drawn as to lend itself to fraudulent manipulation. If the bank pays a cheque which has a forged indorsement, it is under obligation to reimburse the customer. If the customer does not notify the bank of a "raised" or forged cheque within a reasonable time after the receipt of his cancelled cheques, the bank is not bound to credit him.

A bank certifies a cheque simply as an accommodation and is under no obligation to do so. A certified cheque gives assurance of payment. If the amount on a certified cheque has been "raised," the customer would receive only the amount of the original cheque.

The customer who has drawn a cheque has the right to stop payment. The stop order should give the number, the date and the amount of the cheque, and to whose order it was drawn, and must reach the bank before the cheque is presented for payment. Banks usually require written verification of a telephone stop order. The holder of a stopped cheque can recover against the drawer and indorser if he has purchased the cheque within a reasonable time after date, without notice of any defence. This is by virtue of the special rules applicable to negotiable paper.

The customer desiring to do so may borrow money from the bank on a promissory note, due on a specified date, or may borrow on a demand collateral note. If the customer has collateral, consisting of bonds listed on the stock exchange, his note usually will be discounted or a loan allowed at once by the officers of the bank. If his collateral is in real estate, notes, trade acceptances, or personal indorsement, more time is necessary, in order that the discount committee may pass on the matter. If money is secured on a promissory note, the customer receives in cash the difference between the face value of the note and the interest for the specified time. If a loan is made on a demand collateral note, the customer receives the face value of the note. An interest statement to the customer is made monthly.

As to promissory notes, a customer should remember that (*a*) a note bears interest before maturity only if so stated, (*b*) if no mention of interest is made, interest begins on the date the note becomes due and at the legal rate obtaining in that State, (*c*) notes due on Sunday fall due on Monday, (*d*) notes due on a holiday, or on Saturday when Saturday is a half holiday, fall due on the next business day. (W. E. Al.)

BANKER MARKS or **MASONS' MARKS,** the marks cut upon the various dressed stones of a masonry building to identify the stone-cutter who prepared the stone, so called from the "banker," or stone bench, at which the stone-cutter works. Banker marks are well-nigh universal in mediaeval buildings in Europe and have been the subject of much archaeological and antiquarian research. It would appear that each stone-cutter had his own individual mark. These were often passed down from father to son. In the 16th century, when others beside working masons were admitted to the lodges of the masonic guilds they, too, received identifying banker marks, which were preserved in

the register of the lodge. Banker marks have completely passed out of use in modern masonry.

For a complete discussion *see* G. F. Fort, *A Historical Treatise on Early Builders' Marks* (Philadelphia, 1885), and *Masons' Marks from Buildings in the Counties of Lancaster and Chester, with Notes on the General History of Masons' Marks* (Historic Society of Lancashire and Cheshire, vol. vii, N.S.), by W. H. Rylands. Victor Didron copied some 4,000 banker marks during a tour in France in 1836 (*Ann. Arch.*, 1845).

BANKERS' CLEARINGHOUSE. The working of the cheque system is greatly facilitated by the establishment of a clearinghouse which enables bankers readily to adjust their accounts with each other. As long ago as 1775 the London bankers doing business within the City of London arranged a common meeting place in Change alley where their clerks set off against each other the various cheques and bills which had been presented for payment, thus economizing time and avoiding the risk entailed in collecting money from each other. In 1854 the Joint Stock banks were admitted to the clearinghouse, and ten years later the Bank of England joined the institution.

The system of the clearinghouse is exceedingly simple. As each bank has an account at the Bank of England, the daily balances of the clearance are settled by transfers at the central institution. The vast amount of labour saved may be gathered from the fact that the daily clearances of the London Bankers' clearinghouse, including the cheques of country banks which clear through their London correspondents, often amount to as much as £125,000,000. In the U.S. the New York clearinghouse established in 1853 clears the immense exchanges of Greater New York city which are 55% to 60% those of the country.

Provincial clearinghouses have been established in a number of British towns, including Manchester, Liverpool, Birmingham, Leeds, Sheffield, Newcastle-on-Tyne, Edinburgh and Glasgow. In the U.S. in 1926 there were 362 clearinghouses beside the one in New York, operating in as many cities, most of them unincorporated co-operative institutions. Next to New York city the largest in order were those at Chicago, Philadelphia, Boston, San Francisco, Los Angeles, Pittsburgh and Detroit, their clearances in 1927 varying from $35,462,000,000 for Chicago to $8,733,000,000 in Detroit. The cheque system is much more highly developed in Great Britain and the U.S. than in any other country, but there are bankers' clearinghouses at Paris, Berlin, Hamburg and other large centres.

(*See* BANKING AND CREDIT.)

See W. E. Spahr, *The Clearing and Collection of Checks* (1926).

BANKERS TRUST COMPANY (New York), A United States banking institution, incorporated in the state of New York, March 24, 1903, with capital and surplus of $1,500,000. In 1911 the Mercantile Trust company, founded in 1868, was absorbed by merger and in the following year the Manhattan Trust company, founded in 1871, was also absorbed. As a result, the capital and surplus of the company were raised to $20,000,000 at the close of 1912, with deposits of more than $134,000,000. In 1917, the Astor Trust company was acquired and became the company's first branch office in the city of New York. No other mergers have taken place after that time.

The main office is located at 16 Wall street, New York city, with branches at Fifth avenue and Forty-Fourth street and at Fifty-Seventh street and Madison avenue, New York. There is also a branch in London at 26 Old Broad street. The Bankers Safe Deposit company, a wholly owned subsidiary, operates safe deposit vaults at all the New York offices.

The Bankers Trust company conducts a general commercial banking business, in both the domestic and foreign fields. It acts as executor and trustee for individuals and as custodian for the safekeeping of securities for both individuals and corporations. It serves as registrar and transfer agent for stocks and bonds, as dividend and interest paying agent, as trustee under mortgages and indentures and as depositary under reorganization or adjustment agreements. It deals in U.S. government, state and municipal securities. On March 30, 1940, the capital amounted to $25,000,000, surplus to $50,000,000 and undivided profits to $31,598,586.63. Deposits were $1,182,468,488.98. (G. EM.)

BANK FOR INTERNATIONAL SETTLEMENTS at Basle, Switzerland, was an institution primarily created for the handling of all reparation transactions arising from the operation of the Young plan (*see* REPARATIONS). A committee, of which Jackson E. Reynolds, of New York, was chairman, met at Baden, Germany, in 1929 and drew up the basic documents creating the bank. The Hague conference of 1930 confirmed the work done at Baden; the bank began business on May 20, 1930. The statutes of the bank provided for a capital of 500,000,000 Swiss gold francs, of which only 25% were ever paid up. While the central banks of six of the seven countries represented at the Baden conference became stockholders, in the United States the Federal Reserve system not having participated officially in the organization of the bank, the U.S. shares were assigned to three private banks: J. P. Morgan and company, the First National Bank of New York and the First National Bank of Chicago. The statute stipulated that the three objects of the bank were: "to promote the co-operation of central banks; to provide additional facilities for international financial operations; and to act as trustee or agent in regard to international financial settlements entrusted to it." Probably the greatest service the bank performed was in enabling, during the 1930s, the heads of the various European central banks to meet and exchange information, without any fanfare. Even during World War II the bank continued to function, at least nominally. The statement of the bank of May 31, 1944, balanced at 467,614,587 Swiss gold francs. The bank paid an annual dividend of 6%. The Bretton Woods conference of July 1944 recommended the liquidation of the bank.

BIBLIOGRAPHY.—Bank for International Settlements, *Documents* (Chicago, 1930); Paul Einzig, *The Bank for International Settlements* (London, 1930); Eleanor Lansing Dulles, *The Bank for International Settlements* (New York, 1932); *Annual Reports* (Basle, 1931-43). (WA./L.)

BANK HOLIDAYS, in the United Kingdom, those days which by the Bank Holidays act, 1871, are kept as close holidays in all banks in England, Wales, Ireland and Scotland respectively. Before the year 1834, the Bank of England was closed on certain saints' days and anniversaries, about 33 days in all. In 1834 these were reduced to four—Good Friday, May 1, Nov. 1 and Christmas day. By the act of 1871, the following were constituted bank holidays in England and Ireland—Easter Monday, the Monday in Whitsun week, the first Monday of August, Dec. 26 if a weekday; and by the Bank Holiday (Ireland) act, 1903, March 17 as a special bank holiday for Ireland (*see* FEASTS AND FESTIVALS). In Scotland—New Year's day, Christmas day, Good Friday, the first Monday of May, the first Monday of August, or if Christmas day and New Year's day fall on a Sunday, the next Monday following are bank holidays under the Bank Holiday act, 1871. By the same act it was made lawful for the sovereign from time to time, as it should seem fit, to appoint by proclamation, in the same manner as public fasts or days of public thanksgiving, any day to be observed as a bank holiday throughout the United Kingdom or any part of it, or to substitute another day. (*See* also HOLIDAY.)

BANKING AND CREDIT. The term "credit" is best understood through its relation to the term debt. Debtor and creditor are correlatives. Debt expresses the relation of the debtor to the creditor; credit, in its simplest use, expresses the relation of the creditor to the debtor. It is, therefore, another name for debt. This definition supplies a clue to all the various uses of the term. A sale of anything creates a debt from buyer to seller. Payment in ready money extinguishes the debt as soon as it comes into being. If payment is postponed, the debt is allowed to subsist. In that case the sale is said to be on credit, and the seller gives credit. By derivation the term credit expresses the trust reposed by the creditor in the debtor. A man has good credit in proportion as he is trusted as a debtor. The credit of a government is commonly measured by the price at which its obligations are quoted in the market. A credit instrument is a document by which a debt is assigned from one creditor to another. A bank credit is a debt due from a banker, whether in the form of a deposit, or of a right to draw bills payable at a future date.

FUNCTIONS OF BANKING

A bank is usually thought of as a reliable agency with which money is deposited. This idea is an approximation to the truth, but it is wanting in precision. A bank must be distinguished from a mere depository, one who receives a package of valuables for safe custody and undertakes to return it unopened. Banks do receive valuables on those terms, but that is only a subsidiary function. It is usually jewellery, deeds, securities and similar articles, not money, that they receive. But if a bank does receive a package of money on those terms, that does not constitute a banking transaction. A bank must also be distinguished from a trustee, who receives money and invests it or otherwise uses it according to the terms of his trust, and has to account in detail for everything he has done with it. Banks may undertake to act as trustees, but this again is a subsidiary function.

The services rendered by a bank either as depository or as trustee are not a part of banking. For the sums deposited with it in its capacity as a bank the bank is neither depository nor trustee; it is simply a debtor. For what purpose then does a bank exist? What services does it render in its capacity as debtor to its customers or depositors? The services fall under three main heads:

(1) It provides safekeeping for people's money. This is the same service as is performed by a depository, but it is performed in a different way. Instead of the money being set apart in a strong room, it is replaced by a debt due from the banker. If the solvency and probity of the banker are sufficiently well established, it may be actually safer so.

(2) The bank provides a temporary investment for money, paying interest so long as the money is retained, and repaying the principal on its being claimed in accordance with the contract (usually on an agreed notice being given). This is useful to two classes of people. (a) Those whose savings are too small to be dealt with conveniently through the machinery of the investment market or stock exchange; (b) Traders who in the course of business find large sums of money in their hands, but who expect to have to use the money in business again soon.

Savings Banks.—It is for the former class that Savings banks and the savings departments of ordinary banks exist. People of small means want to invest small sums at a time, and they also want to be able to withdraw the sums invested at any time in case they need them. Accordingly a savings bank receives small deposits, and gives the depositors the right of withdrawing their money at short notice. This right of withdrawal is the characteristic of a temporary investment, but in practice the savings bank depositor intends his investment to be permanent, and only to be withdrawn in case of an emergency. Traders on the other hand need a really temporary investment. They want to receive some interest on idle money in the interval before they need it again for employment in business. The right of withdrawal will actually be exercised after a few months or even weeks. The sums deposited will be large, but investment through the Stock Exchange or in mortgages would be inappropriate because it would involve expenses, commission, etc., and a possible loss on realization. When a bank is employed as an agency for temporary investment, it must use the funds entrusted to it to earn interest. The manner in which it does so is described below. (*See* SAVINGS BANKS.)

(3) **Means of Payment.**—A third service performed by a bank, and one which over-shadows the other two, is the provision of a means of payment.

Payment is the process by which a debt is discharged. Money is the means established by law for discharging debts. The debtor has the right to pay his debt in money, and the creditor has the right to require payment in money. But the use of money may not be the most convenient means of payment either to the debtor or to the creditor. And there is an alternative. A debt may be discharged by being set off against another debt. This is quite simple where each of two people is indebted to the other. If A and B are trading together, and A owes B £100, while B owes A £90, they can settle B's debt by deducting it from A's, so that A merely owes B the balance of £10. They may carry forward the balance from account to account, so that money need only be paid in relatively small sums to discharge balances at infrequent intervals.

Payment in Credit Money.—But in general a man's creditors are not the same people as his debtors, and this simple direct system of set-off is not possible. A bank may be regarded as an agency for extending the discharge of debts by set-off to that case. Suppose a group of people indebted to one another. If the creditors assign their rights to a banker, he becomes the debtor of all the creditors and the creditor of all the debtors. Each man's debts can then be deducted in the banker's books from his credits, leaving a net balance. Some people's debts will exceed their credits, and for them the net balances will be debit balances. If it were desired to complete the settlement at a particular moment so that all debts are discharged, those with debit balances would have to pay the amount due to the banker, and he would distribute the amount received among the creditors. If all the debtors paid up, all would then be quits.

The Bank's Assets and Liabilities.—But people do not want money except as a means of payment. For the major payments a transfer in a bank's books is a more convenient means than money. Consequently the creditors prefer not to have their credits paid off in money. They prefer to hold balances of bank credit or credit money, that is to say, debts due from the banker, which can be used as a means of payment. If the banker is solvent, he must hold equivalent assets against his liabilities. These are provided by the debtors. It is not necessary that the debtors should pay in money. The banker may consent to let a customer remain indebted for an agreed period and pay interest on the amount. Or the banker may buy investments and himself become indebted for their value. The sellers of the investments acquire equivalent bank credits which when spent will pass into other people's hands. Anyone who would otherwise be indebted to the banker can extinguish his indebtedness if he can acquire a share of these bank credits by selling something. There being a persisting demand for bank credit as a means of payment, the banker can remain continuously indebted to his customers for sums equal to the working balances that they find it convenient to hold available to be drawn upon for the payments they must make from day to day. Any one customer's balance will fluctuate widely, but the aggregate of all balances will be comparatively stable.

BANK-NOTES AND CHEQUES

In order that bank credit may be used as a means of payment, it is quite clearly essential that some convenient procedure should be instituted for assigning a banker's debt from one creditor to another. In the infancy of deposit banking in mediaeval Venice, when a depositor wanted to transfer a sum to someone else, both had to attend at the bank in person. In modern times the legal doctrine of negotiable instruments has been developed, and the assignment of a debt can be readily effected by the delivery of a document from the old creditor to the new, provided that the contract with the debtor (the banker) contemplates this being done. The document may take either of two forms: (1) a cheque, or the creditor's order to the banker to pay; (2) a note or the banker's promise to pay.

Bank-notes.—Historically the bank-note came first. It may be regarded as the creditor's title deed of a debt due from a banker. The rights it represents are assigned by simple delivery; the bearer of the note for the time being is *ipso facto* the creditor of the bank. Payment in bank-notes is therefore effected in exactly the same way as payment in money. Payment of large sums in coin is inconvenient; the coins must not only be counted but scrutinized to see that none of them are counterfeit, or unduly worn, etc., and the expense of handling and transporting considerable quantities of the precious metals is serious. By the use of bank-notes of large denomination the labour of counting is reduced to a trifle, and the rest of the trouble is avoided altogether.

Cheques.—A note is issued by the banker when he has to make a payment to someone (*e.g.*, a depositor or a borrower) who is willing to accept it in that form. A cheque on the other hand is made out by his customer on the occasion of the payment to be effected by it. The bank-note is for a round sum, the cheque for the exact sum to be paid. The bank-note circulates from hand to hand like money, and may be held by people who have no direct

dealings with the issuing bank. The cheque is delivered to the person to whom payment is to be made and is in general thereupon presented to the bank and cancelled after the single payment it was designed to discharge. A cheque can only be drawn by a creditor of the bank, a depositor. And his deposit must be of the kind payable on demand (on current account). He cannot draw a cheque on a deposit payable only after notice or at an agreed future date (a temporary investment). If he wishes to use such a deposit as a means of payment, he must first give the requisite notice or agree with the banker terms on which the notice is to be dispensed with. Deposits subject to notice are sometimes called time deposits. Sometimes the term deposit is treated as belonging specially to them as distinct from balances on current account. Nevertheless the latter are very commonly described as demand deposits, and the word, deposits, itself used to include both. For the largest payments the cheque is distinctly more convenient than the bank-note.

THE CLEARING SYSTEM

Bank Clearing.—If a number of people who are all customers of the same bank pay one another with cheques, their debts are set off against their credits in the books of the bank. But if there are several banks, the process of set-off is more complicated. Each bank will receive some cheques drawn in favour of its own depositors by those of other banks. It will credit its own depositors with the amounts of these cheques conditionally on the banks on which the cheques are drawn paying them. It will sort out the cheques and present to each bank those drawn on it. But all the other banks will be following the same procedure; every bank will be both debtor and creditor. To settle between any two, it is not necessary for each to pay the gross amount due to the other. They can set off debts and credits, and leave a net balance to be paid by one to the other. The process of set-off can be further developed and simplified by the creation of a central organization called a clearing-house. Instead of each bank presenting its claims to each of the others separately, each bank presents all its claims to the clearing-house. The clearing-house is then in a position to set off all the debts and credits of any one bank. If the bank is on balance a debtor it pays the net amount to the clearing-house; if it is on balance a creditor it receives the net amount from the clearing-house. The receipts and payments of the clearing-house balance exactly.

Clearing Agents and Correspondents.—In a place which is a clearing centre all the banks will not necessarily be members of the clearing-house. But those which are not members cannot easily dispense with its facilities; they will probably make arrangements with the banks which are members to act as their agents. A clearing bank which undertakes to act as agent for one or more non-members can deal with their cheques along with its own, keeping a separate account for each. They must then make arrangements to pay or receive the net balance disclosed every day after the process of set-off is completed. This arrangement can also be made for banks at a distance from the clearing centre. Clearing requires the personal presence in one room of representatives of all the clearing banks and a bank with no establishment (whether head office or branch) at the clearing centre cannot take part in it except through the agency of one of the banks carrying on business there. The outlying bank will probably arrange for the clearing bank to be its correspondent; it becomes a depositor in the correspondent bank, and maintains a balance on current account from which it can meet its clearing liabilities, and to which it can credit its receipts. In a country like the United States, where branch-banking is greatly restricted, this relation of the outlying bank to its correspondent at the clearing centre plays a great part in banking organization. There are intermediate clearing centres at which the banks, while acting as clearing agents or correspondents of the outlying banks of the district, themselves rely on correspondents at the greater centres.

Central Banks.—In every country there tends to be a single ultimate clearing centre to which the residue of cheques not cleared locally will gravitate. One of the primary functions of a modern central bank is to hold deposits from the clearing banks, with which they settle their clearing balances. The London clearing banks settle with cheques on the Bank of England. Clearing facilities form one of the principal features of the Federal Reserve Banks of the United States.

Clearing of Bank-notes.—At the present day clearing is chiefly concerned with cheques. But the same machinery is applicable to bank-notes, and is often applied in communities where there are several note-issuing banks. Each bank presents to the note-clearing house the notes of other banks which it has received in the course of business, and its claims are set against its liabilities in respect of its own notes held by the other banks.

Payments in Money.—By means of the clearing system payments that people are willing to make with bank credit, can be carried right through to ultimate settlement without the use of money. On the other hand there are classes of payments for which bank credit is a less convenient medium than money, that is to say (1) payments to or by people (usually of small resources) who have no banking accounts, and (2) the smaller payments (*e.g.*, to shops, places of entertainment, railways, trams, etc.) of those who have banking accounts. Employers of labour regularly draw out money from the banks to pay wages, and all people with banking accounts draw sums out for use as pocket-money. The banks must be prepared to meet these demands. They are the debtors of their depositors, and like all debtors are bound to pay, if so required, in money. To a great extent the money they pay out returns to them.

Localization of Bank Deposits.—It is these transactions in money that make the place at which the bank undertakes to pay its depositors a matter of practical concern. If all payments were made in bank credit, the cheques and notes with which they were made would in any case all go to the clearing centre, wherever they might be presented. But one who has to make payments in money will want to keep his deposits with a bank or a branch bank in close proximity to the place where he resides or carries on business. One who has deposited money in a bank expects to find the money, when he needs it, at the place where he left it. In reality the money itself has become the unencumbered property of the bank, and the rights of the depositor to it have been replaced by his rights as a creditor against the bank. Nevertheless it is an understood condition of the contract between them that the bank's debt shall be paid in money on demand (or after notice when that is stipulated) at the place at which the account is kept.

BANK ASSETS

Need for Cash Reserve.—A bank is the debtor of its depositors. Against its debts it must hold equivalent assets. Against deposits received for temporary investment, on which the bank pays interest, it must hold interest-bearing investments. Against deposits held by its customers for use as a means of payment it can also in part hold interest-bearing investments. But in its choice of assets to be held against these latter it is limited by the character of its obligations. It must be ready at all times (1) to pay out money on demand (2) to meet an adverse balance at the clearing. The bank must keep a part of its assets in actual money, or cash reserve. Idle cash earns no interest, and a bank run for profit will seek to keep down its cash reserve to the minimum required by safety. In ordinary circumstances it can rely on the demands of its depositors for money keeping within narrow limits. People determine the amount of money they keep in hand by considerations of convenience, and these considerations are not subject to arbitrary and discontinuous changes. People need more cash when they go on holidays or when they travel, and there are seasonal variations in the demands on the banks for money for these purposes. But these are in general easily foreseen and provided for. Money is drawn out for innumerable small payments, and the amount in circulation at any moment is the aggregate of innumerable small balances. This aggregate exhibits the steadying effect of the law of averages. But the aggregate of balances of credit money, that is to say, of bank deposits, is on a different footing. The number of depositors is comparatively restricted, and it is likely that among them will be a small number of people carrying on business on

a large scale, whose balances form a disproportionately large part of the total, and who hold large balances because they frequently make very large payments. The law of averages will not apply here. The bank must be prepared to settle through the clearing-house widely fluctuating balances the extent of which cannot be foreseen. A clearing bank may rely for this purpose on reserves of cash. Or if the practice is to settle with cheques on a central bank, it may rely on balances deposited with that bank. But, like cash reserves, balances deposited with the central bank yield no interest.

Liquid Investments.—In order to keep their unprofitable assets down to a minimum, and yet to be sure of meeting all demands, whether for money or for payments through the clearing-house, without difficulty or delay, banks make a practice of holding a considerable part of their assets in the form of what are called liquid investments. Liquid investments are those which can be turned quickly and without loss into money. They may be either (1) short-dated investments, that is to say, debts maturing for payment in a short time or on short notice being given, or (2) securities readily saleable in the market.

SHORT-DATED INVESTMENTS

Advances to Traders.—Short-dated investments are possible because it suits the convenience of certain classes of people to borrow temporarily. That is especially true of traders who produce or buy commodities with a view to sale. Usually a trader either buys or sells goods in large quantities at a time; if he is a wholesale dealer he both buys and sells in large quantities. If all the goods he buys are paid for out of his own capital, he must always hold a large balance of idle cash just before a large purchase or after a large sale. While these balances are accumulating or being disposed of, there is a loss of interest. Balances can be kept down and the loss of interest reduced to a minimum, if, instead of accumulating cash, the trader can borrow the sum required for his outlay and repay the debt out of subsequent receipts. If he possesses plenty of capital of his own, he can find profitable permanent investments for the resources released from his own business, so that all his capital will be earning interest, while he will only have to pay interest on the fluctuating amount of temporary indebtedness outstanding. And the trader whose business is capable of expansion beyond the limits of his own capital, can supplement that capital by temporary borrowing and take better advantage of his opportunities. Loans to traders of this type form the principal bankers' investment. But the degree of liquidity varies greatly. The banker reserves to himself the right to call in the advance at any time on demand or on short notice. But it may be highly embarrassing to the trader to pay up, and the banker cannot in practice wholly disinterest himself in his customer's affairs. The trader, if he had superfluous cash in hand, would in any case desire to pay. If he has not, he can only obtain the means of paying either (1) by borrowing from someone else, or (2) by selling something. It may be extremely inconvenient to sell. Even if he possesses goods ready in all respects for market, it may still only be possible to hasten his sales at a sacrifice (possibly a heavy sacrifice) in price. Forced sales might even make the trader bankrupt. On the other hand, if under pressure the trader borrows from someone else, the new lender will probably be another banker, and the result may be that the first banker will lose the trader's custom. The upshot is that advances to traders are apt to be wanting in liquidity unless either (1) the trader is one who deals in a very active market with a rapid turnover, so that in any case he repays his advances and reborrows them at short intervals, or he holds a certain amount of capital outside his own business invested in readily marketable securities.

Loans to the Stock Exchange.—Dealers in the investment market (stock brokers and jobbers) are a particular class of traders who are well placed to borrow from banks. Stocks and shares of the kind they deal in are likely to be more readily marketable than commodities. A slight sacrifice in price will often elicit purchases from investors in anticipation of future savings, whereas the consumer's demand for commodities cannot be stimulated to any important extent in this way. The investment market is active, dealers are accustomed to borrow for short periods, and under normal market conditions can readily be induced to curtail their indebtedness.

Bills of Exchange.—But the banker's favourite liquid investment is the bill of exchange. A bill of exchange is an instrument for assigning a debt; it takes the form of a written order from the creditor (the drawer) to the debtor (the drawee) to pay the debt to a third person (the payee), who, on the debtor signifying his assent (acceptance), becomes the new creditor. Thus a seller of goods may draw a bill upon the buyer in favour of his banker, payable at an agreed future date. He is thereby enabled to sell the debt to the banker, who will pay the present value of the debt, that is to say the sum due, less interest for the period up to maturity. This interest (discount) makes the holding of the bill a profitable investment to the banker. The bill has several incidental advantages. (1) The bill is regarded as guaranteed by both the drawer and (after acceptance) the drawee. (2) The bill is saleable; the bank can assign its rights in it, if need be, to another creditor. (3) The drawee is expected to provide at all costs for punctual payment on maturity. The bill in fact is subject to the law of negotiable instruments, with all the venerable traditions handed down from the law merchant. The personal relation which modifies the legal rights of the banker in the case of a direct advance to his customer is eliminated from the bill, because the bill is designed to be marketable. The customer has no right to complain if the bill is sold and passes into the hands of strangers who know and care nothing for his affairs, and who will not listen to excuses, before enforcing their rights. In general the relation of banker and customer exists between the payee and the drawer, not between the payee and the drawee or acceptor, who is the debtor. In practice the drawee is often another bank. Banks are accustomed (at the charge of a small commission) to allow bills to be drawn on them on behalf of their customers. The bank assumes all the responsibilities of the acceptor; the customer, who is the ultimate debtor, undertakes to pay the sum due on the maturity of the bill to the accepting bank, but assumes no other obligation.

Promissory Notes.—Another form of negotiable instrument is the promissory note. If a borrower from a bank gives the bank a note promising to pay the sum at the date it is to fall due, the bank can, if need be, sell the note before maturity, just like a bill. But the note differs from the bill in having (in the first instance) no second signature upon it as a guarantee. It also differs in that, in general, the note is the direct obligation of a customer of the bank that holds it, and while so held does not escape altogether from the influence of the personal relation of banker and customer. The banker is not in practice so free to harden his heart as when he holds a bill drawn on a stranger.

MARKETABLE SECURITIES

The Discount Market.—The bill of exchange possesses both the special attributes of liquidity. Not only is it a genuinely short-dated security with safeguards for prompt payment at maturity, but it is also marketable. Banks can sell bills to one another, and when a bank has to make large and unforeseen payments, its holding of bills forms a secondary reserve behind its cash. There are degrees of marketability. The facilities for dealing in bills of exchange in any centre are not necessarily adequate to meet the requirements of banks. The most highly organized market in bills is to be found in the London discount market or money market. Here there is a class of dealers, the discount houses, specializing in the buying and selling of bills. They not only act as intermediaries between the banks which want to sell bills and those which want to buy, but they buy and hold bills on their own account. To provide funds for this purpose, they borrow money from day to day, at call, from the banks and other lenders with free balances. It is the dealing in this day-to-day money that constitutes the money market properly so called.

Rediscounts.—To the banks the loans to the discount market represent their most liquid asset. The borrowers are dealers in the most liquid of all securities, the bill of exchange. But that

is not the whole story. It happens from time to time that the volume of bills coming into the London market for sale is excessive in relation to the capacity of the banks to absorb them. If the market were left entirely to itself the effort to dispose of the bills might result in the rate of discount and the rate of interest on day to day money being forced up to an exorbitant level. But the Bank of England intervenes on such occasions, and stands ready to lend to the discount houses or buy bills from them at a specified rate (bank rate). In other countries, where no counterpart of the London discount market exists, substantially the same result is secured by the presence of a central bank which undertakes to buy or rediscount bills for the other banks. There is a market in bills because the central bank is always a willing buyer at its own price (bank rate). The functions of a central bank are further explained below and in the article CENTRAL BANK.

The Investment Market.—Marketable securities include those dealt in on the investment market or stock exchange, that is to say stocks and shares, debentures and bonds, etc. Securities of these kinds are not all marketable. The less well known cannot be sold in the open market at all, or, if they can, it may be only after delay in finding a buyer and with a substantial sacrifice of price. But the securities which really are marketable form under normal conditions a liquid investment. Occasionally it may happen that the investment market breaks down; demand fails, and the market cannot be made to absorb even first rate securities except at a relatively very low price. Here, as in the case of a breakdown of the discount market, it is possible for the central bank to relieve the strain; it can offer to lend to the other banks on stock exchange securities. But central banks are usually less willing to make this kind of loan than to rediscount bills. Bills have both forms of liquidity, being both short-dated and marketable. Stock exchange securities are only marketable. If the capital sums they represent are repayable at all it is only at a distant date.

SOLVENCY

Liquidity is a special need of banks. Solvency is a requirement common to them and to all other enterprises. But the conditions of solvency of a bank are in certain respects peculiar. A trader's debts are incidental to his business, and ought to be moderate in proportion to his own capital. A banker's debts are the very basis of his business. Moreover if his debts are to be used by his customers without hesitation as the means of payment, the equivalent of money, the banker's solvency ought to be put beyond question. He ought not to take risks.

Short-dated Securities.—Against liabilities fixed in terms of money, he ought not to hold assets of which the money value is susceptible of wide variation. The money value of commodities, of shares and of long-dated securities is liable to heavy and unforeseen depreciation. The only assets secure against such depreciation are short-dated investments. That does not mean that a banker is to limit himself absolutely to bills, and to advances for periods not exceeding a few months. Bonds maturing in a moderate period of years are not liable to more than a slight degree of depreciation.

Collateral Security.—To some borrowers banks are willing to make advances unsecured, their wealth and standing being such that no doubt is felt as to all their obligations being fully and punctually met. Where this is not so, the bank will require collateral security. The nature of the security depends on the circumstances. When a merchant borrows to buy commodities which are to be sold again without going through any productive process, it is usually possible to give the bank a lien on the commodities till they are sold. When a producer borrows to meet the cost of wages, etc., the products in which his expenditure is to be embodied have no separate existence when the loan is made. In that case sometimes the fixed capital of the concern can be pledged, debentures or a mortgage being handed to the banker and returned by him on repayment. Sometimes a trader possesses investments outside his business which he can pledge. If they are gilt-edged or readily marketable securities, the banker will prefer them to a lien on commodities or on fixed plant. A dealer in the investment market can provide security without difficulty, because when he borrows it is to buy marketable stocks and shares which can easily be pledged. This system of requiring collateral security for bank advances has other advantages besides safeguarding the lending bank against ultimate loss. The advance is never granted up to the whole value of the security. Some margin is required. Consequently the borrower is compelled to use a certain proportion of his own capital in his business; he cannot work entirely with borrowed money. This prevents the abuse commonly called over-trading, the assumption of heavy commitments by a man who has comparatively little or nothing to lose. For bills collateral security is less necessary than for advances. The liability of the acceptor is supported by the guarantee of the drawer and of all the endorsers. Nevertheless where the names on the bill are not of first rate credit, collateral security is required. When a bill is drawn by an exporter in one place on an importer in another, and is bought in the former place by a bank before it has been sent to the latter to be accepted, it is a common practice to give security to the bill by attaching to it the bills of lading which constitute the title deeds to the goods while in transit. The bank is thereby given legal possession of the goods in the interval before acceptance.

Bank Capital.—By these methods risk can be minimized, but it is not in the nature of human affairs that it should be eliminated from the banker's business altogether. To provide for losses, the banker must have some capital of his own, a margin of his total assets over his total liabilities. This margin may be regarded as a guarantee fund. It may be increased by the accumulation of a reserve or surplus out of profits. A banker need not be so strict in the selection of investments for his capital and surplus as for his deposits. And the bigger the margin in proportion to his demand obligations, the freer he is. Banks on the continent of Europe are much less restricted in their investments than those in England or America. They regularly participate in issues of shares in industrial companies, though the shares are not likely to be marketable at any rate in the first instance, and they may result in loss. But these banks have relatively large capital in proportion to deposits. And the larger the capital in proportion to deposits, the less need is there for strictness in the selection even of investments to be held against the deposits themselves. The need for liquidity indeed is unaffected, but given an adequate proportion of liquid assets, a greater risk of loss can be incurred on the remainder without endangering the solvency of the bank. Risk in business, it will be remembered, is a means of profit. In countries where the commercial and financial business which needs short-term advances and discounts from banks is not very extensively developed, the tendency is for banks to be relatively highly capitalized and to assume a different character. They do a large business in shares, mortgages and long-term investments, and play a leading part in the investment market.

FOREIGN EXCHANGE

A clearing system is only possible where the debts to be cleared are expressed in the same monetary unit. Otherwise they cannot be set off against one another. The need for clearing is felt in international transactions where this condition is not fulfilled. The requisite facilities are created through the instrumentality of the foreign exchange market. At any centre where a foreign exchange market exists, the dealers who constitute this market offer to buy and sell bank credits in foreign countries. They quote prices for the currencies of these foreign countries in terms of the currency of the place where they are dealing. These prices permit of the set-off of debts expressed in the currencies and they form the basis of what is in effect a system of clearing. The dealers are for the most part banks. In order that a bank at any centre (A) may deal in foreign exchange between that and another centre (B), it must have some sort of establishment at the foreign centre (B), either a branch or a correspondent bank. In either case it will have a supply of liquid assets localized in (B) and expressed in its currency. If it has a branch, the assets will be in the form of bills, marketable securities, advances and cash; if it has a correspondent, it will maintain a deposit with the

correspondent. In the course of business the bank's customers in (A) will want to buy and sell credits at (B). Some will have acquired pecuniary rights there and will bring the cheques, bills or other credit instruments, by means of which such rights are assigned to be bought by the bank, and others, seeking to acquire similar rights, will want the bank to sell them the appropriate credit instruments. The bank will draw upon its resources at (B) to sell to the latter, and will replenish them with the credits bought from the former. Its purchases and sales will not exactly balance; there will be excess of one or the other. But meanwhile the other banks at (A) will be dealing in exchange upon (B), and it is probable that some will have an excess of purchases and others an excess of sales. All will want to avoid any greater disturbance of the amount of liquid assets held at (B) than is necessary. Through the channel of the foreign exchange market those whose holdings at (B) have increased can sell the surplus and those whose holdings have been reduced can buy enough to make up the deficiency. This is a process analogous to clearing, but in general it will leave a residue, an increase or decrease in the aggregate holdings at (B) of all the banks at (A). But other foreign centres will have been dealing in exchange on (B), and the banks at each centre will have a residual balance, an increase or decrease in the aggregate holdings of its banks at (B). At any centre where the holdings have increased, the foreign exchange market will tend to quote a lower price for the currency of (B), and at any centre where the holdings have decreased, the market will tend to quote a higher price. But these divergencies of price will quickly lead to those centres which have an excess of liquid assets at (B) selling them to those which have a deficiency. Here we have a further stage in the process of clearing, but there will still be a residual balance, and an excess or deficiency of liquid assets in (B) held among the banks dealing in foreign exchange all over the world. The existence of this residual balance will affect the quotations of the currency of (B) in the foreign exchange market in terms of all other currencies; an excess will lower the value of the currency, and a deficiency will raise it.

CREDIT POLICY

Banks create credit. It is a mistake to suppose that bank credit is created to any important extent by the payment of money into the banks. Money is always being paid in by tradesmen and others who receive it in the course of business, and drawn out again by employers to pay wages and by depositors in general for use as pocket money. But the change of money into credit money and of credit money back into money does not alter the total amount of the means of payment in the hands of the community. When a bank lends, by granting an advance or discounting a bill, the effect is different. Two debts are created; the trader who borrows becomes indebted to the bank at a future date, and the bank becomes immediately indebted to the trader. The bank's debt is a means of payment; it is credit money. It is a clear addition to the amount of the means of payment in the community. The bank does not lend money. The borrower can, if he pleases, take out the whole amount of the loan in money. He is in that respect in the same position as any other depositor. But like other depositors he is likely in practice to use credit for all major payments and only to draw out money as and when needed for minor payments.

Credit Limits.—The statement that banks create credit has been the occasion of much unnecessary controversy. It does not mean that any bank can create any amount of credit at its sole discretion without limit. There are limits, and neither the theory nor the practice of banking can be fully understood without regard to those limits. When a bank lends to its customers it increases its deposit liabilities. To the customers those liabilities are money, the means of payment. They draw upon their balances and pay them away. The people to whom they make payments will be average members of the community. In so far as they have banking accounts they will be for the most part with other banks, and the payments to them will appear as debits against the lending bank at the clearing. At the same time previous advances and bills will be maturing. The customers of the bank who pay them off will have procured the wherewithal by selling things and doing business with other members of the community; they receive payment, and thereby there arise credits in favour of the bank at the clearing. If the bank increases its lending, the tendency will be for the debits at the clearing to exceed the credits. The bank's cash will be diminished, and to reinforce its reserves it must realize some of its liquid assets. To that extent it loses the profit on its additional lending, and at the same time its position will be weakened. On the other hand, if all the banks in the community are increasing their lending to the same proportional extent, no one of them will lose at the clearing, and this check upon them will be inoperative. But there is another check. The payments made by the borrowers out of the credit money placed at their disposal include payments to wage-earners and others who have no banking facilities. In so far as these people spend what they receive, the money comes back to the banks and there is no loss of cash. But the presumption is that when the outflow of money is increased, some will remain out; the cash holdings of the community will grow, and the cash holdings of the banks will be reduced.

Cash Holdings.—Now the banks must hold a certain amount of cash, corresponding to their deposit liabilities. Unless at the outset their cash holdings are redundant, they cannot let them be reduced. Indeed if, as we have assumed, their deposit liabilities are increasing, they would rather want their cash to increase in proportion. Banks commonly aim at keeping their cash approximately in a fixed ratio to their liabilities. Any bank which seeks to make good its lack of cash can do so at the expense of the other banks by damping down its lending. It will secure a credit balance at the clearing, and will receive this balance either in money or in cheques upon the central bank which can be turned into money. If one bank replenishes its reserves at the expense of the others, they will feel the shortage all the more. All will soon be impelled to curtail their lending, or, as it is called, to contract credit. But there is an alternative. If there is a central bank the other banks (which we may call the competitive banks) can replenish their cash by borrowing from it. If (as is invariably the case) the central bank is a note-issuing bank, and its notes are either legal tender or are treated by the community as entirely equivalent to money, the central bank by lending creates money. If its assets are increased by a certain amount of new loans or discounts, its liabilities are increased by the same amount. Its liabilities are either notes, and therefore money, or deposits which can be drawn on for clearing purposes or converted into money and which are regarded by the competitive banks as part of their cash reserves.

Power of Central Bank.—The central bank has the power of removing the obstacle interposed by the limitation of the supply of cash to the indefinite expansion of credit by the competitive banks. This power it ought to be cautious in using. The instrument through which it regulates its lending is the bank rate, the rate of interest that it charges. As a rule the bank rate properly so called is the rate of discount charged by the central bank on bills, another and somewhat higher rate being charged for advances. The accepted practice of central banks is to lend to all comers, provided they bring the approved kinds of bills or securities, and, if they seem to be borrowing too much, to rely on a high bank rate to deter them. It occasionally happens in exceptional circumstances that the central bank refuses to lend at all, or rations borrowers, refusing to lend beyond a prescribed limit. That is an emergency measure, only appropriate at a time when under the influence of a tendency towards inflation there is a class of speculative borrowers unamenable to any rate of interest short of one which to other and more reasonable borrowers would seem extortionate. Far from being advisable in other emergencies, a refusal to lend is disastrous in a financial crisis. A crisis is caused by a collapse of prices, which threatens the solvency of traders who are holding stocks of goods with borrowed money. It is likely to occur at a time when there has been excessive lending and the competitive banks are calling in loans. To refuse a loan is to compel a sale, and forced sales accentuate the fall of prices. If the competitive banks can bor-

row (at a price) from the central bank, they can afford to grant or renew loans (at a price) to their customers, and forced sales, at any rate on the part of solvent traders, can be avoided without undue difficulty.

Bank Rate and Rates of Interest.—Under normal conditions, when there is no crisis, the bank rate sets the standard for short-term rates of interest throughout the market. The extent to which the competitive banks borrow from the central bank is governed by the extent of their own customers' borrowing from them. If bank rate is to affect the competitive banks' demands, it can only be through their customers. If the market rate moves with the bank rate, that occurs; traders borrow less if they have to pay more. Some traders, it is true, are little affected by the rate of interest on temporary loans; it is a negligible item in the calculations of a producer with big fixed capital which he cannot afford to leave idle. But others are highly sensitive to it; particularly the merchant who makes a narrow margin of profit on a large turnover of goods, and who can vary his stock in trade within wide limits without inconvenience. The effect of bank rate on the market depends on the extent to which the competitive banks are compelled actually to borrow from the central bank. The central bank may hold securities bought in the open market. To support a given total of liabilities (note-issue and deposits), the more of these open market assets it holds, the less the competitive banks will need to borrow. The open market assets might be raised to such a figure that the competitive banks need not borrow at all. In that case the market rate would for the time being be dissociated from the bank rate; bank rate would be ineffective. To make it effective, the central bank would have to reduce its open market assets (by sale or non-renewal). Its liabilities would fall by the same amount as its assets, and there would be a shortage of cash which would drive the competitive banks to borrow.

Influence of Banks to Deter Borrowing.—When the competitive banks are subjected to pressure by the central bank, they do not rely only on high interest charges to deter their customers from borrowing. They can exercise influence upon them in many other ways, by conditions as to security, by limiting the period of a loan or by simple persuasion. It is when they are more than usually indebted to the central bank that they are likely to make most use of these methods. It was pointed out above that in London the borrowing from the Bank of England is done not by the competitive banks but by the discount houses. But that does not alter the essential character of the system of credit control.

Central Bank Regulation of Credit.—The central bank by adjusting bank rate, and when necessary making it effective, absolutely dominates the credit market. How is it to use this power? One answer (but as will be seen, an incomplete one) is that it is guided by the state of the foreign exchange market. If one among several countries creates credit too freely, the effect is much the same as when one among several banks does so. The borrowers pay away the deposits they acquire, and a part they pay away to international markets for imported goods, etc. The outcome is what may be regarded as a debit clearing balance against the country in the foreign exchange market. The dealers in that market receive too much of its currency. Either the adverse balance must be settled by exports of gold (which plays the part among gold standard countries of an international currency) or the currency of the country will tend to depreciate in terms of other currencies in the foreign exchange market. It is the practice of central banks to aim at preventing this situation from arising. An expansion of credit that threatens to disturb the foreign exchange market they check by raising bank rate. The contrary case where credit contracts, and the currency appreciates in the foreign exchange market, they deal with by a reduction of bank rate. But this manner of proceeding is open to the objection that if all the countries expand credit simultaneously, no one of them will have to pay a balance to any other. At this point the theory of banking merges in the theory of money and a further explanation of this somewhat intricate subject is given in the article MONEY.

DISTRUST, RUNS AND SUSPENSIONS

A great part (probably the greater part) of a bank's liabilities will be payable on demand. No bank keeps enough cash to pay all its demand obligations. It is unlikely that cash and liquid investments together would suffice. Supposing all its customers simultaneously exercised their rights of withdrawing deposits on demand in money, the bank, if left to its own resources, would probably be unable to fulfil its obligations. In general this does not occur. People deposit their money in banks on grounds of convenience, and, so long as the balance of convenience remains, they continue to do so. But a vital condition is that they should feel confidence in the bank. Let them doubt its solvency, and they will immediately demand payment. If something occurs to cast doubt on the solvency of a bank, there will be a *run* upon it, a simultaneous (possibly panic-stricken) withdrawal of deposits by all or by a large proportion of its customers. The bank's first resource is to turn its liquid assets into money. It must sell them or borrow upon them from other banks. One of the advantages of the central bank system is that the central bank is at hand to afford help to a bank in difficulties. Provided the bank's position is demonstrably sound, the central bank can lend it whatever cash may be necessary to satisfy its depositors. But if that condition is not fulfilled, the bank may find its cash reserves exhausted and be compelled to suspend payment. Suspension is not quite the same thing as failure. But it is a breach of the understanding on which credit has been created to serve as a means of payment. For it stops not only the withdrawal of deposits in money, but also the clearing of cheques drawn by the depositors. Legally it is not possible to enforce payment on demand, since a court would always give reasonable time for payment (though damages might be given for a default on an obligation to pay on demand). Banks have often been compelled to suspend payment when they are perfectly solvent in the sense that their assets, when realised, have paid all their depositors and left something over for the shareholders. Suspension can arise in another way. A country with a gold standard currency may be exposed to an adverse balance of payments and heavy losses of gold, so that all the banks simultaneously experience a rapid depletion of their cash not owing to distrust, but because a profit can be gained on exports of gold. If the currency laws are such that the money withdrawn cannot be replaced with fresh supplies (*e.g.*, by increased issues of notes from the central bank), there may be a general suspension of payments by the banks.

BANKING ORGANIZATION

Branch Banking.—The establishment of branches enables one bank to do business over a wide area. It thereby becomes possible for the whole of the banking business of a great country to be concentrated in the hands of a small number of banks. Branches give better facilities for payments between one place and another. If such payments have to be made through correspondents a charge will probably be made in the form of a small (but vexatious) commission. Mere magnitude is itself an advantage to a bank. The bigger the bank, the more effectively the law of averages applies to its transactions and in particular to its losses. If the losses to be guarded against are a smaller proportion of the total assets, then a smaller proportion of capital will give the same security to depositors, or a given proportion of capital will give greater security. In the United States, where branch banking is prohibited except on a very restricted scale, hundreds of little banks fail every year. The big bank can also give better facilities to the big customer. A trader whose balances and borrowings are considerable in proportion to the total resources of the bank is difficult to deal with. His transactions may sometimes upset all the banker's calculations. But if the trader can find a banker who has many customers doing business on the same big scale, their transactions will become subject to the law of averages. The result is a tendency for the big banks to absorb the little ones, or for many little banks to combine and form a few big ones wherever branch banking is permitted. The process has gone farther in England than anywhere else, and it has come to be recognized that it ought not to proceed indefinitely. There is no apparent

stopping place short of the union of all banks into a single monopoly. Such a monopoly could hardly be left in private hands and the result would be the nationalization of banking.

Nationalization of Banking.—The nationalization of banking in its entirety is a policy closely associated with Socialism or Collectivism. It is a feature of Communism, as established in Russia. A nationalized central bank, or State bank, on the other hand is an institution quite in harmony with an individualist or competitive economic system. A central bank is in any case a public institution. When it is the property of private shareholders, who have subscribed the capital, as is usually the case, it still must be carried on with a view rather to the public interest than to profit. The State is usually given some footing in the management, *e.g.*, by appointing a governor or at any rate some of the directors. The Bank of England is an exception. Its governor and directors are solely dependent on the shareholders and responsible to them.

VARIETIES OF BANKS

The foregoing description is applicable to the ordinary bank of discount and deposit, which combines the functions (1) of supplying credit money as a means of payment (current accounts); (2) of giving facilities for the temporary investment of balances (deposits subject to notice); and (3) of short-term lending. But there are other activities, more or less closely related to these, which are undertaken by banks, and some concerns which specialize in these other activities are commonly given the name of bank.

Acceptances.—It was mentioned above that banks allow their customers to arrange for bills of exchange to be drawn on them. The customer, when he buys goods, can tell the seller to draw a bill on the bank, and the bank will accept the bill. A bill accepted by a bank can be discounted on more favourable terms than one accepted by an ordinary trader. It should be borne in mind that the bill will be drawn by the seller of the goods and will be discounted by the seller's bank; the buyer's bank will only see it when it is presented for acceptance and later on for payment. There is nothing to prevent a bank buying its own acceptances if offered in the market, but banks do not make a practice of doing so. On any bill which a bank has accepted it is the principal debtor, and it shows its acceptances in its balance-sheet among its liabilities. On the credit side the bank shows an exactly equal sum, being the liability of its customers to provide the means of paying the bills on maturity. The charge made for accepting takes the form of a commission.

Accepting Houses.—In international trade it often happens that the bank where an importer of goods keeps his account is not of sufficient reputation outside its own country for bills accepted by it to command a good price. He may then arrange for bills to be accepted by some financial house of world wide credit in a foreign centre. The centre chosen will be one where it is convenient to get the bills discounted. London, with its highly developed free discount market has long been pre-eminent in this respect, though since the World War there has been a rapid and important development of facilities in New York. This accepting on behalf of clients in foreign countries is sometimes undertaken by banks (especially those with branches abroad), but also by concerns which specialize in the business. These latter are known as accepting houses.

Merchant Bankers.—Merchant bankers are a special class of bankers, peculiar (at any rate under that name) to London. Their characteristic is that they do not depend mainly on deposits like an ordinary bank, but use their capital and the power of their credit to carry on certain classes of business involving the movement of large sums, and remunerated by commission. The accepting of bills is one of these. Foreign exchange business is another. A third, and one which diverges more markedly from the functions of an ordinary bank, is the issuing of new capital. Issuing houses (as the merchant bankers who undertake this business are called) act as intermediaries between the company promoters or public authorities who seek to raise capital, and the investment market which provides it. They do not necessarily provide any of the capital themselves, nor even act as underwriters. It is their function to provide channels of approach through the market to the investors, and to find underwriters who will guarantee the subscription of any part of the desired capital which the investors do not in the first instance supply. Every financial centre has financial houses of some kind to do the work which in London falls on the issuing houses. In the United States, they are called investment bankers, in France *banques industrielles*. In many countries the function is combined with ordinary banking. In London itself this practice is growing among the banks. The merchant bankers differ from ordinary bankers in that they are usually private partnerships, not companies or corporations. Exceptions have begun to appear in recent times (*e.g.*, Barings and Lazards are both limited companies). The name merchant banker has a historical significance, in that the firms which bear it were evolved from mercantile concerns. The merchant engaged in international trade was likely frequently to find himself either with liquid funds to spare at any of the centres at which he carried on business, or short of funds and obliged to borrow temporarily. He was compelled to keep in touch with all the facilities for temporary lending and borrowing and for the transfer of funds from place to place. The big merchant was in a position to make a profit by allowing, at a suitable charge, his smaller colleagues to share in these facilities.

Exchange Banks.—Banks with branches in several different countries form a special class. They tend to specialize in foreign exchange and in the bills drawn to finance international trade, and they may be called (as in India) exchange banks, though the name is not in general use. In general an exchange bank has its head office or a branch at some big financial centre (such as London, New York, Paris or Amsterdam), and is constantly buying from its customers at its other branches bills drawn on this centre. These bills it sometimes sells and sometimes holds till maturity. The London discount market buys the greater part of its supply of commercial bills from the exchange banks. The exchange banks also do acceptance business.

Mortgage Banks.—The designation bank is sometimes given to institutions which raise money by the issue of shares or debentures and lend it on mortgage to farmers and others who seek capital to develop land. When such institutions do not receive any money on deposit it is hardly correct to call them banks. They are rather investment companies or finance companies. But as usage allows them to be called banks, they require mention here.

See also BANKS, HISTORY OF; MONEY; MONEY MARKET; CURRENCY; DISCOUNT AND DISCOUNT HOUSES; MERCHANT BANKERS; CENTRAL BANK; BANK OF ENGLAND; CHEQUE; BILL OF EXCHANGE; BANKERS CLEARING-HOUSE; INFLATION AND DEFLATION.

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UNITED STATES

The general term "bank" in the United States means an institution chartered by the State or National Government to accept the care of money belonging to individuals, firms and corporations, thereby, among other things, relieving them of the risk of keeping large sums of money in their possession. It is also a grantor of credit, and is the medium through which all general business transactions are ultimately cleared. There are, however, many kinds of banks. There is the bank of deposit, just described, and there are savings banks, trust companies, private banks, banks of discount, acceptance banks, and the Federal Reserve Banks.

Savings Banks.—A savings bank is one in which people deposit in a savings account money which they do not expect to use immediately, and upon which they can receive payments of

interest which are not allowed by banks of deposit. Such payments of interest are possible because the account is not a cheque-drawing one as in a bank of deposit, consequently the operations of savings banks are much simpler and the expenses not as high as in banks of deposit. The amount any one person may deposit in a savings bank is usually limited.

Federal Reserve Banks.—There are 12 Federal Reserve Banks in the United States. The depositors of the Federal Reserve Banks are the banks of deposit that are members of the Federal Reserve system. Their deposits include the reserves required by law for all banks of deposit. Each bank of deposit in the Federal Reserve system is a stockholder in the Federal Reserve Bank, its holdings being in proportion to the capitalization of the banks of deposit. There are no other stockholders in the Federal Reserve Banks. The Federal Reserve Banks, however, are of much greater importance than mere custodians of the reserves for banks of deposit, as they are the principal means of procuring an elastic currency to meet the credit needs of the country. This is accomplished principally by permitting banks of deposit (which are members of the Federal Reserve system) to rediscount certain classes of commercial paper with the Federal Reserve Banks, for which the Federal Reserve Bank pays the bank of deposit in Federal Reserve notes, which currently pass as money. The method of conducting this transaction is for a bank of deposit requiring additional money to take to the Federal Reserve Bank paper (notes) arising out of a business transaction, such paper being subject to certain restrictions making it eligible. The Federal Reserve Bank then gives the bank of deposit Federal Reserve notes equal in amount to the full face value of the paper accepted for discount. The Federal Reserve Bank then pledges 60% of such paper, together with 40% of gold certificate, with the U.S. Government as collateral for the Federal Reserve notes which were given to the bank of deposit in exchange for the paper.

In theory, the Federal Reserve notes issued when the individual's note is discounted or pledged with the Federal Reserve Bank are retired when the individual pays his note at maturity. The individual then gets back his note and the Federal Reserve Bank gets back the Federal Reserve notes issued therefor, which are sent to Washington for redemption and cancellation. Thus everything reverts to the same condition that existed before the individual's note was taken to the Federal Reserve Bank. This produces an elastic currency, making a greater amount of money available when needed, and retiring the money as soon as the need for additional credit has passed. As a practical matter, it is not possible to use the identical Federal Reserve notes to pay off the individual's note at maturity, nor is it practicable always to pay off the notes with the Federal Reserve notes issued through any particular Federal Reserve Bank. Therefore, Federal Reserve notes issued through any Federal Reserve Bank can be used for this purpose, so that the individual is relieved of the task of hunting around to secure any particular Federal Reserve notes, and the burden of sorting out the notes falls on the Federal Reserve Banks. As a matter of practice, the individual merely gives his cheque to the bank of deposit that took his note in the first place, and that bank makes the necessary settlement with the Federal Reserve Bank.

The extent to which these rediscounting transactions can be employed is limited by the supply of gold certificate in the Federal Reserve Bank, for the latter must deposit gold certificate with the U.S. Government to the extent of 40% of the amount of notes issued.

Banks of deposit may also borrow from the Federal Reserve Banks by pledging U.S. Government bonds as collateral.

Banks of Deposit.—Banks of deposit may be generally classified as National banks, State banks and trust companies. The principal difference between National banks and State banks originally was that the National banks could issue bank-notes, while a State bank or trust company could not.

Under recent laws, national banks, as a general rule, can perform all the fiduciary acts of a trust company, so that the difference between the three classes of banks today is considered of small importance, particularly among members of the Federal Reserve system.

The chief functions of a bank of deposit are in acting as custodian for the money of individuals, firms and companies, making collections for such customers and supplying credit facilities for the transaction of business. In its simplest form, the bank of deposit accepts deposits and moneys subject to cheque and lends out the funds during the period in which the money is not required by depositors. A bank's most common service to its depositors is the collection of cheques, drafts, coupons, etc., which makes necessary a vast machinery for the smooth and speedy handling of these items. The collection of items deposited by customers not only includes cheques and drafts drawn on other banks, in the same city or in other cities, but also the collection of enormous amounts for export of cotton, oil, wheat and other materials to foreign countries, and provides the necessary machinery to enable the farmer and manufacturer to market their products abroad. These latter transactions are usually financed by drafts drawn on foreign banks, which are purchased by banks of deposit, the purchase price being based on rate of exchange, interest rate, time required for collection of drafts, etc. Through the issuance of import letters of credit the banks also facilitate the importation of products required in this country.

Another universal service that a bank of deposit renders is the payment of cheques drawn by its depositors as they spend their money. To render them this service it is necessary for a bank to keep records showing at all times how much balance each depositor has in his account. These operations may appear simple, but they necessitate the employment of officers and clerks and involve various expenses that the bank must earn by loaning out a portion of the deposits in its possession. If a bank allows interest on deposits, such interest also must be earned. A bank affords depositors a cheap and safe way of transacting their financial affairs, and, as compensation for this service, the bank has the use of part of the money while it is on deposit. The bank can use only part of the money because a portion of the deposits must be held under the law as legal reserve, to facilitate payments in the event of heavy, unexpected withdrawals of deposits. The amount of legal reserve varies according to the population of the city or town in which the bank is located.

On the other side of the picture, there is the loaning of funds by the banks, a function necessary to meet the credit needs of business and to supply the banks with revenue to meet expenses, pay taxes and declare dividends to their stockholders. In loaning out its money, a bank must look first to the safety of the loan; whether it will be paid promptly at maturity and whether the collateral, if it is a secured loan, will have a ready market value in case of default of the loan, at maturity; or, if it is an unsecured loan, whether the borrower can pay 100 cents on the dollar in event of forced liquidation. A bank must next consider whether, in view of the maturities of its other loans and the probable withdrawal of deposits at certain seasons of the year, it is justified in lending money for the period desired by the borrower. It must also determine whether, if it advances the full loan desired, it may later be obliged to refuse loans to other depositors who may desire accommodation during the period involved. For a bank must keep in a liquid position and at the same time endeavour to arrange its affairs to take care of all its customers. It will lose business if it attempts to cater to a favoured few.

Other Banks.—Private banks consist of individuals or firms engaged in the banking business. Such banks accept deposits, but cannot avail themselves of the privileges of the Federal Reserve system, and hence usually make their collections through some bank of deposit where they have accounts. Banks of discount confine their activities largely to discounting commercial paper, acceptances and bills of exchange, and are comparatively new institutions in the United States. Acceptance banks primarily accept bills drawn by their customers, which are then usually sold in the open market. For guaranteeing the credit of their customers in this manner, the acceptance bank receives compensation from its customers, the principal source of revenue. (S. H. P.; X.)

BANK-NOTES. For our present purpose we include in this description all paper substitutes for metallic currency, whether issued by banks, governments or other financial institutions. Metal

and leather have been used as tokens in many parts of the ancient world, but they need not here be considered.

Early bank-notes were simply printed forms in which the amounts were written by hand. They were usually for large amounts (£40 and upwards) and were printed upon water-marked paper; and, although no precautions were taken in the engraving to prevent fraudulent imitation, forgeries were comparatively rare. But, when at the end of the 18th century small notes for £1 and £2 were put in circulation, forgery became rife, as many as 352 persons being convicted of this crime in England in a single year; and a constant trial of skill has since been going on between the makers of bank-notes and the counterfeiters. Engine-turned ornaments and emblematical figures or views introduced in the engraving, in conjunction with special water-marks in the paper, held the forgers somewhat in check until the discovery of photography put into the hands of the counterfeiter a most dangerous weapon, by the aid of which complicated patterns and vignettes could be reproduced. To prevent such reproduction Henry Bradbury, in 1856, introduced anti-photographic bank-note printing, in which the essential portions of the note were printed in one colour and over this another protective colour was placed. A photograph of a note printed in this way presented a confused mingling of the two colours.

The advance of photographic knowledge provided a means of obtaining a photograph of one or both of the colours that were in use in these early notes, and in order to make reproductions still more difficult a third colour was introduced.

Modern currency notes have for their security certain features which experience has found are not easily reproduced. The quality of the paper and its water-marking have long been regarded as providing elements of security of no mean importance, because it is not easy to make paper which has the characteristic rattle of some bank-notes, nor can the water-marking be copied very easily. The water-marking may take two forms. It may be an over-all water-mark, which forms a continuous pattern, and is not registered with the note, or the water-mark may be registered with the printing so that it always forms a characteristic pattern of the note, and this scheme has in many modern notes been elaborated to the extent of producing designs and even borders in several tones, two and three plane water-marks.

When a good portrait water-mark is registered in a conspicuous window in the note, it forms a feature which the eye can pick out immediately, and it requires very considerable skill on the part of the counterfeiter to copy sufficiently well. The effect of water-marking is to give different thicknesses and hence different degrees of translucence to the paper, but with modern papers, especially the so-called mould-made papers, the thinning produced by the water-mark is not sufficient to reduce the strength of the paper unduly.

All three possible methods of printing have been employed for the printing of paper currency: intaglio printing, where the design is recessed into the surface of a plate or cylinder; lithographic printing, where the printing is on a flat surface of lithographic stone or grained metal plate; and letterpress printing, where the design is raised as in ordinary type.

The most widely used method has been plate printing, an intaglio process of printing from steel plates. The engraving in this case is carried out in lines and dots, and since the printing is from the recessed portion of the plate it is possible to transfer to the paper considerable quantities of ink, so that great variation in the strength of the print may be made according to the depth and width of the engraved lines. Thus in a single design rich bold lines fade away to extremely fine and delicate shading. Excellent samples of this are seen in the United States currency. Work of this kind, produced by engraving lines upon metal, is known as black line work, but much use has been made of geometrical patterns with white lines. In this case it is the space between the lines which is printed, and the lines are left clear of ink. Work of this kind is naturally very difficult to imitate by hand engraving, and it is in this that its value chiefly lies.

British Currency Notes.—Another notable example of intaglio printing was the head of H.M. King George V on the British £1 treasury notes introduced during World War I, which were produced by rotary photogravure. The printers of this note had to overcome the difficulty of printing by this method on a hard and dry paper, but so well was this done that the head retained that richness associated with the photogravure process. In this case, as in so many other cases of intaglio printing, further printings by other processes were added in order to render the work difficult to copy by photography.

Letterpress printing has been used considerably for bank-note work, and also for printing stamps. This method has the advantage of being rapid and much cheaper than plate printing, as the work is done on ordinary letterpress printing machines. Such printing is characterized by the lines and dots having sharp edges, but the amount of ink which is transferred to the paper is much less than in plate printing, so that the raised lines and rich effects of the latter method are wanting. The method has, however, several important advantages. In the first place, the printing plates can be duplicated to any desired extent by electrotyping, and provided that these electros are replaced before they are badly worn, great numbers of exactly alike impressions can be secured.

Bank of England Notes.—The £5 notes issued from the Bank of England are printed from such relief or letterpress plates. Here the security lies very largely in the paper with its characteristic rattle and water-marking, but the printing is very carefully and uniformly carried out, so that any attempts at forgery can only be successful when both the paper and the high quality letterpress printing are well imitated. The comparative immunity of these notes from forgery is also partly due to the fact that they are usually examined with some care when they pass from hand to hand. Their average life is quite short, so that old and worn notes are rarely seen, and the return of every note is checked before it is destroyed. This latter precaution is hardly possible with notes having very large circulations, such as the British £1 and 10s. notes or the United States or Canadian $5 and $1 notes. The Bank of England £1 and 10s. notes carry a narrow opaque line in the paper as an additional security feature. Letterpress printing has also been largely used for supplementary printings in notes where the main printing may be plate work. Besides intaglio and letterpress printing, lithographic printing has been used for security work in the form of offset printing, where the design is photographed upon the thin zinc plate that replaces the lithographic stone, and the lithographic impression is not made directly from the zinc on to paper, but from zinc on to a rubber blanket, which delivers the ink image to the paper. The advantage of this is that very fine lines can be printed upon paper which is by no means smooth. It has also the advantage of being much cheaper than plate printing, but in some cases the printed impression has been flat and wanting in rigour. Great improvements in this type of printing were made, however, during the early 1940s.

Photography a Danger.—The steady progress which has been made in photography is a constant menace to the security of paper money, and those responsible for the production of notes have so to utilize additional printings as to make photographic copying impossible, or at any rate extremely difficult; this has often determined the choice of the colours blended together on the notes, and many beautiful designs have had to be disfigured by over-printings in order to prevent their easy photographic reproduction. The addition of too many elements of security in one note may, however, defeat its own ends, for there is a danger that notes may become so complicated and the paper so covered with a multiplicity of designs and colours that no one can carry with him a mental picture of the genuine note. In Great Britain a wise restraint has been shown in avoiding much over-elaboration, and in not covering up the whole of the paper with printing, so that the texture and water-marking retain their value.

Designs which are too simple can be imitated by a skilful engraver; and there have even been cases in which individual notes have been drawn by hand with some little success.

Complete security is perhaps impossible, but a high degree of security may be obtained by careful attention to the following points: (1) identity of appearance of all the notes of an issue; (2) arrangement of colour scheme so that none of the printings

can be secured by photographic copying; (3) use of paper which itself contains elements of security in its quality and watermarking. (A. J. B.)

In the United States, the treasury department has always relied on finely executed intaglio engraved plated printing and a high-grade distinctive paper having, since 1885, two rows of coloured silk fibre in the body of the paper, from top to bottom of the note. The serial number and seals on the face of the note are of a different colour than the black face printing, and the back of the note is generally an elaborately engraved plate impression.

A study of the existing paper currency of the United States was undertaken by the Bureau of Efficiency in 1925 at the request of the Treasury Department. Estimates placed the life of the most popular note in circulation, the dollar bill, at eight months, while the cause of damage by wear was attributed chiefly to folding. The bureau found that the life of the currency could be lengthened by producing a better paper, permitting the paper to season after each process of manufacture in the Bureau of Engraving and Printing, and by suitably surface treating the bills before they were issued. In 1927 the Treasury Department adopted a paper money of new size and redesigned it in the interest of security, simplification and economy. The new note is 2 11/16in. by 6 5/16in., about one-third less than the older in size. The principal notes in use (1939) are Federal Reserve notes and silver certificates. As fast as they are presented to the Federal Reserve Banks all national bank notes, gold certificates and Federal Reserve Bank notes are retired. The Bureau of Engraving and Printing at Washington prints all U.S. paper currency and, although the total in circulation fluctuates little, it is constantly producing new notes to take the place of old ones unfit for further use.

BANK OF ENGLAND. The movement towards the establishment of the Bank of England dated from before the French wars of William III., and sprang from the city merchants' dislike of the London goldsmiths for their rapacity and speculative propensities. Commercial development too had reached the point where the advantages and significance of a sound well-backed paper currency could be appreciated, the more so as the current coin of the realm fell far short of its purported value.

Formation and Early History.—The Bank of England was not the original scheme of William Paterson, its founder. As is usual in English political history, it came into being almost by the back-door, deriving its life from the Tonnage act of 1694, of which the preamble read "An Act for granting to their Majesties several Rates and Duties upon Tunnages of Ships and Vessels, and upon Beer, Ale and other Liquors: for securing certain Recompenses and Advantages, in the said Act mentioned, to Such persons as shall voluntarily advance the Sum of Fifteen hundred thousand Pounds towards carrying on the war against France."

The bank clearly arose from a deal between the Government and its promoters, the former receiving the cash, and the latter the privilege, and political opposition from the Jacobites and goldsmiths ran upon the expected lines. It failed, and the bank came into being. The capital was £1,200,000, the whole of which sum was to be advanced to the Government at a rate of 8% plus £4,000 per annum for expenses, or £100,000 per annum in all. The privileges of a bank were granted for 12 years to the corporation, which was allowed to deal in bills of exchange or bullion, but not in merchandise, and to issue notes up to a volume equal to that of its capital. Its profits were derived from the interest on the Government loan, and from its general banking business.

Its early days were naturally troubled. The national finances and currency were in a sad mess, and its own privileges were repeatedly threatened. Nevertheless, it survived, and provided a safe depository for the citizens' money, and thanks to its power of accumulating funds caused a marked fall in the rate of discount.

The next landmark in the history of the bank is the act of 1709, following the expiry of the bank's charter. This was the fruit of a fresh "deal" with the Government. The Government got its rate of interest reduced from 8 to 6%, a fresh loan of £400,000, and the right to ask the bank to issue exchequer bills for them. In return, the bank got its privileges renewed until 1732, the right to double its capital and so its note issue, and a monopoly of joint-stock issue banking in England. This last clause was of great importance, as for over a century it forced the banking system of the country into the hands of private individuals of varying substance, knowledge and experience.

Meanwhile, as the bank's own capital was lent to the Government the volume of the Bank of England's note issue depended on the size of the Government debt.

South Sea Bubble.—In 1711, the South Sea Company was founded, and for nine years was conducted upon a more or less sane basis. In 1720, as every history book relates, its directors and the whole financial world went mad. The company offered to take over the national debt at an interest rate of 5%, falling to 4% in seven years' time, and to pay 3½ millions for the privilege. The Bank of England was not to be outdone in this form of lunacy, and bid 5 millions. The South Sea Company promptly raised their bid to 7½ millions. Fortunately for the bank, even their most generous (and insane) offers were rejected. When the crash came, the bank had to meet a run, but just managed to stave off disaster. Later on, the bank played its part in the solution of the numerous financial problems which were the legacy of the crash. It took over fresh obligations, and incidentally increased its capital by £3,400,000 to £8,959,955. As its new stock was issued at 18% premium, the bank was well rewarded for its new responsibilities.

Having been prevented from committing suicide, and subsequently saved from accidental death, the bank's fortunes were now to run on more even lines. In 1722, the Reserve Fund or "Rest" was established. In 1742, when the bank's charter expired, the Government of the day was once more in a state of impecuniosity, and so the renewal was easily effected, the bank's capital being raised to £9,800,000. The early successes of the Young Pretender in 1745 caused another run upon the bank, but largely owing to the loyal support of the city merchants, disaster was avoided. The years 1750–51 were notable for a more humdrum, and far more important event. At that date the national debt was consolidated upon a 3% basis, and at the same time the Bank of England was entrusted with the administration of the national debt. It, therefore, assumed at this time one of the main functions of a modern central bank.

Subsequent history up to 1797 consists of recurrent crises, the renewal of the bank charter in 1764 and again in 1781, and the famous attack on the bank by the Gordon rioters in 1780.

Napoleonic Wars.—In 1797, following the strain of war, and successive internal crises, the bank was forced to suspend cash payments. The next 25 years were some of the most interesting in the history of the bank. For the greater part of this period England was in the throes of the Napoleonic wars, with their drain upon the resources of the country. Heavy borrowings on behalf of the Government were the rule, and the money so raised was devoted not only to war expenditure at home, but also to subsidies to Britain's allies. Trade was crippled by crises at home and by war risks on the high seas, while a large proportion of the Continental markets were closed to Great Britain.

In the light of the greater economic knowledge and the experiences during and after another and greater war, we can understand exactly what happened, why the bank was unable to encash its notes upon demand, why the foreign exchanges moved against the pound, and prices rose at home. The fact that in four years the bank was forced to lend the Government £10,000,000 seems to us perfectly natural, and so does the expansion in its note issue. The Restriction act of 1797, which legalized the bank's suspension of payments, found its counterpart in the currency note issue of 1914, and it is only fair to say that up to a point Pitt realized the dangers of inflation and the need for increased taxation, just as Lloyd George and McKenna did in 1914–15.

Bullion Committee.—In 1810 the famous Bullion Committee was appointed, and the fact that its deliberations were concentrated upon the Bank of England notes, shows the eminence and importance which the bank and its notes had reached during the first century of its life. For all practical purposes the bank's

notes had imperceptibly become the national currency though it took the suspension of their convertibility to bring the fact home. The Bullion Report, for the first time in our history, exposed the dangers of inflation and enunciated the advantages of the gold standard. It attributed the evils of high prices to the excess issue of bank-notes, which in turn was stated to arise from the suspension of cash payments by the bank. It regretted that what had been intended to be a temporary suspension had been prolonged indefinitely, and called for a resumption of cash payments and the restoration of the pound to its former value.

The report aroused a storm of controversy, and was rejected by a House of Commons who felt itself competent to pass a series of resolutions in flat contradiction of economic laws and facts. This led to fresh inflation and its inevitable results. It was only when the war was over, that conditions were ripe for a return to sanity and stability. The first move came from the bank itself, which in 1816 declared itself able to resume partial cash payments. By 1819, official opinion had swung round to the point where it could accept the doctrines of the Bullion Committee, and by 1821 the full gold standard was re-established upon its original basis of 77s. 10½d. per standard ounce of gold.

The next stage in the bank's history runs from 1821 to 1844. It witnessed the spread of industry and the attempts of banking to keep pace, and was punctuated by various crises, such as those of 1825 and 1836–39. The first of these crises was the direct cause of the initial breach in the bank's monopoly. The act of 1826 permitted joint-stock issue banking outside a radius of 65 miles from London, and henceforth the bank's monopoly was doomed. In 1833, another act was passed, making the bank's own notes legal tender, but at the same time legalizing joint-stock deposit banking in London itself. If the former of these acts had sounded the doom of the Bank's monopoly of issue banking, the latter presaged the gradual extinction of the bank-note itself as the main medium of payment. Once cheques replaced notes, the Bank of England was to change over from its rôle of the chief British bank of the 18th and early 19th centuries to that of the central or bankers' bank of to-day.

In 1836–39, the bank itself was involved in difficulty and only escaped having to suspend payment by a timely loan from the Banque de France (*q.v.*). Public opinion was now alarmed at the fact that while the bank's notes were convertible, the bank was not found to maintain any definite backing in gold behind them. Enquiries and discussions took place, culminating in Peel's Bank Charter act of 1844 (*q.v.*).

Peel's Bank Act.—The provisions of this act are dealt with elsewhere, so that it is sufficient to say that the bank's functions of note issue and general banking were separated into water-tight compartments, and that the volume of the fiduciary issue of Bank of England notes was defined rigidly by the act. In case of emergency, the Government could give the bank leave to issue notes beyond this limit, and this was the operation known as "suspending the Bank Act." Otherwise, every additional note issued had to be backed by gold.

The one exception permitted was that if any country bank-note issue lapsed, the Bank of England could raise its fiduciary limit by an amount equal to two-thirds of the lapsed issue.

Nineteenth Century Crises.—Three times in the 19th century was the Bank act to be suspended, in 1847, 1857 and 1866. The first crisis was the aftermath of the outbreak of railway speculation, and also of high grain prices and heavy corn importation. Numerous country bank failures occurred, and in its efforts to lend assistance, the bank put too high a strain upon its own resources. The suspension of the act immediately restored confidence, and on this occasion no notes were actually issued beyond the normal limit.

The 1857 crisis was more widely spread, and arose in fact from over-rapid development in the United States. The crisis spread to England, and caused a heavy and continued demand for funds upon the bank. The act was suspended in the nick of time (or else the bank would have had to close its doors) and this time £998,000 excess notes came into circulation.

The 1866 crisis originally affected general industrial speculation which rapidly attained an unhealthy volume. It was identified with the failure of the famous London finance house of Overend and Gurney, which caused an immediate panic and a run on the bank, who on "Black Friday," May 11, saw its reserve shrink from 5.7 to 3 millions. As before, the suspension of the act relieved the tension. Money remained dear for a long time and further failures occurred, but as in 1847, no additional notes were issued.

The Baring collapse in 1890 caused another severe crisis, but this time the bank managed to keep things in hand, and with the help of loans from the Banque de France, managed to avoid having to ask for a suspension.

The Bankers' Bank.—It was during this generation that the bank finally recognized that it had "suffered a sea-change" and became primarily a "bankers' bank." Not that it did not from its inception accept deposits from other banks and discount bills for the market. The pre-eminence of its note circulation alone would have ensured that it should receive business from every financial institution. In 1844, deposits from London bankers amounted to £963,000, and it is reasonable to suppose that an omnibus item of £5,631,000, termed "other deposits" included a fair proportion of "bank money."

The act of 1844 crystallized the whole position, and 20 years later Bagehot and Goschen interpreted it to the authorities of the bank itself. In brief, the Bank of England holds the gold at the basis of the nation's credit structure, and is responsible for maintaining a proper proportion between gold and the supply of credit. Should the proportion fall too low, it has various time-honoured means of rectifying the situation (*see* BANKING AND CREDIT; MONEY MARKET).

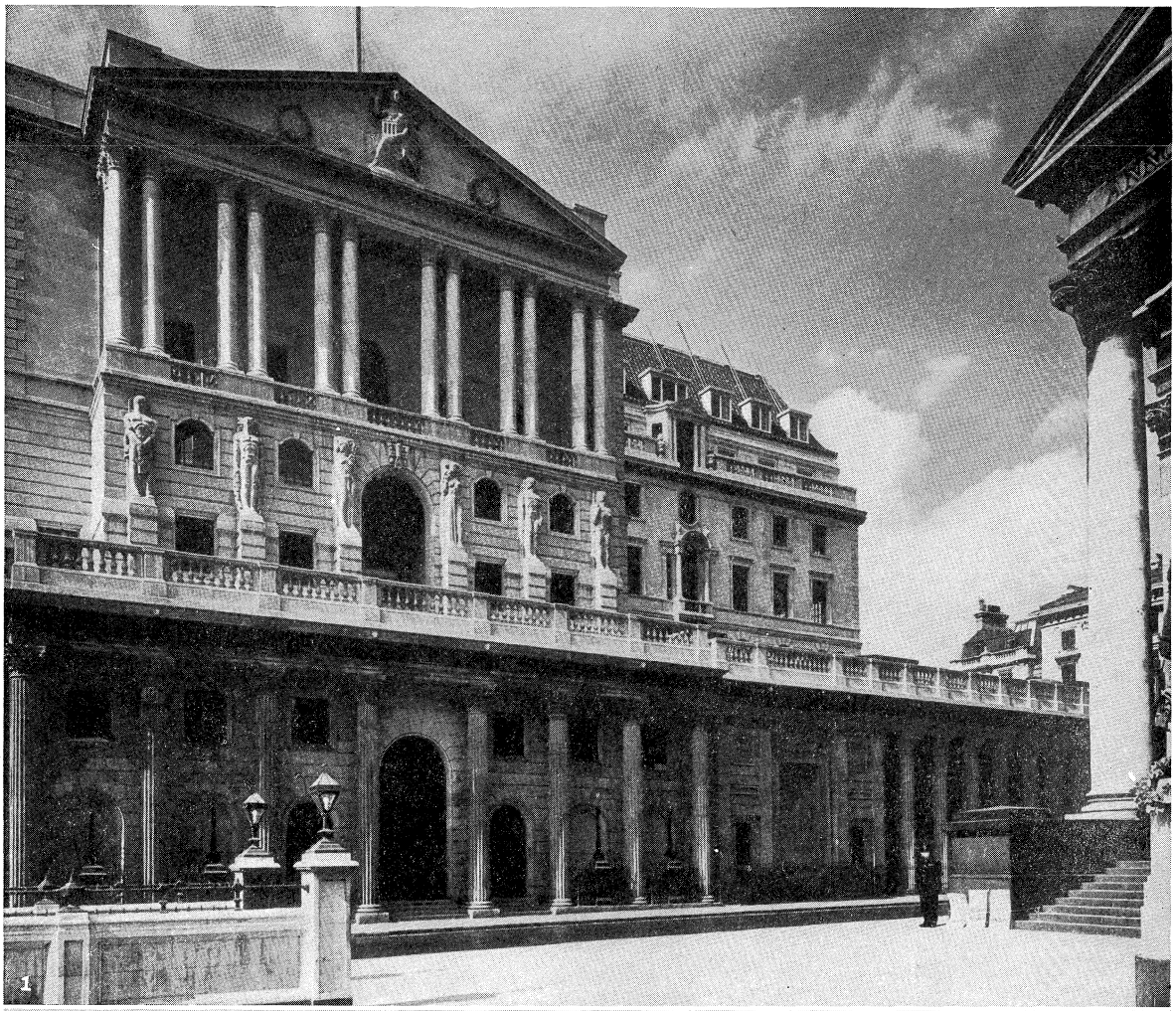
This was the main function of the bank up to 1914. The growth in its business is shown by this composite balance-sheet representing the years 1844 and 1903. To save space, all figures represent millions. Post-war figures are also given in the table, but these will be considered later.

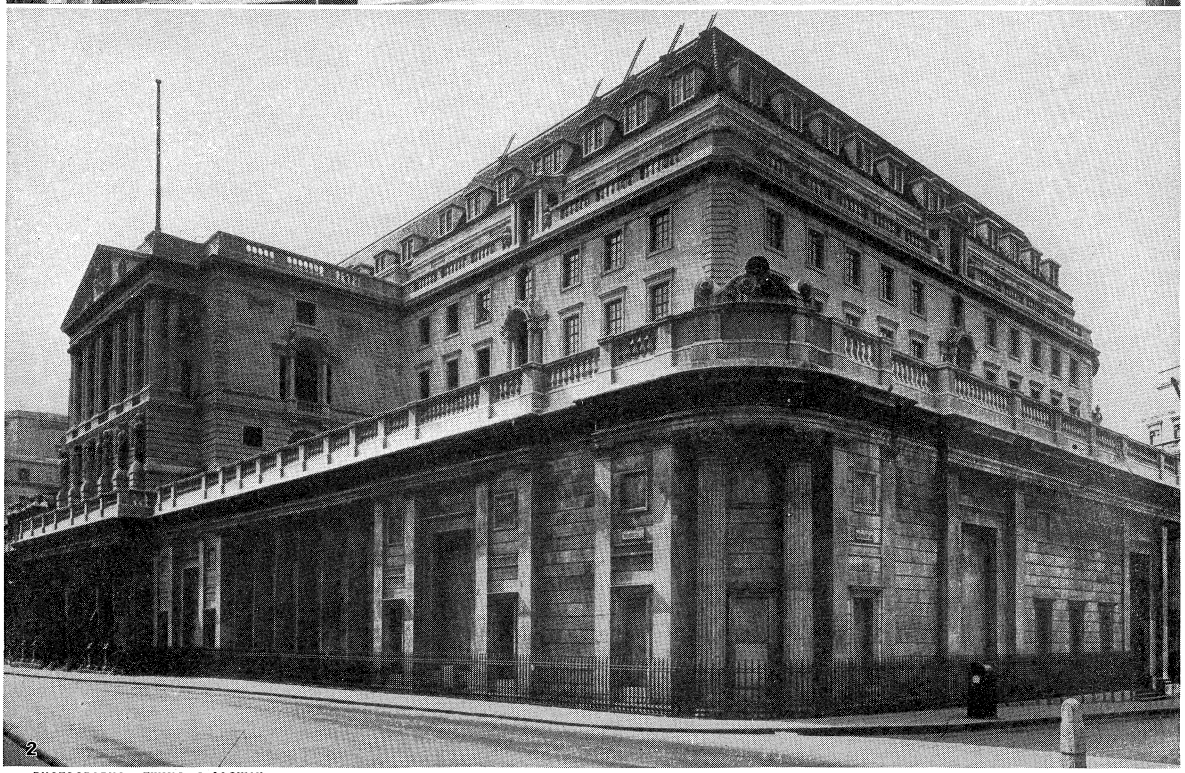
Issue dept.	16–9–1844	29–7–1914	18–2–1920	2–11–1927
Notes issued	28·3	55·1	126·1	169·5
Govt. debt	11·0	11·0	11·0	11·0
Other securities	2·9	7·4	7·4	8·7
Gold	12·7	36·7	107·7	149·7
Silver	1·7	..	..	..
Banking dept.				
Capital	14·6	14·6	14·6	14·6
Rest	3·6	3·5	3·6	3·1
Public deposits*	3·6	12·7	26·3	21·3
Other deposits*	8·6	54·4	164·8	100·7
Seven-day bills	1·0		Negligible	
Govt. securities	14·6	11·0	87·1	44·6
Other securities	7·8	47·3	88·8	60·7
Notes†	8·1	25·4	32·5	32·9
Gold and silver coin†	·9	1·5	·8	1·5

*Represents "liabilities."
†Represents "reserve."

Taking for the moment the first two columns, the note issue has expanded from 28·3 in 1844 to 55·1 millions in 1914. This is due to two causes, these being the lapse of the majority of private note issues and the great increase in the supply of gold. Reserves in the banking department have risen from 9·0 to 26·9 millions and liabilities from 12·2 to 67·1 millions. The "proportion" between the two has fallen from 74% to 40%, and this is largely a measure of the increased confidence placed in the ability of the bank to meet its obligations, and also represents the increased economy effected in the use of gold and the provision of greater credit facilities to the public. It will be seen that loans to the Government have fallen slightly with the result that the whole of these increased facilities have gone through the medium of "other securities" to the money market and so to the public.

The Bank and the War.—The outbreak of the World War caused an immediate run on the bank. In one week, the reserve dropped to 9·9 millions, a four days' Bank Holiday was proclaimed, and the Bank act once more suspended. This time the suspension was virtually made permanent. The Government issued one pound





PHOTOGRAPHS, EWING GALLOWAY

REMODELLED BUILDING OF THE BANK OF ENGLAND

1. Threadneedle street entrance, with new portico and structure above. Sir John Soane's blind defensive outer wall remains around the building

2. View of the Bank of England from the corner of Threadneedle street and Bartholomew lane

and ten shilling currency notes, which had little gold backing and were legal tender for any amount. With these available *ad libitum*, the fact that the bank's own notes were speedily restored to their normal limits was a matter of purely academic importance: for as long as notes are indefinitely available and are made legal tender, it does not matter *who* issues them. In point of fact, until currency notes could be printed and issued, the bank did have to take advantage of the suspension. This only lasted for a few days, has never been generally known, and in any case is of minor importance.

The subsequent history of the bank is wrapped up with the general financial history of the country. War expenditure forced the Government to borrow heavily, and as the 1920 return shows part of these loans were raised direct from the bank. The money so borrowed quickly found its way into the deposits of the clearing banks at the bank, so Government securities and other or private deposits swelled apace. As a consequence of this, the whole credit structure was inflated, and prices rose and business expanded accordingly.

The other war change of importance was the concentration of the country's stocks of gold in the hands of the bank. This explains the huge increases in the issue department. The increase since 1920 is due to the substitution of bank-notes for gold in the backing to the currency note issue.

The deflation of 1920–22 was an act of the bank in conjunction with and in compliance with the wishes of the Government. The Government repaid its debt, and the items in the banking department were contracted. This caused the whole credit structure to shrink.

The issue of the various war loans and subsequent conversions entailed an enormous increase to the work of the bank. At times, help was obtained from the staffs of other banks, and in general this side of the bank's work has gained enormously in size and importance.

The Gold Standard Restored.—The next development of the bank came with the restoration of a modified gold standard in 1925. Till then, bank and currency notes alike had been nominally convertible, but as the gold so obtained could neither be used commercially, nor exported, convertibility was but an empty name. The act of 1925 made both notes inconvertible. The bank was still bound to buy gold in any quantity and to sell gold in multiples of 400 ozs., but gold could not be withdrawn in smaller or broken quantities. It was decided that to allow gold to become a medium of circulation was then a luxury Great Britain could not afford.

In 1928, the anomalous covering position created by the war was at last ended by the amalgamation of the two note issues under the control of the bank. According to the act passed in that year, the bank was to have power to issue notes up to a fiduciary limit of £260,000,000, while to give some measure of elasticity to the British currency system the bank might obtain permission from the Treasury to exceed this limit, such leave being granted for six-monthly periods but not for more than two years in all.

Simultaneously, two changes were made in the bank return. "Other deposits" were divided into "bankers' deposits" and "other deposits," the former representing the balance held at the Bank of England by the British banks. "Other securities" were divided into "discounts and advances" and "other securities." The distinction here was one of initiative. If the market borrowed from the bank or discounted bills, the operation came under discounts and advances. If the bank bought bills on its own initiative, these bills rank as Government securities in the case of Government stock or Treasury bills and as other securities in the case of anything else.

During the financial crisis of 1931, the outflow of foreign funds from London was so large as to bring about a fundamental change. The bank lost gold so heavily that in order to maintain the banking departments' reserve, the fiduciary issue had to be raised from £260 to £275 millions. To replenish its gold reserves the bank itself first obtained credits in New York and Paris, and a few weeks later the Treasury in its turn obtained further credits in those centres. Even these re-inforcements proved insufficient and in September, 1931, legislation was passed suspending the gold standard. Henceforward the bank has ceased to be obliged to sell gold bars at its statutory price on demand.

By the middle of 1932 confidence was restored, and foreign funds began to return. The result was an almost embarrassing influx of gold. Furthermore the rise in the sterling price of gold, due to the abandonment of the gold standard and the depreciation of the pound, stimulated gold production and also dishoarding in India. Enough of this gold came to London to add substantially to the British gold reserves. On September 16, 1931, at the height of the crisis, the bank only held £135.6 millions of gold. By June, 1937, the bank's reserve had risen to £376.4 millions (still valued at 84s. 11½d per ounce fine), while the Exchange Equalization Accounts held £537.6 millions of gold (valued at 140s per ounce fine, this being approximately the sterling price of gold at that date).

Meanwhile the government had adopted a policy of cheap money and moderate reflation, designed to rescue trade from the 1932 depression and to facilitate internal debt conversion. Bank rate was reduced to 2 per cent in the summer of 1932, and remained there until Aug. 24, 1939, when it was raised to 4 per cent on account of the gravity of the international situation. The rate was lowered to 3 per cent on Sept. 28, 1939, after the introduction of the emergency war budget on the day before; and to 2 per cent on Oct. 26, 1939. The bank's heavy gold acquisitions up to 1937, supplemented by a deliberate increase in the banking department's government securities from £49.4 to £98.0 millions, facilitated this reflation process. The note circulation expanded from £352 to £484 millions, bankers' deposits from £58.4 to £95.0 millions. It was possible to reduce the fiduciary issue from £275 to £200 millions, without depleting unduly bankers' reserve.

In early 1938 the influx of foreign funds ceased, and was succeeded by a heavy and prolonged outflow of funds and gold. These gold losses were borne initially by the Exchange Equalization Account, but by the end of 1938 the Account's gold reserves needed re-inforcement. In January, 1939, therefore, the bank sold £200 millions of gold to the Exchange Equalization Account. To compensate for this heavy loss of gold by the bank, the fiduciary issue was raised to £400 millions.

During all this time the bank, by statute, had continued to value its gold at 84s.11½d per fine ounce. This practice was anomalous, for gold had risen to over 140s. per fine ounce. It was also inconvenient, for every time the bank bought or sold gold, it incurred a loss or made a profit; and by the Finance Act, 1932, these profits and losses were transferred to the Exchange Equalization Account. It was also anomalous for the fiduciary issue to be £400 millions, when the 1928 Act envisaged a normal fiduciary issue of £260 millions.

To put an end to these anomalies, a new Act was passed in February, 1939.

This Act laid down that the bank's gold should be written up to a price to be agreed by the bank and the Treasury. This was not to be a fixed price, but should be calculated afresh each Wednesday in readiness for the week's bank returns. In practice, the agreed price corresponds very closely with the London market price of the day.

The immediate consequence was to revalue upwards the bank's gold from £126 to £226 millions, and so the Act further provided that the fiduciary issue should be fixed at £300 millions instead of the level of £400 millions then prevailing. This put an end to the other anomaly, but the power in the 1928 Act to vary the fiduciary issue still holds good. The reduction in the fiduciary issue off-set the re-valuation of the bank's gold, and so the general position of the bank remained unchanged. On the outbreak of war, however, practically all the bank's gold was transferred to the Exchange Equalization Account, and the fiduciary issue was raised to £580 millions.

The duties and functions of the bank have been considerably enlarged during recent years. As the Government's agent and technical adviser, it has played a leading part in the evolution of British monetary policy since 1931. It did important technical

TABLE I.—*Post War Bank Returns*
(£ millions)

	Apr. 14 1920 post-war boom	Apr. 20 1925 return to gold	Dec. 5 1928 union of note issues	Sept. 16 1931 gold standard suspended	June 23 1937 peak of gold influx	Mar. 1 1939 bank's gold re-valued
Issue Dept.						
Note circulation	106	148	371	352	484	478
Notes in reserve	34	26	47	59	42	48
Total note issue	130	174	418	411	526	526
Fiduciary issue	18	20	260	275	200	300
Gold	112	154	158	136	326	226
Banking Dept.						
Public Deposits	19	17	9	17	15	12
Bkrs. Deposits	123	105	78	58	95	110
Other Deposits			37	50	37	36
Govt. securities	55	37	64	49	98	99
Disc. & advs.	80	76	11	8	4	6
Other securities			20	26	20	22
Reserves	25	27	47	60	44	49

work in the War Loan conversion and subsequent issue of funding loans and defence loans. It also exercises on behalf of the Government an unofficial but effective control over financial affairs. Thus it controls municipal borrowing, so as to prevent too heavy demands on the capital market. It also issues instructions regarding such matters as loans and investments overseas, control over dealings in gold and forward exchange and other measures designed to protect the stability of the pound. It operates clearing and payments agreements with countries such as Italy and Turkey.

Last but not least, it operates the Exchange Equalization Account, buying and selling gold and foreign exchange each day in accordance with the Government's policy.

Through its subsidiary, the Banker's Industrial Development Company (in which most British banks also have a shareholding), the bank has for many years played a part in industrial rationalization and the elimination of redundant plant. The Lancashire Cotton Corporation and National Shipbuilders Security, Ltd., owe their origins to the Banker's Industrial Development Company. The first brought a partial measure of consolidation to the cotton trade, while the second provided for the closure of surplus shipyards.

The Bank has also taken a share in the re-organization of certain large individual companies.

Altogether, in both its structure and its functions the Bank occupies a position vastly different from that existing before the war or even as recently as 1929. Its new functions are both national and, through its association with the Bank for International Settlements, international. And it has not yet reached its final evolution.

Internal Affairs.—The government of the bank is in the hands of a governor, deputy-governor, and 24 directors. By custom, none of these are connected with the London clearing banks, but were originally drawn from the partners and directors in the big London accepting houses and merchant banking firms.

Fundamental changes, however, have been made in recent years. First, Mr. Montagu Norman, who became Governor in 1920, held that office until 1944. Next, both Mr. B. G. Catterns, who in 1939 was Deputy-Governor, and his predecessor, Sir Ernest Harvey, came from the staff of the bank. Many of the present directors, too, are today prominent industrialists, with no previous connections with merchant banking or the City. Finally, the directorate includes three "whole-time" directors, who take a leading executive part in the conduct of the bank's affairs.

(N. E. C.)

BANKRUPTCY is the status of a debtor who has been declared by judicial process to be unable to pay his debts. Bankruptcy and insolvency, although sometimes used indiscriminately, have in legal usage distinct significations. When a person's financial liabilities are greater than his means of meeting them he is said to be "insolvent." A debtor may be insolvent without becoming bankrupt, but he cannot be a bankrupt without being insolvent; for bankruptcy is a legal declaration of his insolvency and operates as a statutory system for the administration of his property, which is thereby taken out of his personal control.

The primary objects of bankruptcy legislation are to obtain justice while not pressing unduly on debtors, to discriminate between involuntary inability to meet obligations and wilful refusal or neglect, and to secure to creditors as between themselves an equitable share of such of the debtor's assets as may be available for the payment of his liabilities. Another object has marked recent legislation, namely, the fostering of a higher tone of commercial morality and the protection of the trading community at large from the evils arising through the reckless abuse of credit and the unnatural trade competition thereby engendered. Creditors have conflicting interests as between themselves, and are therefore incapable of acting together as a homogeneous body. Hence the necessity for calling in the aid of professional assignees or trustees, solicitors and other agents, who make it their special business to deal with such matters, exercising both administrative and quasi-judicial functions, in return for the remuneration which they receive out of the property for their services.

BANKRUPTCY IN ENGLAND

The earliest English statute on the subject, 34 and 35 Henry VIII. *c.* 4 (A.D. 1542), was directed against fraudulent debtors, and gave power to the lord chancellor and other high officers to seize their estates and divide them among the creditors, but afforded no relief to the debtor from his liabilities. Subsequent legislation modified this attitude and introduced the principle of granting relief to the bankrupt with or without the consent of the creditors, where he conformed to the provisions of the bankruptcy law.

The courts exercising jurisdiction originally consisted of commissioners appointed by the lord chancellor. But as a result of legislation in 1831 and 1869 the bankruptcy laws are now administered by two judges of the chancery division specially appointed for the purpose by the lord chancellor, with bankruptcy registrars who deal with the ordinary judicial routine of bankruptcy procedure in the London district, while similar duties are performed by the county-court judges throughout the country.

The Act of 1883.—A feature of the Act of 1883 was the separation it effected between the judicial and the administrative functions, which had previously been exercised by the court, and the transfer of the latter to the Board of Trade as a public department of the State directly responsible to parliament. Under the powers conferred by the act a new department was subsequently created under the title of the Bankruptcy Department of the Board of Trade, with an officer at its head called the inspector-general in bankruptcy. This department exercises, under the direction of the Board of Trade, a general supervision over all the administrative work arising under the act. It has extensive powers of control over the appointment of trustees, and conducts an audit of their accounts; and it may, subject to appeal to the court, remove them from office for misconduct, neglect or unfitness. A report upon the proceedings is annually presented to parliament by the Board of Trade, and although the department is practically self-supporting, a nominal vote is each year placed upon the public estimates, thus bringing the administration under direct parliamentary criticism and control. The act also provided for the appointment and removal by the Board of Trade of a body of officers entitled official receivers, with certain prescribed duties having relation both to the conduct of bankrupts and to administration of their estates, including the interim management of the latter until the creditors can be consulted. These officers act in their respective districts under the general authority and directions of the Board of Trade, being also clothed with the status of officers of the courts to which they are attached. The main objects of the measure were to secure—(1) An independent and public investigation of the debtor's conduct; (2) the punishment of commercial misconduct and fraud in the interests of public morality; (3) the summary and inexpen-

sive administration of small estates where the assets do not exceed £300 by the official receiver, unless a majority in number and three-fourths in value of the creditors voting resolve to appoint a trustee; (4) full control in other cases by a majority in value over the appointment of a trustee and a committee of inspection; (5) strict investigation of proofs of debt, with regulations as to proxies and votes of creditors; (6) an independent audit and general supervision of the proceedings and control of the funds in all cases. Besides amending and consolidating previous bankruptcy legislation, the measure also contained special provisions for the administration under bankruptcy law of the estates of persons dying insolvent; and for enabling county courts to make administration orders for payment by instalments in lieu of immediate committal to prison, in the case of small judgment debtors.

An amending act, under the title of the Bankruptcy Act, 1890, was passed in that year, more particularly with regard to the conditions under which a bankrupt should be discharged or schemes of arrangement or composition be approved by the court. These two acts were supplemented by a large body of general rules made by the lord chancellor with the concurrence of the president of the Board of Trade, which may be added to, revoked or altered from time to time by the same authority. These rules are laid before parliament and have the force of law.

Besides these general acts, various measures dealing with special interests connected with bankruptcy procedure have from time to time been passed since 1883, the chief of which are as follows, viz., the Bankruptcy Appeals (County Courts) Act, 1884; the Preferential Payments in Bankruptcy Act, 1888, regulating the priority of the claims of workmen and clerks, etc., for wages and salaries; and the Bankruptcy (Discharge and Closure) Act, 1887, dealing with unclosed bankruptcies under previous acts. In 1906 the Board of Trade appointed a committee to enquire into and report upon the effect of the provisions of the laws in force at the time in relation to bankruptcy, etc.

The Acts of 1913 and 1914.—The recommendations of the committee were embodied in an act of parliament passed in 1913. This measure was repealed and re-enacted in 1914 as part of the Bankruptcy Act, 1914, which consolidates substantially all the previous statutes. Among the changes effected by the Act of 1913 the following are conspicuous. Offences by bankrupts were made punishable summarily, and power was given to official receivers to institute and conduct prosecutions. In many cases of offences by bankrupts it was declared that the onus of proving absence of intent to defraud should lie on the debtor. Failure to keep proper accounts by a person who has previously been made bankrupt was made an offence, provided the unsecured liabilities exceed £100 and the bankrupt is unable to show that in the circumstances in which he traded or carried on business the omission was honest and excusable. The act also rendered criminally liable a bankrupt who, having been engaged in trade or business and having contracted debts therein, has contributed to his insolvency by gambling or rash or hazardous speculation. For a bankrupt to obtain credit in the sum of £10 or upwards without disclosing the fact that he is undischarged was declared criminal (the limit having formerly been £20), while it was also declared criminal for him to trade in any name other than that in which he was made bankrupt without disclosing the fact. This act also amended the law as to married women in relation to bankruptcy, and as to the avoidance of settlements. It also dealt with assignments of book debts, providing that, where a person engaged in any trade or business makes an assignment of his existing or future book debts and is subsequently adjudicated bankrupt, the assignment is void against the trustee as regards any book debts which have not been paid at the commencement of the bankruptcy, unless the assignment has been registered as if it were a bill of sale. This, however, does not affect assignments of book debts due at the date of the assignment from specified debtors, or debts growing due under specified contracts, or debts included in the assignment of a business made *bona fide* for value.

The cost of bankruptcy administration is provided for: (1) by fees charged to bankrupt estates, (2) by interest on balances at the credit of such estates with the bankruptcy estates account, and (3) by interest on unclaimed funds at the credit of estates under former Bankruptcy Acts. The system is practically self-supporting and involves hardly any charge upon the taxpayers of the country.

Who May Be Made Bankrupt.—Generally speaking any person, being a debtor, may in certain circumstances be made bankrupt in England and Wales. The term "debtor" as used in the Act of 1914 (unless the context otherwise implies) includes any person, whether a British subject or not, who at the time when any act of bankruptcy was done or suffered by him (*a*) was personally present in England; or (*b*) ordinarily resided or had a place of residence in England; or (*c*) was carrying on business in England, personally, or by means of an agent or manager; or (*d*) was a member of a firm or partnership which carried on business in England. It will be seen from this that a foreigner may in certain circumstances be subject to the English bankruptcy laws. Subject to what will be said presently about married women, every adult may be made bankrupt, whether engaged in trade or not; but an infant cannot usually be made bankrupt although he is engaged in trade and obtains credit in the course of his business. If he can be made bankrupt at all, it can only be in respect of a judgment debt for "necessaries"—a phrase which has a special meaning amongst lawyers. With regard to a married woman, although she could not formerly have been made bankrupt at all, now, if she carries on a trade or business, whether separately from her husband or not, she is subject to the bankruptcy laws as if she was a *feme-sole*. Whether a lunatic can or cannot be made bankrupt has never been decided; but it is plain that he cannot commit an act of bankruptcy (the necessary preliminary to an adjudication) which involves intent. A convicted felon may be made bankrupt. Peers and members of the House of Commons although having "privilege of parliament" may be made bankrupt. Although a corporation or limited company is for some purposes a "person," a receiving order (the order which leads to adjudication) cannot be made against any such body.

Petition and Receiving Order.—Any court exercising bankruptcy jurisdiction in the district in which he resides or carries on business in England or Wales may make a receiving order against a debtor, whether a trader or not, either on his own petition or on that of a creditor or creditors whose claims aggregate not less than £50. In the case of a creditor's petition proof must be given of the debt, and of the commission of an act of bankruptcy within three months preceding the date of the petition. An act of bankruptcy is committed if the debtor fails to satisfy the creditor's claim upon a bankruptcy notice; if he makes an assignment for the benefit of his creditors generally; if he absconds or keeps house; if he gives notice of suspension of payments; if his goods are sold or seized under execution; if he files in court a declaration of inability to pay his debts; if he grants a fraudulent preference or conveyance, or if, upon an application being made to commit him under the Debtors Act, a receiving order is made in lieu of an order to commit. In such a case the judgment debtor is deemed to have committed an act of bankruptcy. These acts are here enumerated in the order in which they most frequently occur in practice, but failure to comply with a bankruptcy notice is by far the most common act of bankruptcy. By a "bankruptcy notice" is meant a notice by a judgment creditor or creditor who has obtained an order for payment by his debtor calling upon his debtor to pay, secure or compound for the debt to the satisfaction of the creditor or the court. Failure to comply with the notice within seven days (if the debtor is in England) constitutes an act of bankruptcy upon which a petition is founded. Bankruptcy notices are constantly used by the judgment creditor as a means of enforcing his judgment, as most debtors, whose credit is at stake, will make every effort to pay rather than face the consequences of a petition in the bankruptcy court.

An assignment for the benefit of creditors generally is a fairly common act of bankruptcy and it is none the less so because it is registered as a deed of arrangement. Such a deed, however, cannot be relied on as an act of bankruptcy by all creditors party or assenting to it, or by any creditor who does not do so within a month after receiving notice of its execution from the trustee.

Bankruptcy proceedings are initiated by a petition, which may

be presented by a creditor or by the debtor himself. Any body or person who can take proceedings to recover a debt at law or in equity may present a bankruptcy petition. A man may take an assignment of a debt for the express purpose of founding a petition upon it. But a creditor may not present a petition unless the debt is a liquidated sum amounting to £50 or more payable immediately or at some future time. The act of bankruptcy on which the petition is founded must have occurred within three months of the date of the petition and the debtor must be domiciled in England or must have ordinarily resided or had a dwelling place or place of business in England; or (except in the case of a person domiciled in Scotland or Ireland, or a firm or partnership having its principal place of business in Scotland or Ireland) he must have carried on business in England by means of an agent or manager, or (except as aforesaid) must have been within the said period a member of a firm or partnership of persons which has carried on business in England by means of a partner or an agent or manager. The petition, if successful, results in a receiving order being made against the debtor, but this is not made until eight days after the service of the petition.

At any time after the presentation of a bankruptcy petition any action, execution or other legal process against the property or person of the debtor may be stayed. The general rule, however, is that proceedings will not be restrained to which the discharge of the debtor from his bankruptcy would be no defence. For example, a claim in tort against a debtor for fraudulent breach of trust would not be restrained, nor a committal order for non-payment of rates.

A "receiving order" does not divest a debtor of his property; it merely protects it. If a receiving order is made on a debtor's own petition, adjudication follows as a matter of course, unless a composition or a scheme of arrangement is accepted by the creditors. As soon as the order is made an official receiver is constituted receiver of the property of the debtor, and thereafter no creditor can pursue any remedy against the debtor save by leave of the court, and then on such terms as the court may impose. And it is obvious that this must be so, otherwise one creditor might secure an advantage over the others. Should it appear that the majority of the creditors are in Scotland or Ireland, and that from the habitation of the property it would be more convenient to administer the bankrupt's property there, a receiving order may be rescinded. It may also be rescinded if the court is satisfied that the debtor has paid all his debts since it was made. Where there is an estate or business to be managed the official receiver may appoint a special manager, who receives such remuneration as the creditors or, failing them, the Board of Trade may determine.

Statement of Affairs.—As a consequence of the receiving order the debtor must make out and submit to the official receiver within a prescribed period a statement of his affairs. The statement must be verified by affidavit, and must show the particulars of the debtor's assets, debts and liabilities, the names, residences and occupations of his creditors, the securities held by them respectively, the dates when the securities were respectively given, and such further or other information as may be prescribed or as the official receiver may require. The official receiver supplies the bankrupt with a form of statement and may employ someone to assist the debtor to prepare it. It must be made out within seven days of the receiving order made on a creditor's petition and within three days of the receiving order made on debtor's petition. Failure to furnish it may involve adjudication; and the omission of material facts may render the bankrupt criminally liable. The statement of affairs is open to the inspection of creditors and may be used against the bankrupt in any proceeding connected with his bankruptcy. The debtor must also in every case submit to a public examination in court, in which the official receiver, the trustee and any creditor who has proved his debt may take part. His evidence may be used against him. He may further be specially examined by the court at any time with reference to his dealings or property, and creditors may attend and take part in the examination. He must attend the first meeting of creditors, wait upon the official receiver, trustee, and special manager, and give all necessary information and generally do all acts which may reasonably be required of him with the view of securing a full investigation of his affairs. He may be arrested if there is reasonable ground for believing that he is about to abscond, destroy papers or remove goods, or if he fails without good cause to attend any examination ordered by the courts. The court may also for a period of three months order his letters to be re-addressed by the postoffice to the official receiver or trustee.

First Meeting of Creditors.—This meeting is summoned by the official receiver, notice being given in the *London Gazette* and in a local paper and sent by post to each creditor. A summary of the statement of affairs should accompany the notice, with any observations by the official receiver which he may think fit to make. The object of the meeting is to decide whether any proposal for payment of a composition or for a scheme of arrangement submitted by the debtor is to be entertained, or whether an application should be made to the court to adjudicate the debtor bankrupt. In the latter case the meeting may by an ordinary resolution appoint a trustee with or without a committee of inspection. It may also give any directions as to the administration of the estate. The meeting should be held at the place most convenient for the majority of the creditors. It is presided over by the official receiver or his deputy, who, subject to appeal to the court, admits or rejects proofs for the purpose of voting. For the transaction of business three creditors qualified to vote, or all the creditors if fewer than three, must be present or represented. Only persons who have proved their debts are entitled to vote, and detailed regulations respecting proofs and the valuation of securities are laid down in the Act of 1914. One of the chief alterations in the law on this point is the condition imposed on creditors on bills of exchange to deduct from their claims the value of the liability of prior obligants before voting, thus cancelling the power of controlling the proceedings previously possessed by persons who had no real interest in the estate. Votes may be given in person or by proxy, and stringent regulations are laid down with the view of preventing the abuse of proxies. General proxies entitling the holder to exercise all the powers which the creditor could exercise if present may be given to the official receiver or to any person in the regular employment of the creditor. Special proxies may be given to any person to vote for specified resolutions, or for the appointment of specified persons as trustee and committee. Only official forms can be used, and the blanks must be filled up in the handwriting of the creditor or some person in his regular employment, including the authorized agent of a creditor resident abroad. A proxy must be lodged with the official receiver not later than four o'clock on the day before the meeting or adjourned meeting at which it is to be used. If solicitation has been used by or on behalf of the trustee in obtaining proxies, or in procuring the trusteeship, the trustee may be deprived of his remuneration. Resolutions are ordinary, special or extraordinary. An ordinary resolution is carried by a majority in value of the creditors voting; a special resolution by a majority in number and three-fourths in value of such creditors. The only instance of a resolution other than these is that required for the approval of a composition or scheme, which requires a majority in number and three-fourths in value of all the creditors who have proved. The majority of questions arising at a meeting are decided by an ordinary resolution.

The creditors entitled to vote may, at their first or any subsequent meeting, appoint from among the creditors generally, or the holders of general proxies, or general powers of attorney from such creditors, a committee of inspection to superintend the trustee in his administration of the bankrupt's property. A person may also be appointed subject to his subsequently becoming the holder of a general proxy or general power of attorney, but he must not act until he has obtained this power. The committee must not consist of more than five or less than three persons. It generally includes the more important creditors. A creditor who is appointed a member may not act until he has proved his debt and his proof has been admitted, and he must not, except by leave of the court, become a purchaser of any part of the estate, nor may he, except with the like permission, receive any payment out of the estate

for services rendered by him in connection with the administration of the estate. One of the functions of the committee is to audit the trustee's accounts, and certain functions of the trustee can only be exercised by him with the sanction of the committee.

If the creditors so resolve, or if a composition or scheme of arrangement is not proposed by the debtor or entertained by the creditors, or if entertained is not approved by the court, or if without reasonable excuse the debtor fails to furnish a proper statement of his affairs, or if his public examination is adjourned *sine die,* the court adjudicates the debtor bankrupt and thereupon his property vests in a trustee, and, subject to the payment of the costs and fees of administration, is divisible among his creditors until all his debts are paid in full with interest at the rate of 4% per annum. An order may also be made on the application of the official receiver where the debtor has absconded, or where the court is satisfied that the debtor does not propose a composition or scheme. Notice of every order of adjudication stating the name, etc., of the bankrupt is published in the *London Gazette* and advertised in a local paper.

Duty of a Bankrupt.—A debtor adjudged bankrupt must aid in the realization of his property to the utmost of his power, and in the distribution of the proceeds among his creditors. He must also, at the request of the official receiver, furnish trading and profit and loss accounts and a cash and goods account for a period not exceeding two years before the date of the receiving order. He must also, if required, attend and be cross-examined as to the whereabouts of his property, and may be arrested on a warrant if he refuses to attend.

The Bankruptcy Act of 1914 altered the law as to offences by debtors, making it rather more stringent than it was before. Thus the onus of proving that he is not guilty of any intent to defraud is now, generally speaking, placed upon him. If he fails to make full discovery of or to deliver up his property or books; if he conceals his property or debts; prevents production of books, etc.; or conceals, mutilates or falsifies his books, he may be guilty of a misdemeanour unless he proves that he had no intent to defraud. He is also liable to be found guilty of an offence if he removes property worth more than £10 after or within six months before the date of the petition; or if he fails to disclose the fact that a false debt has been proved by anyone in the bankruptcy. Other offences are the fraudulent parting with or alteration of books; declaration of fictitious losses; obtaining credit by false representations within six months before or after the date of a petition. Again, a bankrupt is guilty of an offence if, having been engaged in any trade or business and having outstanding at the date of the receiving order any debts contracted in the course and for the purpose of such trade or business, he has within two years before the date of the petition materially contributed to or increased the extent of his insolvency by gambling or speculation. A prosecution for this offence, however, cannot be set on foot save by order of the court. Failure by a man who has once been bankrupt or who has compounded with his creditors to keep books of account within two years before a second bankruptcy may also be an offence. With regard to obtaining credit, it is obvious that the public must be protected against the undischarged bankrupt. Accordingly, it is provided that where an undischarged bankrupt (*a*) either alone or jointly with any other person obtains credit to the extent of £10 or upwards from any person without informing such person that he is an undischarged bankrupt, or (*b*) engages in any trade or business under a name other than that under which he was adjudicated bankrupt without disclosing to all persons with whom he enters into any business transaction the name under which he was adjudicated bankrupt, he shall be guilty of a misdemeanour.

An undischarged bankrupt cannot sit or vote in the House of Lords. He cannot be elected to sit in or vote in the House of Commons, or be elected or act as a justice of the peace, or mayor, alderman or councillor. Nor can he be a guardian or an overseer of the poor or member of a county council. He cannot be a member or chairman of a parish council, rural district council, or board of guardians if he has within five years before his election or since his election been adjudged bankrupt or compounded with his creditors. These disqualifications disappear on the annulment of the bankruptcy, or if the court grant a certificate to the effect that the bankruptcy was caused by misfortune without any misconduct on the part of the debtor.

Discharge.—The court may at any time after the conclusion of the bankrupt's public examination, and after hearing the official receiver, the trustee and any creditor, to all of whom previous notice of the application must be given, grant the bankrupt a discharge either absolutely or under conditions, but subject to the following qualifications, viz.:—(1) If the bankrupt has committed (*i.e.,* has been tried and convicted of) a criminal offence connected with the bankruptcy, the application must be refused unless for special reasons the court determines otherwise. (2) If the assets are not equal in value to ten shillings in the pound of the unsecured liabilities (unless the bankrupt can show that he is not responsible); or if proper books have not been kept; or if the bankrupt has traded after knowledge of insolvency; or has contracted debts without reasonable probability of payment; or failed to account for his deficiency; or contributed to the bankruptcy by rash speculation, gambling, culpable neglect, or by unjustifiable expenses; or has taken or defended legal proceedings on frivolous grounds; or has within three months preceding the receiving order given an undue preference; or has increased his liabilities with the view of making his assets equal to ten shillings in the pound; or has previously been bankrupt or made an arrangement with creditors; or has been guilty of any fraud or fraudulent breach of trust; then the court shall, on proof of any of these facts, either (*a*) refuse the discharge or (*b*) suspend it for a period of not less than two years, or until a dividend of not less than ten shillings in the pound has been paid; or (*c*) qualify the order by the condition that judgment is entered up against the bankrupt for payment of any unpaid balance of his debts, or of part of such balance out of his future earnings or property. Assets are deemed to be equal to ten shillings in the pound when the court is satisfied that the property of the bankrupt has realized, or is likely to realize, or with due care in realization might have realized an amount of ten shillings in the pound on his unsecured liabilities. If of the facts referred to the only fact proved is that the assets are not of a value equal to ten shillings in the pound the discharge may be suspended for a period of less than two years. The bankrupt may, however, after two years apply to the court to modify the conditions if he is unable to comply with them. An order of discharge releases the debtor from all his obligations except debts due to the Crown and other obligations of a public character which can only be discharged with the consent of the Treasury, debts incurred by fraud and judgment debts in an action for seduction or as a co-respondent in a matrimonial suit or under an affiliation order, which are only released to such extent and subject to such conditions as the court may expressly order. Debts incurred by fraud in so far as they are the subject of actions of tort are not provable and are not therefore affected by an order of discharge. The release of the bankrupt does not operate as a release of any partner or co-obligant with him. Neither does it release the bankrupt from liability to criminal prosecution. Notwithstanding his discharge a debtor is still bound to help the trustee to distribute the assets.

Composition or Scheme of Arrangement.—After a receiving order has been made the debtor may submit a proposal for the payment of a composition or for the liquidation of his affairs, by a trustee or otherwise, without adjudication. The proposal must be lodged with the official receiver in sufficient time to allow notice, together with a report by that officer, to be sent to the creditors before the meeting is held at which it is to be considered. If the proposal is entertained at the meeting by a majority in number and three-fourths in value of all the creditors who have proved their debts, and if it is thereafter approved by the court, it becomes binding upon all creditors who would be bound by an order of discharge had the debtor been adjudicated bankrupt. A similar proposal may be made after adjudication, and if entertained by the creditors and approved by the court the adjudication may be annulled. The debtor's release will be subject to the terms of the scheme, but his future acquired property will not

pass to the creditors unless there is an express stipulation to that effect. If default is made in carrying out the scheme, or if it is found that it cannot proceed without injustice or undue delay, the court may at any time adjudicate the debtor bankrupt, in which case the scheme will fall to the ground, except in respect of past transactions under it. The approval of a composition or scheme does not release the debtor from his liabilities under the criminal law, nor from the necessity of undergoing a public examination which must, in fact, be held and concluded before the approval of the court is applied for. Also before such approval is given a report must be filed by the official receiver upon its terms and on the conduct of the debtor, and the court must be satisfied, after hearing that officer and any creditor, that the proposal is reasonable and calculated to benefit the creditors and that no criminal offences connected with the bankruptcy have been committed by the debtor. Further, if any fact is proved which would have prevented the debtor obtaining an absolute or unconditional order of discharge had he been adjudged bankrupt, the composition or scheme cannot be approved unless it provides reasonable security for the payment of not less than five shillings in the pound on all the unsecured debts. Where a trustee is appointed to carry out the composition or scheme, all the provisions of the act with reference to the remuneration of the trustee, the custody of funds, the audit of his accounts, and the control exercised by the Board of Trade apply in the same manner as they would under an adjudication. Further, the provisions relating to the administration of property, proof of debts, dividends, etc., will also apply, so far as the nature of the case and the terms of the arrangement admit.

Property Divisible Among the Creditors.—No part of the law of bankruptcy is more intricate or has been the subject of more litigation than this, and any detailed view of the effect of legal decisions can only be gathered by a perusal of the cases; but the following general principles may be stated:—The term "property" includes not only property of which the bankrupt is the true owner, but property in his possession, order or disposition in his trade or business with the consent of the true owner, in such circumstances that he is the reputed owner thereof. The application of the doctrine of reputed ownership has been considerably restricted in recent years by the growth of alleged trade customs, in accordance with which property is frequently lent under a contract of "hire and purchase" or otherwise; and by the decisions of the courts that where such custom is sufficiently proved the doctrine does not apply. Further, the trustee's title not only includes property in the actual possession of the bankrupt, but relates back to the date of the first act of bankruptcy committed by him within the three months preceding the presentation of the bankruptcy petition, and thus invalidates all payments and assignments to creditors made during that period with knowledge on the part of the creditor or assignee of the commission of the act of bankruptcy. In such cases the trustee may, therefore, require the money or property to be restored to the estate. And even where no prior act of bankruptcy is proved any payment made to a creditor with the view of giving such creditor a preference over the other creditors, within the three months preceding the presentation of the petition on which the payer is made bankrupt, is rendered void as against his trustee. Settlements of property within the two years preceding the bankruptcy, unless made before and in consideration of marriage, or made in good faith for valuable consideration, are also void, as are similar settlements within ten years, unless it is proved that the settlor was (independently of the settled property) solvent at the date of the settlement and that the interest in the property passed to the trustees on the execution of the deed.

Certain settlements made in consideration of marriage are also made void or voidable against a trustee in bankruptcy. Thus any covenant or contract by a settlor in consideration of marriage for the future payment of money for the benefit of wife or child, or for future settlement on wife or children of property in which the settlor had no interest at the date of the settlement is void against his trustee in bankruptcy, if it has not been executed at the date of the bankruptcy. This is subject to the exception that beneficiaries may claim dividends in the bankruptcy, such claims, however, being postponed until the claims of the settlor's other creditors have been satisfied. Not only is such a settlement void, but any payment made thereunder is void against the trustee unless the payee can prove either that the payment was made more that two years before the bankruptcy or that at the date of the payment the settlor could pay all his debts without the aid of the money so paid; or that the payment was made pursuant to a covenant or contract to pay money expected to come to the settlor on the death of a particular person named in the covenant and was made within three months after the money came into the possession of the settlor. If any such payment is declared void, the payee can nevertheless rank as a creditor for dividend in respect of it.

Executions by a creditor not completed at the date of the receiving order are also void, and the proceeds of an execution in the hands of the sheriff must, with certain exceptions and subject to deduction of costs, be handed over to the trustee. But all property held by the bankrupt on trust, and tools of trade, wearing apparel and bedding to a total value not exceeding £20 are excluded from the property divisible among the creditors. With respect to property acquired by the bankrupt, whether by gift or legacy, or consisting of accumulations of business or other profits after the commencement of the bankruptcy and before he obtains his discharge, the trustee's title also prevails; but *bona fide* transactions by the debtor for value, other than transactions relating to freehold property, appear to be valid. Where the bankrupt is a beneficed clergyman the trustee may, subject to certain provisions for the due discharge of the duties of the office, apply for the sequestration of the profits of the benefice, and where he is in receipt of a salary, income or pension, etc., the court may order any part thereof to be paid to the trustee; but where he is an officer of the army, navy or civil service such order is only to be made with the consent of the chief of the department concerned. When a banker has ascertained that a person having an account with him is an undischarged bankrupt it is his duty to inform the trustee or the Board of Trade of the existence of the account, and thereafter the account cannot be operated on except under the order of the court.

When a bankrupt who owns the copyright of a work is liable to pay royalties or a share of profits therein to the author, the trustee may not sell copies of or perform the work, except upon terms of paying the royalties due to the author. Nor can he assign or licence the copyright without the consent of the author or the court except upon terms which will secure to the author payments not less than those which the bankrupt was liable to pay.

Claims of Creditors.—In the distribution of the debtor's property certain claims are entitled to priority over others. Thus the landlord, although not entitled to a preference out of the funds in the hands of the trustee, can distrain for unpaid rent on the goods and effects of the debtor remaining on the landlord's premises; but where the distraint is levied after the commencement of the bankruptcy this right is limited by the Act of 1890 to six months' rent due before adjudication, the remainder of his claim ranking for dividend with the claims of other creditors. Various gas and water companies have also statutory powers of distraint under special acts, but the policy of recent legislation has been to discourage any extension of such privileges. Where the bankrupt holds an office of trust in any savings bank or friendly society, any balance in his hands due to such bank or society has been held under the acts relating to these bodies to be payable in preference to any other claim against the estate. Workmen's compensation, too, up to £100 in each case, is entitled to priority; but where an employer who is injured becomes bankrupt, his rights against the insurance company pass to his workmen. Contributions payable by a bankrupt under the National Insurance Act 1911 are also entitled to preference. Other preferential claims are regulated by the Bankruptcy Acts and include taxes, parochial and other local rates for not more than one year, wages and salaries for four months, but not exceeding £50 (limited in the case of ordinary labourers and workmen to two months' wages not exceeding £25), and agricultural labourers' claims not

exceeding one year's wages, if hired by special contract for payment of a lump sum at the end of a year. These claims are entitled to preference not only over funds in the hands of the trustee, but also over the proceeds of any distraint levied by the landlord within the three months prior to the receiving order, the latter in that case becoming a preferred creditor for the amount so paid. Articled clerks and apprentices may also be allowed repayment of a proportion of the premium on their unexpired agreements. On the other hand, usual trade discounts (exceeding 5%) must be deducted from traders' proofs, and the following claims are postponed until the general creditors are paid in full, viz., claims by a married woman for loans to the husband for the purposes of his business, claims for loans advanced to any person in business at a rate of interest varying with the profits, and claims for interest in excess of 5% per annum. Where a married woman has been adjudged bankrupt her husband cannot claim any dividend in respect of money lent to her for her trade or business until all claims of her other creditors have been satisfied. Subject to these exceptions all debts proved in the bankruptcy must be paid *pari passu*. Any surplus after payment of 20s. in the pound and interest at the rate of 4% per annum, from the date of the receiving order, is payable to the bankrupt.

All claims and liabilities present or future, certain or contingent, arising out of obligations incurred before the date of the receiving order are provable in the bankruptcy, an estimate of the liability in the case of contingent debts being made by the trustee subject to appeal to the court. But demands in the nature of unliquidated damages arising otherwise than by reason of a contract, promise, or breach of trust are not provable, nor are gaming debts or debts barred by the statutes of limitation. A secured creditor if he proves must either surrender his security or value the security and prove for the balance, and the trustee can thereupon, subject to the creditor's power in certain circumstances to amend the valuation, take over the security by paying the amount of the valuation or may require it to be realized. He may be required by the creditor to elect which of these courses he will adopt, failing which the equity of redemption will vest in the creditor.

After payment of costs of administration and preferential debts it is the duty of the trustee to distribute the estate with all convenient speed—the first dividend within four months after the first meeting of creditors and subsequent dividends at intervals of not more than six months; but the declaration may be postponed for sufficient reason by the committee of inspection.

Trustee's Administration.—While the interim preservation and management of the estate is conducted by or under the direct supervision of officers appointed by and responsible to the Board of Trade, the ultimate realization and distribution of the assets devolve upon the trustee appointed by the creditors. But besides acting as receiver prior to the first meeting of creditors, the official receiver also becomes trustee by operation of law on the making of an order of adjudication. He vacates the office when a trustee is appointed by the creditors, and certified by the Board of Trade, but again becomes trustee on the creditors' trustee being released, dying, resigning or being removed from office. As the bankrupt's property vests in the trustee for the time being, and passes from trustee to trustee by operation of law, and without any formal act of conveyance, the continuity of the office is thus secured.

A trustee may be appointed by a majority in value of the creditors voting at the first or any subsequent meeting, or the appointment may be left to the committee of inspection. In either case the appointment is subject to confirmation by the Board of Trade. Before such an appointment may be confirmed, the trustee-elect must also furnish security to the satisfaction of the Board of Trade, and such security must be kept up to the amount originally fixed, or to such lesser amount as that department may require throughout the tenure of the trusteeship, failing which the trustee is liable to be removed from office. Where the creditors fail to appoint a trustee the Board of Trade may do so, but such appointment may at any time be superseded by the creditors.

The trustee is required to take immediate possession of the bankrupt's property, including deeds, books and accounts, and has the powers of a receiver in the high court for the purpose of enforcing delivery. After payment of the costs of administration it is his duty to distribute the estate in dividends as speedily as possible.

Where any part of the property is held subject to onerous obligations, such as the payment of rent, etc., the trustee may disclaim the same, subject in certain cases to the leave of the court, and the disclaimer operates to determine all interest in or liability in respect of the property on the part of the estate. The trustee is required to keep a record book (which is commenced by the official receiver), containing minutes of the proceedings in the bankruptcy, and a cash book in the prescribed form, in which all receipts and payments by him must be entered. All monies received must forthwith be paid into an account at the Bank of England, entitled the "Bankruptcy Estates Account," which is under the control of the Board of Trade, unless where in special circumstances the sanction of that department is obtained to the opening of a local banking account, but in no circumstances must estate monies be paid to the trustee's private account. When monies are required for the purpose of the estate, special cheques or money orders are issued by the Board of Trade on the application of the trustee.

In his administration of the estate the trustee is subject to control by the committee of inspection, the creditors, the court, and the Board of Trade. The committee is appointed by the creditors and must consist of not more than five or less than three creditors. The Board of Trade is required to take general cognizance of the conduct of trustees, to enquire into any complaints by creditors, and, in the event of any trustee not faithfully performing his duties, to take such action, including the power of removal, as may be expedient.

The trustee's accounts must be audited by the committee of inspection not less than once in every three months; and once in every six months, as well as at the close of the administration, the record and cash books must also be submitted, with the vouchers and the committee's certificate of audit, to the Board of Trade for final audit. If it appears that the trustee has retained more than £50 in hand for more than ten days without a satisfactory explanation he may be removed from office, surcharged with interest at the rate of 20% per annum, and lose all claim to remuneration.

The trustee's remuneration is fixed by the creditors or by the committee, if so authorized by them. It must be in the nature of a percentage on the amount of the realization and on the dividends. If one-fourth of the creditors in number or value dissent from the resolution, or if the bankrupt satisfies the Board of Trade that the remuneration is excessive, the Board may review the same and fix the remuneration. A trustee may not receive any remuneration for services rendered in any other capacity, *e.g.*, as solicitor, auctioneer, etc., beyond that voted to him as trustee; nor may he share his remuneration with the bankrupt, the solicitor, or other person employed about the bankruptcy, or receive from any person any gift or other pecuniary or personal benefit in connection therewith.

A trustee receiving remuneration is not allowed the costs of any other person in respect of duties which ought to be performed by himself. All bills of solicitors and other agents employed must be taxed before payment, as being in accordance with the prescribed scales of costs; and the taxing master must satisfy himself that the employment has been properly authorized before the work was done. All bills of costs must be delivered to the trustee within seven days of the request for the same, otherwise the estate may be distributed without regard to such costs.

When the property, so far as it is capable of realization, has been realized and distributed, the trustee must apply to the Board of Trade for his release, forwarding to each creditor a notice of his having done so, together with a copy of his final accounts.

Small Bankruptcies.—When the official receiver reports or the court is otherwise satisfied that the debtor's property is not likely to realize more than £300 the court may make an order for the summary administration of the estate; in which case, if the debtor is adjudged bankrupt, the official receiver in the ordinary course becomes and remains trustee and certain other modifications are effected with the view of simplifying and accelerating the

procedure. The chief of these modifications are as follows, viz., the Board of Trade acts as committee of inspection; there is no advertisement of the proceedings in a local paper; in legal proceedings all questions of law and fact are determined by the court without a jury; adjudication may be made on a report by the official receiver before the first meeting of creditors where no composition or scheme is proposed; meetings of creditors may be held in the town where the court sits or the official receiver's office is situated; notice to creditors of meetings other than the first meeting and application by a debtor for his discharge are dispensed with in the case of creditors for amounts not exceeding £2. Costs, other than a solicitor's charges, may be paid without taxation, and the time for declaring the first dividend is extended to six months; but the whole estate must be realized and distributed within this period if practicable. No modification, however, is permitted in the procedure relating to the public examination and discharge of the bankrupt. Notwithstanding that an order has been made for summary administration, the creditors may at any time, by a resolution passed by a majority in number and three-fourths in value of those voting at the meeting, appoint a trustee in place of the official receiver, in which case the summary order ceases to be operative.

BANKRUPTCY IN SCOTS LAW

In Scots law the term "bankruptcy" is not capable of any exact definition. Indeed, it has no technical legal meaning and may refer to any one of the three stages in the process of divesting a debtor of his property for the benefit of his creditors—insolvency, notour bankruptcy or sequestration.

Insolvency may be either "absolute" or "practical." Absolute insolvency arises when at a particular time a debtor's liabilities exceed his total assets; practical insolvency when a debtor cannot pay his debts as they fall due although he may not be insolvent in the absolute sense, for his assets when realized may exceed his liabilities. Absolute insolvency is considered in questions relating to the validity of dispositions made by the debtor; practical insolvency in questions between the debtor and his creditors.

Unlike the bankrupt in English law, a notour bankrupt is not deprived of his property but is only restricted as to his capacity to deal with it. The object is to prevent him from disposing of his assets to favoured creditors and to preserve his property for the whole body of his creditors.

Sequestration is the process corresponding to an adjudication in English law whereby a debtor is divested of his property for the benefit of his creditors.

In Scotland, as in England, the law of bankruptcy arose as a remedy against the frauds of debtors. By an Act of the Scottish parliament (1621) all gratuitous alienations made by a debtor at a time when he was "absolutely insolvent" to "conjunct and confident persons" (*i.e.*, near relations or confidential friends and servants) are annulled in the interests of prior creditors. The onus of showing that value has been given or that the debtor was in fact solvent at the time of the alienation lies upon the person who received the property.

The Act of 1696, c. 5, defined a "notour bankrupt" and struck at preferences to creditors. Under it all voluntary dispositions made at or after notour bankruptcy or within 60 days before to any creditor by way of security for prior debts may be set aside at the instance of prior creditors. No proof of fraud or collusion is necessary and it is immaterial whether the debtor was or was not insolvent at the time of the disposition. This act does not affect any payment to a creditor made in the ordinary way of business.

Notour Bankruptcy.—In 1913 the Bankruptcy (Scotland) Act was passed, which consolidated the law of bankruptcy but left in force the acts of 1621 and 1696. By this act "Notour bankruptcy shall be constituted by the following circumstances:—(1) By sequestration or the issuing of an adjudication of bankruptcy or the granting of a receiving order in England or Ireland; or (2) By insolvency (*i.e.*, practical insolvency) concurring (*a*)—(1) with a duly executed charge for payment when a charge is necessary, followed by the expiry of the days of charge without payment; (2) where a charge is not necessary, with the lapse without payment of the days which must elapse before poinding or imprisonment can follow on a decree or warrant for payment of a sum of money; (3) with a poinding or seizure of any of the debtor's movables for non-payment of rates or taxes; (4) with a decree of adjudication of any part of his heritable estate for payment or in security; or (*b*) with sale of any effects belonging to the debtor under a sequestration for rent" (s. 5).

Notour bankruptcy continues in case of a sequestration till the debtor obtains his discharge and in other cases until insolvency (*i.e.*, practical insolvency) ceases (s. 7). The notour bankrupt is not divested of his property, for, as has been stated above, the object of notour bankruptcy is not to transfer the debtor's property to his creditors but to preserve it in his hands for their benefit. The effects of notour bankruptcy on preferences to creditors under the Act of 1696 have already been noted and in addition notour bankruptcy has the effect of equalizing diligences (*i.e.*, executions of all kinds). Arrestments and poindings used within 60 days prior to the constitution of notour bankruptcy or within four months thereafter are ranked *pari passu* as if they had all been used of the same date (s. 10).

Sequestration.—Sequestration of the estate of any person may be awarded in the following cases:—(1) in the case of a living debtor subject to the jurisdiction of the supreme courts of Scotland: (*a*) on his own petition with concurrence of creditors for not less than £50; (*b*) on the petition of a creditor or creditors for not less than £50, provided the debtor be notour bankrupt and has within a year before the date of the presentation of the petition resided or had a dwelling-house or place of business in Scotland. (2) In the case of a deceased debtor who at the date of his death was subject to the jurisdiction of the supreme courts of Scotland: (*a*) on the petition of a mandatory; (*b*) on the petition of a creditor or creditors for not less than £50 (s. 11).

A petition for sequestration may be made either in the court of session or in the sheriff court (s. 16), and a petitioning or concurring creditor must lodge with the petition an oath as to the verity of his debt (ss. 20 and 21). When the debtor presents or concurs in the petition sequestration must be awarded forthwith, the court having no discretion in the matter (s. 28). The interlocutor (*i.e.*, order of the court) awarding sequestration declares that the debtor's estate belongs to his creditors for the purposes of the act.

A meeting of creditors is next held to elect a trustee and the election is made by a majority in value of the creditors present. Each creditor must take an oath as to the verity of his debt, produce vouchers for it, and value and deduct any securities he holds. He is then entitled to vote on the balance (ss. 64 and 96). At the same meeting three commissioners are elected from the creditors or their mandatories (s. 72), and it is their duty to advise the trustee, audit his accounts, and declare the amount of dividends (s. 81).

The election of a trustee must be confirmed by an interlocutor of the sheriff and this interlocutor—called the "act and warrant"—vests the property of the debtor in the trustee for the benefit of the creditors (s. 70). Instead of electing a trustee the creditors may decide to have the estate wound up by a deed of arrangement. This requires the support of a majority in number and three-fourths in value of the creditors present and must be approved by the lord ordinary or the sheriff (s. 34).

Sequestration is declared by s. 104 of the act to be equivalent to an arrestment in execution and decree of forthcoming and to an executed and completed poinding. No arrestment or poinding—*i.e.*, no process of execution—executed of the funds or effects of the bankrupt on or after the 60th day prior to the sequestration is effectual, and any funds or effects attached must be given up to the trustee.

After the trustee's appointment has been confirmed the sheriff names a day for the public examination of the bankrupt (s. 83) and may order that the bankrupt's family and confidential servants be examined also (s. 86). Creditors lodge claims for ranking and must value and deduct their securities (s. 61). The trustee may require the creditor to hand over the security at the valuation he (the creditor) has placed on it. S. 118 contains a list of debts

which are entitled to preference. The first dividend is paid at the end of six months from the date of the sequestration (s. 126), the second ten months from the sequestration (s. 128), and subsequent dividends, if any, at three-monthly intervals (s. 129).

Discharge.—The bankrupt may be discharged either on composition or without composition with his creditors. An offer of composition may be made at the "meeting for election of trustee" or at any subsequent meeting, and if it is to be accepted it must be approved by a majority in number and three-fourths in value of the creditors present and finally by the lord ordinary or sheriff (ss. 134 to 142).

If no composition is made, the bankrupt may petition for his discharge (1) at any time with the concurrence of all creditors, (2) after six months with the concurrence of a majority in number and four-fifths in value of the creditors, (3) after 18 months with the concurrence of a majority in value and number, and (4) after two years without any such consents (ss. 143 to 149). The petition for discharge cannot be presented until the trustee has prepared a report of the bankrupt's conduct.

No discharge can be given whether with or without composition unless it is proved to the lord ordinary or the sheriff that a dividend of five shillings in the pound has been paid or that the failure to pay such a dividend is due to circumstances for which the bankrupt is not responsible (s. 146). The debtor by the discharge is free from all debts except debts due to the Crown and certain other obligations. After a final division of the funds the trustee is entitled to his discharge whether the bankrupt has been discharged or not (s. 152).

Summary Sequestration.—The Bankruptcy (Scotland) Act 1913 swept away the very old process of *cessio bonorum* even as amended by the Debtors Act 1880, and introduced an entirely new system of "summary sequestration" for small estates. This process is competent when the debtor's assets do not exceed £300 (s. 174), and the petition must be presented to the sheriff. The procedure is in the main the same as in the case of an ordinary sequestration, with the sheriff taking the place of the lord ordinary, but there the several differences in detail which are set out in ss. 175 and 176 of the act.

The act also contains certain provisions for the punishment of bankruptcy offences (s. 178). It should be noted that failure to keep proper books will constitute such an offence.

The estate of an insolvent debtor may be wound up without a sequestration by a private trust deed for creditors. The Act of 1913 does not provide for this remedy and it depends upon the common law of Scotland. In such a trust deed the debtor conveys his property to a trustee with accession of some or all of his creditors. The trustee makes good his title to the property in the same way as any private person and then proceeds to divide the property. The trust deed may be reduced as a preference to creditors under the Act of 1696 if some creditor who has not acceded to it makes the debtor notour bankrupt within 60 days of the trust deed, and if sequestration is awarded the trust deed automatically falls. There is no provision in Scotland for the registration of private trust deeds.

COMPARATIVE LAW

Irish Bankruptcy Law.—The Government of Ireland Act 1920 provided that all laws in force in Ireland at the date of the act should remain in force unless modified by the parliaments of either Southern or Northern Ireland or in certain other specified ways. No modifications in the law relating to bankruptcy have yet been made (Jan. 1, 1928), so that branch of the law remains unaffected by the passing of the act.

The law is regulated by the two leading statutes of 1857 and 1872, together with the Irish Debtors Act 1872, and corresponds in its main features to some of the older English enactments, with modifications adopted from the English Act of 1869. A special act was passed in 1888 for establishing local bankruptcy courts in certain districts in Ireland, and an Act of 1889 applied the main provisions of the English Act of 1888, relating to preferential payments in bankruptcy, to Ireland.

In 1897 the court of bankruptcy was abolished and its jurisdiction was vested in the queen's bench division of the supreme court of judicature in Ireland.

The Deeds of Arrangement Act 1887, though repealed as to England by the Deeds of Arrangement Act 1915, is still in force in Ireland and is supplemented by the Irish Deeds of Arrangement Amendment Act 1890. This last mentioned act requires the registration of all petitions for arrangement under the Bankruptcy Act 1857.

British Empire.—Of recent years great progress has been made in the consolidation of the law in the various parts of the British empire and especially is this the case with regard to the laws of bankruptcy. In Australia a consolidating act was passed by the commonwealth parliament in 1924 (Bankruptcy Act 1924, No. 37 of 1924) but its operation was suspended until a date to be fixed by proclamation. In New Zealand the law is consolidated by the Bankruptcy Act 1908 (Consolidated Statutes 1908, No. 12). All of these statutes follow closely the English Bankruptcy Acts. In South Africa the consolidating statute of the Union parliament is the Insolvency Act 1916 (No. 32 of 1916), which applies to the Cape of Good Hope, Natal, Transvaal, and the Orange Free State. In Canada the Dominion parliament passed the Bankruptcy Act of 1919, subsequently amended by Acts of 1920, 1921, 1922, 1923 and 1925.

There are two systems of insolvency law in force in India to-day, one applicable to the presidency towns and the other to the rest of the country. The first depends on the Presidency Towns Insolvency Act 1909 (Act III. of 1909) as amended by Acts X. of 1914, XI. of 1921, IX. and XXXIV. of 1926 and XI. and XIX. of 1927, and the second on the Provincial Insolvency Act 1920 (Act V. of 1920) as amended by Acts XIX. of 1925, IX., XXXIV. and XXXIX. of 1926 and XI. and XII. of 1927. Here again the English law has been the model.

The Indian Provincial Insolvency Act has been used as a convenient code of bankruptcy law for new colonies or territories. In Kenya Protectorate, for example, the Indian Provincial Insolvency Act 1907 was adopted as law by an Ordinance of 1910 (cap. 106) and still remains in force, although a separate code superseding the Indian Act was set out in the Bankruptcy Ordinance 1926 (No. 1 of 1926) which will come into force on a date yet to be fixed.

In other parts of the British empire English law is adopted specifically. For example, in Tanganyika territory by the Bankruptcy Ordinance No. 8 of 1920 English bankruptcy law as at the date of the ordinance is declared to be the law of the territory. In British Guiana, Gambia, Jamaica, Hong Kong, Mauritius, Grenada, Trinidad, Tobago, and the Straits Settlements the law is modelled on the English pattern.

France.—Bankruptcy in France is regulated by the Commercial Code of 1807, amended and supplemented by the law of June 9, 1838. By Article 437 of the code bankruptcy is defined as the state of a trader who is unable to meet his commercial engagements. Simple insolvency of this kind is known in France as *faillite*. Insolvency attended with circumstances of misconduct or fraud is known as *banqueroute simple* or *banqueroute frauduleuse*. Only a trader can become bankrupt. The debt, too, for obtaining adjudication must be a commercial debt, the laws regulating bankruptcy being designed exclusively for the protection of commerce. To be made a bankrupt a trader need not be insolvent; it is sufficient that he has suspended payment. Commercial companies of all kinds are liable to be declared bankrupt in the same manner as individual traders. A trader-debtor can be adjudicated bankrupt upon his own petition, or upon the petition of a creditor, or by the court itself *proprio motu*. A petitioning debtor must within 15 days file at the office of the tribunal of commerce of the district a declaration of suspension, with a true account of his conduct and of the state of his affairs, showing his assets, debts, profits and losses, and personal expenses. On adjudication the tribunal of commerce appoints a person, called a *syndic provisoire*, to manage the bankrupt's estate, and a *juge commissaire* is also named to supervise the syndic. A bankruptcy terminates by an ordinary composition (*concordat*), a sale of the debtor's assets (*union*), or a composition by relinquishment of assets. It is a striking feature of the French system, and highly creditable to French commercial integ-

rity, that a discharge in bankruptcy, even when accompanied by a *declaration d'excusabilité,* leaves the unpaid balance a debt of honour. At the time of the French Revolution the National Convention passed a resolution that any man who contracted a debt should never be free from liability to pay it. The spirit of this resolution still survives, for until a trader has paid every penny that he owes he is not rehabilitated and remains under the stigma of various disabilities; he has no political rights, he cannot hold any public office, or act as a stockbroker, or sit on a jury. *Banqueroute simple* is where the bankrupt has been guilty of grave faults in the conduct of his business, such as extravagance in living, hazardous speculation, or preferring creditors. *Banqueroute frauduleuse* involves the worse delinquency of fraud. Both *banqueroute simple* and *banqueroute frauduleuse* are punishable—the latter with penal servitude which may range from five to as many as twenty years. (See *The Commercial Laws of the World,* vol. xxi. p. 132 *et seq.*)

Germany.—Bankruptcy in Germany is governed by a code passed in 1877, as amended by a Supplementary Law dated May 17, 1898. Prior to this each State had its system and the law was "wholly chaotic." The same distinction is drawn in Germany as in France between mere commercial failure and bankruptcy, simple or fraudulent. Simple bankruptcy is established by such offences as gambling, dealing in "futures," disorderly book-keeping or extravagance in living; fraudulent bankruptcy, by offences of a deeper dye—the concealment of property, the falsifying of books, the manufacture of fictitious debts, and the giving of illegal preferences. Both kinds of bankruptcy are punishable, fraudulent bankruptcy by penal servitude or, in case of mitigating circumstances, by imprisonment for not less than three months. Accessories in fraudulent bankruptcies are liable to penal servitude—for instance, a creditor who conspires with the debtor to secure an advantage to the prejudice of the other creditors. The creditors are called together within one month from the date of adjudication, and at their meeting they may appoint a committee of their number to advise with the trustee. It is the duty of the court to see that the trustee performs his functions. Estates are liquidated with great rapidity. In order that the creditors may receive dividends at the earliest moment it is customary to sell the assets by auction. The creditors by a majority in number and three-fourths in value may accept a composition, but such an arrangement must have the approval of the court. The fees are very moderate: in an ordinary bankruptcy the attorney's fees do not, it is said, exceed £5. (See *The Commercial Laws of the World,* vol. xxiv. p. 265 *et seq.,* where an exhaustive statement of the German law of bankruptcy will be found.)

Italy.—Bankruptcy in Italy is regulated by the Commercial Code of 1883 (Part III.). Only traders can pass through the bankruptcy court. Traders are defined by the code as those who, as an habitual profession, engage in commercial business. This definition includes merchant companies. Bankruptcy proceedings may be taken either by the debtor or by a creditor for a *commercial* debt, or may be ordered by the court. The amount of the debt is immaterial: a small sum will suffice, provided its non-payment is proof of insolvency. Bankruptcy can only be declared where there is insolvency. The judgment adjudicating a debtor bankrupt deprives the bankrupt of the right to administer his affairs and nominates a trustee to realize the property under the superintendence of a judge and a commission of creditors. All the property of the bankrupt, movable and immovable, is sold by auction and distributed in dividends. This is one way of closing the bankruptcy, but it may also be closed by an arrangement. No minimum percentage is required for such arrangement, but it must have the assent of creditors representing three-fourths of the bankrupt's indebtedness. Composition before bankruptcy is not recognized by Italian law. Bankrupts are liable to criminal proceedings involving punishments more or less heavy for offences against the law, *e.g.,* for not keeping books in the way prescribed by law.

Spain.—The law of bankruptcy in Spain is to be found in the 4th book of the Commercial Code, ss. 870 *et seq.,* as modified by the law of June 10, 1897. (See *The Commercial Laws of the World,* vol. xxxii. pp. 212 *et seq.*). (W. V. B.)

BANKRUPTCY IN THE UNITED STATES

History.—In the United States control over the administration of insolvent estates is divided between the Federal and State governments. The Constitution (Art. 1, s. 8) gives to Congress power to establish "uniform laws on the subject of bankruptcies throughout the United States." But the Supreme Court has held that the States have power: (1) to establish and administer their own bankruptcy or insolvency laws in the absence of any regulation of the subject by Congress and subject to certain restrictions on impairing the obligations of pre-existing contracts, and (2) to enact insolvency, assignment or stay laws that do not conflict with any statute which Congress may have enacted.

In exercise of its constitutional grant, Congress has enacted four different statutes. Each statute was adopted as the result of national panic or depression, and each, except the last, was repealed on the return of prosperity. The dates of enactment and repeal for the first were 1800 and 1803, for the second 1841 and 1843, and for the third 1867 and 1878. The last statute was enacted in 1898 and has apparently become a permanent institution; in recent years (1903, 1906, 1910, 1917, 1922, 1926, 1932, 1933, 1934 and 1935) it has been much amended, and there is today little agitation for its repeal.

These statutes and amendments reveal a constant expansion of the federal power. The Act of 1800 was confined to merchants and traders, made no provision for voluntary proceedings, and put severe restrictions on discharge. In the Act of 1841 provision was made for voluntary proceedings by all debtors, involuntary proceedings against merchants and traders were retained, and the provisions for discharge were liberalized. The Act of 1867 abolished the distinction between traders and other debtors, made provision for compositions, and made discharge still more easily obtainable. Each of these changes was opposed or contested on constitutional grounds and each was finally approved or acquiesced in by the Supreme Court.

The present Act is more comprehensive than any of its predecessors. The statute of 1898, augmented by amendments adopted prior to 1933, offers voluntary proceedings to all debtors other than certain excepted corporations (municipal, railroad, insurance, banking, and building and loan) and provides for involuntary proceedings against all debtors other than farmers or wage earners (those working at a rate of compensation not exceeding $1500 a year) and the same excepted corporations. Discharge and composition provisions are more liberal than those of any previous act.

The most extensive innovations appear, however, in amendments adopted during the past three years. Several new sections are grouped in a chapter (VIII) of "provisions for the relief of debtors." Section 74 extends, for the benefit of individual debtors, the scope of the old composition and provides for "extensions" that affect a secured creditor. Section 75 sets up an extremely complicated machinery designed to affect compositions and extensions for farmers burdened with mortgages. Section 77 offers a procedure for reorganization, supposedly more efficacious than the equity receivership, to railroads engaged in interstate commerce, and Section 77B offers a somewhat similar procedure to all corporations authorized to become voluntary bankrupts and to railroads not engaged in interstate commerce. Finally, Section 80 of another new chapter (IX) provides a plan for the readjustment of municipal debts.

The constitutionality of some of these innovations is still a subject for conjecture. Two recent opinions by the Supreme Court offer an interesting contrast. In the first (294 U.S. 648) the Court gave its approval to the reorganization provisions of Section 77 by likening them to the older composition sections and remarked upon the striking capacity of the bankruptcy power to expand to meet new conditions. In the second (295 U.S. 555) the Court (by invoking the due process restriction of the Fifth Amendment) held unconstitutional Subsection (s) of Section 75, which in effect gave farmers who were willing to pay a reasonable rental value for property in their possession a five year moratorium from the claims of mortgagees. To distinguish the two cases the Court found "fundamental" differences between secured and

unsecured creditors and between secured creditors who were members of a "class" and those who held their claims singly. The compulsion put on a dissenting bondholder in a reorganization was for the benefit of other creditors of the same class but compulsion put on a single secured creditor could be for the benefit of the mortgagor only. The result of the two decisions is to leave the judicial fate of the other innovations in some doubt; the Court retains a wide discretion to determine what Congress may or may not do by expanding or contracting either "bankruptcy" or "due process." The new Section 80, providing a plan for the readjustment of municipal debts must overcome the additional argument that it "impairs the sovereignty" of the States.

For administration by State Courts or departments there remain the insolvencies of all corporations denied relief under any of the Federal provisions—insurance companies, building and loan associations, and State banks. A recent decision (294 U.S. 211) of the Supreme Court impairs effective administration of these estates where the corporate business transcends State lines. The Court held that an Iowa "statutory successor" to an insolvent Iowa insurance corporation took "title" to assets in Montana subject to the "lien" of a subsequent Montana judgment creditor. This makes necessary expensive ancillary proceedings in all States where the corporation being administered has property. Again, in its determinations of what State statutes "conflict" with the national Act the Supreme Court has been generous to the States. A State insolvency or assignment statute is in conflict only if it supplies a discharge for the debtor; and to determine whether or not a statute supplies discharge the Court promises to look to the "interpretation" of State courts (287 U.S. 527). Finally in theory equity receiverships in the State courts remain available to all classes of corporations; in practice Section 77B is likely to deprive the State courts of this business.

Operation—Liquidation.—The liquidation sections of the Federal Act—designed to secure an equal distribution of assets among creditors and a discharge for the debtor—set up an administrative machinery that is fairly simple, but offer rules for administration that are exceedingly complex. The proceedings are begun by a petition filed either (1) by the debtor or (2) against a debtor who owes $1,000 or more by (a) three or more creditors whose provable claims aggregate $500 or more, or (b) by a single creditor with a claim of the latter amount if the creditors are less than 12 in number. When the petition is involuntary, adjudication does not follow as a matter of course but only on a showing that the debtor has committed an act of bankruptcy within four months of the filing of the petition.

The statute proscribes as acts of bankruptcy: the making of a fraudulent conveyance, the giving of a preference while insolvent, suffering or permitting while insolvent a creditor to obtain a preference by legal proceedings, the making of a general assignment for benefit of creditors or being subjected while insolvent to the appointment of a receiver, and lastly an admission in writing of inability to pay debts and willingness to be adjudged a bankrupt. The meaning of the various "acts" has been extensively litigated. A debtor is insolvent within this section of the statute whenever the aggregate of his property, excluding that fraudulently conveyed, is not at a fair valuation sufficient in amount to pay his debts.

The petition must be filed in the Federal district court of a district where the debtor has had his principal place of business, resided, or had his domicile for the preceding six months or the greater portion thereof. When a voluntary petition showing (on its face) the necessary jurisdictional requirements is filed, adjudication may follow almost immediately. When an involuntary petition is filed, the debtor is given an opportunity to appear and has the right to a jury trial on the question of solvency and the commission of an act of bankruptcy. The court after a hearing either makes an order of adjudication or dismisses the petition. If an order of adjudication is made, the court normally refers the case to a referee.

Referees are appointed by the court for a term of two years. Their compensation is regulated by statute and depends on the size of the estate and number of claims filed. They have broad judicial and administrative powers over allowance of claims and collection of assets. Their orders, however, are always subject to a review by the Court.

The referee when a case is referred secures from the debtor a statement of assets and liabilities and calls a meeting of creditors. At this meeting a trustee is usually elected, a majority vote in number and amount of claims of all the creditors present whose claims have been allowed being necessary to elect. If the creditors are unable to agree, the court or referee may appoint a trustee. The trustee is an executive officer whose fee is fixed by the court within a statutory minimum. It is his duty to take possession of the property of the bankrupt and convert the property into cash. Creditors are given six months after the adjudication to file proofs of claims against the estate. Claims duly proved are allowed by the referee unless objected to by the trustee or creditors. Secured creditors are allowed to prove for the amount of their claims in excess of the value of the security. The valuation of the security is made under court supervision.

To facilitate liquidation, trustee is given title to all of the bankrupt's property as of the date of the adjudication except that by State law exempted from the payment of debts. He likewise gets title to property of the bankrupt conveyed in fraud of creditors within four months of the filing of the petition, and is further empowered to invoke any State law which any creditor of the bankrupt could have invoked to set aside conveyances by the bankrupt. Finally, he is subrogated to certain preferential liens obtained by creditors within four months of the filing of the petition and given power to recover certain preferential transfers made by the bankrupt within that period. All these rights and powers of the trustee are subject to various restrictions that have generated an enormous amount of litigation.

All property collected by the trustee is converted into cash under the supervision of the Court.

Limitations.—The actual distributive process does not effect complete equality of distribution. The normal administrative expenses of the bankruptcy proceeding; wages not exceeding $600 each due to workmen, clerks, salesmen and servants, and earned within three months before the commencement of the bankruptcy proceeding; taxes due to the Federal and State Governments, and various political subdivisions thereof; debts owing to any person who by the law of a State or of the United States is entitled to priority—all these are paid in that order before dividends payable to general creditors.

A limitation from the debtor's point of view is that he is not entitled to a discharge as a matter of right. Application must be made and trustee and creditors are given reasonable opportunity to object. If they do not object, the discharge is granted. They may successfully object by proving that the bankrupt has violated the penal provisions of the act; or destroyed, concealed, etc., books of account; or, in exceptional cases, failed to keep books of account; or obtained money or property on credit by making written false statements concerning his financial condition; or transferred property, with intent to defraud creditors, within 12 months preceding the filing of the petition; or received a discharge in bankruptcy within six years; or refused to obey any lawful order of the referee or court or to answer any material question approved by the referee or court; or failed to explain satisfactorily any losses or deficiencies of assets. But this limitation is more apparent than real since lethargy of creditors has produced a situation where substantially all bankrupts who apply for a discharge are given one.

Another limitation from the debtor's point of view is that even though a discharge is granted all debts are not thereby released. Only provable debts are dischargeable. But debts due as a tax levied by the Federal or State Government or a political subdivision thereof; liabilities for certain fraudulent acts, wilful and malicious injuries, or certain immoral conduct; certain wages and moneys owing to employees; claims known to the bankrupt but not filed by the creditor because of his lack of notice or knowledge of the proceedings; and, of course, debts incurred subsequent to the filing of the petition are not discharged. And all debts which are not provable are not discharged. What debts are not provable

has been a question of extended litigation due to the ambiguous wording of the statute; but the claims against the normal business are provable and thus dischargeable.

Operation—Reorganization, Compositions, Extensions.—The recent amendments to the Bankruptcy Act are designed not to produce liquidation, *i.e.*, distribution of the debtor's assets among his creditors, but to permit the debtor to retain control of assets after liabilities have been reduced in amount or extended. This is accomplished by giving the bankruptcy court power to confirm plans of reorganization, composition, or extension that bind dissenting minorities of each class of a debtor's creditors. These amendments, though often defended upon the ground that creditors will ultimately receive more from such capitalization of a debtor's future earning power than they would receive from liquidation at forced sale prices, are, of course, primarily designed for the relief of distressed debtors.

The amendment of most practical importance is Section 77B which supplies a procedure for the reorganization of all corporations authorized to file voluntary petitions in bankruptcy. This procedure is similar to that of the equity receivership previously developed by the federal courts. Yet substantial changes have been made. The debtor is permitted to file a petition without shopping around for a friendly creditor. Ancillary receivers are no longer necessary; the bankruptcy court is given exclusive jurisdiction of the debtor and its property wherever located. Cash is not always required for the payment of dissenters nor a judicial sale for determining the participation of dissenters; the court may on certain conditions confirm a plan by decree. The conditions for confirmation without sale are that creditors holding two thirds of the amount of each class of claims allowed accept the plan; that, if the corporation is not found insolvent, a majority of the stockholders of each class accept; and that provision be made, in securities or otherwise, for dissenters to the extent that the judge finds fair under the circumstances of the particular case. However, a judge may still, it appears, find a plan fair that has not been accepted by a definite percentage of creditors or stockholders and order a judicial sale at an upset price in order to determine cash payments to dissenters. To obtain the benefits of this section a corporation need not allege that it is insolvent, as that term is defined in liquidation sections of the Act, but only that it is unable to meet its debts as they mature. Three or more creditors with provable claims which amount in an aggregate, in excess of security, to $1000 or over may file a petition against the corporation.

Elaborate provisions for the relief of individual debtors are found in Section 74. Their chief attraction is that they offer the debtor a chance of getting his secured debts extended. Here again the debtor need not allege that he is insolvent but only that he is unable to meet his debts as they mature. He may apply for confirmation of a plan of composition or extension only after it has been accepted in writing by a majority in number of all creditors whose claims if unsecured have been allowed, or if secured are proposed to be affected by an extension. This number must also represent a majority in amount of claims. The plan may not reduce the amount or impair the lien of any secured creditors; but, if enough of the other creditors so vote, it may affect the time and method of his liquidation. The court (referee) shall confirm a proposal if satisfied of its fairness to creditor and feasibility for the debtor.

The details of Section 75 on Agricultural Compositions and Extensions, of Section 80 on Municipal Debt Readjustment and of Section 77 on reorganization of Railroads Engaged in Interstate Commerce Commission are too complex for brief summary. *See* Glenn, *Liquidation* (1935). (W. O. D.; M. S. McD.)

BANKS, SIR JOSEPH, BART. (1743–1820), English naturalist, was born in London, on Feb. 13, 1743. In 1764 he came into possession of the ample fortune left by his father, William Banks, M.P. In 1766 he made his first scientific expedition to Newfoundland and Labrador, bringing back a rich collection of plants and insects. Shortly after his return, Captain Cook was sent by the government to observe the transit of Venus in the Pacific ocean, and Banks joined the expedition in the "Endeavour," which was fitted out at his own expense (1768–71). He was anxious to join Cook's second expedition but circumstances obliged him to relinquish his purpose. He, however, employed the assistants and materials he had collected in a voyage to Iceland in 1772. In 1778 Banks succeeded Sir John Pringle as president of the Royal Society and held the office until his death on June 19, 1820. In 1781 he was made a baronet; in 1795 he received the order of the Bath. He bequeathed his collections of books and botanical specimens to the British Museum.

See J. H. Maiden, *Sir Joseph Banks* (1909); E. Smith, *The Life of Sir Joseph Banks* (1911).

BANKS, NATHAN (1868–), American entomologist, was born in Roslyn, N.Y., on April 13, 1868. He graduated at Cornell university in 1889 and in 1890 entered the division of entomology of the United States department of agriculture. In 1916 he left this post to become curator of insects in the museum of comparative zoology at Harvard university. He made researches on insects and on protective resemblances and mimicry.

His publications include: *Treatise on the Acarina* (1904); *Catalogue of the Acarina* (1907); *Catalogue of Nearctic Neuroptera* (1909); *How to Collect and Preserve Insects* (1909); *Catalogue of Nearctic Heteroptera* (1911); *Index of Economic Entomology* (1917).

BANKS, NATHANIEL PRENTISS (1816–1894), American politician and soldier, was born at Waltham, Mass., on Jan. 30, 1816. He received only a common school education and at an early age began work as a bobbin-boy in a cotton factory of which his father was superintendent. Subsequently he edited a weekly paper at Waltham, studied law and was admitted to the bar. He served as a Free Soiler in the Massachusetts house of representatives from 1849 to 1853, and was speaker in 1851 and 1852; and, in 1853, was elected to the national House of Representatives as a coalition candidate of Democrats and Free Soilers. He soon after joined the Republican Party. In 1856, after a protracted contest, he was chosen speaker on the 133rd ballot. He resigned his seat in Dec. 1857, and was governor of Massachusetts from 1858–61. In 1861 President Lincoln appointed him major-general of volunteers. In 1862 Banks was ordered to move against Jackson in the Shenandoah Valley, but the latter with superior forces defeated him at Winchester, Va., on May 25. Aug. 9 Banks again encountered Jackson at Cedar Mountain, and succeeded in holding his ground. In November, Banks sailed from New York to replace Gen. B. F. Butler at New Orleans. In May, 1863, he invested the defences of Port Hudson, La., which surrendered July 9. In the autumn of 1863 Banks organized expeditions to Texas, and secured possession of the region near the mouths of the Nueces and the Rio Grande. But his Red River expedition, March–May 1864, forced upon him by superior authority, was a complete failure. From 1865 to 1873 he was again a representative in Congress, serving as chairman of the committee on foreign affairs. A personal quarrel with President Grant led in 1872, however, to his joining the Liberal-Republican revolt in support of Horace Greeley. In 1874 he was successful as a Democratic candidate, serving one term (1875–77). Having rejoined the Republican Party in 1876, he was United States marshal for Massachusetts from 1879 until 1888, when for the ninth time he was elected to Congress. He died at Waltham on Sept. 1, 1894.

See Frank M. Flinn, *Campaigning with Banks in Louisiana, '63 and '64* (1887); and Charles Kassel, "The Labor System of General Banks," in *"Open Court,"* xli. 35–50 (1928).

BANKS, THOMAS (1735–1805), English sculptor, son of a surveyor who was land steward to the duke of Beaufort, was born in London on Dec. 29, 1735. He was taught drawing by his father, and in 1750 was apprenticed to a wood-carver. In his spare time he worked at sculpture, and before 1772, when he obtained a travelling studentship and proceeded to Rome, he had already exhibited several fine works. He spent two years in St. Petersburg (Leningrad), being employed by the empress Catherine who purchased his "Cupid tormenting a Butterfly." On his return he modelled his colossal "Achilles mourning the loss of Briseis," a work full of force and passion. The monuments in St. Paul's Cathedral, London, to Captain Westcott and Captain

Burges, and in Westminster Abbey to Sir Eyre Coote are by him. His bust of Warren Hastings is in the National Portrait Gallery. Banks's best-known work is perhaps the colossal group of "Shakespeare attended by Painting and Poetry," now in the garden of New Place, Stratford-on-Avon. He died in London on Feb. 2 1805.

BANKS, HISTORY OF. Perhaps the earliest definition of a bank is found in "Lex Mercatoria" by Gerard Malynes, published in London in 1622. He says:—

"A Bank is properly a Collection of all the ready money of some Kingdom, Commonwealth, or Province, as also of a particular City or Town, into the hands of some persons licensed and established thereunto by publick authority of some King, Prince, or Commonwealth."

This definition was in all probability derived from the author's experience of the exchange banks, such as Rotterdam, Middelburg, Amsterdam and possibly Hamburg, and also from his knowledge of the famous Italian banks in Venice and Genoa. These latter banks were even in 1622 of great fame and antiquity. The Casa di San Giorgio of Genoa had gradually extended its commitments and powers, until it was not only a deposit bank but also acquired many of the functions and powers of the Government itself. In 1453 Corsica, Péra and the Genoese Black sea colonies were ceded to it, and according to Machiavelli, its administration was more efficient and less tyrannical than that of the State. In short, it had an honourable history until 1797, and it is arguable that it is a direct ancestor of the present Banca d'Italia (*q.v.*).

Venice saw the growth in the middle ages of a number of private institutions which gradually developed from money-changers to something very like the modern bank.[1] Their history was not so uniform as that of the Casa di San Giorgio and ultimately it was deemed necessary to found a "public bank." This was the Banco della Piazza del Rialto, which dates from 1584. Thirty years later the more famous Banco del Giro was founded, and the two combined in 1637. The new bank survived until 1806.

BANKING IN ANTIQUITY

Pastoral nations such as the Hebrews, while they maintained money-lenders, had no system of banks that would be considered adequate from the modern point of view. But as early as 2000 B.C., the Babylonians had developed such a system.

It was not the result of private initiative, at that time, but an incidental service performed by the organized and wealthy institution of the cult. The temples of Babylon, like those of Egypt were also the banks. "Two shekels of silver," runs a Babylonian document, "have been borrowed by Mas-Schamach, the son of Adadrimeni, from the sun-priestess Amat-Schamach, daughter of Warad-Enlil. He will pay the Sun-God's interest. At the time of the harvest he will pay back the sum and the interest upon it." It is evident enough that the priestess Amat-Schamach was merely the accredited agent of the institution. No doubt the clay tablet with the inscription corresponds to what we call negotiable commercial paper. Another document of the same period was certainly such. It runs: "Warad-Ilisch, the son of Taribum, has received from the sun-priestess Iltani, daughter of Ibbatum, one shekel of silver by the Sun-God's balance. This sum is to be used to buy sesame. At the time of the sesame-harvest he will repay in sesame, at the current price, to the bearer of this document."

At a much later period, about 575 B.C., private initiative had taken the lead in Babylonian banking. At that time we hear of an institution that has been compared to the Rothschilds of 19th century Europe—the Igibi bank of Babylon. Its last great head died at a time not far distant from the date just given. The records of this bank show that it acted as buying agent for clients; loaned on crops, attaching them in advance to insure reimbursement; loaned on signatures and on objects deposited, and received deposits on which it paid interest.

In Greece in the 4th century B.C., *i.e.*, at the time of the great commercial prosperity that brought on the Persian wars,—banking was well established. As in Babylon, there was no prohibition of interest taking, so that banking was free to develop as circumstances might permit. There was, no doubt, some concentration of functions in certain large institutions, but the different operations of banking were performed by various kinds of bankers. Thus, the *trapezitai*—the name is still used by Greek bankers—were those who received deposits on interest to administer as current accounts such as checking; the *kermatistai* were the equivalent of the mediaeval goldsmiths, their function being the testing of coins and the changing of them; the *daneistai* were the money-lenders. A well verified function of the banks of Greece was to prepare letters of credit on correspondents with a view to obviating the actual transport of specie in payment of accounts.

The private bankers, however, had no monopoly on most of these transactions, and indeed it is probable that, as in Babylon, private banks followed the temple banks by a long interval. The temple system seems to have included most of the typical banking operations, except, perhaps, those of changing and of assay. There is small doubt, in any case, that such great temples as those of Ephesus and of Delphi were the most powerful of the Greek banking institutions before the time when the progress of irreligion had destroyed the public sense of security in making temple deposits or in allowing priests to act as financial agents.

Yet the Greek private bankers never monopolized the business, for the public, or State, bank was everywhere to be found, as at Abdera, Sinope and Cyzicus, and the surviving records show that, except in times of national emergency, the private bankers had but little chance to get profit from the financial transactions of the State.

The Greek system influenced Rome to the extent that certain Roman temples engaged in financial transactions for individuals. The College of the Flamens is known to have been entrusted with carrying out a will wherein was inserted a clause that turned over to it the ownership of the estate in question unless the heir should comply with a certain stipulation. The document is of particular interest because it shows a sense of absolute confidence in the integrity of the Flamens. But Roman legislation was inclusive on all such subjects, and fraud in banking was a matter of the greatest difficulty. In 210 B.C. we find the earliest definite regulations as to Roman private bankers—an ordinance which assigned the places in the Forum where the *tabernae argentariae*, or banking offices, might be located. The Romans did not follow the Greeks in the organization of State banks. But their minute regulations as to the conduct of private banking were calculated to create the utmost confidence in it; it touched all of the various divisions of the business, which were typically assumed by different individuals, as in Greece.

Hellenistic Egypt, unlike Rome, imported the Greek banking system bodily. On the one hand we find a private bank in Alexandria operating at night, when vessels could best come to anchor in that port, and displaying, as a sign, a little poem especially ordered from a famous bucolic poet. On the other hand, the State banks were as widely distributed as they were in Greece; their organization, each with a director, a sub-director, and a responsible manager, whether at Memphis, Thebes or Arsinoë, is well known. Everywhere, it appears, the State and private banks managed to exist together. In one little village, that of Dionysias, near Lake Moeris, there were two private banks in A.D. 151. One was that of Palamedes and Company "*ἀπὸ τῆς Παλαμήδους καὶ μετόχων τραπέζης Διονυσίαδος*," as a somewhat mutilated papyrus has it. The title occurs in a receipt for rent paid in to the bank for the account of a land-owner. (*cf.* Westermann and Kraemer, pp. 215–17.)

With the end of the civilization of antiquity banking degenerated, for a period of some centuries, into a system of financial makeshifts. There were various reasons for this, the most important, no doubt, being administrative decentralization and the weakening of governmental authority, with its inevitable counterpart of commercial insecurity. The very widely distributed means of banking brings out the prevalence of this insecurity in a striking manner: as in Babylon, in Egypt and in Greece the sanctuaries

[1] *See* A. Andreades, *History of the Bank of England;* P. S. King and Sons.

were the banks. But if the phenomenon appears a similar one in those ancient countries and in mediaeval Europe it shows, upon analysis, fundamental differences. The ancient State was strong, whereas the mediaeval one was weak; and although the Christian churches and monasteries represented the mediaeval State religion, still, the Church in each country was no stronger than the State in question. Therefore there could be no such absolute guarantees for depositors in Church treasuries as had been common to those who used the temples as banks in antiquity.

But there was a certain guarantee—that furnished by the practical unanimity of opinion as to the inviolability of sacred buildings—and this was accepted as the best available one. The result was that people entrusted the officials of churches and monasteries with their money, either as a deposit to be withdrawn or as a cash payment for a stipulated annual income, whether perpetual or for a term. As for receipts calling for periodic payments by a church treasury, they came to be the most widely distributed of European commercial paper, and ranged through all denominations; they were negotiable, and as such were often divided into infinitesimal sums for the purpose of marketing them with poor investors. The order of the Templars (*c.* 1118–1320) became the outstanding representative of ecclesiastical banking and its records show that its operations included almost every type of the modern bank's activities, including those of the trust company.

The relative lack of commercial security, and especially outside the Church, was not the only reason for the slow development of lay banking. Pagan theory had gained precedence in Europe over Pagan practice. Aristotle's dictum that interest taking is unnatural and consequently immoral was remembered, and it was forgotten that the ancient world, the Hebrews included, made no sin of interest but only of usury. The Church, indeed, made the distinction; but governments—excepting those of Lombardy and of Cahors—generally forbade their nationals engaging in the operations which are associated with banking. However, growing necessity forced the issue: in 1148 the San Giorgio bank was formed in Genoa; and in 1157 the Vitale was constituted in Venice by a forced loan to the State, the loaners being empowered to organize as a bank. In 1407 a similar institution was founded in Genoa. In 1609 a municipal bank was opened in Amsterdam, where, however, no interest was paid on deposits, the purpose of the bank being rather that of a place of safe deposit under the city's guarantee.

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ENGLISH BANKING

Until the 17th century, there was a lot of indefinable banking carried on elsewhere in Europe, though it is impossible to separate deposit banking from investments in trading ventures, money-changing and other commercial transactions of the period. The Fuggers undoubtedly did a lot of general financing, while the North-European exchange banks alluded to above, performed many of the functions of the modern bank, and may be regarded as being the linear ancestors of the great London merchant banking and accepting houses of to-day. In England, it is probably true to say that the ground was prepared for modern banking by the influx of gold from America in the Elizabethan age and the simultaneous birth of foreign trade. Land ceased to be the only form of wealth, and the country gentleman and town merchant began to hold part of their "capital" in cash. The final impetus was given by two political facts. The first was the seizure by Charles I. in 1640 of £130,000 in bullion deposited by City merchants at the Tower. The second was the outbreak of the Civil War, and the consequent sense of insecurity that spread throughout the country.

To secure safety, owners of money began to deposit it with the London goldsmiths. Against these sums the depositor would receive a note, which originally was nothing more than a receipt, and entitled the depositor to withdraw his cash on presentation. Two developments quickly followed, which were the foundation of "issue" and "deposit" banking, respectively. Firstly, these notes became payable to bearer, and so were transformed from a receipt into a bank-note. Secondly, inasmuch as the cash in question was deposited for a fixed period, the goldsmith rapidly found that it was safe to make loans out of his cash resources, provided such loans were repaid within the fixed period.

The first result was that in place of charging a fee for their services in guarding their client's gold, they were able to allow him interest. Secondly, business grew to such a pitch that it soon became clear that a goldsmith could *always* have a certain proportion of his cash out on loan, regardless of the dates at which his notes fell due. It equally became safe for him to make his notes payable at any time, for so long as his credit remained good, he could calculate on the law of averages the exact amount of gold he needed to retain to meet the daily claims of his note-holders and depositors.

The cheque came in at an early date, the first known to the Institute of Bankers being drawn in 1670, or so. Hoare and Co. the only private banking firm left in London, who are directly descended from goldsmiths of that name, have in their possession a cheque dated July 11, 1676. It reads:—

> Mr. Hoare,
> Pray pay to the bearer hereof Mr. Witt Morgan fifty-four pounds ten shillings and ten pence and take his receipt for the same. Your loving friend
> Will Hale.
> 54/10/10
> for Mr. Richard Hoare
> at the Golden bottle in Cheapside.

This, and further interesting documents were published in the *Banker's Magazine*, Oct. 1927.

Here we have the early elements of both issue banking, which centres round the bank-note, and deposit banking, which centres round the cheque. In the one case, the banker is bound to pay gold against his notes, in the other against his deposits. The amount of gold he had to hold had still to be determined by experience, and Bank Acts, fiduciary issues and Treasury minutes were as yet unheard of.

The first shock to English banking came in the days of Charles II., who, several hundred years ahead of his time, borrowed heavily from the goldsmiths and promptly repudiated his loans. This occurred in 1672, and occasioned a general suspension of payment. Despite this incident, and a general (and well-founded) belief that the goldsmiths were guilty of imprudence and usurious practices, public confidence was restored, and it was soon after that date that the goldsmiths found that they could receive money on what is now termed "current account," *i.e.*, money withdrawable without notice. Some 20 years later came the foundation of the Bank of England (*q.v.*).

The Bank of England.—The Bank of England took its origin partly in the public distrust of the goldsmiths, but mainly in the current impecuniosity of the British Government. In return for a loan of £1,200,000, the founders of the Bank were granted certain valuable privileges, which were added to as time went on. It kept, and still keeps, the accounts of the Government. It had what was then the unique privilege of being a joint stock company with limited liability. Its notes, though not yet legal tender, were accepted without question in payment of taxes. These made it a formidable competitor to the comparatively small private banking firms which had grown up from the London goldsmiths and to the country firms, such as Smiths' of Nottingham, which were already coming into existence.

The 18th century was the hey-day of the private banker and of the issue bank. The Bank of England Act of 1708 prohibited any other bank with more than six partners issuing "promissory notes," *i.e.*, bank notes. The cheque, though in existence, was still in its infancy and was not universally accepted as it is in England and the United States to-day. The Act assumed that a bank must have the right to issue notes, or it ceased to have any

justification for its existence—in fact "to be a bank." For over a century this assumption remained correct, and so the Act carried into effect its real intention of conferring a monopoly over banking upon the Bank of England.

During all these years, the Bank of England was nothing more than an ordinary bank of issue and deposit. It had certain privileges which gave it a favoured position, but in return refrained in practice from competing with the private bankers for deposits at interest from the public. It was in no respect a central bank in the modern sense of the term.

THE LONDON CLEARING HOUSE

Probably the most important landmark in the 18th century was the birth of the London Clearing House, and this in its turn marks the growth in the use of the bill, draft, cheque and similar negotiable instruments. Each bank in London employed clerks whose duty was to "walk" round the whole circuit of every other bank and present all cheques, etc. drawn thereon or domiciled there for payment and collect the money so due. This was a wearisome business, and about the middle of that century the walk-clerks gradually agreed to meet and offset all their cheques and bills against each other and pay over the balances. This practice was of course unofficial, but in time it was officially recognized, and in 1810 a house was rented for the clearing.

The system was originally limited to banks in close proximity to the Clearing House, in fact to what to-day is known as the "Town" clearing. "Country" clearing was added in 1858, and "Metropolitan" clearing in 1907. The reader will be familiar with the letters "T," "C" or "M" which appear on all cheques and denote to which clearing they belong.

From this unofficial start, the London Clearing House has grown to its present dimensions, while provincial clearing houses have also been set up in the British Provinces. The expansion in the volume of London clearings, due before the World War mainly to the substitution of cheques for notes as a means of payment, is shewn below. The table also shews how the number of clearing banks has been reduced by amalgamations.

Year	Number of Clearing Banks	Total Clearings £
1839	29	954,401,000
1899	19	9,150,269,000
1906	18	12,711,334,000
1926	10	39,825,000,000
1927	10	41,551,000,000

It will be seen that only a limited number of banks are members of the "London Clearing." Other banks have to "clear" through a member who acts as their agent.

The 18th century also witnessed the coming into universal use of the bank-note. Bank of England notes were received practically everywhere, while the notes of any London or country banker were usually acceptable.

The 18th century closed with the Napoleonic wars. These quickly imposed a severe strain upon the national finances and shewed the weaknesses of the existing British banking system. Its chief defect arose directly from the privilege conferred on the Bank of England by the limitation of joint-stock banking. No strong banking company could be founded in the country districts, but any private individual, whatever his lack of capital, knowledge or experience, could call himself a banker, accept deposits and issue notes. The Napoleonic wars exposed the instability and dangers of the whole system. Following a run upon the Bank of England, in 1797 Parliament suspended specie payments and made the Bank of England notes inconvertible. This was England's first experience of a purely paper currency, and it lasted till 1821. In 1814–16, a severe crisis occurred and many country banks had to suspend payment. Even after the return to gold in 1821, the period of strain was not over. The rapid development of industry at home and the opening up of new countries abroad stimulated a period of speculation which culminated in the crash of 1825. In normal times, the majority of private bankers were perfectly capable of carrying on their business. Despite their lack of experience, they knew their customers, and their customers knew and trusted them. Their notes circulated freely, with the result that they could readily discount their customers' bills, and even participate in the development of local industry. It was only when a general crisis arose that the country banker would realize the danger of his position. The year 1824–25 tells many a tale. First the banker would tentatively "shorten sail" thereby arousing the wrath of his clients. Next a feeling of insecurity would arise, whence no man knew. The banker would quietly seek to get in more of his loans and at the same time apply to his London agents for help. Back would come the reply from the London banker that all his country clients were seeking to rediscount their paper, and that he had to guard his own funds. Money was tight and the Bank of England was discouraging fresh borrowing. Finally came the run on the country banker, the crowd of note-holders jostling before his counter, the ever dwindling stocks of gold and Bank of England notes, and the racking suspense which lasted until either the gold held out and the corner was turned, or he was forced to put up the shutters.

MODERN ENGLISH BANKING

The crisis of 1825 marked a turning-point, and tolled the death-knell of the small country bank and of the note as the foundation of the banking system. Legislation quickly followed. In 1826 joint-stock banking (with unlimited liability) was permitted outside a radius of 65 miles from London, and at the same time the issue of bank-notes of less than £5 face value was prohibited. In 1833, the monopoly of the Bank of England was breached to the extent that joint-stock banking was permitted within the 65 mile radius, but without the right of issuing notes. This qualification was of minor practical importance, for it was already clear that the note was to be replaced by the cheque, and that deposit as opposed to issue banking could be made a paying business. In 1834, the London and Westminster and London and County Banks were founded, and though cold-shouldered by the London private banking firms, rapidly established themselves, and when they had fought their way into the London Clearing House, as they did at an early date, their position was secure.

Meanwhile the Bank of England was to undergo a series of radical changes, which were to transform it from its old position of being the foremost issue and deposit bank in the country to its present position of being a Central Bank in the modern sense of the word. The crises of 1829, in which the Bank had to borrow from the Banque de France to meet the demands of the public, forced the Government to take action, and there followed Peel's famous Bank Act.

The Bank Act.—This measure divided the Bank of England virtually into two banks—issue and deposit. The sole duty of the issue department was to issue bank-notes, and the fiduciary part of the issue was limited to the original Government debt of £14,000,000. Permission to exceed this limit could only be given by the Prime Minister and the Chancellor of the Exchequer acting conjointly, this forming the famous operation known as "suspending the Bank Act." The issue of notes by private or joint-stock banks was limited to those who already had and exercised the right, and to the average amount outstanding in the first quarter of 1844. If a bank, by reason of coming to London or absorption by another bank, lost its right to issue notes, the Act empowered the Bank of England to increase its fiduciary issue by two-thirds of the lapsed private issue. It may be added, as a matter of historical interest, that the last English country bank lost its right to issue as late as 1920, and that since that year the Bank of England's fiduciary limit has stood at £19,750,000.

The Birth of "Big Five."—Meanwhile, the nuclei of the "Big Five" were growing up. A union of private banks gave birth to Barclays, Birmingham saw the rise of Lloyds and of the Midland, while the National Provincial found its origin at Gloucester. The twin birth of the Westminster, in the shape of the London and County and London and Westminster banks, has already been mentioned. During the 19th century, this growth continued, taking the double form of the absorption of smaller banks, and the opening of new branches. The 20th century amalgamations were

but the culminating point in a process which had been going on for many years before.

The following is a very brief history of the great banking institutions familiarly known as the "Big Five":—

(1) *Barclays Bank, Limited,* was established as a private bank early in the 18th century and became a joint-stock company in 1896 as the result of an amalgamation of twenty private banks. In 1916 it absorbed the United Counties Bank, in 1918 the London Provincial and South-Western Bank (itself an amalgamation of the London and Provincial and London and South-Western Banks), and has since acquired one or two small country banks and also the control of the Union Bank of Manchester. In Scotland, it has acquired the British Linen Bank, while abroad it owns Barclays Bank (France), Barclays Bank S.A.I. (in Italy), and Barclays Bank (Dominion, Colonial and Overseas), which includes the Anglo-Egyptian Bank and the National Bank of South Africa.

(2) *Lloyds Bank, Limited,* was founded in 1765 and became a joint-stock company in 1865. In 1918 it amalgamated with the Capital and Counties Bank, and a year later acquired the West Yorkshire Bank. In Scotland, it owns the National Bank of Scotland, and abroad it controls the Bank of London and South America. Among other absorptions of interest is that of Messrs. Cox and company, the famous army agents. In conjunction with the National Provincial Bank, it owns Lloyds and National Provincial Foreign Bank, operating in France, Belgium and Switzerland.

(3) *Midland Bank, Limited,* was established in 1836, and in 1918 amalgamated with the London Joint-Stock Bank. In Scotland it owns the Clydesdale Bank and the North of Scotland Bank, and in Ireland it owns the Belfast Banking company. It has no overseas branches or subsidiaries.

(4) *National Provincial Bank, Limited,* was established in 1833, and was registered as a limited company in 1880. In 1917 it amalgamated with the Union of London and Smiths Bank, and in 1920 it acquired the control of Messrs. Coutts and company. In the course of its history it has absorbed numerous country banks, the most famous perhaps being Prescotts Bank, itself a union of many west country banks. It has no direct interests in Scotland and Ireland, while its foreign interests are referred to above under Lloyds Bank.

(5) *Westminster Bank, Limited.* The London and Westminster Bank was established as a joint-stock bank in 1834, and the London and County Banking company two years later. Both were registered as limited in 1880, and amalgamated in 1909. Parrs Bank was founded in 1865, and the final union between it and the London County and Westminster took place in 1918. Among well-known country banks now incorporated in the Westminster Bank are Stuckeys of Bristol and the West, Cromptons of Derbyshire, Becketts of Yorkshire and the Nottingham and Nottinghamshire Banking company. In Ireland it owns the Ulster Bank, while its subsidiary, the Westminster Foreign Bank, operates in France and Belgium.

To return to London, Peel's act did not put an end to banking crises. Three times in the 19th century the Bank Act was suspended; in 1847, following the "railway mania"; in 1857, on which occasion alone the Bank had to take advantage of the suspension and issue notes in excess of its fiduciary limit; and in 1866. In this last year, the bank rate was raised to 10%, in an attempt to draw money from the Continent and so to ease the pressure. The attempt proved vain. Continental bankers for some time thought that the "suspension of the Bank Act" meant a suspension of cash payments or a moratorium, and even when convinced to the contrary, roundly said that if a first-class London acceptance sold at a discount rate of 10%, there must be "something wrong somewhere." Paradoxically enough, the Bank of England had to *lower* its rate before it could restore confidence abroad and attract foreign money to London.

It was about this time that the Bank of England began to assume its present functions of a Central Bank. Mr. Walter Leaf, in *Banking,* ascribes this change to the writings of two famous financiers. In 1860, Goschen in his celebrated *Theory of the Foreign Exchanges* shewed how the bank rate could be used to influence the course of the foreign exchanges, the movement of gold to and from the country, and so the contraction or expansion of credit. Thirteen years later, Bagehot convinced the directors of the Bank and the financial world at large of the changed position of the Bank of England. Imperceptibly, the Bank had ceased to be a rival to the deposit banks of the country, and had become the custodian of their balances and the guardian of the nation's credit. Henceforward, the governing factor in its policy had to be, not the earning of profits for its shareholders, but the maintenance of a cash reserve, which though unremunerative to its owner, would be sufficient and more than sufficient to meet the probable demands of the nation.

Meanwhile, legislation was extending the scope of the joint-stock bank, and in accordance with the Bank Act of 1844, each such extension brought about a contraction in the private bank-note issue, and so helped the change-over from issue to deposit banking. In 1858, joint-stock banks were permitted by law to assume limited liability. For a time the permission was mainly of nominal effect, for there was a general belief that the voluntary continuance of unlimited liability added to the prestige and goodwill of a bank. In 1878, this belief was to receive a rude shock. In that year, the City of Glasgow bank failed, and all the stock holders were liable to the depositors to the full extent of their means.

The natural result was that no bank could obtain new capital, and to remedy this a fresh Companies' Act was passed in the following year. Henceforward unlimited liability only attached to bank-notes, which already were a diminishing quantity. It also followed that limited liability became an asset rather than a reproach to the banks, for its adoption rendered it easier for them to raise fresh capital. In point of fact, at the outbreak of the World War most banks were over- rather than under-capitalized.

It is now necessary to leave purely internal banking, and to trace the part played by the banks in the field of foreign trade. Originally, foreign trade was financed by the great Continental Exchange Banks, such as the Bank of Hamburg and Bank of Amsterdam. These were not issue or deposit banks, but primarily money-changers, though an important and growing function was the financing of trading ventures out of the capital of their proprietors. Their lineal descendants in the City of London are the great merchant bankers and accepting houses of to-day.

Until the end of the 18th century, Amsterdam was the great international finance centre, but at that time the Bank of Amsterdam fell upon evil days, while the Napoleonic wars completed the destruction. Many of the big finance houses migrated to London, and since then the famous London houses, such as Rothschild's, Barings and Lazard's, have reigned supreme. For the whole of the next century, the financing of the growing overseas trade was in their hands. Their acceptance gave the hall-mark of respectability to an obscure foreign bill, and rendered it saleable in the London money market. It was mainly their representatives who dealt in foreign currencies "on 'change." A foreign merchant needing a London credit, a foreign Government wishing to float a loan naturally applied to them. The British banks kept outside their business, and frankly admitted they did not understand it. A British bank would discount internal bills for its customers, but would only buy foreign bills through the money market, and these had to be "clean" and carry at least one first-class name.

There were, it is true, two sets of rivals to the Accepting Houses. First came the foreign banks, which opened offices in London, and on the whole received a cordial welcome. Next came the great Eastern "Exchange Banks," and these had the financing of the Far Eastern trade largely in their hands. The London offices of the Dominion Banks also had their full share of financing Empire trade.

One point must be emphasized. The Accepting Houses and Merchant Bankers do not as a rule accept deposits. The money they employ is almost entirely their own.

This was the position in 1914. The private banking house was not dead, but joint-stock banking, with limited liability, was the preponderating element. The Bank of England controlled the

great majority of bank-notes then outstanding, but gold was still diffused throughout the banks and the public at large. Amalgamations had reached the point where the final step could be taken, but numerous independent concerns were still in existence. Finally the banks largely confined their attention to home trade, and, while holders of foreign bills, left the "spade-work" to the foreign banks and London Accepting Houses.

Banks and the War.—The first effect of the outbreak of war in 1914 was an immediate strain upon the resources of the Bank of England, necessitating the suspension of the Bank act, the raising of bank rate to 10%, and the proclamation of a four days' bank holiday. The second was the institution of £1 and 10s. currency notes, which were made legal tender and were issued upon a largely fiduciary basis. This in effect has meant that the Bank act has remained suspended (1928). The third was a general moratorium which lasted for some time, while special arrangements had to be made for the accepting houses, which were prohibited from collecting the sums due to them from belligerents. This was done by providing that their acceptances, as they fell due, should be taken up by the Bank of England and put into "cold storage."

The war history of banking is inseparable from general financial history. The demands of the Government for money overshadowed everything. For patriotic reasons, the Banks had to take up large holdings of war loan, and also finance by over-draft their customers' purchases of stock. Over and above this came the gradual increase in the floating debt and in indirect inflation.

Whether the Government borrowed by issuing Treasury bills or by "ways and means" advances from the Bank of England, the ultimate effect was much the same. The money so raised was disbursed by the Government to its creditors of one kind and another, and was paid by them into their accounts at the different banks. Hence, deposits grew with the floating debt, while in so far as money was raised direct from the Bank of England, the immediate result was an increase in the joint-stock banks' balances at that institution, which form the basis of bank credit. Hence loans to the public and also deposits could be multiplied several times for each such advance by the Bank to the Government. Notwithstanding the intensive production of all kinds of commodities during the war, this multiplication of credit had the inevitable effect upon prices and wages, and when the peak was reached some 18 months after the close of hostilities, wholesale price index numbers stood at about three times their 1913 level.

The war witnessed one or two important changes in the banking world itself. First and foremost comes the final amalgamations, resulting in the appearance of the "big five." Next came the concentration at the Bank of England of the gold formerly in the hands of the banks and the public, who received in exchange bank and currency notes. The German banks disappeared from London, while foreign finance houses began to demand that London bills should carry the name of a British bank. This forced the British banks into what was to them the new fields of foreign bills and foreign trade, and to-day "acceptances" are a prominent item in our bank balance-sheets. Immediately after the war, the "big five" started opening up branches on the continent, and also affiliating with or obtaining control over Dominion and Colonial banks. They had already acquired control over certain famous Scottish and Irish banks, such as the British Linen Bank and the Ulster Bank.

It may be added that the banks to-day form the chief element in the London Foreign Exchange market. The bi-weekly meeting "on 'change" was abandoned in 1921, and dealings in foreign currencies now take place by telephone between the banks, finance houses and similar institutions. Even the bill of exchange no longer possesses its former importance. Many transactions are settled by cable drafts (called "telegraphic transfers" or T.T.) or cheques drawn by a British bank upon its balance with agent in the country concerned. This again is a war and post-war development. The trade depression of 1921 and onwards created a new set of problems for the banks. To begin with they were violently attacked as being the authors of deflation and industrial depression, while all along the real responsibility rested with the Government, who were obtaining huge budget surpluses and applying them to the reduction of the floating debt, thereby reversing the war process of inflation described above. In fact, at the time when these attacks were the most violent, bankers were experiencing extreme difficulty in liquidating the huge mass of their "frozen loans," which was the direct result of the trade slump. Their losses, though unrevealed, must have been enormous, but against these they could set the increase (also unrevealed) in the values of their holdings of Government stock, resulting from the simultaneous improvement in the national credit.

The Gold Standard.—Banking opinion in England was on the whole favourable to the restoration of the gold standard. It is true that the Bank Act was still virtually suspended, or rather ceased to be of practical importance. The nation has learnt to prefer paper to gold, while the power foreign bankers have of drawing gold from the Bank of England gives all the advantages of a full gold standard, and allows the Bank to perform its normal function of regulating discount rates and the foreign exchanges, as defined by Goschen in 1860.

Despite the amalgamations, banking competition in England is even fiercer than before, as is shown by the following official table:

	Number of banking offices.			Number of inhabitants per office.		
	1844.	1906.	1925.	1844.	1906.	1925.
England and Wales .	976	5,547	9,100	16,307	5,885	4,262
Scotland .	368	1,180	1,563	7,120	3,790	3,162
Ireland .	180	777	1,293	45,417	5,738	3,518

It is also admitted by the banks that it takes longer to-day for a new branch to become remunerative than it did before the war.

It is not true that the banks are restricting loans unduly. In Aug. 1927, advances to customers equalled 55% of deposits, whereas 50% is regarded as a normal proportion.

SCOTTISH BANKS

In 1695 the Scottish parliament passed an Act establishing the Bank of Scotland. This, though contemporaneous with the Bank of England, was given wider privileges, for it received the exclusive right to carry on the business of banking for 21 years, and not only had to give no consideration in return, but was expressly forbidden to lend money to the king.

In addition to issuing notes, the Bank of Scotland began at an early date to accept money on deposit and current account, a record of the last-named being found in 1729. Early in that century the Bank, the head office of which was at Edinburgh, made sporadic attempts to found branches in other Scottish burghs, but it was only in 1744 that these proved successful. By this time, the next Scottish bank, called the Royal Bank of Scotland, had established itself, while in 1746, the year after the invasion of the Young Pretender, came the British Linen Company. Henceforward, banking in Scotland was an old-established and highly competitive business.

There is little doubt that Scotland had one great advantage over England in these early years, and that was that there was no law restricting the foundation of joint-stock banks as was the case in England. The result was that whereas all country business in England perforce fell into the hands of numberless small private bankers, of varying capabilities and experience, banking in Scotland remained in fewer but stronger hands. Nor were the public starved of banking facilities, for branches were rapidly established, and in 1844 there was one banking office to every 7,000 people in Scotland as against a ratio of 1: 16,000 in England.

The strength of Scottish banking was proved in the crises of the Napoleonic wars and the following years. Only one failure occurred, and even here the creditors were ultimately paid in full.

The Scottish note issue came within the scope of Peel's act of 1844. A definite limit was laid down, and every note issued above that limit had to be fully covered by gold. The amount of specie thus to be held was to be dependent upon the average amount of

notes issued during the four weeks preceding April 25, 1844. One result of this restriction was that since that date no important bank has been established in Scotland. The reason is that in the 19th century, the right to issue notes was still in Scotland an essential to a successful banking business.

Despite its previous immunity, Scotland did not escape the major crises of 1847 and 1857, while allusion has already been made to the failure of the City of Glasgow Bank in 1878. Progress was in general similar to that made in England, and from 1844 to 1906, the number of banking offices grew from 368 to 1,180. Notes circulated freely in Scotland, but were not legal tender in England, and most British banks made a small charge for changing them.

World War I had similar effects in Scotland as in England. As part of the general measures to relieve the pressure for currency, Scottish bank notes were made legal tender, though this privilege was withdrawn after the conclusion of hostilities. The introduction of currency notes, of course, made its effect felt in Scotland as in England.

After the closing years of the 19th century Scottish and English banks naturally drew closer together. Many of the Scottish banks opened London offices, and on its foundation Scottish banks were admitted to the British Bankers' Association. More important still, the amalgamation movement initiated by the war spread to Scotland, and some of the "big five" have acquired the control of famous Scottish banks. The British Linen bank is now affiliated to Barclays, while the Midland bank has the control of the Clydesdale bank.

IRISH BANKS

The early history of banking in Ireland was marked by legislation even less favourable to the formation of a steady and dependable system than in England, and in 1695 several of the principal merchants in Dublin met together for the purpose of forming a public bank for Ireland on the model of the Bank of England. For many years this proposal met with no favour. It was not till 1783 that the Bank of Ireland was established and commenced its business. The first governor was David La Touche, junior, and two other members of his family were amongst the first board of directors. The bank met with very great success, but the jealousy against rival establishments was extreme. By the Act forming the Bank of Ireland it was enacted that no company or society exceeding six in number, except the Bank of Ireland, should borrow or take up money on their bills or notes payable on demand. In the year 1821 the Act was so far modified as to permit the establishment of banking companies exceeding six in number at a distance of 50m. from Dublin. In 1824, in consequence of the ambiguity of that Act, an Act had to be passed to explain it. It was not till 1845 that the restriction as to the 50m. limit was withdrawn.

The establishment of any other bank but the Bank of Ireland was for a long time hindered by the legislation on the subject. Some of the restrictions were so extraordinary that it will be interesting to refer to three of the more important acts.

1741, 15 Geo. II.—Partnership authorized for the purpose of trade and manufacture; but such partnerships were not to exceed nine in number, nor was the capital stock of such co-partnership to exceed, at any time, the sum of £10,000.

1780–1781, 21 and 22 Geo. III.—"Anonymous Partnership act"—limited liability not to exceed £50,000, but "business of banking or discounters of money" expressly excluded.

1759, 33 Geo. II.—By this act a person while he continued a banker could not make a marriage settlement on a son or daughter, a grandson or granddaughter, so as to be good against his creditors, though for a valuable consideration, and though such creditors were not creditors at the time the grant was made. This act gave power to creditors over all conveyances by bankers affecting real estates; and all dispositions after May 10, 1760, by bankers of real or leasehold interest therein to or for children were made void as against creditors, though for valuable consideration and though not creditors at the time. No banker to issue notes or receipts bearing interest after May 10, 1760.

The number of banks which failed in Ireland in earlier times was extraordinary; thus Sir Robert Peel in his speech of June 9, 1845, on the Bank Act of that year, made a quotation "from the report of the committee of Irish exchanges, which sat in 1804. At that period there were 50 registered banks, but they all failed, and their failures, I know personally, led to the most fearful distress." After the legislation of 1845, however, the business was carried on with equally extraordinary steadiness and success.

The earlier history of banking in Ireland pursued very closely the same process of development as in England. Circulation preceded and fed deposits. The credit which the banks obtained by the ready acceptance of their notes brought customers to their counters, and thus existing system, fortunate in excellent managers, was built up gradually and surely.

Irish banks came in for their full share of the political troubles from 1916–23. Apart from the institution of the frontier between Northern Ireland and the Irish Free State, which created several new problems, many branch banks suffered damage in the disturbance. For all that, progress has been made, and the banks have taken their share in the work of financial reconstruction following the inauguration of the Free State in 1922.

The "big five" have also extended their activities into Ireland. To quote one example, the Westminster Bank acquired the control of the Ulster Bank during the war.

CONTINENTAL BANKING

France.—With the exception of the Banque de France (*q.v.*) modern French banks virtually date from the years following the revolution of 1848. Thus the Comptoir National D'Escompte de Paris was founded in 1848, the Crédit Lyonnais in 1863, and the Société Générale in 1864. These and many other well-established institutions are deposit banks in the ordinary sense of the word, but cheques are in far less use to-day in France than in England, and the bulk of business transactions is settled by bills of exchange which are ultimately paid at the acceptor's house in currency. It is probably true to say that banking accounts are owned by far fewer people in France than in England, and a current examination of a French bank's balance-sheet shows that "bills discounted" outweighs "advances."

Many French banks are far more closely connected with industry than is considered prudent in England. There are a whole number of "banques d'affaires," whose prime purpose is to finance industrial undertakings, even at the sacrifice of that liquidity which should be a banker's chief aim.

Notwithstanding the Franco-Prussian war and the following crisis of 1873, French banking seems to have suffered less shocks in the 19th century than did English banking. The inflation during and after World War I appears not to have involved the banks in any serious difficulty, though it must have occasioned many moments of anxiety.

Germany.—Like French banking, German banking dates from the years succeeding the revolution of 1848. Thus of the four great "D" banks, so called from the initial letters of their names, the Deutsche Bank was founded in 1870, the Discontogesellschaft in 1851, the Dresdner Bank in 1872, and the Darmstadter und Nationalbank in 1853. The establishment of these banks was immediately prior to the union of Germany in 1870 and the era of German commercial prosperity and expansion. This probably accounts for the intimate relations between German banking and industry.

British and American banking practice is to grant loans to industry for temporary purposes, but to refrain from long-term financing or actual participation. Not that banking and trade are entirely divorced, for every British bank has several prominent industrialists upon its board. Yet liquidity is the guiding principle of banking in England.

The German principle is different. Before World War I, German banks habitually had a proportion of their funds invested permanently in definite industrial concerns, and the chief duty of many bank directors was to exercise control, on the part of the bank, over virtually "subsidiary" manufacturing companies,

and to seek out fresh channels in which the bank could employ its funds. This participation in industry had its good and its bad side. It brought a ready flow of capital into industry, but the banks sacrificed a good deal of their liquidity and so ran a greater risk of becoming insolvent.

Nevertheless, the practice worked, and even the war and the collapse of the mark did not destroy the leading German banks. This is not the place to give a detailed history of the inflation period, but one or two incidental results may properly be mentioned.

The inflation meant an enormous increase in the "paper" assets and liabilities of the banks, but a marked decrease in their "real" assets, measured in gold values. Dr. Schacht in his book *The Stabilization of the Mark* gives the following table, which incidentally shews the relative pre-war importance of ordinary banks, savings banks and co-operative banks, each of which played their definite part in the economic life of the country.

"Real" Assets of German Banks, Measured in Gold

	1913.	1923 (end).
	Milliards of marks.	Milliards of marks.
Saving Banks	19·7	0·1
Banks	13·4	2·7
Co-operative Banks	4·6	0·4
Insurance Institutions	6·3	1·2
Total	44·0	4·4

The fact that the German banks were active participants in industry possibly saved them severe loss, for part of their assets were represented by factories and commodities which preserved them "real" value at a time when Government and other securities fell in value to vanishing point. The above table bears out this suggestion.

The inflation also caused an enormous increase in the rapidity of circulation of a currency which nobody dared to keep. This meant far more work for the banks, and a consequent increase in staffs. So long as they were measured in paper marks, profits easily kept pace with expenses, but when stabilization came, and the nation was faced with "real" values, the banks like everyone else found that the country had been stripped of liquid cash and working capital. Staffs had to be cut down, expenses reduced, and most important of all, credits obtained from abroad to enable the banks to provide industry with liquid funds. Dr. Schacht's book gives an illuminating picture of the situation that then obtained.

The ratio between the old paper mark and the new gold mark was fixed at the astronomical figure of one billion to one. The banks recast their swollen balance-sheets in this proportion, and carried out all the superhuman readjustments of capital, expenses and so on, which the emergency demanded. Their extent is shewn in the following table, representing the Deutsche Bank, which is in itself sufficiently eloquent:

	1913.	1923.	1924.
	Mks. million (gold).	Mks. (paper).	Mks. million (gold).
Liabilities			
Paid-up Capital	200	$1{,}500\times10^{6}$	150
Reserve Fund	112	600×10^{12}	50
Deposits	1,580	349×10^{18}	864
Acceptances	301	550×10^{15}	6
Miscellaneous	17	1×10^{15}	2
Profits	36	..	19
Assets			
Cash	189	165×10^{18}	294
Investments	161	3×10^{18}	15
Shares in Allied Banks	136	2×10^{18}	33
Bills Receivable	639	11×10^{18}	229
Stock Exchange Loans	233	..	..
Loans and Advances	855	169×10^{18}	473
Premises	31	..	46

As regards recovery since 1924, fair progress has been made, and thanks to temporary credits and long term loans from abroad, the stringency of credit is becoming abated. To quote but two examples, the banks' bill holding rose from 229 millions in 1924 to 406 in 1926, and loans from 473 millions to 1,098. As regards the further progress of German banking, this must be left to the future.

SAVINGS BANKS

These were first suggested by Daniel Defoe in 1697, but nearly a century was to elapse before they were actually established. The first was founded in Brunswick in 1765, and others rapidly followed upon the Continent. In 1799, following a suggestion of Jeremy Bentham, the Rev. Joseph Smith founded the first British Savings Bank at Wendover. The movement once started, spread in England as on the Continent and by 1817 had become sufficiently important to demand legislation.

The guiding principle laid down in the Acts of that year was that the local management of each bank should be in the hands of trustees who gave their services gratuitously, but that these should make periodical returns to the Government and also invest all the bank's funds in Government stock. Depositors were to receive interest at 3d. per day or £4 11s. 3d.% per annum. This was above the current yield on Government stock, and was designed to act as a bonus upon thrift. To minimize the losses to the Government, who had to bear the difference, and also to prevent abuse of the principle, a limit was placed to the total amount an individual could deposit. Even so, the Government rapidly found that they had shouldered a bigger burden than they could bear, and successive reductions were made in the rate of interest. Finally in 1888, the rate allowable to bank trustees was fixed at 3%, and that to depositors at $2\frac{3}{4}$%, the margin representing the requirements of the trustees for management and other necessary expenses.

In 1863, which was possibly the hey-day of the independent savings bank, there were 622 of such institutions in existence. In that year, the Post Office entered the field, and inexorably encroached upon the domain of the private bank. By 1889 the number of banks had fallen to 380, and by 1905 to 224. The Post Office commanded a greater degree of public confidence, and provided more convenient facilities, while the decline of the private bank was hastened by such events as the break-up of the Cardiff Bank in 1886. The famous "penny banks," such as the Yorkshire Penny Bank and the National Penny Bank, held their own, but in general forces were at work to reduce the number of private banks.

Even as late as in the 'nineties, the customer of a joint-stock bank was expected to maintain a balance of some £200. By 1925, banking accounts were no longer the prerogative of the rich, but belonged to the middle-classes as well. By 1960, they may well be in universal use. In 1927 we find the "big five" prepared to receive sums as low as £1 on deposit; one such bank has supplemented this with a system of "home-safes."

From 1900, the private savings bank developed weakness within. By its rules, it was bound to invest its customers' funds in gilt-edged stock, mainly consols. When the pre-war slump in consols occurred, the defect of this rule appeared, and the fall in prices brought many savings banks face to face with difficulty, and in some cases led to enforced liquidation. Directors and trustees could not be blamed for what was only carrying out the rules, but this did not minimize the seriousness of the loss.

Finally, the war inflicted on all savings banks, including the Post Office, a new and formidable competitor. This was the War (afterwards National) Savings Certificates. Even at its present price of 16s. per £1 certificate, it offers a yield greater than any savings bank can afford, while it is readily encashed, and in every way has a greater popular appeal than the Trustee savings bank. The latter's usefulness is far from extinct and in fact has made progress during post-war years, but it no longer has the field to itself.

A fuller account of the developments which have taken place in the savings bank movement since the World War is given in the article Savings Banks (*q.v.*). (N. E. C.)

UNITED STATES

Banking in most countries is conducted by a small number of large banks operating numerous branches, and failures are infrequent. In the United States, in striking contrast, banking is conducted (1945) by more than 14,000 banks; charters have been freely granted to new banks and many failures have been an invariable incident of successive periods of business depression. In spite of evident drawbacks, this American system of independent unit banking, as it is commonly styled, has persisted, supported in general by public opinion and sheltered in most of the states by legislation which either narrowly restricts or entirely prohibits the establishment of branches. The functioning of this decentralized system of banking organization has given rise to many special problems, and it is with the handling of these problems that American banking history is in large measure concerned.

Throughout almost the entire course of the history of banking in the United States two conflicting tendencies or objectives are manifest. The maintenance of safety and the development of a smoothly working credit mechanism have been beset with difficulties, owing to the potent influence in the management of the banks of desire to stimulate and further to the utmost the rapid exploitation of the country. In a purely local bank the wishes of borrowers are apt to overshadow the interests of the noteholder and the depositor, particularly in communities which are ambitious for rapid development.

First Bank of the United States.—For some two decades after the establishment of the first bank in the country, the Bank of North America, in 1782, the expansion of banking facilities was very gradual and the business seems to have been conducted along safe and conservative lines. Special charters by legislative enactment were required and were neither sought by numerous applicants nor freely granted, since, as during the entire colonial period, the economic development of the country was still proceeding slowly with little in the situation of affairs to stimulate enterprise and excite speculation. Sound banking practice was also furthered by the establishment in 1792 of the First Bank of the United States under a Federal charter. This nation-wide institution, with head office in Philadelphia and eight branches extending from Boston to New Orleans and serving the Government as its fiscal agent, was in a position to exert a predominating influence over other banks and the steady, conservative policies of its management contributed much toward the maintenance of proper credit restraint.

But, from about the beginning of the 19th century, the tempo of American economic life became more and more rapid. Rich opportunities for the development of natural resources, manufactures and transportation furnished a demand for capital which exceeded the available supply, and any means that seemed to meet the deficiency found hearty support in wide circles, and, at times, throughout entire sections of the country. Among these substitutes for actual capital, bank-credit dispensed by a multiplicity of banks was freely and continuously employed. Special charters were granted more readily and in one State after another general laws were passed permitting the organization of banks under conditions that were commonly by no means of an exacting character.

Second Bank of the United States.—Between 1800 and 1811 the number of banks increased from 28 to 88 and the ill feeling excited by the steady pressure exerted upon them by the First Bank of the United States was largely responsible for the refusal of Congress to renew its charter in 1812. Four years later, however, a similar institution, the Second Bank of the United States, was established. This reversal of policy was a direct outcome of the inability of the purely local State banks to handle effectively the fiscal operations of the Government during the War of 1812. But, after twenty years of generally effective banking service, the Second Bank of the United States met the fate of its predecessor and for similar reasons. By 1836 the number of State banks had increased to 713 but their operations were restrained by the practice of presenting their notes for redemption, which was regularly followed by the Bank of the United States.

Upon the closing of the Bank of the United States, the Federal Government set up the so-called independent Treasury system, handling its own receipts and payments without utilizing banking facilities and, indeed, refusing to receive the notes issued by the State banks, insisting that payment be made in specie. Under this system the Government withdrew money from use whenever its receipts for any reason exceeded its current expenditures. During years of peace the operations of the independent Treasury were a matter of minor consequence, but serious difficulties were immediately experienced upon the outbreak of the Civil War. The banks of the country patriotically made liberal advances to the Government which felt compelled at once to withdraw the funds from the subscribing banks. A monetary crisis was inevitable. Specie payments were suspended and soon thereafter the Government resorted to successive issues of inconvertible and depreciated paper money. It is by no means improbable that the Civil War could have been financed on a gold basis if the Second Bank of the United States had then been in operation. It was impossible to do so without that co-ordinating agency.

From 1837 until the establishment of the national banking system in 1863, banking in the United States was handled exclusively by banks organized under the laws of the various States, and the number of these institutions had increased to more than 1,600 at the time of the outbreak of the Civil War in 1861. Experience with the working of these banks disclosed three defects of major consequence—the presence of many weak and badly managed banks, excessive credit expansion during periods of business activity, and, finally, inability to cope with situations of severe financial strain manifested in the suspension of specie payments and the general dislocation of the credit mechanism.

Although the use of cheques was steadily becoming more general, bank-notes, which all banks were permitted to issue, were still the principal means of extending bank credit. When issued by hundreds of banks scattered over a wide territory, bank-notes lend themselves far more readily to unwise use than deposit credit, against which cheques are drawn, because the note is less certain than the cheque to be speedily presented for payment. The wide diffusion of losses among the scattered holders of the notes of failed banks and the impossibility of intelligently discriminating between the strong and the weak banks brought home to the public the importance of securing greater safety in banking. With this objective in view, one State after another developed elaborate banking codes covering virtually every banking activity and subjected the banks to Government supervision and examination. These codes included provisions relating to the amount and payment of capital, restrictions on loans, the maintenance of required reserves, and, above all, a wide diversity of arrangements designed to provide special security for the bank-note. In addition to the limitation of note issue to the capital of the several banks, the safeguard most generally adopted by the States was the requirement of the deposit of approved securities of sufficient value presumably to protect the outstanding notes of failed banks.

Banking Act of 1863.—The passage of the National Banking Act in 1863 made no fundamental change in the situation. The various provisions of this act were in some respects more exacting than those to be found in most, if not all, of the States, but they were of the same general character. The most certain gain was in the matter of currency. In 1865 a prohibitive tax of 10% was imposed upon the note issues of State banks and thereafter the country enjoyed in the note issue of the national banks a currency which possessed the advantages of uniformity and absolute safety, since each national bank was authorized to issue notes only to the amount of its capital, and these notes were secured by the depositing of U.S. Government bonds taken at 90% of par (after 1900, at par). But, like the issues which it superseded, the national bank-note lacked one desirable quality—elasticity. The amount outstanding tended to fluctuate with the price of Government bonds rather than in response to varying requirements of the community for currency.

The importance still attached to note issue and, even more, the high yield to be secured from Government bonds induced most of the State banks to become national banks soon after the system was established. But, within less than 20 years, the organization of banking institutions under State laws had become once more





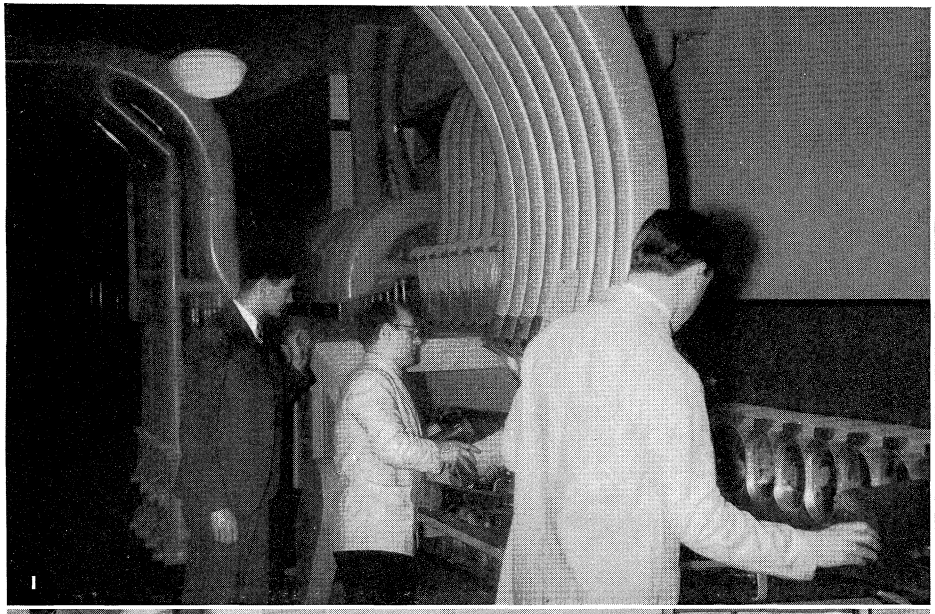




BY COURTESY OF (1, 3) CONTINENTAL ILLINOIS NATIONAL BANK AND TRUST COMPANY OF CHICAGO, (2, 4) THE CHASE NATIONAL BANK, NEW YORK CITY

DEPARTMENTS OF A BANK

1. Tellers' cages in a savings department. The amount of deposit, interest or withdrawal is printed in each depositor's passbook
2. Check department, in which checks drawn on the bank are listed on adding machines, proved and cancelled
3. Administrative division of a trust department
4. Coin-wrapping machine which counts and wraps U.S. coins of all denominations









BY COURTESY OF (1) THE NATIONAL CITY BANK OF NEW YORK, (2, 3) THE CHASE NATIONAL BANK, NEW YORK CITY, (4) CONTINENTAL ILLINOIS NATIONAL BANK AND TRUST COMPANY OF CHICAGO

SPECIALIZED DEPARTMENTS OF A BANK

1. Pneumatic tube room for the swift transit of interoffice memoranda
2. Securities department, the personnel of which handles the securities of customers for whom the bank acts as custodian or in a fiduciary capacity
3. Foreign exchange trading table. In normal times, such tables have numerous direct connections with foreign exchange brokers, stock exchange houses, commercial corporations and transmitting rooms of radio and cable companies
4. The library of a large bank

attractive. The requirements of State laws with regard to the minimum of capital, to loans (notably those secured by real estate) and as to required reserves, were less exacting and, finally, State laws permitted chartered institutions, known as trust companies, to undertake fiduciary functions of many kinds in addition to regular banking operations, a field of business that was not open to national banks. In 1870 there were but 325 State banks as against 1,612 in the national system, but, by 1924, the number of State banks and trust companies had increased to more than 19,000, and there were 8,085 national banks in operation. Within the next 15 years, however, the relative attractiveness of federal and state charters had approached more nearly to equality, partly through the strengthening of state laws, and in part through a general widening of the powers enjoyed by the national banks.

Returning now to the period following the closing of the Second Bank of the United States in 1836, it is noteworthy that for more than 70 years thereafter all efforts to improve the banking system of the country were concentrated upon measures designed to strengthen the individual bank. But, even had these efforts been more completely successful in maintaining all banks in a solvent condition, that alone would not have provided the country with a satisfactory banking system. There is at all times a close interrelation between banks through the huge mass of cheques and other items in process of collection. If regular settlements between banks are delayed, or the possibility of their continuance is questioned, the machinery for making payments instantly becomes dislocated and trade is seriously obstructed. Again, the payment of bank loans at any time depends in large measure upon the ability to secure anticipated accommodation from banks by those who are indebted in the ordinary course of business to present borrowers. In the United States, as elsewhere, repeated experience has clearly shown that in the absence of some co-ordinating agency banks in periods of financial strain are prone to adopt policies which are almost certain to bring about the dislocation of the payment machinery, and also affect unfavourably the ability of borrowers to liquidate their loans. Such was American experience in 1837 and in 1857 before, and in 1873, 1893 and 1907 after the establishment of the national banking system. In each instance the resources of all of the banks were fully employed before the outbreak of the crisis and each bank endeavoured to strengthen itself by an immediate reduction of loans and the husbanding of its reserve of cash. Limited co-operative arrangements were indeed employed during each crisis after that of 1857, but these arrangements did not extend beyond the groups of banks associated in the clearing house of particular cities. In all of these instances, payments between banks in different sections of the country were interrupted and the business community was subjected to unnecessary loss as a consequence of the frantic and largely unavailing efforts of the banks to contract loans in wholesale fashion.

Federal Reserve Banks.—The need for radical change in the banking organization of the country that was disclosed in successive crises was not clearly recognized until after the crisis of 1907. The attention of bankers as well as of the public had previously been absorbed by the more urgent needs for monetary reform—after 1873 the resumption of specie payments, and after 1893 the repeal of the Silver Purchase law (secured at once)—and the establishment of the gold standard upon a firm basis which was finally accomplished with the passage of the Currency Act of 1900. Difficulties due to monetary causes were, however, entirely absent in the case of the crisis of 1907 and, consequently, the unsatisfactory state of the banking machinery and practice of the country at length became evident. Experience elsewhere clearly indicated that a central banking organization, if not the sole, was at least the remedy most certain to prove effective. Many other countries had already developed an effective agency of banking co-ordination in single banks commonly known as central banks. In the United States the proposal to follow the existing practice was urged, but finally in 1913 a modified form of decentralized organization was adopted under which 12 Federal Reserve banks, virtually central banks, were established, each operated by its own officers but subject to general supervision by the Federal Reserve Board in Washington. These banks, like central banks elsewhere, share responsibility for the maintenance of the monetary standard and for the uninterrupted functioning of the credit machinery of the country. In order to perform these functions, the Reserve banks have been endowed with large resources and are authorized to issue bank-notes under conditions which make them an instrument of credit. Unlike the ordinary commercial banks, the Reserve banks do not endeavour fully to employ their resources at all times. On the contrary, they hold large lending power in leash for use in emergencies. Consequently, there is less danger that there will be resort to the policy of hasty loan contraction. Again, settlements are now made on the books of the Reserve banks where a large proportion of the commercial banks maintain balances, and this practice coupled with ability to borrow from the Reserve banks lessens the temptation for deferring payments by any solvent bank. *See* FEDERAL RESERVE SYSTEM.

Thanks to the improvements in the banking system secured through the establishment of the Federal Reserve banks, the financial operations incident to World War I involved no such dislocation as had occurred at an early stage in the Civil War; but it soon became evident that the American bank system was still seriously defective in the vital matter of solvency of large numbers of the commercial banks of the country.

The Reserve banks had no control over the conditions under which new banks might be organized, and by 1920 the number of banks had increased to nearly 30,000. Moreover, the Reserve Banks were unable to exert an effective influence on the managerial policies of the banks—even of those that were members of the system (all national banks and such state banks as elected to become members) to say nothing of the majority of State banks that remained outside the system.

Between 1921 and 1929, 5,714 banks, with deposits of $1,600,000,000, failed. Most of these banks were of small size, situated in agricultural sections of the country, and their failure largely reflected the decline in agricultural prices which speedily followed the return of peace. With the more general depression that began in the autumn of 1929, failures became numerous among urban banks. Between January, 1930, and March, 1933, 5,522 banks, with deposits of $3,400,000,000 failed. These numerous and widespread failures inevitably weakened general confidence in the banks. Hoarding of currency and gold became rife, together with feverish transfers of funds to banks that still enjoyed some measure of public confidence.

In the early months of 1933, payments were suspended by all banks in one locality after another, and finally on March 4 of that year the Federal Government declared a banking holiday, closing all banks for the time being. A fortnight later all banks that were deemed to be reasonably solvent, some 14,000 in number, were reopened under a virtual governmental guaranty that they were in a reasonably sound condition. Later in the year a system of deposit insurance was established which, in its final form as adopted in 1935, provided for the insurance of all deposit accounts up to $5,000. Very nearly all the banks of the country became insured, paying annual assessments of one-twelfth of one per cent. of gross deposits to the Federal Deposit Insurance corporation, an agency of the federal government.

At the same time much additional legislation designed to strengthen the banking system was enacted. The payment of interest on demand deposits was prohibited, and the reserve board was given power to change reserves of member banks within a range of 100% of above existing statutory requirements. Banks were excluded from the field of investment banking with the exception of dealings in federal, state and municipal issues, and in the case of long term mortgage loans amortization was required. And, further, in order to restrain the excessive use of credit for the purchase or carrying of securities, the reserve board was empowered to establish and vary margin requirements on loans by brokers and other security dealers.

During the years immediately following the reopening of the banks in 1933 there were few bank failures and not many new banks were chartered. In the absence of a widespread demand for

credit, these years were marked by a high record of safety in the conduct of the business of banking. In the United States as elsewhere, the financing of World War II brought about an unprecedented change in the position of the banks. During the five-year period from 1939, bank deposits more than doubled in amount, an increase that was entirely due to purchases of government securities by the banks. From less than one-fifth in 1939, government securities had become more than two-thirds of the earning assets of the banks.

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BANKS, SAVINGS: *see* SAVINGS BANKS.

BANKSIA, an Australian genus of shrubs and trees (family Proteaceae), with leathery leaves, often deeply cut, and handsome, bracted, spikes of flowers. It is named after Sir Joseph Banks (*q.v.*). The plants are chiefly evergreen greenhouse shrubs but grown outdoors in California.

BANKS OF ISSUE: *see* CENTRAL BANK.

BANKURA, a town and district of British India, within the Burdwan division of Bengal. Pop. (1941) 46,617. The district has an area of 2,646 sq.mi., and in 1941 its population was 1,289,640. Bankura forms a connecting link between the delta of the Ganges on the east and the plateau of Chota Nagpur on the west. Two hills, Susinia and Biharinath, which are outliers of the plateau, rise to a height of 1,442 and 1,469 ft. above sea level. Along its eastern boundary adjoining Burdwan district the country is flat and alluvial. To the west, however, the surface gradually rises into long undulating tracts; rice lands and swamps give way to jungle or forest trees. The Raniganj coal field extends to a narrow strip along the river Damodar, and coal is worked in a few mines. Laterite, which is used for road metalling and railway ballast, is quarried extensively. Shellac is produced and silk and tussur are woven. A branch of the Bengal-Nagpur railway passes through the district, and a light railway, the Bankura-Damodar river railway, runs from Bankura town through Indas to Rainagar. The district is exposed to drought and also to destructive floods. It suffered in the famines of 1866, 1874–75 and 1896–97, and famine had again to be declared in 1915–16. The subdivisional town of Vishnupur (pop. 19,696) was formerly the capital of a small principality under the rajahs of Vishnupur. The temples in the town, which are memorials of their power and piety, represent the most complete set of specimens of the Bengali style of temple architecture.

BANN, the largest river in Northern Ireland. Rising in the Mourne mountains in the south of Co. Down it runs northwest to Lough Neagh (*q.v.*), which it drains north-northwest to an estuary at Coleraine, forming Lough Beg immediately below the larger lough. The length of its valley is about 90 mi. The total drainage area of the system is about 2,300 sq.mi., extending westward to Co. Fermanagh, and including parts of the Counties Down and Antrim, Armagh and Monaghan, Tyrone and Londonderry. The river has valuable salmon fisheries. Above Lough Neagh it is known as the Upper Bann and below as the Lower Bann.

BANNATYNE, GEORGE (1545–?1608), collector of Scottish poems, was a native of Newtyle, Forfarshire. He became an Edinburgh merchant and was admitted a burgess in 1587. Some years earlier, in 1568, when the "pest" raged in the capital, he retired to his native county and amused himself by writing out copies of poems by 15th and early 16th century Scots poets. His work extended to 800 folio pages, divided into five parts. The ms. descended to his only daughter Janet, and later to her husband's family, the Foulises of Woodhall and Ravelston, near Edinburgh. From them it passed to the Advocates' Library (National Library of Scotland). This ms., known as the "Bannatyne Manuscript," constitutes with the "Asloan" and "Maitland Folio" mss. the chief repository of Middle Scots poetry, especially for the texts of the greater poets Henryson, Dunbar, Lyndsay and Alexander Scott. Portions of it were reprinted (with modifications) by Allan Ramsay in his *Ever Green* (1724), and later, and more correctly, by Lord Hailes in his *Ancient Scottish Poems* (1770). The entire text was issued by the Hunterian club (1873–1902). The name of Bannatyne is perpetuated in the Bannatyne club (founded 1823), devoted to the publication of historical and literary material from Scottish sources.

See the 33rd publication of the club (1829), *Memorials of George Bannatyne* (1545–1608), with a memoir by Sir Walter Scott and an account of the ms. by David Laing; also Gregory Smith, *Specimens of Middle Scots* (1902).

BANNERET, a noble with the right to lead his vassals under his own banner. Ultimately bannerets obtained a place between barons and knights bachelor, which has given rise to the idea that they are the origin of King James I's order of baronets. Selden, indeed, points out that "the old stories" often have *baronetti* for *bannereti,* but he is careful to say that banneret "hath no relation to this later title." The title of knight banneret, with the right to display the private banner, came to be granted for distinguished service in the field.

"No knight banneret," says Selden, of the English custom, "can be created but in the field, and that, when either the king is present, or at least his royal standard is displayed. But the creation is almost the self-same with that in the old French ceremonies by the solemn delivery of a banner charged with the arms of him that is to be created, and the cutting of the end of the pennon or streamer to make it a square or into the shape of a banner in case that he which is to be created had in the field his arms on a streamer before the creation." The creation of bannerets is traceable, according to Selden, to the time of Edward I.

BIBLIOGRAPHY.—*See* Selden, *Titles of Honour* (3rd ed., London, 1672), p. 656; Du Cange, *Glossarium* (Niort, 1883), *s.v.* "Bannereti."

BANNERS, FEAST OF, a Japanese festival in honour of male children, held on May 5 (Jap. *Nobori-no-Sekku*). Every householder who has sons fastens a bamboo pole over his door and hangs from it gaily coloured paper fishes, one for each of his boys. These fishes are made to represent carp, which are in Japanese folklore symbolical of health and longevity. The day is recognized as a national holiday.

BANNISTER, CHARLES (1738–1804), English actor and singer, was born in Gloucestershire, England, made his first London appearance in 1762 as Will in *The Orators* at the Haymarket. Bannister was a singer as well as an actor, and Garrick engaged him for Drury Lane. He died Oct. 26, 1804.

His son JOHN BANNISTER (1760–1836), born at Deptford on May 12, 1760, first studied painting, but soon took to the stage. His first formal appearance was at the Haymarket in 1778 as Dick in *The Apprentice.* The same year at Drury Lane he played in James Miller's version of Voltaire's *Mahomet* the part of Zaphna. Bannister was the best low comedian of his day. As manager of Drury Lane (1802) he was no less successful. He retired in 1815 and died on Nov. 7, 1836.

See Adolphus's *Memoirs of John Bannister* (1838).

BANNOCKBURN, a town of Stirlingshire, Scotland. Pop. (1931) 4,522. It is on the "burn" from which its name is derived, the Bannock (Gaelic, *ban oc,* "white, shining stream"), an affluent of the Forth. It is 2¼ mi. S.S.E. of Stirling by the L.M.S.R., and has woollen manufactures (chiefly tweeds, carpets and tartans) though at the beginning of the 19th century it was only a village. The Bore Stone, in which Bruce planted his standard before the battle in which he defeated Edward II is preserved by an iron grating. Bannockburn house was Prince Charles Ed-

ward's headquarters in Jan. 1746 before the fight of Falkirk.

The famous battle of Bannockburn (June 24, 1314) was fought for the relief of Stirling castle, the principal strategic key to Scotland, which was besieged by the Scottish forces under Robert Bruce. The English governor of Stirling had promised that, if he were not relieved by that date, he would surrender the castle, and Edward II hastily collected an army in the northern and midland counties of England. Bruce made no attempt to defend the border, and selected a defensive position first in Tor Wood on the Roman road about 8 mi. south of Stirling. For the main battle, however, he had selected a site on the Roman road nearer Stirling. On the 23rd the van of Edward's army, which heavily outnumbered the Scots (perhaps about 21,500 to 6,000), appeared before Tor Wood and skirmishing ensued. Gloucester, attempting to press Bruce, who held the road through the woods, was unhorsed. Henry de Bohun, in scouring the woods, got ahead of his men and Bruce hastened to cut off his retreat. Bohun rode at him, but missed, and was cut down by Bruce's battle-ax as he passed. Another English detachment, thinking to outflank the Scots, moved round lower ground and fields to the west of the Scottish position; but they were watched from the woods and, when they had lost touch with their supports, were taken from the rear. Meanwhile, Bruce was making an orderly retreat and fell back behind the Bannock burn, pitching his standard at the Bore Stone, the highest point of a ridge on which he established his centre. Before him was the valley of the stream and to his right and left were decidedly steep slopes. The English encamped opposite the Scots on the other side of the burn on somewhat swampy ground some distance above the village of Bannockburn. Early on St. John's day the Scottish army took up its assigned positions. Three corps of pikemen in solid masses formed the first line, though the two wings were thrown forward; and Bruce had with him in reserve another corps of pikemen and a small force of light cavalry under Sir Robert Keith, the marischal of Scotland. Bruce also covered his front with a series of pits 3 ft. deep, close together and covered by turf laid on hurdles. On the English side archers led the way, followed by the cavalry, formed in "battles," arranged in three lines, with the unwieldy masses of foot behind. Ignoring the lesson of Falkirk (*q.v.*), the mounted men rode up the slope, only to tumble into the pits and then be met by a wall of pikes; and it would seem that the attack was precipitated before the English dispositions were complete. It failed to make any gap in the line of defense, and the battle became a melee, the Scots, with better fortune than at Falkirk and later at Flodden (*q.v.*), presenting always an impenetrable hedge of spears, the English, too stubborn to draw off, constantly trying in vain to break it down. So great was the press that the "battles" of the second line which followed the first were unable to reach the front and stood on the slope, powerless to take part in the struggle on the crest. The advance of the third English line only made matters worse, and the sole attempt to deploy the archers was crushed with great slaughter by the charge of Keith's mounted men. Bruce threw his infantry reserve into the battle on a flank, the arrows of the English archers wounded the men-at-arms of their own side, and the remnants of the leading line were tired and disheartened when the final impetus to their rout was given by the historic charge of the "gillies," some thousands of Scottish camp-followers who had been watching from the heights. They charged down the hill, blowing horns, waving such weapons as they possessed, and holding aloft improvised banners. Their cries of "Slay, slay!" seemed to the wearied English to betoken the advance of a great reserve, and in a few minutes the whole English army broke and fled. Many perished in the burn, and the demoralized fugitives were hunted by the peasantry until they recrossed the English border. The losses among the English chivalry were enormous, but on the Scottish side only two knights fell. The fundamental lesson of the battle (the folly of launching a mounted attack against unbroken pikemen) was turned to account at Dupplin (1332) and Halidon Hill (1333), and led in turn to the repeated victories of the Hundred Years' War (*q.v.*), wherein the English archers disorganized the enemy before any decisive stroke was attempted.

See Barbour, *Bruce* (W. M. Mackenzie's ed., 1909); J. E. Shearer, *Fact and Fiction in the Story of Bannockburn* (1909); Oman, *History of the Art of War in the Middle Ages* (1924), vol. ii, 24–100. J. H. Round, "Bannockburn," in *Commune of London* (1899); Sir James Ramsay, *The Genesis of Lancaster* (1913).

BANNS OF MARRIAGE, the public legal notice of an impending marriage. The church in earliest days was forewarned of marriages (Tertullian, *Ad Uxorem, De Pudicitia,* c.4). The first canonical enactment on the subject in the English Church is that contained in the 11th canon of the synod of Westminster in London (A.D. 1200), which orders that "no marriage shall be contracted without banns thrice published in the church, unless by special authority of the bishop." It is, however, believed that the practice was in France as old as the 9th century, and certainly Odo, bishop of Paris, ordered it in 1176. By the Lateran Council of 1215 the publication of banns was made compulsory on all Christendom. In early times it was usual for the priest to betroth the pair formally in the name of the Blessed Trinity; and sometimes the banns were published at vespers, sometimes during mass. In Great Britain, under the canon law and by statute, banns are the normal preliminary to marriage; but a marriage may also be solemnized without the publication of banns, by obtaining a licence or a registrar's certificate. In the United States there is no statutory requirement; and the practice of banns (though general in the colonial period) is practically confined to the Roman Catholics. (*See* BETROTHAL and MARRIAGE.)

BANNU, a town and district of British India, in the Derajat division of the North-West Frontier Province. The town (also called Edwardesabad and Dhulipnagar) lies in the N.W. corner of the district, in the valley of the Kurram river. Pop. (1941) 33,210. The district, which consists only of the Bannu and Marwat tahsils since the constitution of the North-West Frontier Province in 1901, contains an area of 1,695 sq.mi., lying north of the Indus. The cis-Indus portions of Bannu and Dera Ismail Khan now comprise the Punjab district of Mianwali. In addition to the Indus the other streams flowing through the district are the Kurram (which falls into the Indus) and its tributary, the Gambila. The valley of Bannu proper, stretching to the foot of the frontier hills, forms an irregular oval, measuring 60 mi. from north to south and about 40 mi. from east to west. In 1941 the population was 295,930, the great majority Mohammedans. The principal tribes inhabiting the district are: (1) Waziri Pathans, recent immigrants from the hills, for the most part peaceable and good cultivators; (2) Marwats, a Pathan race, inhabiting the lower and more sandy portions of the Bannu valley; (3) Bannuchis, a mongrel Afghan tribe of bad physique. After the annexation of the Punjab the valley was administered by Herbert Edwardes so thoroughly that it became a source of strength instead of weakness during the mutiny, but it is always subject to incursion from the Waziri tribes in the Tochi valley and the neighbouring hills.

Salt is quarried on government account at Kalabagh and alum is largely obtained in the same neighbourhood. The chief export is wheat.

A military motor road leads from Bannu town towards Dera Ismail Khan, and another up the Tochi valley and up to the new cantonment of Razmak in Waziristan. The Indus, which is nowhere bridged within the district, is navigable for native boats throughout its course of 76 mi. The chief frontier tribes on the border are the Waziris, Battannis and Dawaris (*see* these names). A 2 ft. 6 in. railway runs from Kalabagh to Bannu, with a branch through the Pezu pass to Tank.

BANQUE DE FRANCE. The Banque de France was founded in 1800 by Napoleon, who reorganized it in 1806 because, as he phrased it, "I must be master in all that concerns me, and above all with respect to the Bank. . . ." The lawmakers attempted to reconcile public and private interests by establishing a general council as the chief agency of the bank. The government was represented by a governor and two deputy governors, appointed by the chief of state; private interests were represented by 15 regents and 3 censors, elected at the annual general assembly by the 200 French citizens who held the largest number of shares of bank stock. Though the structure of the general coun-

cil was not changed for 130 years thereafter, the balance of power within it varied from government domination at the time of Napoleon to private dictation in 1935.

The political power of the "200 families" became a major political issue; and in 1936, after the overwhelming victory of the Popular Front in the French elections, the bank was completely reorganized to increase the power of the government and of various public economic and financial bodies. A second reorganization was announced in Nov. 1940 and another in Nov. 1944.

Under the ordinance adopted by the council of ministers in Nov. 1944, the governor and deputy governors remained the chief executive officers; 14 councillors administered the bank, and 4 censors supervised or audited its operations. The ordinance provided that two councillors be elected by the shareholders and one by the staff; that six be designated, in agreement with the minister of finance, by ministers representing various branches of the national economy, that a seventh represent the combined interests of these ministries; and finally, that four be included by right of office as heads of national financial institutions. Two censors are elected by the shareholders and two are appointed by the secretary of state for finance.

Objectives.—The Banque de France is the central bank of the French banking system and banker to the government as well as to many other institutions and individuals. As central banker its primary objective during most of its history was to maintain convertibility of its notes into coin or bullion and within the limits set by convertibility to make credit more generally available at low and stable rates of interest. It did not devise a positive credit policy to exert continuous influence on the general level of business activity before 1936.

As banker to the government it has come—though at times unwillingly—to the financial aid of the government in great national emergencies such as the costly wars of Napoleon, the revolutions of 1830 and 1848, the Franco-Prussian War, payment of the Prussian indemnity of 1871, and World Wars I and II. Among technical banking services performed for the government have been the marketing of government securities, handling redemptions and periodic interest payments on such securities, and maintaining and servicing the deposit account of the treasury.

As banker to the public it receives deposits and makes payments from deposit accounts, discounts bills, makes loans against specified collateral, collects bills and checks, and provides safekeeping facilities. In 1938 it operated 660 offices throughout the country.

One-fifth of the bills discounted in 1935 were for amounts of 5 to 100 francs and three-fourths were for amounts not exceeding 1,000 francs.

Restrictions.—Originally, the Banque de France was authorized to discount 60-day bills, to accept deposits, and to issue notes in such amounts "that, with the cash reserves held by the bank and with the commercial paper in its portfolio, it should at no time be in danger of deferring the payment of its obligations."

In the revolution of 1848, when the notes of the bank were declared legal tender and it was relieved of the obligation to redeem notes in specie, the circulation was limited to a maximum amount; but this amount was increased as the actual circulation approached the limit.

The legal maximum was dropped in Aug. 1850 when the legal tender and suspension provisions of 1848 were abrogated. The legal maximum was reintroduced in Aug. 1870 during the Franco-Prussian War under conditions similar to those existing in 1848. The limit was increased periodically to meet expanding currency issues. Under the monetary law of June 1928, which re-established the gold standard in France, the principle of a maximum permissible issue was abandoned in favour of the more popular percentage system and the bank was required to maintain a gold reserve of at least 35% against its notes and current deposits. This requirement was abandoned with the outbreak of World War II in Sept. 1939.

Instruments of Policy.—Rationing, the refusal to grant credit, was the original instrument employed by the Banque de France to keep the amount of credit within desired limits. Toward the middle of the 19th century, as the doctrine of *laissez-faire* gradually permeated the bank's parlors and the upper limit of 6% to the rate was removed, the management began to rely upon the rate of rediscount, or charge that it made, to influence the volume of credit requested by customers. The change is illustrated in the fact that whereas the rate remained unchanged from 1820 to 1847, it was changed 11 times in 1864. The management, which had taken credit for the long period of stability, now developed the theory that "the Bank does not determine, it verifies the rate of interest." Nevertheless, after the critical parliamentary inquiry of 1865, the rate was kept much more stable than it had been in the preceding decades. It was also kept lower and more stable than the discount rates at other important central banks. The bank was not empowered to undertake open market operations until June 1938.

The Bank During World War II.—Before both World Wars I and II the bank and the government concluded secret conventions whereby the former was to make advances to the treasury in the event of mobilization. On Sept. 1, 1939, such an agreement became operative under which the bank was authorized to grant temporary advances up to 25,000,000,000 francs for the expenses of mobilization. The amount was raised to 45,000,000,000 in Feb. 1940 when the government utilized "profits" from a revaluation of the franc to repay the bank 20,000,000,000 francs of prewar advances. On June 6, 1940, the authorization was increased to 70,000,000,000, although the amount used was only 36,000,000,000. The bank met the great demands of the French economy in the critical days of Sept. 1939 and of May–June 1940 without increasing its rate.

The cost of military operations from the mobilization to the armistice was 165,000,000,000 francs. An increase of 51,000,000,000 francs or 40% in note issues of the bank during this period was matched by new loans to the government (36,000,000,000) and the increase in bills and advances (16,000,000,000).

Developments after the armistice of June 22, 1940, were determined by the tribute exacted by the Germans. From July 8, 1940, to June 1941, a German commissioner controlled the Banque de France. Occupation costs from the armistice to the end of 1943 were 543,000,000,000, and the deficit in the Franco-German clearing for the same period was 119,000,000,000.

The French national debt increased from 446,000,000,000 francs on Aug. 1, 1939, to 1,417,000,000,000 on April 1, 1944, when 448,000,000,000 was owed to the Banque de France.

The note circulation, which increased with the government debt held by the bank, rose from 142,000,000,000 on Oct. 31, 1939 to 552,000,000,000 on May 25, 1944. Pressure which this increase in money exerted on prices was the core of the French monetary problem after the liberation. Toward the end of 1944 a great national liberation loan was floated to absorb some of the excess money. (K. R. Bp.)

BANQUETTE, in military language, the place upon which men stand to fire over a parapet.

BANSDA, a native state in the south Gujarat division of Bombay, India, belonging to the Surat agency. Area 212 sq.mi. Pop. (1941) 54,735. Its chief is a rajput. About half the total area of the state is cultivable, but the bulk is forested.

BANSHEE, a supernatural being in Irish and general Celtic folklore, whose mournful screaming at night is held to foretell the death of some member of the household visited (Ir. *bean sidhe;* Gael. *ban sith,* "woman of the fairies"). The Irish banshee is held to be the distinction only of families of pure descent. The Welsh banshee is the *gwrach y Rhibyn* (witch of Rhibyn). Sir Walter Scott mentions belief in the banshee in the highlands of Scotland (*Demonology and Witchcraft,* p. 351).

See W. Wirt Sikes, *British Goblins* (1880).

BANSWARA, a state in Rajputana, India. It borders on Gujarat and has an area of 1,606 sq.mi. The population in 1941 was 258,760. The Mahi is the only river in the state and great scarcity of water occurs in the dry season. The Banswara chief is a Sisodhyia rajput of the Dungarpur family. During the decline of the Delhi empire Banswara passed under the Mahrattas. Wearied out by their oppressions, its chief in 1812 petitioned

for English protection. By a treaty of 1818 the British guaranteed the prince against external enemies and refractory chiefs; he, on his part, pledging himself to be guided by a British representative. The chief has the title of Maharawal and a salute of 15 guns. The chief town is Banswara, situated about 8 mi. W. of the Mahi river, surrounded by an old disused rampart and adorned by various Hindu temples, with the battlements of the chief's palace overlooking it. Population (1941) 12,772. The petty state of Kushalgarh is feudatory to Banswara.

BANTAM, the westernmost residency of Java, Netherlands Indies, bounded east by the residencies of Batavia and Buitenzorg, west by the Strait of Sunda, north by the Java sea and south by the Indian ocean. The area is 3,069 sq.mi. It includes Princes Island and several smaller islands off the west and south coasts. The population (1930) was 1,028,628, including 726 Europeans and 8,090 foreign Asiatics. The natives are Sundanese, except in the northern division (Serang), where they are Javanese. The northern part is fertile and flat, except for a hilly group in the centre, where there are two inactive volcanoes, Karang and Pulosari; on a ridge of the former is the crater-lake Dano. In the south the Kendang mountains extend into Preanger, while the extreme southwest is very hilly and thickly wooded. The coast is mostly low-lying and, in parts, swampy, but the hills extend to near the coast in the south. Rice and rubber are the chief crops, and coco-nuts, coffee, coca (cocaine), pepper, and the usual tropical fruits are grown. The rivers of Bantam are navigable only at their mouths, but the residency is well provided with roads and is connected with Batavia by rail. The line divides at Rangkas Betung, one branch going north to Anjer and Merak, where it connects with steamers to Teluk Betong in Sumatra, the other branch running westward to the coast, at Labuan. Bantam contains three native regencies—Serang, Pandeglang and Lebak. The principal towns are: Serang, the capital (pop. 11,163), Pandeglang and Rangkas Betung (a rubber centre). Serang is $2\frac{1}{2}$ mi. from Bantam bay, where its port, Karangantu, is situated. Close to Serang is the ruined town of Bantam, once the capital of the kingdom of Bantam. The ruins include the remains of the former pepper warehouses, the old factory and Fort Speelwijk, of the Dutch East India company, whose settlement at Bantam was their principal one in Java, in the days before the foundation of Batavia; also a well-preserved mosque, supposed to have been built by the third Mohammedan ruler of Bantam (1572–76), a former palace of the sultans of Bantam and some of their tombs.

Bantam was a powerful Mohammedan state, whose sovereign extended his conquests in Borneo and Sumatra. In 1596 the Dutch arrived at Bantam, expelled the Portuguese and set up an establishment. A British factory, established in 1603, which was for some years the chief settlement of the East India company in the East Indies, continued to exist until 1682, when the staff was expelled by the Dutch. In 1683, the Dutch, who had reduced the sultan of Bantam to a state of vassalage, built Fort Speelwijk, at Bantam, and monopolized the port, which had been free; for more than a century Bantam was an important seat of Dutch East Indian commerce. In 1811, after Batavia had surrendered to the British, Bantam followed suit. In 1814 it was restored to the Dutch, who removed the capital to Serang. Revolts occurred in Bantam during the British rule in Java, and at intervals from 1822 to 1850 there were outbreaks against the Dutch. In 1872 a priest from Mecca formed a religious association, the members of which, in 1883, ravaged the whole province and destroyed 51 villages. Bantam was later the scene of organized communistic revolts against Dutch rule. Bantam suffered very severely as a result of the Krakatoa eruption in 1883; it has also had disastrous outbreaks of fever and cattle plague. The residency was occupied by Japan in March 1942. (E. E. L.)

BANTIN or **BANTING,** the wild ox of Java, *Bibos sondaicus*. The white patch on the rump distinguishes the bantin from its ally the gaur (*q.v.*). Adult bulls of the bantin are completely black except for the white rump and legs, but the cows and young are rufous. In Burma the species is represented by the tsine, in which the bulls are rufous fawn. (*See* BOVIDAE.)

BANTING, SIR FREDERICK GRANT (1891–1941), Canadian scientist, born in Canada, was educated at the University of Toronto. He served in World War I and then practised medicine in London, Ontario, until May 1921, when he commenced research at the University of Toronto on the internal secretion of the pancreas. In 1922 it was announced that he, with Prof. Macleod and others, had succeeded in preparing insulin, a specific in cases of diabetes. He became professor of medical research at the University of Toronto in 1923 and, together with Prof. Macleod, received the Nobel prize for medicine in the same year. In 1923 the Canadian parliament voted an annuity of £1,500 to enable Banting to carry on his investigations. In 1924 a Banting Research foundation was established. In 1930 the Banting institute was opened at Toronto. Banting was created K.B.E. in 1934. He was killed in an aeroplane accident Feb. 21, 1941, in Newfoundland. (*See* INSULIN; THERAPEUTICS.)

BANTOCK, SIR GRANVILLE (1868–), English composer, born in London on Aug. 7, 1868; studied at Trinity College of Music and the Royal Academy of Music, London. From 1893–96 he edited the *New Quarterly Musical Review* and toured the country as conductor of musical comedy and light music. At the same time, and throughout the succeeding years, he associated himself actively with the more advanced school of musical thought, and attracted attention by the individuality and freedom from conventionality of his own earlier compositions. In the autumn of 1900 he became principal of the school of music attached to the Birmingham and Midland institute, and later professor of music at the University of Birmingham, and in both positions he found further opportunities for proclaiming his ideals and advancing their acceptance. Of his own works composed during this period the most important was his picturesque and elaborate setting for solo voices, chorus and orchestra of Fitzgerald's *Omar Khayyam,* which immediately took its place among the most notable achievements of its time. How great are Bantock's powers as an orchestral colourist is made sufficiently plain in such works as *Omar Khayyam,* the Hebridean symphony and *The Great God Pan,* while not less striking have been some of his experiments in the evolution of a new choral technique in such works as his *Atalanta in Calydon* and *Vanity of Vanities.* In connection with the latter and his other choral compositions it may be noted that Bantock has always been an enthusiastic supporter and apostle of the competition festival movement.

BANTRY, town, County Cork, Eire, 58 mi. S.W. of Cork by the Great Southern railway. Pop. (1936) 2,643. It is a centre for fisheries, is terminus of the railway, and was a coaching station on the famous "Prince of Wales" route (named after King Edward VII) from Cork to Glengarriff and Killarney. The bay, with excellent anchorage, is a picturesque inlet some 22 mi. long by 3 to 6 mi. broad with several islands. It was the scene of attempts by the French to invade Ireland in 1689 and 1796, and troops of William of Orange were landed here in 1697. Ruins of the so-called "fish palaces" testify to the failure of the pilchard fishery in the 18th century.

BANTU LANGUAGES. The greater part of Africa south of the equator possesses but one linguistic family so far as its native inhabitants are concerned. This clearly marked division of human speech has been entitled the Bantu, a name invented by Dr. W. H. I. Bleek, and it is, on the whole, the fittest general term with which to designate the most remarkable group of African languages. *Bantu* (literally *Ba-ntu*) is the most archaic and most widely spread term for "men," "mankind," "people," in these languages. It also indicates aptly the leading feature of this group of tongues, which is the governing of the unchangeable root by prefixes. The syllable *-ntu* is nowhere found now standing alone, but it originally meant "object," or possibly "person." It is also occasionally used as a relative pronoun—"that," "that which," "he who." Combined with different prefixes it has different meanings. Thus (in the purer forms of Bantu languages) *muntu* means "a man," *bantu* means "men," *kintu* means "a thing," *bintu* "things," *kantu* means "a little thing," *tuntu* "little things," and so on. This term *Bantu* has been often criticized, but no one has supplied a better, simpler designation for this sec-

tion of Negro languages, and the name has now been definitely consecrated by usage.

Though there is a certain physical resemblance among those tribes who speak clearly marked Bantu dialects (the Babangi of the upper Congo, the people of the Great Lakes, the Ova-herero, the Ba-tonga, Zulu-Kafirs, Awemba and some of the east coast tribes), there is nevertheless a great diversity in outward appearance, shape of head and other physical characteristics, among the Negroes who inhabit Bantu Africa. Some tribes speaking Bantu languages are dwarfs or dwarfish, and belong to the group of forest Pygmies. Others betray relationship to the Hottentots; others again cannot be distinguished from the most exaggerated types of the black West African Negro. Others again, especially on the north, are of Gala (Galla) or Nilotic origin. We have no clue at present to the exact birthplace of the Bantu, nor to the particular group of dialects or languages from which it sprang. Perhaps in grammatical construction (suffixes taking the place of prefixes), Fulani shows suggestive resemblance.

In the northwest of the Bantu field, in the region between Cameroon and the northwestern basin of the Congo, the Cross river and the Benue, there is an area of great extent occupied by languages of a "semi-Bantu" character. The resemblances to the Bantu in certain word-roots are of an obvious nature; and prefixes in a very simple form are generally used for singular and plural, but the rest of the concord is very doubtful. Here, however, we have the nearest relations of the Bantu, so far as etymology of word-roots is concerned. Further evidence of slight etymological and even grammatical relationships may be traced as far west as the lower Niger and northern and western Gold Coast languages (and, in some word-roots, the Mandingo group).

The legends and traditions of the Bantu peoples themselves invariably point to a northern origin, and a period, not wholly removed from their racial remembrance, when they were strangers in their present lands. The areas in which are spoken Bantu languages of typical structure and archaic form are somewhat widely spread. Perhaps on the whole the most archaic dialects at the present day are those of Mount Elgon, Ruwenzori, Unyoro, Uganda, the north coast of Tanganyika and of the Bemba country to the southwest of Tanganyika; also those in the vicinity of Lake Bangweulu, and the Nkonde and Kese dialects of the north and northeast coasts of Lake Nyasa; also (markedly) the Subiya speech of the western Zambezi. The Zulu-Kafir language, despite marked changes and deviations in vocabulary and phonetics (both probably of recent date), preserves a few characteristics of the hypothetical mother-tongue.

Classification.—On a geographical basis 11 distinct groups are recognized: (1) Northern or Ganda; (2) Ruanda, Northeastern Tanganyika; (3) Northeastern or Kilimanjaro; (4) Eastern, including Swahili; (5) East African group; (6) Southeastern group; (7) Zulu group; (8) Central group; (9) Western group; (10) Congo group, and (11) Northwest group. Sir Harry Johnston proposed a more elaborate classification on linguistic data, and other authorities have put forward schemes based on philological principles. Much of the difficulty is due to imperfect knowledge and to deficiency of material—especially in regard to the phonetic variations (*see* SANDAWE). The discovery that tones are used in Bantu languages points to the need for an exhaustive investigation by modern methods of the phonology of this great language family.

Phonology.—The phonology of the western group is akin to that of the Negro languages of Western and West-Central Africa. Zulu has picked up clicks, perhaps borrowed from the Hottentots and Bushmen. Here and there on the borders of the western group, the peculiar West African combinations of *kp* and *gb*, so characteristic of African speech between the Upper Nile and the Guinea coast, have been adopted.

The special features of the Bantu languages are:—

Syntax.—(1) The syntax is formed by adding prefixes principally and also suffixes to the root, but no infixes (that is to say, no mutable syllable incorporated into the middle of the root-word).

(2) The root excepting its terminal vowel is practically unchanging, though its first or penultimate vowel or consonant may be modified in pronunciation by the preceding prefix, or the last vowel in the same way by the succeeding suffix.

(3) The vowels of the Bantu languages are always of the Italian type, and no true Bantu language includes obscure sounds like *ö* and *ü*. Each word must end in a vowel (though in some modern dialects in eastern Equatorial, West and South Africa the terminal vowel may be elided in rapid pronunciation, or be dropped, or absorbed in the terminal consonant, generally a nasal). No two consonants can come together without an intervening vowel, except in the case of a nasal, labial or sibilant. This does not preclude the *aspiration* of consonants, or the occasional local change of a palatal into a guttural. No consonant is doubled. Apparent exceptions occur to this last rule where two nasals, two *r's* or two *d's* come together through the elision of a vowel or a labial.

(4) Substantives are divided into classes or genders, indicated by the pronominal particle prefixed to the root. These prefixes are used either in a singular or in a plural sense. With the exception of the "abstract" prefix *Bu*, no singular prefix can be used as a plural nor vice versa. There is a certain degree of correspondence between the singular and plural prefixes. The number of prefixes common to the whole group is perhaps 16. The pronominal particle or prefix of the noun is attached as a prefix to the roots of the adjectives, pronouns, prepositions and verbs of the sentence which are connected with the governing noun; and though in course of time these particles may differ in form from the prefix of the substantive, they were akin in origin. The pronominal particles, whether in nominative or accusative case, must always precede the nominal, pronominal, adjectival and verbal roots, though they often follow the auxiliary prefix-participles used in conjugating verbs, and the roots of some prepositions.

(5) The root of the verb is the second person singular of the imperative.

(6) No *sexual gender* is recognized in the *pronouns* and *concord*. Sexual gender may be indicated by a male "prefix" of varying form, often identical with a word meaning "father," while there is a feminine prefix, *na* or *nya*, connected with the root meaning "mother," or a suffix *ka* or *kazi*, indicating "wife," "female." The first and second prefixes invariably indicate living beings and are usually restricted to humanity.

The 16 original prefixes of the Bantu languages are given below in the most archaic forms to be found at the present day. The still older types of these prefixes met with in one or two languages, and deduced generally by the other forms of the particle used in the syntax, are given in brackets. It is possible that some of these prefixes resulted from the combination of a demonstrative pronoun and a prefix indicating quality or number.

Old Bantu Prefixes

Singular		Plural	
Class 1.	*Umu-* (*Ñgu-mu-*).	Class 2.	*Aba* (*Mba-ba* or *Ñga-ba*).
„ 3.	*Umu-* (*Ñgu-mu-*).	„ 4.	*Imi-* (*Ñgi-mi-*).
„ 5.	*Idi* (*Ndi-di-*).	„ 6.	*Ama-*(*Ñga-ma-*).
„ 7.	*Iki-* (*Ñki-ki-*).	„ 8.	*Ibi-* (*Mbi-bi-*).
„ 9.	*I-n-* or *I-ni-* (*?Ngi-ni-*).	„ 10.	*Iti-*, *Izi*, *Iti-n-*, *Izi-n* (*?Ñgi-ti-*).
„ 11.	*Ulu* (*Ndu-du-*).	„ 12.	*Utu* (*?Ntu-tu-*); often diminutive in sense.
„ 13.	*Aka* (*?Nka-ka-*); usually diminutive, sometimes honorific.		
„ 14.	*Ubu-* (*?Mbu-bu-*); sometimes used in a plural sense; generally employed to indicate abstract nouns.		
„ 15.	*Uku* (*?Ñku-ku-*); identical with the preposition "to," used as an infinitive with verbs, but also with certain nouns indicating primarily functions of the body.		
„ 16.	*Apa* (*Mpa-pa-*); locative; applied to nouns and other forms of speech to indicate place or position; identical with the adverb "here," as *Ku-* is with "there."		

To these 16 prefixes, the use of which is practically common to all members of the family, might perhaps be added No. 17, *Fi-* or *Vi-*, a prefix in the singular number, having a diminutive sense, which is found in some of the western and northwestern Bantu tongues, chiefly in the northern half of the Congo basin and Cameroon. It is represented as far east (in the form of *I-*) as the Manyema language on the Upper Congo, near Tanganyika. Prefix No. 18 is *Ogu-*, which has, as a plural prefix, No. 19, *Aga-*. These are

both used in an augmentative sense, and their use seems to be confined to the Luganda and Masaba dialects, and perhaps some branches of the Unyoro language. The 20th prefix, *Mu-*, is really a preposition meaning "in" or "into," often combined in meaning with another particle, *-ni,* used always as a suffix. The 20th prefix, *Mu-*, however, does not have a complete concord, it is used adjectively or as a preposition and has no pronom. accusative.

The Bantu verb consists of a practically unchangeable root which is employed as the second person singular of the imperative. To this root are prefixed and suffixed various particles. These are worn-down verbs which have become auxiliaries or they are reduced adverbs or prepositions. A method of forming the preterite tense seems to be shared by a great number of widely spread Bantu languages. Thus the Zulu *tanda,* love, changes to *tandile,* have loved, did love. This *-ile* or *-ili* may become in other forms *-idi, didi, -ire, -ine,* but is always referable back to some form like *-ili* or *ile,* which is probably connected with the root *li* or *di* (*ndi* or *ni*), which means "to be" or "exist." The initial *i* in the particle *-ile* often affects the last or penultimate syllable of the verbal root, thereby causing one of the very rare changes which take place in this vocable. In many Bantu dialects the root *pa* (which means to give) becomes *pele* in the preterite (no doubt from an original *pa-ile*). Likewise the Zulu *tandile* is a contraction of *tanda-ile.*

Two other frequent changes of the terminal vowel of the common root are those from *a* (which is almost invariably the terminal vowel of Bantu verbs), (1) into *e* to form the subjunctive tense, (2) into *i* to give a negative sense in certain tenses. With these exceptions the vowel *a* almost invariably terminates verbal roots. By changing the terminal vowel of the verbal root and possibly adding a personal prefix, one can make nouns from verbs. Thus in Luganda *senyua* is the verbal root for "to pardon." "A pardon" or "forgiveness" is *ki-senyuo.* "A pardoner" might be *mu-senyui.* In Swahili *pataniša* would be the verbal root for "conciliate"; *mpatanaši* is a "conciliator," and *upatanišo* is "conciliation." Bantu verbs modify the sense of the original verbal root by suffixes, the affixion of which modifies the terminal vowel and sometimes the preceding consonant of the root.

Thus an original Bantu root, *tanda,* to love, may become

tandwa	to be loved.
tandeka or *tandika* . . .	to be lovable.
tandila or *tandela* . . .	to love for, with, or by some other person.
tandisa (or *-esa*) } . . .	to cause to love.
tandiza (or *-eza*) }	
tandana	to love reciprocally.

The suffix *-aka* or *añga* sometimes appears and gives a sense of continuance to the verbal root. Thus *tanda* may become *tandaka* in the sense of "to continue loving." Although *tanda* is a common verb in Zulu, it has not in Zulu *all* these variations, and in some other language where it may by chance exhibit all the variations its own form is changed to *londa* or *randa.*

The negative verbal particle in the Bantu languages may be traced back to an original *ka, ta* or *sa, ki, ti* or *si* in the Bantu mother-tongue. These alternative forms resemble those in some West African Negro languages. In the vast majority of the Bantu dialects at the present day, the negative particle in the verb (which nearly always coalesces with the pronominal particle) is descended from this *ka, ta* or *sa, ki, ti* or *si,* assuming the forms of *ka, ga, ñga, sa, ta, ha, a, ti, si, hi,* etc. Sometimes in the modern languages the negative particle (such as *ti* or *si*) is used without any vestige of a pronoun being attached to it and is applied indifferently to all the persons. Occasionally this particle has fallen out of use, and the negative is expressed (1) by stress or accent; (2) by suffix (traceable to a root *-pe* or *-ko*) answering to the French *pas,* and having the same sense; and (3) by the separate employment of an adverb. In some languages, the verb used in a negative sense changes its terminal *-a* to *-i.* The subjunctive is very frequently formed by changing the terminal *-a* to *-e:* thus, tanda = love; tande = may love.

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BANVILLE, THÉODORE FAULLAIN DE (1823–1891), French poet and miscellaneous writer, was born at Moulins in the Bourbonnais, on March 14, 1823, and died in Paris on March 15, 1891. In 1842 he published his first volume of verse (*Les Cariatidès*), which was followed by *Les Stalactites* in 1846. The poems won for their author the approbation and friendship of Alfred de Vigny and Jules Janin. He printed other volumes of verse, among which the *Odes funambulesques* (Alençon, 1857) received unstinted praise from Victor Hugo, to whom they were dedicated. Later, several of his comedies in verse were produced at the Théâtre Français and on other stages; and from 1853 onwards a stream of prose flowed from his industrious pen, including studies of Parisian manners, sketches of well-known persons (*Camées parisiennes,* etc.), and a series of tales (*Contes bourgeois, Contes héroïques,* etc.), most of which were republished in his collected works (1875–78). He also wrote freely for reviews, and acted as dramatic critic for more than one newspaper. Throughout a life spent mainly in Paris, Banville's genial character and cultivated mind won him the friendship of the chief men of letters of his time. Banville's claim to remembrance rests mainly on his poetry. A careful and loving student of the finest models, he did even more than his greater and somewhat older comrades, Victor Hugo, Alfred de Musset and Théophile Gautier, to free French poetry from the fetters of metre and mannerism in which it had limped from the days of Malherbe. In the *Odes funambulesques* and elsewhere he revived with perfect grace and understanding the *rondeau* and the *villanelle,* and like Victor Hugo in *Les Orientales,* wrote *pantoums* (pantuns) after the Malay fashion. He published in 1872 a *Petit traité de versification française* in exposition of his metrical methods. He was a master of delicate satire and used with much effect the difficult humour of sheer bathos, happily adapted by him from some of the early folk-songs.

Among his other works may be mentioned the poems, *Idylles prussiennes* (1871), and *Trente-six ballades joyeuses* (1875); the prose tales, *Les Saltimbanques* (1853); *Esquisses parisiennes* (1859) and *Contes féeriques;* and the plays, *Le Feuilleton d'Aristophane* (1852), *Gringoire* (1866) and *Deidamia* (1876).

See also J. Lemaître, *Les Contemporains* (1st series, 1885); Sainte-Beuve, *Causeries du lundi,* vol. xiv; Maurice Spronck, *Les Artistes littéraires* (1889); J. Charpentier, *Th. de Banville* (1925).

BANYAN, a well-known tree of which the scientific name is *Ficus benghalensis.* It belongs to the mulberry family (Moraceae) and is notable for the aerial roots which grow from the branches and on reaching the soil thicken and form supporting pillars. By this means the tree may cover a very great area. The tree is considered sacred throughout India. The name was originally given by Europeans to a tree on the Persian Gulf beneath which some Hindu "merchants" had built a pagoda. In Calcutta the word was generally applied to a native broker or head clerk in any business or private house, now known as *sircar. Bunya,* a corruption of the word common in Bengal, is usually applied to the native grain-dealer. Early writers sometimes use the term generically for all Hindus in western India. *Banyan* was Anglo-Indian for an undershirt, in allusion to the body garment of the Hindus, especially the Banyans.

In the royal navy *Banyan days* were formerly the two days in each week on which meat was excluded from the men's ra-

tions, in allusion to the vegetarian diet of the Hindu merchants. *Banyan hospital* was a slang term for a hospital for animals, in reference to the Hindu's dislike of taking animal life as a principle of their religion.

BAOBAB, *Adansonia digitata* (family Bombacaceae), a native of tropical Africa, one of the largest trees known, its stem reaching 30 ft. in diameter, though the height is not great. It has a large woody fruit, containing a pleasant, cool-tasting mucilaginous pulp in which the seeds are buried. The bark yields a strong fibre used locally for ropes and cloth. The wood is light and soft, and the trunks of living trees are often excavated to form houses.

BAOULE, a short, dark-skinned, animistic people, on the French Ivory Coast between the Comoé and Bandama rivers, who migrated there from the Gold Coast somewhere about the 16th century, being joined later (*c.* 1730) by noble families of Ashanti origin; the Warebo family ruled them for a time but was unable to maintain its authority. They now live in independent villages, formed of extended family groups. There are no special marriage rules and the women enjoy great freedom. Succession passes to uterine brothers, then to nephews and maternal uncles. They practise cultivation, arboriculture and gold-seeking.

See Delafosse, *Manuel de la Langue Agni* (1900).

BAPAUME (anc. *Batpalmoe*), a town of northern France in the department of Pas-de-Calais, about 13 mi. S.E. of Arras and connected by rail with that city and Paris. The population in 1936 was 2,833.

Situated on the northern defense line of France, the history of Bapaume has been a record of periodic armed conflict, and a fortified castle was built there in the 11th century. It was given rights of self-government by Philip Augustus in 1196, but was subjugated by Louis XI in 1477, by Francis I in 1521, and again in 1641 by Marshal Duc de la Meilleraye. On Nov. 7, 1659, Louis XIV concluded the treaty of the Pyrenees with Philip IV of Spain and Bapaume became part of France. Two centuries later, it was again a battlefield in the Franco-Prussian War. On Jan. 3, 1871, General Louis L. C. Faidherbe forced the retreat of a German division under the command of General August Karl von Goeben, but Faidherbe was forced to withdraw on Jan. 4. During World War I, it was held by the Germans until the British spring offensive of 1917 and again through the summer of 1918. In the retreat of March 1917, the Germans mined the town, leaving it virtually demolished.

As an early objective in World War II, it was occupied by German troops in June 1940, suffering heavy damage throughout the operations in that theatre of the war. It was liberated in the first days of Sept. 1944, when the combined Allied offensive passed that sector in its drive toward Belgium.

The church of St. Nicolas, the tower of which was rebuilt in the late 16th century, was the scene of the wedding of Philip Augustus to Isabella of Hainaut in 1180.

BAPAUME-PÉRONNE: *see* AMIENS, BATTLE OF (1918).

BAPHOMET, the imaginary symbol or idol which the Knights Templars were accused of worshipping in their secret rites, in which they were supposed to have revived the impurities of the gnostic Ophites. (*See* OPHITES; TEMPLARS.)

BAPTISM. Concerning the origin of Christian baptism we cannot make statements which are certain. Jesus indeed let himself be baptised by John the Baptist; but that he himself baptised is nowhere reported, and it is expressly contested by S. John's Gospel, iv. 2. In the same passage, however (and in iii. 22), it is asserted that the disciples had already administered baptism in Jesus' life-time, a report which we have every reason to treat with the greatest scepticism. In the primitive community, on the other hand, baptism is universally practised as a rite of admission into the Christian community, and we meet with it as an institution taken for granted both in the circles of the Jerusalem community and in the mission districts of the Apostle Paul. Paul himself is baptised after his conversion (Acts ix. 18), he himself baptised and had the ceremony performed by his assistants (1 Cor., i. 16), and, what is of special importance, he assumes that all those who belong to the Christian community, Pagans as well as Jews, are baptised (1 Cor., xii. 13).

Jewish and Christian Baptism.—The act itself took place without special preparation, as soon as the new convert confessed his faith in Christ and desired to become a member of the community: the baptism of the eunuch of Queen Candace (Acts viii. 38) is a good instance of this. Everywhere in the oldest sources it is stated that baptism takes place "in the name of Jesus." For the first time in the relatively late final chapter of S. Matthew's Gospel the command to baptise with the trinitarian formula (in the name of the Father and of the Son and of the Holy Spirit, Mt. xxviii. 19) is put into the mouth of Jesus.

The so-called Jewish baptism of proselytes has been pointed to in explanation of this rite. It was in fact a strict regulation that a pagan convert to Judaism must, after his circumcision, go through a purificatory washing (Lev. xv. Num. xix.) which washed from him his pagan impurity, and its execution made him for the first time a member, fully qualified and with full status, of the people of Israel. It cannot be denied that this proselyte baptism has great similarity to Christian baptism. Yet it can be said definitely that Christian baptism cannot be derived from this Jewish prototype, because Christian *Jews* also had to undergo Christian baptism, whilst the meaning of proselyte baptism, as the washing away of ritual impurity, could only have been considered in relation to pagans. We hear further of a baptism as a ceremony of admission in the mysterious Jewish order of the Essenes; and here baptism appears to have had a sacramental meaning which was more than symbolic or ritual: yet our information, especially about the diffusion of the Essenes and their significance in the whole system of the Jewish people, is too scanty to allow with any probability of the connection of Christian baptism with these reports.

What lies nearest to hand is to start rather from the baptism which Jesus himself underwent, namely the baptism of John. Though much in the picture of this prophet of the wilderness may be enigmatical and in dispute, yet so much is clear from all the reports, that he baptised Jews and pagans without distinction in the Jordan to the confession and forgiveness of sins, and that he connected with this action the proclamation of the approaching kingdom of God as a judgment. His baptism was thus not a levitical purificatory washing, but signified a spiritual turning away from sins and the entry into a new and purer life. We know that round the person of John there gathered a circle of disciples which survived his death and meets us more than once at a later time (Acts xviii. 25; xix. 3. *Clem. Recog.* i. 54). At the present time it is a subject of lively discussion whether the still existent sect of the Mandaeans (*see* MANDAEANS), whose sacred writings are extensively preserved for us, is perhaps the last remnant of a religious society which can be traced back in direct succession to the communities of disciples of John. The religious world of ideas of these writings also, saturated with hellenistic-iranian mysticism, are in this case commonly traced back to the circle of the disciples of John the Baptist. Yet all this is very questionable conjecture, and important arguments render not improbable the conclusion that the Mandaean sect is of post-islamic origin and has no kind of historical connection with the early extinct sect of John's disciples. At all events, we shall do well to confine ourselves to the reliable ancient accounts of John the Baptist and to accept with reserve even the sacramental significance which Josephus (*Ant.* xviii. 117) ascribes to the baptism of John. As at all events the Christian community regarded Jesus as the fulfiller of the message of John and in a certain sense as the executor of his will, the taking over of the rite of baptism can be interpreted as a Johannine heritage for the primitive community. We must, however, be clear that the motives for so taking it over are and remain in the end unknown.

The Apostolic Age.—Whether the judaic primitive community formulated special theological ideas about baptism, we are not informed, and no probable conjecture enables us to infer that it was so. On the other hand with the Apostle Paul we come upon a developed sacramental theology. In 1 Cor. x., baptism appears as a sacrament already foreshadowed in the Old Testament, and in Rom. vi. a fully articulated doctrine of the nature of baptism is produced in connection with the question of the Christian's

relation to sin. When in the ceremony the candidate for baptism is submerged under the water, he is thereby buried with Christ and dies with him; *i.e.*, this submersion in water is for the Apostle, not merely a symbol of purification, nor only a *symbol* of being buried, but a real act of wonderful effect. The candidate for baptism experiences actually and genuinely the death of Jesus in his own body, and is likewise actually laid in the grave, as Jesus lay in the grave. And thereby the saving effect of these events too is transferred to him. He dies and in doing so pays to sin the tribute due: for the wages of sin is death. When he emerges again from the water, the resurrection of Christ becomes his. He who was dead awakes to new life, but under quite other conditions than those which governed his mode of life hitherto. If till then the world-encircling power of sin exercised its dominion in the flesh without restraint, now that is possible no more. The flesh, dead in the sacramental union with Christ, has become free from the power of sin, which till now worked upon it with the force of a law of nature. As Christ rose from the dead through the spirit of God which gave him life, so too is the baptised Christian equipped with the new life-principle of the divine spirit, and can fulfil the ordinance of the law (Rom. viii. 4). He is a new creature: the old man is dead and all is become new (2 Cor. v. 17). How realistically the effect of baptism is conceived is evident also from a curious custom which was the practice in Corinth (1 Cor. xv. 29). If a Christian died there unbaptised, another had himself baptised in the place of the dead person, naturally in the belief that the sacramental action would also have its effect in the other world upon the person who had died. And traces of this "vicarious baptism" can actually be shown in various places even into the 4th century.

Parallels of the Pauline Doctrine.—To the comparative study of religion the connections which unite this Pauline doctrine of baptism to the kindred notions of other religions could not remain hidden. It is not necessary to go back to the religious ideas of primitive peoples, among whom the entry into the clan or into a particular group is celebrated by ceremonies which express the death and new birth of the individual concerned. It is of much greater significance that we can trace numerous views of the kind in the civilization by which early Christianity was surrounded. These parallels had already struck the ancient Christian writers, been noted by them, and explained in various ways. We are particularly well informed about the ideas associated with the initiation rites of the initiates in the Isis Mysteries. The African Apuleius, who wrote about A.D. 160, informs us that the disciple had to undergo a ceremony of sanctification, which was celebrated in the likeness of a voluntary death followed by salvation won through prayers: when, namely, a man, his natural life complete, shall stand already on the threshold of the light departing and be so qualified that the great secrets of religion could safely be confided to him, then the Goddess would call him back from death and set in the way of new salvation the man who, through her care, was as it were born again. And so, too, the hero in the romance of Apuleius signifies the day of his consecration to Isis as his "holy birthday," and reports that he approached the bounds of death, that he trod the threshold of Proserpina, and then returned back through all the elements, that at midnight he saw the sun shining with bright light, that he approached the gods of the world below and of the world above, and adored them face to face.

The Isis Mysteries were spread over the whole Roman Empire in a form suited for world propaganda, and there is no doubt that the leading ideas here expressed had their root in the ancient Egyptian religion (the cult of Osiris) and have suffered slight modifications by the spirit of Graeco-oriental mysticism. In the cult of Attis and Adonis also we meet with a god who, like Osiris, dies and awakes to life again, and whose fate is lived through in figure by the member of his community. From our knowledge, even though in general it is very scanty and embraces only limited fragments of the variegated piety of the early Empire, the conjecture that the circle of ideas mentioned exercised its effect in all kinds of other places besides amounts almost to certainty. When, therefore, in the communities of the Apostle Paul we meet with so kindred an interpretation of Christian baptism, we can definitely assume an influence from extra-Christian piety. It must only remain questionable whether this sacramental theology was introduced into the Christian community directly by baptised pagans, or whether it had already taken hold here and there of "liberal" Greek-speaking Judaism, and so entered into Christianity as a semi-Jewish way of thinking.

Baptism in the Early Church.—The early Church developed further both the liturgical expression and the theological interpretation of baptism in the direction marked out by Paul. In the first place a liturgical regulation of the procedure of baptism arose out of the freedom of the early period. Before the act itself a longer instruction of the candidates for baptism, the training of catechumens, is prescribed. And as the life of the community adapted itself to settled forms of order, so a definite time in the course of the year was fixed for the training of catechumens: it took place in the season of fast which preceded Easter. Then the spiritual leader of the community collected all those who were to receive baptism into a group for training and baptised them also together at the one period which in early times was fixed for baptism, viz., on Easter Eve; later the Epiphany festival of 6 January, as the day of commemoration of the baptism of Christ, was added, and also the whole Easter period up to Whitsuntide was occasionally regarded as a permissible time for baptism. Naturally, baptism could be administered at any time to those dangerously ill. Gradually the character of baptism as a Mystery was with conscious purpose more and more emphasized, and this was also given expression in external details: thus arose the *disciplina arcani*, which bound the candidate for baptism to mysterious silence concerning things which were held to be essential points of the Mystery—which nevertheless everyone could come to know who desired to. Thus the baptismal creed (*see* CREEDS) was learned by heart in the catechumens' training, because probably it was not allowed to be written down (*traditio symboli*), and then in the act of preparation for baptism it was solemnly proclaimed by the candidate (*redditio symboli*).

The baptism was preceded by a fast, it might be of several days; then the ceremony began on Easter Eve. The following is a description of it in accordance with the statements of Cyril of Jerusalem (*circ.* 340). The candidates for baptism are led into the vestibule of the baptistry and there drawn up facing west. Then they stretch out their hands to the west and call: "I renounce thee, Satan, and all thy works and all thy being." Then they turn round and eastwards, as to the land of light, confess the creed. Now they enter the inner room of the baptistry and divest themselves completely of their garments. They are anointed from head to foot with exorcised oil and led to the baptismal tank. Each makes answer to the threefold question, if he believes in Father, Son and Holy Ghost, with the prescribed formula and is submerged at each confession, three times therefore. When he has come up from the tank he is again anointed with holy oil (*chrisma*) on the forehead, ears, nose and breast, and clothed in a white garment, the outward sign of the purity from sin he has won through the sacrament. At once the procession of candidates enters the church and partakes for the first time of the Eucharist. In Egypt, Italy and Africa, the custom survived till the 5th century of giving to the newly baptised, in addition to the wine, a mixture of milk and honey, as a neophyte communion: apparently also a custom taken over from the hellenistic Mysteries.

Theological Developments of the 3rd and 4th Centuries.—According to the view of the whole early Church, baptism is a sacrament unconditionally necessary for the Christian: the one and only substitute for it is the baptism of blood of martyrdom; for whoever, even without having received baptism, suffers death for his confession of Christ, will without doubt be reckoned by Christ among His own. But in addition baptism cannot be repeated: only once can a man die in Christ and be born again. In consequence of this a controversy arose in the middle of the 3rd century in Africa, known as the controversy over heretical baptism, and became of fundamental significance for succeeding ages. After the Decian persecution (A.D. 250) the sect of the Novatians

had separated itself from the Church. Yet when some years were passed, many returned penitently to the Church. In the meanwhile they had received baptism in the sect of the Novatians. The problem now arose for the Carthaginian bishop Cyprian, whether he should reckon this baptism performed by heretics as a real baptism or not. He adopted the standpoint that outside the Church there is no salvation (*extra ecclesiam nulla salus*) and drew the conclusion that there can be no real sacraments outside the Church. In his opinion, therefore, heretical baptism was a ceremony without significance, and thus, as occasion arose, he baptised the returned heretics afresh.

In Rome the opposite decision in the same question had been reached: the idea of a sacrament was developed more vigorously and regarded as effective quite independently of the worthiness of him who administered it and of the surrounding community. He who has received baptism, even if it be in the circle of heretics, is incorporated into the community of Jesus, and only his severance from the heretical community and his union with the Catholic Church is needed to bring out also the saving effect of the sacrament. Heretical baptism was thus recognised in Rome. For half a century Africa maintained its practice, then the Roman standpoint prevailed, and has ultimately remained till the present day decisive for our church practice. At a later time only did the Roman Catholic Church begin to question, on grounds of form, the correctness of protestant baptisms, and to make use of the safety provision of a "conditional" re-baptism, in the form: "in case thou shouldest not have been baptised, I baptise thee," etc.

The whole early period knows baptism only for adults, who join themselves of their own resolve to the Christian community. Infant baptism appears sporadically towards the end of the second century and was indeed practised also during the following centuries, yet only as an exception. In contrast to it the custom was widespread rather of postponing the baptism even of adults as long as possible in the prudent calculation that the complete forgiveness of sins conferred by baptism might be first undertaken at a time when the person considered that he had the main period of transgression behind him. For the effectiveness for the forgiveness of sins of the sacrament of penance, which alone was still available to one already baptised, was by no means free from all doubt in the belief of the people.

Influence of St. Augustine.—The theorist of baptism who has been most influential for succeeding ages is S. Augustine. He develops the Pauline idea, according to which the baptised person is engrafted as a member into the community which forms the body of Christ. The first effect of baptism is the forgiveness of sins, which extends itself to all sins, both to all actual sin and also to original sin. This latter sinfulness, inherited from Adam, would indeed alone suffice, without actual sin, to bring man to damnation, as, too, infants dying unbaptised are excluded from the Kingdom of heaven in consequence of original sin, and live in the world beyond in some form of perdition, even if of the mildest kind. Baptism has effect upon original sin, in the sense that it takes from it its character of guilt: thereby free access to God and His heavenly kingdom is opened. But there remains the material effect of original sin which shows itself in the inclination to evil (*concupiscentia*). This remains even in the baptised Christian, and accurately regarded it must remain, because without it no moral struggle, no overcoming of evil in meritorious conflict with sin, would be possible. But this concupiscence is not guilty in one who is baptised: the commission of fresh actual sin first makes the Christian once more guilty before God. Infant baptism, when practised early, will, as a rule, count only as the effacement of original sin. But the child still receives, just as does the adult, the positive effect of the Holy Spirit, which expresses itself in his case as protection, guarding him from evil influences and allowing him to grow towards maturity, till the time when he shall consciously make his own what was received in baptism and confessed through the mouth of the sponsor representing him, and become in the full sense a Christian personality.

The Mediaeval Period.—The mediaeval development altered little in the practice and theory of baptism. The ritual is modified here and there in the various countries, but is preserved everywhere in its essential points. Western theology in the main builds further on the foundation supplied by Augustine and develops all kinds of conceptual distinctions, which leave the essence of the matter untouched. The Augustinian doctrine also of the effacement of original sin as guilt and of the retention of concupiscence as tinder for sin (*fomes peccati*) is retained and still more minutely elaborated. Baptism appears as one of the two sacraments (the other is the ordination of priests), which confer an indelible character (*character indelibilis*). Whoever has received this sacrament bears indelible to all eternity the mark of Christ. Through it alone man obtains the right and the capacity to receive also the other Christian sacraments. Of considerable practical importance became the theory of the three baptisms. The first is the baptism of water, the second the martyr's baptism of blood, the third the baptism by desire (*baptismus flaminis*=spiritual baptism) of him who finds himself in peril of death, who would fain be baptised, but cannot owing to external circumstances receive the sacrament. Certainly in such a case a priest is not required: in peril of death a layman is justified in administering the sacrament of baptism to him who is endangered. But where that too is denied, God will reckon as fulfilled the wish of one who desires baptism. For that he has the desire is an evident sign of the working of divine grace. He possesses therefore what is essential in the sacrament, the *res sacramenti;* even though the form, the *sacramentum,* is lacking. (H. Li.)

BAPTISM DURING AND AFTER THE REFORMATION

At its fifth session (June 1546) the Council of Trent drew up a decree on Original Sin which defined the doctrine of the Roman Church on the grace of Baptism. The decree steers a middle course between the Thomist (or Augustinian) and the Scotist doctrines of the nature of man and the consequences of the Fall. The sin of Adam passes to all his descendants and can only be removed by the merit of Jesus Christ which is conferred in the Church, by the sacrament of Baptism. By regeneration in Baptism original sin and actual sins already committed are remitted, but there remains in the regenerate concupiscence, the "fomes" (tinder) of sin. This concupiscence, though it comes from sin and leads to sin, yet is not itself sin. At its seventh session (March 1547) the Council promulgated 14 anathemas designed to rule out the new teachings on Baptism which had arisen through the Reformation.

The teachings of the Reformers on Baptism represent varying modifications of the traditional doctrine under the influence of the cardinal principle—"Justification by Faith."

Luther and Zwingli.—In his sacramental teaching Luther closely associates the Sacrament with the Word. There can be no sacrament apart from an express divine promise to which faith may respond. It is not easy to accommodate this fundamental conception of the nature of a Sacrament to the practice of infant Baptism. To that practice Luther consistently adhered, but his justification of the practice differed at different periods of his life. In 1518 he still held that the infant is regenerated and saved through the merit of the faith of its sponsors; in 1520 (*De Captiv. Babyl. Eccl.*) he abandons this view and holds that in Baptism infants themselves believe. If God can turn the heart of the wicked, much more can he turn the heart of a child. After 1528 without abandoning the view that infants themselves believe, Luther tends to base his defence upon the scriptural texts Matt. xxviii., 19; Mk. x., 14. The doctrine of original sin inevitably influenced his thought: since all men are born in sin, it was necessary that they should as infants be brought into the relation of grace. Luther seems not to depart from the scholastic doctrine that Baptism confers indelible "character," but he differs from Roman doctrine in ascribing to Baptism unlimited forgiveness of sin. Post-baptismal sin does not require the special grace of a fresh sacrament—penance; rather, in Luther's view, does penance throw the penitent back upon the all-sufficient grace of God of which he was assured in his Baptism.

Zwingli's doctrine of Baptism is more radical than Luther's. The outward washing is a token of the grace which the believer already possesses—if an adult, in virtue of previous hearing of the word,

if an infant, in virtue of God's promise that the children of Christian parents are as much members of the Christian Church, as Jewish children were members of the Jewish Church. "It is an external thing when men are baptized—a sign and ceremony of the true reality (*rei*) . . . ceremonies are outer signs which testify to others that he who receives them has bound himself to a new life, and that he will confess Christ till death" (*De ver. et fals. rel.* Werke III., p. 773).

Calvin and Hooker.—Calvin lays more stress than Zwingli upon the value of the rite to him who receives it, as being a confirmation of God's promise. Baptism is the seal upon election, and the solemn sign by which those who already belong to Christ's Body are received into the Church (cf. *Instit.* IV. 15, 22). It was in keeping with this view of Baptism that Calvin rejected the literal interpretation of Joh. iii., 5 "Except a man be born of water and the spirit. . . ." It was to be explained on the analogy of Matt. iii., 11 "He shall baptize you with the Holy Ghost and with fire." Regeneration was not more contingent upon literal water than it was upon literal fire. Baptism of infants *in extremis* he regarded as a superstition. Baptism should not be administered by others than ministers, nor elsewhere than in the Church.

The Calvinistic doctrine of Election stands in the background of Hooker's Baptismal teaching, but it is not allowed to dictate the interpretation of Joh. iii., 5 or the practice of the Church: the expressed promise of God attaches to Baptism by water: infants should therefore be baptized—if necessary by laymen or even women.

Infant Baptism.—The great Reformers shared the main political presuppositions of the Middle Age. To them Church and State were aspects of one society, and the ecclesiastical outcome of the Reformation was the rise of independent national Churches. A Church conceived as virtually co-extensive with Society is unlikely to reject the principle of infant Baptism. But the sectarian idea of the Church as the society of the Saints independent of, if not hostile to, the order of secular society was a not unnatural sequel of the doctrine of Justification by Faith only; and not unnaturally it took the form of a rejection of infant Baptism. Zwingli himself at the beginning of his career as a Reformer had felt doubts about the baptism of infants, but the extravagances of the Anabaptists at Zurich confirmed him in accepting the principle of infant Baptism. The excesses of the reign of the Saints at Münster discredited the Anabaptists, but their position with regard to the Baptism of believers only was inherited by the Mennonites and by other Baptist Churches.

A further influence which no doubt strengthened the Reformers in their adherence to the practice of infant Baptism was the doctrine of Original Sin. If infants were born in sin it would seem desirable and right that they should receive the sacrament of regeneration. It is worthy of notice that the sectaries of the 16th century were less consistently Augustinian than the great Reformers in their doctrine of sin and that the General Baptists of the 17th century were avowedly Arminian.

"The Children of Light" (the Quakers) carry the doctrines of the Sectaries a stage further. All external authority and all outward rite, is, in principle, set aside. "The testimony of the spirit is that alone by which the true knowledge of God hath been, is, and can be only revealed." Adam's posterity is fallen, and, apart from God's Grace, deprived of the sensation of this inward testimony. "Nevertheless this seed [of the serpent] is not imputed to infants, until by transgression they actually join themselves therewith." "Baptism is a pure and spiritual thing, to wit the Baptism of the spirit and fire . . . of which the Baptism of John was a figure, which was commanded for a time, and not to continue for ever; as to the Baptism of infants it is a meer humane tradition, for which neither Precept nor Practice is to be found in all the Scripture." (Barclay *Apology*, Theses Theol. i., iv., xii.)

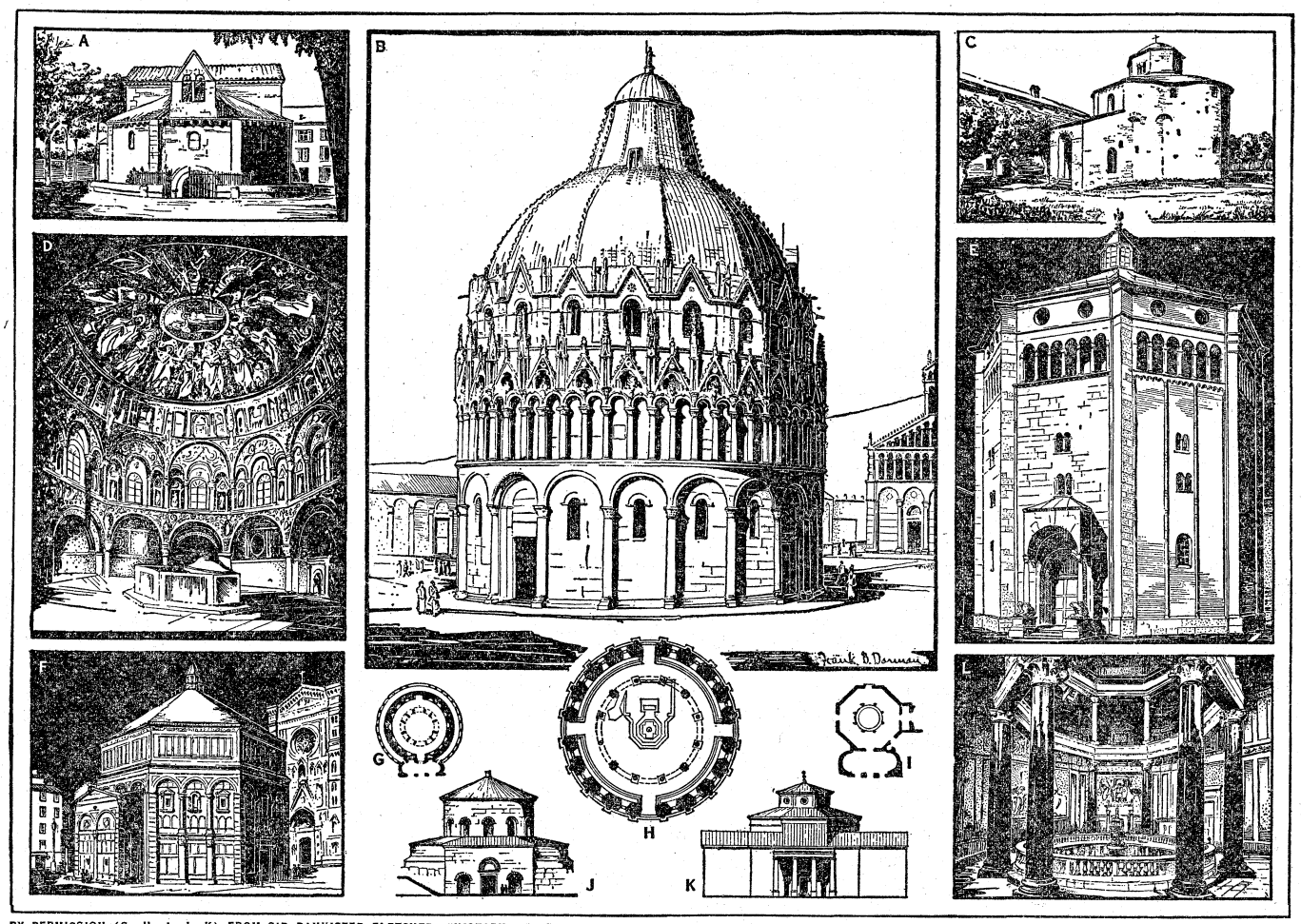
Modern Reinterpretations.—The rise of rationalism further disintegrated belief in original Sin and weakened the sense of dependence upon divine grace. Baptism tended to be regarded as an outward rite signifying the adherence of the individual to the Church, rather than as a means of Grace or a seal of regeneration.

In the revival of Church consciousness in the 19th century Baptism takes on a deeper meaning. Original sin is asserted afresh, but it is re-interpreted as a social rather than a biological inheritance. Baptism is the act of the Church incorporating a new member into its own life. Schleiermacher's criticisms of Zwingli and Quakers give forcible expression to this view of Baptism. If the act of Baptism be considered in itself, Zwingli's theory of the Sacrament may be allowed to be true. But it is not the whole truth. It errs in ignoring the dependence of Baptism upon the activity of the Spirit in the Church. Similarly the Quaker rejection of water-Baptism has a certain justification in that it rests upon the desire to exalt the idea of regeneration at the expense of the ceremony as such. But it errs, in that it fails to do justice to the relation between the influences of the society and "the inner development of the individual towards regeneration." Infant Baptism, Schleiermacher holds, is incomplete Baptism: the confession of faith at Confirmation after full instruction should be regarded as the final act which completes the Baptism. (*Der Christliche Glaube*, 2nd ed. §§ 136–138.)

So too, to Ritschl, Baptism is primarily an act of the Church. The Church by Baptism associates the individual with that revelation of God on which its own existence depends. Washing with water symbolises purification of the spiritual life and this purification is effected by adoption into "the circle of reconciliation." The rite then is not the mere confession of the individual but the act of the society, and this carries with it the justification of infant Baptism (*Unterricht in der Christlichen Religion*, 3rd ed. Bonn 1886 § 89).

Anglican Internal Controversy.—Baptismal doctrine became the subject of an important internal controversy in the Church of England in the second quarter of the nineteenth century. Baptismal doctrine had not been prominent in the theological controversies of the 16th and 17th centuries in England. The Baptismal formularies of the Church of England had been drawn up under Lutheran rather than Calvinistic influences, and they use language which implies that an infant is regenerated in Baptism. The Anglican service however had been continuously used by many who held the Calvinistic doctrine of election, and their right to use it had not been disputed, albeit their doctrine required a "conditional" interpretation of the language concerning regeneration. Not all who were baptized were regenerate. Regeneration was conditional on repentance and faith, and these were bestowed not by Baptism, but by "prevenient grace." The Evangelical party in the Church of England was largely Calvinistic. Though accepting the general necessity of Baptism, it associated regeneration with conversion rather than with Baptism. Pusey's Tracts for the Times Nos. 67, 68, 69 re-asserted the Catholic (and Lutheran) view that regeneration is bestowed upon all who are baptized. Gorham represented the Evangelical position and the question at issue was whether the Catholic interpretation of the formularies was alone to be admitted. The Gorham Judgment of the Judicial Committee of the Privy Council upheld Gorham's interpretation as legitimate (1850). The leaders of the High Church party protested against the Judgment, and it was the occasion of the secession of Manning, the future Cardinal Archbishop of Westminster, to the Church of Rome. J. B. Mozley, himself a High Church Theologian, produced a weighty treatise upon the controversy, in which he maintained that the Gorham Judgment did but confirm the liberty which Calvinistic theology had continuously enjoyed in the Church of England.

Present Status.—In the later decades of the century controversial interest in the doctrine of Baptism abated. The strict conception of original sin—the starting point of Catholic and Calvinist alike—as well as the idea of Predestination was losing its hold upon the mind and imagination of Christians. Moreover the critical and historical study of Christian origins, which was little known or practised in England before the middle of the century, was changing the entire method of theological argument. The importance of Baptism in the early Church is seen to have been not less than was formerly assumed, but there is a widespread consciousness of the difficulties which arise, when language of the New Testament which clearly has adult Baptism in view is transferred to the entirely different situation which the general prac-



BY PERMISSION (G. H. I. J. K) FROM SIR BANNISTER FLETCHER, "HISTORY OF ARCHITECTURE ON THE COMPARATIVE METHOD," 8TH EDN. 1928 (BATSFORD)

A, FRENCH ROMANESQUE, ST. JEAN, POITIERS; B AND H, ITALIAN ROMANESQUE AND GOTHIC, PISA; C, E AND F, ITALIAN ROMANESQUE; C, GALLIANO, E, CREMONA, F. FLORENCE; D, BYZANTINE, RAVENNA; G AND J, EARLY CHRISTIAN, STA. COSTANZA, ROME; I, K AND L, EARLY CHRISTIAN, PLAN, ELEVATION AND INTERIOR OF BAPTISTERY OF THE LATERAN, ROME

tice of infant Baptism has created. There does not however appear to have been any pronounced tendency to break with the tradition of infant Baptism, which indeed admits of an obvious justification when incorporation into the life of the Christian Society is the dominant idea associated with the rite. (J. M. C.)

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BAPTISTE, NICOLAS ANSELME (1761–1835), French actor, was born in Bordeaux on June 18 1761, the elder son of Joseph François Anselme, a popular actor. Nicolas Anselme made his first appearance as de Belloy in *Gaston et Bayard.* After some time spent at Arras, where he played all kinds of parts, and at Rouen (1783–91), he was engaged at Langlois-Courcelles' new theatre in Paris, where he secured the engagement of his family also. Nicolas soon obtained the public favour, specially in La Martellière's mediocre *Robert, chef de brigands,* and as Count Almaviva in Beaumarchais' *La Mère coupable.* His success secured for him a place in the Théâtre de la République. Later he, as well as his younger brother, became *sociétaire.* Nicolas acted in both comedy and tragedy but was more at home in comedy. He retired in 1828. But after the revolution of 1830, when the Théâtre Français was in great straits, the brothers Baptiste reappeared on the stage and helped to bring back its prosperity. The elder died in Paris on Dec. 1 1835. The younger brother, Paul Eustache Anselme, known as BAPTISTE *cadet* (1765–1839), was also a comedian of great talent, and had a long and brilliant career at the Comédie Française, where he made his *début* in 1792 in *L'Amour et l'intérêt.*

BAPTISTERY, the hall or chapel connected with a church, in which the sacrament of baptism is administered. The earliest baptistery extant is probably that of the Lateran palace in Rome, which dates largely from the time of Constantine. Octagonal in shape, this baptistery consists of a central area in which was the large octagonal basin or pool called a font, surrounded by eight columns, and an ambulatory (*q.v.*). The round church of Santa Costanza, in Rome, built, probably, as a tomb for the daughter of Constantine, was also used, in early times, as a baptistery. Following this tradition, baptisteries, throughout the early Church, were separate buildings, circular or polygonal in plan, up to the 9th or 10th century. When the change from immersion to sprinkling as the method of baptism rendered large baptisteries unnecessary, the baptistery became a mere chapel within a church, or even disappeared entirely, the font being placed at any convenient spot. Many baptisteries of the earlier type, especially in Italy, are of great size and richly decorated (Florence, Pisa). In modern usage the baptistery is frequently near the church entrance. The use of immersion, by the modern Baptist Church, has given a new importance to the baptistery in churches of that denomination, where it is often placed immediately behind the chancel, so that the sacrament may take place in the full view of the assembled congregation.

See C. von Hefele, *Concilies, passim;* Du Cange, *Glossary,* article "Baptisterium"; Eusebius, *Hist. Eccl.* x. 4; Joseph Bingham, *Antiquities of the Christian Church,* book xi. (1710–22).

BAPTISTS, a body of Christians, distinguished, as their name imports, from other denominations by the view they hold respecting the ordinance of baptism (*q.v.*). This distinctive view, common and peculiar to all Baptists, is that baptism should be administered to believers only. The mode of administration of the ordinance has not always been the same, and some Baptists (*e.g.*, the Mennonites) still practise baptism by pouring or sprinkling, but among those who will here be styled *modern* Baptists, the mode of administration is also distinctive, viz., immersion. The primary principle, however, is that of baptism as the basis of a Church of regenerate believers. It should also be understood that the rise of the modern Baptists, whose churches are to be found in all parts of the English-speaking world but most numerously in the United States, was largely independent of the Anabaptist movement. (*See* ANABAPTISTS).

1. Great Britain and Ireland.—For the beginning of the modern Baptist movement we must look abroad. Although there were doubtless many who held Baptist views scattered among the Independent communities, it was not until the time of John Smith or Smyth (d. 1612) that the modern Baptist movement in England broke away from Brownism. Smyth was appointed preacher in Lincoln in 1600 as an ordained clergyman, but became a separatist in 1605 or 1606, and, soon after, emigrated under stress of persecution with the Gainsborough Independents to Amsterdam. With Thomas Helwys (*c.* 1560–*c.* 1616) and Morton he joined the "Ancient" church there, but, coming under Mennonite teaching in 1609, he separated from the Independents, baptized himself (hence he is called the "Se-baptist"), Helwys and others probably according to the Anabaptist or Mennonite fashion of pouring. These then formed the first English Baptist Church which in 1611 published "a declaration of faith of English people remaining at Amsterdam in Holland." The article relating to baptism is as follows:—"That every church is to receive in all their members by baptism upon the confession of their faith and sins, wrought by the preaching of the gospel according to the primitive institution and practice. And therefore churches constituted after any other manner, or of any other persons, are not according to Christ's testament. That baptism or washing with water is the outward manifestation of dying unto sin and walking in newness of life; and therefore in no wise appertaineth to infants." They held "that no church ought to challenge any prerogative over any other"; and that "the magistrate is not to meddle with religion, or matters of conscience nor compel men to this or that form of religion." This is the first known expression of absolute liberty of conscience in any confession of faith.

Smyth died in Holland, but in 1612 Helwys returned to England with his church and formed the first Baptist church worshipping on English soil. The church met in Newgate street, London, and was the origin of the "General" Baptist denomination, so called because they repudiated the Calvinistic doctrine of predestination and affirmed the Arminian view of individual responsibility. The next leading event in the history of the Baptists is the rise of the first Calvinistic or Particular Baptist Church. This was the Jacob church in Southwark, which was originally Independent. A group of its members separated (the church having grown beyond what was held proper limits) and in 1633 became the first Particular Baptist Church. Thus there were now in existence in England two sets of Baptists whose origins were quite distinct and who never had any real intercourse as churches. They differed in many respects. The General Baptists were Arminian, owing to the influence of the Mennonite Anabaptists. The Particular Baptists were Calvinists, springing as they did from the Independents. But on the question of baptism both groups, while they utterly rejected the baptism of infants, were as yet unpledged to immersion and rarely practised it. The development of their doctrine as to baptism was marked along three lines of dispute: (1) who is the proper administrator of baptism? (2) who are the proper subjects? and (3) what is the proper mode? Eventually agreement was reached, and in 1644 a Confession of Faith was published in the names of the Particular Baptist churches of London, now grown to seven, "commonly (though falsely) called Anabaptist." The article on baptism is as follows: "That baptism is an ordinance of the New Testament given by Christ to be dispensed only upon persons professing faith, or that are disciples, or taught, who upon a confession of faith, ought to be baptized." "The way and manner of dispensing this ordinance the Scripture holds out to be dipping or plunging the whole body under water." They further declare (particularly in order that they may avoid the charge of being Anabaptists) that "a civil magistracy is an ordinance of God," which they are bound to obey. They speak of the "breathing time" which they have had of late, and their hope that God would, as they say, "incline the magistrates' hearts so for to tender our consciences as that we might be protected by them from wrong, injury, oppression and molestation"; and then they proceed: "But if God withhold the magistrates' allowance and furtherance herein, yet we must, notwithstanding, proceed together in Christian communion, not daring to give place to suspend our practice, but to walk in obedience to Christ in the profession and holding forth this faith before mentioned, even in the midst of all trials and afflictions." From the Restoration (1660) the meetings of nonconformists were continually disturbed and their preachers fined or imprisoned; but with the Revolution of 1688, and the passing of the Act of Toleration in 1689, the history of the persecution of Baptists as well as of other Protestant dissenters, ends. The subsequent removal of the remaining disabilities, such as those imposed by the Test and Corporation Acts repealed in 1828, has no special bearing on Baptists more than on other nonconformists.

The Baptists, having had a double origin, continued for many years in two sections—those who in accordance with Arminian views held the doctrine of "General Redemption," and those who, agreeing with the Calvinistic theory, held the doctrine of "Particular Redemption." In the 18th century many of the General Baptists gradually inclined to Arianism or to Socinianism in their view of Christ's person and work; whilst, on the other hand, the Calvinism of the Particular Baptists in many of the churches became more rigid, and approached or actually became Antinomianism. In 1770 the orthodox portion of the General Baptists formed themselves into a separate association, under the name of the General Baptist New Connection, since which time the "Old Connection" has gradually merged into the Unitarian denomination. By the beginning of the 19th century the New Connection numbered 40 churches and 3,400 members. Towards the end of the 18th century many of the Particular Baptist churches became more moderate in their Calvinism, a result largely attributable to the writings of Andrew Fuller. Up to this time a great majority of the Baptists admitted none either to membership or communion who were not baptized, the principal exception being the churches in Bedfordshire and Hertfordshire, founded or influenced by Bunyan, who maintained that difference of opinion in respect to water baptism was no bar to communion. At the beginning of the 19th century this question was the occasion of great and long-continued discussion, in which the celebrated Robert Hall (1764–1831) took a principal part. The practice of mixed communion gradually spread in the denomination. Still more recently many Baptist churches have considered it right to admit to full membership persons professing faith in Christ, who do not agree with them respecting the ordinance of baptism. Such churches justify their practice on the ground that they ought to grant to all their fellow-Christians the same right of private judgment as they claim for themselves.

In 1891, largely under the influence of Dr. John Clifford, a leading General Baptist, the two denominations, General and Particular, were united, there being now but one body called "The Baptist Union of Great Britain and Ireland." This Union, however, is purely voluntary, and some Baptist churches, a few of them prosperous and powerful, hold aloof from their sister churches so far as organization is concerned. There are other Baptist bodies outside the Baptist Union beside certain isolated churches. Throughout England there are many "Strict" Baptist churches which really form a separate denomination. For the most part they are linked together according to geographical distribution in county associations. The general characteristic of the Strict Baptists is their rigorous adherence to a type of Calvinistic theology

now generally obsolete, and their insistence upon baptism as the condition of Christian communion. Their loose organization makes it impossible to obtain accurate statistics, but the number of their adherents is small.

The Baptists early felt the necessity of providing an educated ministry for their congregations. Some of their leading pastors had been educated in one or other of the English universities. Generous bequests made it possible to found an academy in Bristol for the training of young men for the ministry. In 1770 the Bristol Education Society was formed to enlarge this academy; and about the year 1811 the present Bristol Baptist college was erected. In the north of England a similar education society was formed in 1804 at Bradford, Yorkshire, which has since been removed to Rawdon, near Leeds. In London another college was formed in 1810 at Stepney; it was removed to Regent's park in 1856. The Pastors' college in connection with the Metropolitan Tabernacle was instituted in 1856, and in 1866 the present Baptist college at Manchester was instituted at Bury. Besides these, which were voluntary colleges not under denominational control, the General Baptists maintained a college from 1797, which, since the amalgamation of the two Baptist bodies, has become also a voluntary institution, though previously supported by the General Baptist Association. It is called the "Midland Baptist college," and is situated in Nottingham. There is also a Baptist theological college in Glasgow, and there are two colleges in Wales and one in Ireland. The Baptists were the first denomination of British Christians to undertake in a systematic way that work of missions to the heathen which became so prominent a feature in the religious activity of the 19th century. In 1792, the Baptist Missionary Society was formed at Kettering in Northamptonshire. The prime mover in this work was William Carey, who in the course of the following year sailed for India. The great work of Dr. Carey's life was the translation of the Bible into the various languages and dialects of India. The society's operations are now carried on, not only in the East, but in the West Indies, China, Africa (chiefly on the Congo river) and Europe. In Asia the feature of recent years is the growth of strong native missions in India and China, able to organize and carry on their own work.

In regard to church government, the Baptists agree with the Congregationalists that each separate church is complete in itself, and has, therefore, power to choose its own ministers and to make such regulations as it deems to be most in accordance with the purpose of its existence, *i.e.*, the advancement of the kingdom of Christ. The greater number of the churches are united in associations voluntarily formed, all of them determined by geographical limits. The associations, as well as the churches not in connection with them, are united together in the Baptist Union of Great Britain and Ireland referred to above. The old distinctions of "General" and "Particular" have faded away. Important financial measures are raising the standard of sustentation and superannuation, and linking the churches in closer fellowship. Much attention is given to the training of lay preachers, whose real importance had been somewhat overlooked. The problem of training and settling ministers is being viewed as a whole, and after careful thought two great changes have been adopted. There is a strong tendency to fix a term for the period of service in any one post, often five years, with the possibility of renewal. Then, to facilitate interchanges and to bring the churches into closer relations with the union, a 17th century office has been revived and modified. General superintendents work in large areas, one for the English-speaking churches in Wales, one for Scotland, one for London and eight for the rest of England. These ministers confer monthly.

2. The Continent of Europe.—During the 19th century what we have called the modern Baptist movement made its appearance in nearly every European country. In Roman Catholic countries Baptist churches were formed by missionaries coming from either England or America; work in France began in 1832, in Italy missions were started in 1866 (Spezia Mission) and in 1884 (Baptist Missionary Society, which also has a mission in Brittany) and in Spain in 1888. In Protestant countries and in Russia the Baptist movement began without missionary intervention from England or America. J. G. Oncken (1800–1884) formed the first church in Hamburg in 1834, and thereafter Baptist churches were formed in other countries as follows: Denmark (1839), Holland and Sweden (1848), Switzerland (1849), Norway (1860), Austria and Rumania (1869), Hungary (1871) and Bulgaria (1884). Baptist churches also began to be formed in Russia and Finland in the '50s and '60s.

The troubles of Continental Baptists during the World War called forth abundant sympathy and practical help from their brethren. A conference at London in 1920 resulted in linking each national group on the Continent with one of the stronger groups elsewhere, in fostering theological seminaries within each country, and in the most promising students receiving further training in Germany, Sweden, England and America.

3. British Colonies.—In every colony the Baptists have a considerable place. There are unions of Baptist churches in the following colonies: New South Wales, Victoria, South Australia, Western Australia, Queensland, New Zealand, Tasmania, Canada (four Unions) and South Africa. The work in South Africa is assisted by the Baptist South African Missionary and Colonial Aid Society, having its seat in London.

The Baptist World Alliance was formed in 1905, when the first Baptist World Congress was held in London. Similar international congresses have been held in Berlin, Stockholm and Philadelphia; another at Toronto in 1928.

The numerical strength of the denomination is given as follows in the *Directory of the Baptist World Alliance* for 1927:—

	Churches.	Pastors and missionaries.	Members of churches.	Sunday scholars.
Europe	8,169	4,274	636,488	672,542
Asia	3,008	1,613	333,379	186,663
Africa	865	332	67,636	38,161
America:				
North	58,575	49,617	8,485,683	5,229,278
Central and West Indies	544	265	58,770	47,962
South	408	195	30,962	25,190
Australasia	429	353	32,512	43,153
	71,998	56,649	9,645,430	6,242,949

This excludes Russia, where there are many Baptists (estimated at a million or more), for whom exact returns are not at present available. As the claim has recently been made that Baptists are now the largest Protestant denomination, it may be well to state that the most recent statistics of all types of Methodism show a total of 11,798,185 communicants (Church members and probationers).

The eastern secretary of the Baptist World Alliance is Dr. J. H. Rushbrooke, to whose book, *The Baptist Movement on the Continent of Europe* (1923), reference may be made for fuller information as to that area. The standard account of the progress of Baptist life in Great Britain is Dr. W. T. Whitley's *A History of British Baptists* (1923). *A History of the Baptists in Scotland* (ed. by the Rev. Geo. Yuille) has been published (Glasgow, 1926).

Not included in the foregoing statistics are bodies such as the "Disciples of Christ" (*q.v.*), practising believers' baptism. The faith of this community is clearly and concisely given by William Robinson in *What Churches of Christ Stand For* (Birmingham, 1926). (N. H. M.)

UNITED STATES

1. Colonial Beginnings.—The first Baptist church in America was founded in the Providence settlement on Narragansett bay, by Roger Williams (*q.v.*). He had been sentenced to banishment (Oct. 1635) by the Massachusetts court because of his persistence in advocating separatistic and other unacceptable views. To escape deportation to England he betook himself (Jan. 1636) to the wilderness, where the natives gave him a tract of land for a settlement. Having been joined by a few friends from Massachusetts, Williams founded what is generally believed to be the first commonwealth in which absolute religious liberty was combined with civil democracy. He rejected the baptism of infants, and in March 1639, with 11 others, formed a church of baptized

believers. Ezekiel Holliman, who had been with him in Plymouth and shared his separatist views, first baptized Williams and then Williams baptized the rest of the company. Soon after, believing that the true ordinances and apostolic church organization had been lost in the general apostasy, Williams, though continuing on friendly terms with the Baptists of Providence, withdrew from the church and assumed the position of a Seeker.

In Nov. 1637 John Clarke (1609–1676), a physician of religious zeal and theological acumen, arrived at Boston, Massachusetts. Finding the State about to banish the Antinomian minority, including Mrs. Anne Hutchinson (*q.v.*) and her family, he assisted the fugitives in forming a colony on the island of Aquidneck, R.I., procured from the Indians through the good offices of Williams. By 1641 there were, according to John Winthrop, "professed Ana-baptists" on the island, and Clarke was probably their leader. Mark Lucar, who was baptized by immersion in London in Jan. 1642 (N.S.) and was a member of a Baptist church there, reached Newport about 1644, and formed a connecting link between early English and American Baptists.

The Providence church maintained a rather feeble existence after Williams' withdrawal. A schism occurred in 1652, with a majority contending for general redemption and for the laying on of hands as indispensable to fellowship, and a minority maintaining particular redemption and rejecting the laying on of hands as an ordinance. The surviving church, composed of the former party, became involved in Socinianism and Universalism, but exerted considerable influence at Newport, in Connecticut, New York and elsewhere. The Newport church extended its influence into Massachusetts, and in 1649 we find a group of Baptists at Rehoboth, with Obadiah Holmes as leader. The intolerance of the authorities rendered the prosecution of the work impracticable and these Massachusetts Baptists became members of the Newport church. In 1651 Baptists holding a meeting in a private house were arrested, compelled to attend the church services of the standing order, fined, imprisoned and otherwise maltreated.

Henry Dunster (1612–1659), the first president of the college at Cambridge (Harvard), had by 1653 become convinced that "visible believers only should be baptized." Being unwilling to hold his views in abeyance, he relinquished in 1654, under circumstances of considerable hardship, the work that he greatly loved. In 1663 John Myles (1621–83), a Welsh Baptist who had been one of Cromwell's Tryers, with his congregation, took refuge in Massachusetts from the intolerance of the Government of Charles II. and settled in Rehoboth, Massachusetts. Even after they were discovered to be Baptists they were allowed to remain on condition of establishing their meeting-place at a considerable distance from that of the standing order. Some time before 1665 some English Baptists had settled in the neighbourhood of Boston and several others had adopted Baptist views. These were baptized (May 1665) and joined in a church covenant with those who had been baptized in England. The church was severely persecuted, the members being frequently imprisoned and fined and denied the use of a building they had erected as a meeting-house. Long after the Act of Toleration (1689) was in full force in England, the Boston Baptists pleaded in vain for the privileges to which they were thereby entitled, and it required the most earnest efforts of English Baptists and other dissenters to gain for them a recognition of the right to exist.

In 1682 William Screven (1629–1713) and Humphrey Churchwood, members of the Boston church, gathered and organized, with the co-operation of the mother church, a small congregation at Kittery, Maine. Persecution led to migration, Screven and a few of the members making their way to South Carolina, where, with a number of English Baptists of wealth and position, what became the First Baptist church in Charleston was organized (about 1684). A few Baptists of the General (Arminian) type appeared in Virginia from 1714 onward, and were organized and fostered by missionaries from the English General Baptists. By 1727 they had invaded North Carolina, where a church was constituted later.

From 1643 onward Antipaedobaptists from New England and elsewhere had settled in the New Netherlands (New York). Francis Doughty, an English Baptist who had spent some time in Rhode Island, laboured in this region in 1656 and baptized a number of converts. This proceeding led to his banishment. From 1711 onward Valentine Wightman (1681–1747) of Connecticut (General Baptist) made occasional missionary visits to New York at the invitation of Nicolas Eyres, a business man who had adopted Baptist views, and helped to organize a church. A number of Baptists settled on Block island about 1663. Some time before 1724 a Baptist church (probably Arminian) was formed at Oyster Bay.

The Quaker colonies, with their large measure of religious liberty, early attracted a considerable number of Baptists from New England, England and Wales. About 1684 a Baptist church was founded at Cold Spring, Bucks county, Pennsylvania. The Pennepek church was formed in 1688. Services were held in Philadelphia under the auspices of the Pennepek church from 1687 onward, but independent organization did not occur till 1698. Almost from the beginning general meetings had been held by the churches of these colonies. In 1707 the Philadelphia Association was formed as a delegated body "to consult about such things as were wanting in the churches and to set them in order." From its inception this body proved highly influential in promoting Baptist co-operation in missionary and educational work, in efforts to supply the churches with suitable ministers and to silence unworthy ones, and in maintaining sound doctrines. Sabbatarianism appeared within the bounds of the association at an early date and Seventh-day Baptist churches were formed (1705 onward).

The decades preceding the "Great Awakening" of 1740–43 were a time of religious declension. A Socinianized Arminianism had paralysed evangelistic effort. The First church, Providence, and the First church, Boston, had become Socinianized and discountenanced the revival. The First church, Newport, had been rent asunder by Arminianism, and the nominally Calvinistic remnant had itself become divided on the question of the laying on of hands. The First church, Charleston, had been wrecked by Socinianism. The General (Six Principles) Baptists of Rhode Island and Connecticut had increased their congregations and membership, and before the beginning of the 18th century had inaugurated annual associational meetings. But the fact that the Great Awakening in America was conducted on Calvinistic principles was sufficient to prevent their hearty co-operation. The churches of the Philadelphia Association were organized and engaged to some extent in missionary endeavour, but they showed little interest in the Edwards-Whitefield movement. And yet the Baptists ultimately profited by the Great Awakening beyond almost any of the denominations. In many New England communities a majority in the churches of the standing order bitterly opposed the new evangelism, and those who came under its influence felt constrained to organize "Separate" or "New Light" churches. These were severely persecuted by the dominant party and were denied even the scanty privileges that Baptists had succeeded in gaining. In several cases entire "Separate" churches transformed themselves into Baptist churches. In many cases a division of sentiment arose regarding infant baptism, but for a while mutual toleration prevailed. Mixed churches, however, had their manifest disadvantages and separation ultimately ensued.

The feeble Baptist cause in Virginia and North Carolina had been considerably strengthened by missionaries from the churches of the Philadelphia Association, and several churches, formed or reformed under their influence, united with the association. In 1776 the Ketockton Association was formed by this group of churches. The Virginia colonial Government, in earlier days cruelly intolerant, gave a limited toleration to Baptists of this type; but the "Separate" Baptists were too enthusiastic and too much alive to the evils of State control in religious matters to be willing to take out licences for their meetings, and soon came into sharp conflict with the authorities. Shubael Stearns, with about a dozen fellow-believers, settled at Sandy Creek, N.C., and in a few years had built up a church with a membership of more than 600. Marshall afterwards organized and ministered to a church at Abbott's Creek about 30m. distant. From these centres "Separate" Baptist influence spread throughout North and South Caro-

lina and across the Georgia border. From North Carolina as a centre, "Separate" Baptist influence permeated Virginia and extended into Kentucky and Tennessee. The Sandy Creek Association came to embrace churches in several colonies, and Stearns, desirous of preserving the harmonious working of the churches that recognized his leadership, resisted with vehemence all proposals for the formation of other associations.

From 1760 to 1770 the growth of the "Separate" Baptist body in Virginia and the Carolinas was phenomenal. The Sandy Creek Association, with Stearns as leader, undertook to "unfellowship ordinations, ministers and churches that acted independently," and provoked such opposition that a division of the association became necessary. The General Association of Virginia and the Congaree Association of South Carolina now took their places side by side with the Sandy Creek. The Virginia "Separate" Baptists had more than doubled their numbers in the two years from May 1771 to May 1773. In 1774 some of the Virginia brethren became convinced that the apostolic office was meant to be perpetuated and induced the association to appoint an apostle. This arrangement, soon abandoned, was no doubt suggested by Methodist superintendency. In 1775 Methodist influence appeared in the contention of two of the apostles and Jeremiah Walker for universal redemption. Schism was narrowly averted by conciliatory statements on both sides. As a means of preserving harmony the Philadelphia Confession of Faith, a Calvinistic document, with provision against too rigid a construction, was adopted and a step was thus taken toward harmonizing with the "Regular" Baptists of the Philadelphia type. When the General Association was subdivided (1783), a general committee made up of delegates from each district association was constituted to consider matters that might be for the good of the whole society. Its chief work was to continue the agitation in which for some years the body had been successfully engaged in favour of religious equality and the entire separation of Church and State.

Since 1780 the "Separate" Baptists had had the hearty co-operation of the "Regular" Baptists in their struggle for religious liberty and equality. In 1787 the two bodies united and agreed to drop the names "Separate" and "Regular." The success of the Baptists of Virginia in securing step by step the abolition of everything that savoured of religious oppression, involving at last the disestablishment and the disendowment of the Episcopal Church, was due in part to the fact that Virginia Baptists were among the foremost advocates of American independence, and that they secured the co-operation of free-thinking statesmen like Thomas Jefferson and James Madison and, in most measures, that of the Presbyterians.

The Baptist cause in New England that had profited so largely from the Great Awakening failed to reap a like harvest from the War of Independence. The standing order in New England represented the patriotic and popular party. Baptists lost favour by threatening to appeal to England for a redress of their grievances at the very time when resistance to English oppression was being determined upon. Though a large proportion of the New England Baptists co-operated heartily in the cause of independence, the denomination failed to win popularity.

About 1762 the Philadelphia Association began to plan for the establishment of a Baptist institution of learning that should serve the entire denomination. Rhode Island was finally fixed upon, and James Manning (1738–91), who had just graduated from Princeton with high honours, was sent to Rhode Island (1763) to confer with leading men, Baptists and others. As a result a charter was granted by the legislature in 1764, and after a few years of preliminary work at Warren (where the first degrees ever bestowed by a Baptist institution were conferred in 1769), Providence was chosen as the home of the college (1770). Here, the institution (since 1804 known as Brown university) was for many years the only degree-conferring institution controlled by Baptists.

In 1751 the Charleston Association was formed, also on the model of the Philadelphia Association, and proved an element of denominational strength. The association raised funds for domestic missionary work (1755 onward) and for the education of ministers (1756 onward). Brown university shared largely in the liberality of members of this highly cultivated and progressive body. The remarkable numerical progress of Baptists in South Carolina from 1787 to 1812 (from 1,620 members to 11,325) was due to the "Separate" Baptist movement under Stearns far more than to the activity of the churches of the Charleston Association. Both these types of Baptist life permeated Georgia, the latter making its influence felt in Savannah, Augusta and the more cultivated communities, the former evangelizing the masses. Many negro slaves became Baptists in Virginia, the Carolinas and Georgia. In most cases they became members of the churches of the white Baptists; but in Richmond, Savannah and some other towns they were encouraged to have churches of their own. By 1812 there were in the United States 173,972 Baptist Church members, the denominational numerical strength having considerably more than doubled since the beginning of the 19th century.

2. Middle Period.—From the beginning of the 19th century the Baptists in the United States developed rapidly and organized themselves more completely. Theological seminaries were founded: Colgate university at Hamilton, N.Y., in 1819; Newton Theological institution at Newton Centre, Mass., in 1825; Rochester Theological seminary at Rochester, N.Y., in 1850; Southern Baptist Theological seminary at Louisville, Ky., in 1859; Baptist Union Theological seminary at Morgan Park, Ill., in 1866; Crozer Theological seminary at Chester, Pa., in 1867; Kansas City Baptist Theological seminary, in 1901; the Berkeley Baptist Divinity school, Berkeley, Calif., 1904; South-western Baptist Theological seminary, Fort Worth, Texas, 1908; Northern Baptist Theological seminary, Chicago, Ill., 1913; and Eastern Baptist Theological seminary, 1925. The ministry thus became increasingly educated. In 1928 the denomination maintained over 100 theological universities and colleges.

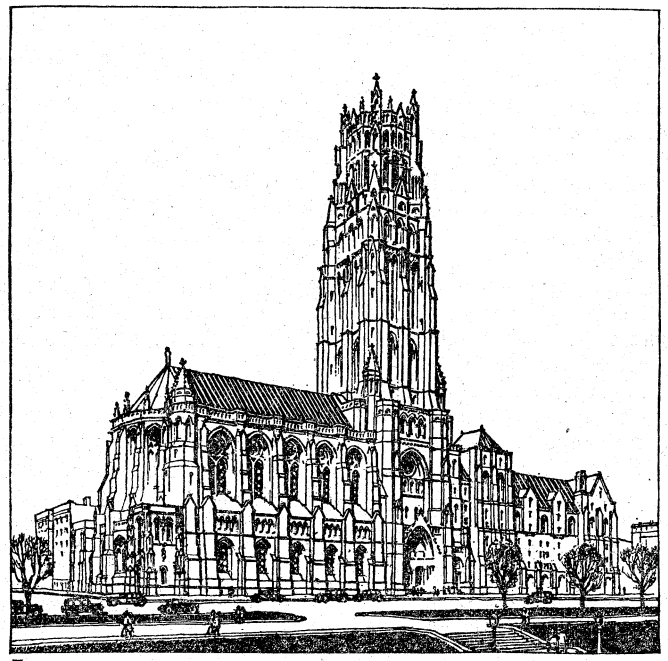
State conventions were organized throughout the States, as a means of co-operation in the support of feeble churches and the extension of home missionary activity. A number of journals were also founded. After Adoniram Judson and Luther Rice, who had gone as missionaries to India under the auspices of the American Board of Foreign Missions, became Baptists *en route* there was organized in 1813 the Baptist Society for Propagating the Gospel in India and other Foreign Parts. In 1832 the American Baptist Home Mission Society was organized for work on the American continents. In 1824 was organized the Baptist General Tract Society which, in 1840, became the American Baptist Publication Society. The struggle of the United States over slavery resulted in a division within the Baptist ranks and the southern Baptists withdrew to organize the Southern Baptist Convention, with a foreign mission board, a home mission board and a Sunday school board. This separation has never been overcome, although in 1891 the Baptist Young People's Union of America somewhat united Baptist interests, and the Baptist World Alliance has also given a new sense of unity to the American Baptists as well as to those of the rest of the world.

3. Modern Period.—The Baptists of America were in 1927 organized in 14 national, or approximately national, bodies. Of these, the Northern Baptist Convention had a membership of 1,399,931, the Southern Baptist Convention 3,708,253, and various negro conventions 3,253,369. After allowance has been made for duplications, the total membership of the Baptist churches in the United States was 8,347,331. The total value in 1927 of church property of American Baptists was $426,416,000, and the amount raised for missions and various other beneficences was $14,541,116, with total annual contributions of $76,031,654. These large figures indicate a rapid development.

The Southern Baptist Convention is vigorously expressing itself in various forms of denominational activity in the South. Southern Baptists have declined to enter the Federal Council of the Churches of Christ in America. The Southern Baptist Convention is organized somewhat differently from the Northern, having boards rather than societies. A large number of Southern Baptist churches are in rural districts. Theologically, the Southern Baptists are conservative and especially insistent upon immersion as the mode of baptism. Their development in wealth and prestige,

especially noteworthy in Texas, is attested by their support of two large theological seminaries, two training-schools, 31 colleges and 34 junior colleges. They have established many hospitals and maintain a number of orphanages. They are making, especially through the faculty of the Southern Baptist Theological seminary at Louisville, distinguished contributions to theological scholarship.

The Northern Baptist Convention. Prior to 1907 the Baptist churches of the northern States had no central body to which



THE BAPTIST RIVERSIDE BUILDING IN NEW YORK CITY, ONE OF THE LARGEST CHURCH BUILDINGS IN THE UNITED STATES, OWES ITS MAJOR ARCHITECTURAL FEATURE TO CHARTRES CATHEDRAL

they could send delegates. There existed a number of societies engaged in foreign and home missions and publication, but these were not strictly representative bodies. In 1907 there was a tentative organization of a Northern Baptist Convention which was subsequently developed into a permanent body, composed of delegates from local churches and 37 affiliating organizations, including State conventions. This body has no authority, but has very great influence. In 1927 the Northern Baptists had in the foreign field 794 missionaries; 2,249 churches with 9,615 native workers; 3,818 schools of all grades, with 143,500 pupils; and 115 hospitals and dispensaries. The Northern Baptists maintained 14 seminaries of different grades, two training-schools, 24 universities and colleges, four junior colleges and 16 academies. They furnish many leaders in theological thinking and scholarship. The Board of Education aids various colleges and seminaries as well as supporting student pastors at state universities.

For several years the denomination suffered considerable inner disturbance because of the efforts of certain conservative elements in the denomination to get control of the convention and adopt a confession or creed for the churches. This move was so thoroughly opposed to the Baptist policy that it was rejected overwhelmingly. By 1928 this agitation had largely passed within the Northern Convention, although it has been continued by members of the Canadian and Southern as well as of the Northern Baptist Convention, who have founded the Baptist Bible Union for the purpose of maintaining what seems to them to be fundamental Baptist positions as opposed to more liberal tendencies.

The Negro Baptists have organized a number of national, or semi-national bodies, the two largest of which are the National Baptist Convention and the National Baptist Convention of America. These bodies maintain various missionary and publication societies with admirable buildings; they are well organized and efficiently led. They maintain two theological seminaries, 15 colleges and 13 junior colleges and are active in educating the youth of their churches.

Foreign-speaking Baptists. For a number of years work has been carried on by Baptists among foreign-speaking immigrants in the United States, and these efforts have resulted in the establishment of a number of Baptist conventions and other organizations in the various nationalities. The largest of these bodies are the German and Swedish Conventions, which represent a total membership of something like 65,000. In addition smaller bodies of Danish, Norwegian, Czechoslovak, Polish, Hungarian, Finnish, Italian, French, Portuguese, Rumanian and Russian bodies have been organized. There are also a large number of unorganized, foreign-speaking Baptists. The entire membership of all the foreign-speaking Baptist bodies, so far as is known, is approximately 83,000. These foreign-speaking groups have been of great value in the process of "Americanization," for the second generation either speaks English or joins English-speaking churches.

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BAR, COUNTS AND DUKES OF. In the middle of the 10th century the territory of Bar (Barrois) formed a dependency of the Empire. In the 11th century its lords were only counts by title; they belonged to the house of Mousson (which also possessed the countship of Montbéliard and Ferrette), and usually fought in the French ranks, while their neighbours, the dukes of Lorraine, adhered to the German side. Theobald I., count of Bar, was an ally of Philip Augustus, as was also his son Henry II., who distinguished himself at the Battle of Bouvines in 1214. But sometimes the counts of Bar bore arms against France. In 1301 Henry III. having made an alliance with Edward I. of England, whose daughter he had married, was vanquished by Philip the Fair, who forced him to do homage for a part of Barrois, situated west of the Meuse, which was called *Barrois mouvant.* In 1354 Robert, count of Bar, who had married the daughter of King John, was made marquis of Pont-à-Mousson by the emperor Charles IV. and took the title of duke of Bar. His successor, Edward III., was killed at Agincourt in 1415. In 1419 Louis of Bar, brother of the last-named, a cardinal and bishop of Châlons, gave the duchy of Bar to René of Anjou, the grandson of his sister Yolande, who married Isabella, duchess of Lorraine. Yolande of Anjou, who in 1444, had married Ferri of Lorraine, count of Vaudémont, became heiress of Nicholas of Anjou, duke of Calabria and of Lorraine, in 1473, and of René of Anjou, duke of Bar, in 1480; thus Lorraine, with Barrois added to it, once more returned to the family of its ancient dukes. United with Lorraine to France in 1634, Barrois remained, except for short intervals, part of the royal domain. It was granted in 1738 to Stanislaus Leszczynski, ex-king of Poland, and on his death in 1766 was once more attached to the crown of France. (M. P.)

BAR, FRANÇOIS DE (1538–1606), French scholar, was born at Seizencourt, near St. Quentin, and became prior of the Benedictine abbey of Anchin, near Pecquencourt, and passed much of his time in the valuable library of the abbey, studying ecclesiastical history, especially that of Flanders. He also made a catalogue of the manuscripts at Anchin and annotated many of them. During the French Revolution his manuscripts passed to the library at Douai. Bar died at Anchin, March 25 1606.

See J. Lelong, *Bibliothèque historique de la France* (Paris, 1768–78); C. C. A. Dehaisnes, "Catalogue des manuscrits de Douai," in the *Catalogue général des manuscrits des bibliothèques des départements,* t. vi. (Paris, 1849–85).

BAR, a town in the Ukrainian S.S.R. on a tributary of the Bug. Lat. 49° 5′ N., long. 27° 38′ E. Pop. (1935) 6,161. It was rebuilt by Sigismund I. of Poland after its destruction by the Tatars in 1452 and renamed Bar (formerly Rov) by his wife Bona Sforza, born in Bari, Italy. It was captured by the Turks in 1672, but re-taken 1699. In 1768 it became the headquarters of the famous anti-Russian Bar confederation of the Polish aristocracy; but it was finally united to Russia in 1793.

BAR, CONFEDERATION OF, a famous confederation of the Polish nobles and gentry formed at the little fortress of Bar in Podolia in 1768 to defend the internal and external independence of Poland against the aggressions of the Russian Government as represented by her representative at Warsaw, Prince Nicholas Repnin. The originators of this confederation were Adam Krasinski, bishop of Kamenets, Osip Pulawski and Michael Krasinski. The confederates, being attacked by the king, Stanislaus, appealed for help abroad and contributed to bring about a war between Russia and Turkey. Their bands under Ignaty Malchewsky, Michael Pac and Prince Charles Radziwill ravaged the land in every direction, won several engagements with the Russians, and at last, utterly ignoring the king, sent envoys on their own account to the principal European powers.

In 1770 the council of the confederation was transferred from its original seat in Silesia to Hungary, from whence it conducted diplomatic negotiations with France, Austria and Turkey with the view to forming a league against Russia. The court of Versailles sent Dumouriez to act as commander-in-chief of the confederates, and their army, thoroughly reorganized by him, gallantly maintained the hopeless struggle for some years. It was not till 1776 that the last traces of it disappeared.

See Alexander Kraushar, *Prince Repnin in Poland* (Pol.), (Warsaw, 1900); F. A. Thesby de Belcour, *The Confederates of Bar* (Pol.) (Cracow, 1895); Charles François Dumouriez, *Mémoires et correspondance* (Paris, 1834).

BAR, THE. This term, as equivalent to the profession of barrister (*q.v.*), originated in the partition or bar dividing the English law-courts into two parts, for the purpose of separating the members and officials of the court from the prisoners or suitors, their advocates and the general public. Theoretically, this division of the court is still maintained in England, those who are entitled to sit within the bar including king's counsel, barristers with patents of precedence, serjeants (till the order died out) and solicitors, while the other members of the bar and the general public remain without. Parties in civil suits who appear in person are allowed to stand on the floor within the bar instead of, as formerly, appearing at the bar itself. In criminal trials the accused still stands forward at the bar. The exclusive privilege of calling to the bar belongs to the Masters of the Bench of each Inn of Court (*q.v.*), who also exercise disciplinary power over their members; but it was widely felt by members of the bar in recent years that the benchers did not keep a sufficiently watchful eye on the conduct of the members. Consequently, in 1883, a bar committee was formed for the purpose of dealing with all matters relating to the profession, such as the criticizing of proposed legal reforms, and the expression of opinions on matters of professional etiquette, conduct and practice. In 1894 the committee was dissolved, and succeeded by the general council of the bar, elected on a somewhat wider basis. It is composed of a due proportion of king's counsel and outer barristers elected by voting-papers sent to all barristers having an address in the *Law List* within the United Kingdom. Its expenses are paid by contributions from the four Inns of Court. Its powers are not disciplinary, but it would draw the attention of the benchers to any gross violation of professional etiquette.

Each state in America has its own bar, consisting of all attorneys-at-law residing within it who have been admitted to practise in its courts. Generally attorneys are admitted in one court to practise in all courts. An attorney of a state cannot practise in a court of the United States unless he has been admitted to it, or to one of the same class in another district or circuit. He cannot appear in the Supreme Court of the United States unless specially admitted and sworn as an attorney of that court, which is done on motion in case of any one who has practised for three years in the highest courts of his state and is in good standing at its bar. In most of the states there is a state bar association, and in some cities and counties local bar associations. These consist of such members of its bar as desire thus to associate, the object being to guard and advance the standards of the profession. Some own valuable libraries. These associations have no official recognition, but their influence is considerable in recommending and shaping legislation respecting the judicial establishment and procedure. They also serve a useful purpose in instituting or promoting proceedings to discipline or expel unworthy attorneys from the bar. There is an American Bar Association, founded in 1878, composed of over 3,500 members of different states of like character and position. Some of these associations publish annually a volume of transactions. The rights, duties and liabilities of counsellors-at-law are stated under ATTORNEY. As members of the bar of the state in which they practise they are subject to its laws regulating such practice; *e.g.*, in some states they are forbidden to advertise for divorce cases (New York Penal Code [1902] 148a) (1905, *People* v. *Taylor* [Colorado], 75 Pac. Rep. 914). It is common throughout the United States for lawyers to make contracts for "contingent fees," *i.e.*, for a percentage of the amount recovered. Such contracts are not champertous and are upheld by the courts, but will be set aside if an unconscionable bargain be made with the client (*Deering* v. *Scheyer* [N.Y.], 58 App. D. 322). So also by the U.S. Supreme Court (*Wright* v. *Tebbets*, 91 U.S. 252; *Taylor* v. *Benis*, 110 U.S. 42). The reason for upholding such contracts is that otherwise poor persons would often fail of securing or protecting their property or rights. In fact such contracts are seldom set aside, though no doubt the practice is capable of abuse.

BAR, in physical geography, an underwater ridge of sand or silt crossing a river or harbour. It may be raised by wave action above sea-level. When a river enters a tidal sea its rate of flow is checked, and the material it carries in suspension is deposited in a shifting bar lying athwart the channel. Where the channel is only partly closed, and the bar is attached to the land on one side, the feature is called a spit ("Nehrung," in the Baltic area). A bar may be produced by tidal action alone in an estuary or narrow gulf (as at Port Adelaide) where the tides sweep the loose sand backward and forward, depositing it where the motion of the water is checked. Nahant Bay (Mass.) is bordered by a ridge which separates it from Lynn harbour, and ties Nahant settlement to the mainland; the bar has been formed in the above manner.

Bar in music, meant originally one of the short vertical lines which divide the stave at regular intervals and in this way mark off the several measures of a composition, but in modern usage it has come to mean the measures themselves and is always used in this sense, the vertical dividing lines being now known as bar-lines. Bars serve not only to divide up a composition into convenient short sections which facilitate its performance but also to indicate its metre, the strongest accent falling always (unless intentionally and temporarily displaced) on the first beat of the bar, and the division is clearly marked.

The term *bar* is also used in meteorology (*q.v.*). Here it denotes the dynamical unit of atmospheric pressure. (*See* BAROMETER: *Units of Measurement of Pressure.*)

BARA BANKI, a town and district of British India, in the Fyzabad division of the United Provinces. The town, which forms one municipality with Nawabgani, the administrative headquarters of the district, trades in sugar and cotton. Pop. (1941) 18,207.

The district has an area of 1,722 sq.mi., level plain interspersed with numerous *jhils* or marshes. In the upper part the soil is sandy, while in the lower part it is clayey and produces finer crops. The principal rivers are the Gogra, forming the northern boundary, and the Gumti, flowing through the middle of the district. In 1856 it came, with the rest of Oudh, under British rule. During the Sepoy war of 1857–58 the whole of the Bara Banki talukdars joined the mutineers, but offered no serious resistance after the capture of Lucknow. Pop. (1941) 1,162,508. The chief crops are rice, wheat, pulse and other food-grains and sugar-cane.

BARABOO, a city of Wisconsin, U.S.A., on the Baraboo river, about 40 mi. N.W. of Madison; the county seat of Sauk county. It is on federal highway 12 and is served by the Chicago and North Western railroad. The population was 5,538 in 1920, 5,545 in 1930 and 6,415 in 1940 by the federal census in those years.

Baraboo is built on a series of hills and bluffs about 1,000 ft.

above sea level, and is a centre for summer tourists. Devil's lake, in the largest of Wisconsin's state parks, is three miles to the south; Mirror lake a few miles to the northwest and the lower dells of the Wisconsin river, noted for their weird beauty, are near Wisconsin Dells, 12 mi. north.

Woollen goods, towels, rugs, refrigerator cars and barn equipment are manufactured in the city, with power from hydroelectric development of the Wisconsin river.

The city, first settled in 1839 and chartered in 1882, was named after Jean Baribault, an early French trapper. The Ringling circus had its winters quarters in Baraboo before its consolidation with the Barnum and Bailey company in 1918.

BARABRA, the modern inhabitants of Nubia. The work of the archaeological survey of Nubia indicates that even before the dawn of Egyptian history lower Nubia was inhabited by a proto-Egyptian race, the near relatives of the pre-dynastic Egyptians whose wares they imported. By the 12th dynasty the population was heavily loaded with negro blood, and the recent discoveries at Kerma seem to carry this population south to the neighbourhood of the third cataract. Thus, apart from local fluctuations of minor importance, the population of Nubia from the 18th dynasty onwards may well have remained substantially unchanged, and the negro language now spoken by the Barabra may go back to this or an even earlier period. But although the Barabra speak a negro language, they must be regarded as predominantly Hamitic in blood and culture, and individuals of a physical type recalling that of the proto-Egyptians are not uncommon even now.

Physical Characteristics.—The Barabra are of medium height (about 66½in.), for the most part long-headed, often of a slight, rather graceful build, which immediately distinguishes them from the Fellahin. The "finest" type, that in which there is least evidence of negro blood, is of medium or dark bronze colour, with regular features and more or less oval face. The hair is black and almost straight, wavy, or curly, but seldom tightly curled like that of a negro. The eyes are dark, often large and handsome; the nose is well formed, though generally short.

Tribal Divisions.—The Barabra are divided into a number of tribes, and although they have adopted the Arab organization the names of a number of their sections indicate affinities with the eastern desert, if not actual Beja (*q.v.*) origin. The following are the tribal units generally recognized: (1) the Kenuz, who often speak of themselves as Nubi, between Aswan and Korosko; (2) the Feyadicha, this being really a nickname; (3) the Mahas, stretching from Wady Halfa to near Dongola; (4) the Danagla, near Dongola.

Mode of Life.—The Barabra are agricultural, where their country is wide enough to permit of any considerable cultivation, and even where the desert closes in on the river they take advantage of every strip which at low Nile is left covered with alluvium. But even with the greatest industry the country does not produce enough grain to maintain its population, and a considerable proportion of its male inhabitants seek their livelihood elsewhere, for they are enterprising, great travellers and traders, and quick at picking up new languages. They are to be found as servants everywhere between the delta and Khartum, and provided a considerable number of the Arab slave-raiders in the middle of last century, while for the last hundred years or more they have been exerting a steady and increasing influence in Kordofan. This is specially true of the Danagla. Most of the men are bilingual, speaking Arabic as well as their own languages, of which there are four (according to some three) recognized dialects. The women do not usually accompany the men on their travels, the result being that few know even a word or two of Arabic. They scar their cheeks with vertical or oblique cuts on each side of the face; they circumcize their boys and infibulate their girls, as indeed do all the Hamitic and almost all Arab tribes of the Sudan. Their houses are of the ordinary rectangular Arab form. Although the women now wear the Arab robe, about 50 years ago their customary garment was a short petticoat reaching to the knee. (C. G. S.)

BARACALDO, a river-port of N.E. Spain, in the province of Biscay, 5 mi. by rail N.W. of Bilbao. Pop. (1940), 4,396 (mun., 36,165). The municipality comprises a number of villages spread over the fertile flats—covered with maize, pod fruit and vines—at the confluence of the rivers Cadagua and Galindo with the Nervión. The industrialization of the district by the establishment of iron and steel works on the banks of these rivers has led to the very rapid increase of population in the last half-century; this is characteristic of the Biscayan metallurgical area.

BARACOA, a port city and head of the municipio of the same name in Oriente province, Cuba, situated on a small semi-circular bay on the north coast in the extreme eastern part of the island; population (1943 census), 10,395. Surrounded by rugged mountains, Baracoa has no road or rail connections with other parts of Cuba. The city is served regularly, however, by planes operated by the Compañía Nacional de Aviación. Bananas and coco-nuts from nearby plantations are the principal exports. Founded in 1512 by Diego Velázquez, Baracoa was the first settlement made in Cuba by the Spanish colonists. It was also the first capital of the island.

BARAHONA DE SOTO, LUIS (1535?–1595), Spanish poet, was born about 1535 at Lucena (Cordova), was educated at Granada, and practised as a physician at Cordova. His principal poem is the *Primera parte de la Angélica* (1586), a continuation of the *Orlando furioso;* the second part was long believed to be lost, but fragments of it have been identified in the anonymous *Diálogos de la monteria,* first printed in 1890; the *Diálogos* also embody fragments of a poem by Barahona entitled *Los Principios del mundo,* and many graceful lyrics by the same writer have been published by Francisco Rodriguez Marín. Cervantes describes Barahona as "one of the best poets not only in Spain, but in the whole world"; this is friendly hyperbole. Nevertheless Barahona has high merits: poetic imagination, ingenious fancy, and an exceptional mastery of the methods transplanted to Spain from Italy.

Barahona's *Angélica* has been reproduced in facsimile (New York, 1904) by Archer M. Huntington.

See F. Rodriguez Marín, *Luis Barahona de Soto, estudio biografico, bibliografico, y critico* (1903); *Diálogos de la monteria,* edited by F. R. de Uhagón (1890). (J. F.-K.)

BARAKA, a term used among the Berbers (*q.v.*) to indicate the quality of "holiness" of people and things. The word is Semitic and primarily meant knee but now means "blessing." It is not derived from or connected with *baraq,* lightning. A person possessing *baraka* in an exceptional degree is called by a term conveniently translated "saint." No one possessed so much *baraka* as the Prophet, and the transmission of a portion of his *baraka* to his descendants through his daughter Fatimah accounts for the veneration paid to every *sherif,* of whom there are immense numbers in Morocco, the majority no doubt with no real genealogical claim to the title. But apart from descent high office produces, or perhaps more fairly is a sign of, *baraka;* thus the Sultan of Morocco possesses both the *baraka* which is inherent in him as head of the 'Alawïim family, and that of the sultanship, he being the vice-regent of God on earth:

"It is on the Sultan's *baraka* that the welfare of the whole country depends. When it is strong and unpolluted the crops are abundant, the women give birth to good children, and the country is prosperous in every respect; in the summer of 1908 the natives of Tangier attributed the exceptionally good sardine fishery to Mûläi Hâfid's accession to the throne. On the other hand, in the reign of his predecessor the deterioration or loss of the Sultan's *baraka* showed itself in disturbances and troubles, in drought and famine, and in the fruit falling down from the trees before it was ripe. Nay even in those parts of Morocco which are not subject to the Sultan's worldly rule the people believe that their welfare, and especially the crops, are dependent on his *baraka.* . . . Besides the shereefs there are other families whose members are possessed of *baraka* as a hereditary quality, namely the families of *mrâbtïn* (sing. *mrâbăt.* . . .). These families consist of the descendants of some saintly ancestor who was not a shereef and whose *baraka* was in some degree transmitted to them."

These "marabout" (the French form—which also denotes the shrines of holy men) are the everyday saints and miracle workers

of north Africa, who so often have given a religious sanction to the anti-European activities of the tribes, while in peaceful times the less distinguished instruct the young, call to prayer, and generally preside over religious functions. The village *Imam* commonly receives a salary for his services besides claiming presents in kind from all who can afford them.

But *baraka* is naturally communicated to the tomb of a saint and the objects associated with it; it is inherent in corn—especially seed corn—bread, trees, especially palms and olives, wells, springs, stones, rocks, caves, sometimes animals or birds (not necessarily those to which medicinal virtues are ascribed), such as the swallow, while of all animal products milk stands pre-eminent as full of *baraka* (in this connection it is worth noting that in Africa while most nomad Arabs will give a traveller milk few will sell it). Finally it must always be remembered, for offence is easy, that *baraka* is extremely sensitive to pollution, and is spoilt, *e.g.*, by contact with infidels. One reason why the sultan Mulāi 'Abdul Aziz lost his *baraka* was the presence of Christians at his court, while the barbers of Andjra say that there is no *baraka* in the razors used by their colleagues in Tangiers because they are sharpened by Christians. A prayer said in a Christian's house or in the house or garden of a Jew is of no avail. A scribe from the Rīf told Westermarck that in order to retain his *baraka* a pilgrim must not go to the market and expose himself to the looks of the Jews who are gathered there. So too Jews are not allowed to come near the place in the market where the Muslims sell their grain, they must not appear on a threshing-floor, enter a granary, nor even approach a beehive, lest *baraka* be lost.

See E. Westermarck, *Ritual and Belief in Morocco.*

BARANTE, AMABLE GUILLAUME PROSPER BRUGIÈRE, Baron de (1782–1866), French statesman and historian, the son of an advocate, was born at Riom on June 10, 1782. He held numerous important administrative posts under the first Empire and under the restoration. After the revolution of 1830 he was ambassador at Turin and at St. Petersburg (Leningrad). After the fall of the monarchy in 1848 he retired into private life. He died on Nov. 22, 1866. Barante's *Histoire des ducs de Bourgogne de la maison de Valois* (1824–28) procured him immediate admission to the French Academy. Its narrative qualities, and purity of style, won high praise from the romantic school. His works include: a French translation of the dramatic works of Schiller; *Questions constitutionnelles* (1850); *Histoire de la Convention Nationale* (1851–53); *Histoire du Directoire de la République française* (1855).

His *Souvenirs* was published by his grandson (1890–99). *See* also the article by Guizot in the *Revue des deux Mondes,* July 1867.

BÁRÁNY, ROBERT (1876–1936), Austrian physician, was born in Vienna, April 22, 1876, and became a lecturer on diseases of the ear at the university there in 1909. In 1915, when he was a military doctor at Przmysl, he was taken prisoner by the Russians, but after some time he was released as an invalid. In 1917 he was invited to Uppsala University as assistant professor for ear and throat diseases and thus gained the title of professor. In 1914 he won the Nobel Prize for medicine, for his investigations in physiology and the methods of diagnosis, of great significance in the development of internal surgery. Bárány also carried out important investigations in the physiology and pathology of the cerebellum and worked out a method for the objective diagnosis of one-sided deafness. His works include *Physiologie und Pathologie des Bogengang—Apparats beim Menschen* (1907).

BARASAT, a subdivisional town in the district of the Twenty-four Parganas, Bengal, India. Pop. (1941) 11,230.

BARATHRUM, in Greek *βάραθρον,* a pit, at Athens the deep cleft west of the Hill of the Nymphs, into which common criminals were thrown. (*See* Athens.)

BARATYNSKI, YEVGENIY ABRAMOVICH (1800–1844), Russian poet. He served for eight years in the army in Finland, where he composed his first poem, *Eda.* In 1827 he settled near Moscow. There he completed his chief work, *The Gipsy,* a poem written in the melancholy and romantic style then the mode among the Russian admirers of Byron. He died in 1844 at Naples. On the journey to Naples he wrote one of his finest poems, *The Steamboat.*

A collected edition of his poems appeared at St. Petersburg (1835); later editions, Moscow (1869), and Kazan (1884).

BARB. (1) A term used of the folds of mucous membrane under the tongue of horses and cattle, and of a disease affecting that part, of the wattles round the mouth of the barbel, of the backward turned points of an arrow and of the piece of folded linen worn over the neck by nuns (Lat. *barba,* a beard). (2) A name applied to a breed of horses imported into Spain from Barbary (Fr. *barbe,* meaning "from Barbary") and to a breed of pigeons.

BARBACENA, an inland town of Brazil, in the state of Minas Gerais, 150 mi. N.N.W. of Rio de Janeiro and about 3,500 ft. above sea level. The surrounding district is chiefly agricultural, producing coffee, sugar-cane, Indian corn and cattle, and the town has considerable commercial importance. It is also noted for its healthy climate and possesses a large sanatorium much frequented by convalescents from Rio de Janeiro during the hot season. Barbacena was formerly an important distributing centre for the mining districts of Minas Gerais before the railway was extended beyond that point.

BARBACOAN, a linguistic stock or sub-stock of South American Indians, so called from the Barbacoas, one of its most important tribes. The stock, which included among other tribes the Cayapas (*q.v.*) and Colorados, occupied the coastal region of southern Colombia and northern Ecuador, from about 3° N. Lat. south to the mouth of the Esmeraldas river. Beyond this the coast was held by Esmeraldan (*q.v.*) tribes, but peoples belonging to the Barbacoan stock extended in the interior as far south as the headwaters of the Daule river. The name Barbacoa is derived from the term applied by the Spanish to the peculiar type of large communal houses, built on high piles, in use by the tribes of this stock. Recent studies have shown that there is considerable reason to believe that the Barbacoan languages are fundamentally related to the Chibchan (*q.v.*). If this is confirmed, the group would then lose its status as an independent linguistic stock.

See F. G. Suarez, *Prehistoria Ecuatoriana* (Quito, 1904); H. Beuchat and P. Rivet, *Affinités des langues du sud de la Colombie et du nord de l'Equateur* (Museon, 1910, vol. xi.); P. Rivet, "Les Indiens Colorados" (*Journ. Soc. Americanistes de Paris* [n.s.], vol. ii. pp. 177–208).

BARBADOS or **BARBADOES,** an island in the British West Indies. It lies 78m. E. of St. Vincent, in 13° 4′ N. and 59° 37′ W., is 21m. long, 14½m. at its broadest and 166sq.m. (106,470 ac.) in extent (roughly equalling the Isle of Wight). Its coasts are encircled with coral reefs, extending in some places three miles seaward. The island is elevated, with Mt. Hillaby (1,100ft.) near the centre, from which the land falls gently on all sides to the sea. The only natural harbour is Carlisle bay on the south-western coast, on which is Bridgetown, the capital; it affords anchorage for vessels of maximum draught.

Geology.—The oldest rocks, the Scotland series, are of shallow water origin, coarse grits, brown sandstones and sandy clays, in places saturated with petroleum and traversed by veins of manjak (glance-pitch). They have been folded and denuded, and form the foundation on which rest the later beds of the island. Upon the denuded edges of the Scotland beds lies the Oceanic series, chalky limestones, siliceous earths, red clay, and, at the top, a layer of mudstone composed mainly of volcanic dust. The limestones contain Globigerina and other Foraminifera, the siliceous beds are made of Radiolaria, sponge spicules and diatoms, while the red clay closely resembles that of the deepest parts of the oceans. The whole series was laid down in deep water. The Oceanic series is generally overlaid directly, and unconformably, by coral limestones which lie indifferently upon the older beds. Although of no great thickness, they cover six-sevenths of the island, rising in a series of terraces to a height of nearly 1,100ft. The Scotland series probably belongs to the Tertiary system, but the want of characteristic fossils makes determination difficult. Sandstone, and clays suitable for brick-making, are found in the district of Scotland, so called from a fancied resemblance to the Highlands of Scotland. Manjak, a species of asphalt, is also found in the

Scotland district. Although petroleum oil has been located, it has not been proved to exist in marketable quantities.

Climate.—The climate of Barbados is pleasant. The seasons are divided into wet and dry, the latter (extending from December to the end of May) being also the cold season. The temperature ranges from 70° to 86°, rarely, even on the coldest days, falling below 65°. The average annual rainfall is about 60 in., September being the wettest month. For eight months the invigorating north-east trade winds temper the tropical heat. The absence of swamps, the porous nature of the soil, and the extent of cultivation account for the freedom of the island from malaria. The climate is beneficial for pulmonary diseases, especially in their earlier stages, and is remarkable in arresting the decay of vital power consequent upon old age. Leprosy and elephantiasis ("Barbados leg") occur among the Negroes.

Industries.—Cultivation of sugar was introduced in the middle of the 17th century, and cheapness of labour, extreme fertility of the soil and care bestowed on cultivation made it the staple product of the island. In 1942–43 124,000 tons of sugar were exported. Other exports are rum and cotton. Prior to World War II three-quarters of the imports came from countries of the British empire (principally from Great Britain), and less than 10% of the exports went to foreign countries. There was also a considerable re-export trade with other West Indian islands. Nearly 500 mi. of roads are suitable for motor traffic. Steamship communications are excellent, and British West Indian Airways provides services to Trinidad and the Leeward and Windward Islands.

Population and Administration.—The estimated population in 1943 was 203,411, the density per sq.mi. being 1,225; over 70% of the inhabitants were of African Negro descent, and about 7% white, the remainder being of mixed blood. The colony has a legislative council of 10 nominated members and a house of assembly, the 24 members being elected biennially. The crown has a veto on legislation and appoints the public officials except the treasurer, who is an officer of the house of assembly. The tercentenary of the house of assembly was celebrated in June 1939. Under the terms of the Colonial Development and Welfare act, 1940, the British government loaned funds for expansion of the island's agricultural department and for housing and other schemes for improving social conditions. The government maintains free elementary schools (126 in 1942) and makes grants to secondary schools. The latter comprise second-grade (the scale of fees being lower) and first-grade; the first-grade schools are Harrison college and the Lodge school for boys, and Queen's college for girls. Codrington college (founded by Gen. Christopher Codrington's bequest in 1710), which provides for higher education, is affiliated with the University of Durham, in England.

Towns.—Bridgetown, the capital is in the parish of St. Michael, the estimated population of which in 1943 was 84,568. The cathedral of St. Michael's, in Bridgetown, serves as a parish church. Trafalgar square has the second earliest monument to Nelson. The town possesses beautiful gardens, a handsome military parade ground and fine beaches. Fontabelle and Hastings are popular suburban watering-places with good sea-bathing. Speightstown is the only other town of any size.

HISTORY

The name of the island may be derived from the Spanish word for the hanging branches of a vine which strike root in the ground, or alternatively from a species of bearded fig-tree. In the 16th-century maps the name is variously rendered St. Bernardo, Bernados, Barbudoso, Barnodos and Barnodo. There are more numerous traces of the Carib Indians here than in any other of the Antilles. Barbados is thought to have been first visited by the Portuguese. Its history illustrates the process of peaceful colonization, for the island, acquired without conquest, has never been out of the possession of the British. It was touched in 1605 by the British ship "Olive Blossom," whose crew took possession in the name of James I; but the first settlement was made in 1625, at the direction of Sir William Courteen under the patent of Lord Ley, afterwards Earl of Marlborough, to whom the island had been granted by the king. Two years later a grant of the island was obtained by the Earl of Carlisle, whose claim was based on a grant, from the king, of all the Caribbean islands in 1624; and in 1628 Charles Wolferstone, a native of Bermuda, was appointed governor. In the same year 64 settlers arrived at Carlisle Bay and the present capital was founded. During the Civil War in England many Royalists sought refuge in Barbados, where, under Lord Willoughby (who had leased the island from the Earl of Carlisle), they offered stout resistance to the forces of the Commonwealth. Willoughby, however, was ultimately defeated and exiled. After the Restoration, to appease the planters, doubtful of their title to their valuable estates, the proprietary or patent interest was abolished, and the Crown took over the government of the island; a duty of 4½% on all exports being imposed to satisfy the claims of the patentees. In 1684, under the governorship of Sir Richard Dutton, a census was taken, according to which the population then consisted of 20,000 whites and 46,000 slaves. The European wars of the 18th century caused much suffering, as the West Indies were the scene of numerous battles between the British and the French. In the course of the American War of Independence Barbados again experienced great hardships owing to the restrictions placed upon the importation of provisions from the American colonies. For three years after the peace of Amiens in 1802 the colony enjoyed uninterrupted calm, but in 1805 it was only saved from falling into the hands of the French by the timely arrival of Admiral Cochrane. Since that date it has remained unthreatened in the possession of the British. The rupture between Great Britain and the United States in 1812 caused privateering to be resumed, the trade of the colony being thereby almost destroyed. This led to an agitation for the repeal of the 4½% duty, but it was not till 1838 that the efforts to secure this were successful. On the abolition of slavery in 1834 the slaves continued to work for their masters as hired servants, and a period of great prosperity succeeded. The proposed confederation of the Windward Islands in 1876, however, provoked riots, which occasioned considerable loss of life and property, but secured for the people their existence as a separate colony. Hurricanes are the scourge of Barbados, those of 1780, 1831, and 1898 being so disastrous as to necessitate relief measures by the home government. Although earth tremors have been felt occasionally, no severe earthquake shocks have occurred.

See V. T. Harlow, *A History of Barbados, 1625–85* (1926); G. F. Sharp, *The Barbados Year Book* (1937); O. P. Starkey, *The Economic Geography of Barbados* (1939); *West Indies Year Book* (annual); *Colonial Report* (annual).

BARBARA, SAINT, a virgin martyr and saint of the Roman Catholic and Orthodox Eastern Churches, whose festival day is December 4. She was the daughter of a heathen named Diosorus who kept her carefully guarded in a tower; during his absence on a journey she caused three windows to be made in her bath-house, as a symbol of the Trinity, instead of the two which her father had intended, and on his return she confessed herself to be a Christian. He dragged her to the prefect of the province, who had her tortured and beheaded. Her father, who himself carried out the death sentence, was struck by lightning as a punishment on the way home. Probably for this reason Barbara was regarded as the patron saint in thunderstorms, and as the protectress of artillerymen and miners. She is represented in art as standing by a tower with three windows, sometimes with cannon near by. The place of her martyrdom is variously given as Heliopolis, as a town of Tuscany, and as Nicomedia, Bithynia, about the year 235.

BARBARIAN, the name among the early Greeks for all foreigners, including the Romans (Gr. *βάρβαρος*). The word probably represents the uncouth babbling of which languages other than their own appeared to the Greeks to consist. It soon assumed an evil meaning, becoming associated with the vices and savage natures of which they believed their enemies to be possessed. The Romans adopted the word for all peoples other than those under Graeco-Roman influence and domination. It has become synonymous with a general lack of civilization.

BARBARO, ERMOLAO (HERMOLAUS BARBARUS) (1454–*c.* 1493), Italian scholar, was born at Venice.

He edited and translated a number of classical works, of which the most important were: *Castigationes Plinianae* (1492), in which he boasted of having made 5,000 corrections in the text of Pliny's *Natural History;* Themistius' *Paraphrases* of certain works of Aristotle (1480); Aristotle's *Rhetorica* (published in 1544); *Castigationes in Pomponium Melam* (1493).

BARBAROSSA, the name given by the Christians to a family of Turkish admirals and sea rovers of the 16th century—Arouj and Khizr (alias Khair-ed-Din) and Hassan the son of Khair-ed-Din. In 1840 Capt. Walsin Esterhazy, author of a history of the Turkish rule in Africa, ventured the guess that "Barbarossa" ("Redbeard") was simply a mispronunciation of Bábá Arouj. The contemporary Arab chronicle published by S. Rang and F. Denis in 1837 says explicitly that Barbarossa was the name applied by Christians to Khair-ed-Din. The founder of the family was Yakub, a Roumeliot, probably of Albanian blood, who settled in Mitylene after its conquest by the Turks. He was a coasting trader and had four sons—Elias, Isaak, Arouj and Khizr, all said to have been born after 1482. Khizr became a potter and Isaak a trader. Elias and Arouj took to sea roving. In an action with a galley of the Knights of St. John, then established at Rhodes, Elias was killed and Arouj taken prisoner; the latter was ransomed by a Turkish pasha and returned to the sea. For some time he served the Mamelukes who still held Egypt. During the conflict between the Mamelukes and the sultan Selim I., he went to Tunis. The incessant conflicts among the Berber princes of northern Africa gave him employment as a mercenary, which he varied by piratical raids on the trade of the Christians. At Tunis he was joined by Khizr, who took, or was endowed with, the name of Khair-ed-Din. Isaak soon followed his brothers. Arouj and Khair-ed-Din joined the exiled Moors of Granada in raids on the Spanish coast. They also pushed their fortunes by fighting for, or murdering and supplanting, the native African princes. Their headquarters were in the island of Jerba in the Gulf of Gabès. They attempted in 1512 to take Bougie from the Spaniards, but were beaten off, and Arouj lost an arm, shattered by an arquebus shot. In 1514 they took Jijelli from the Genoese, and after a second beating at Bougie in 1515 were called in by the natives of Cherchel and Algiers to aid them against the Spaniards. They occupied the towns and murdered the native ruler who called them in. The Spaniards still held the little rocky island which gives Algiers its name and forms the harbour. In 1518 Arouj was drawn away to take part in a civil war in Tlemçen. He promptly murdered the prince he came to support and seized the town for himself. The rival party then called in the Spaniards, by whom Arouj was expelled and slain while fleeing at the Rio Salado. Khair-ed-Din clung to his possessions on the coast and appealed to the sultan, Selim I. He was named *beylerbey* by the sultan, and with him began the establishment of Turkish rule in northern Africa. For years he was engaged in subduing the native princes, and in carrying on warfare with the Christians. In 1519 he repelled a Spanish attack on Algiers, but he could not expel his enemies from the island till 1529.

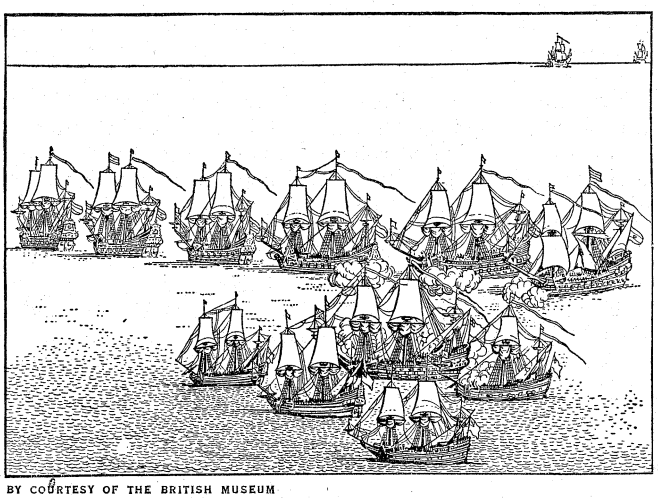
As a combatant in the forefront of the war with the Christians he became a great hero in Islam, and dreaded by its enemies under his name of Barbarossa. In 1534 he seized Tunis, acting as Kapitan pasha for the Sultan Suleiman. The emperor, Charles V., intervened on behalf of the native prince, retook the town, and destroyed a great part of Barbarossa's fleet. He was absent from Algiers when it was attacked by Charles V. in 1541. In 1543–44 he commanded the fleet which Suleiman sent to the coast of Provence to support Francis I. Barbarossa would not allow the bells of the Christian churches to be rung while his fleet was at anchor in the ports. He plundered the coast of Italy on his way back to Constantinople. When he died in his palace at Constantinople he was succeeded as *beylerbey* of Africa by his son Hassan. Hassan Barbarossa, like his father, spent most of his life in the Levant.

BIBLIOGRAPHY.—J. von Hammer-Purgstall, *The History of the Ottoman Empire,* French trans. by J. J. Hellert (1835–43), contains accounts of the Barbarossas, but requires to be corrected by other authorities. See *La Fondation de la régence d'Alger, histoire des Barberousse, chronique arabe du XVI*ème *siècle,* published by Sander Rang and Ferdinand Denis (1837) for a curious Moslem version of their story. H. D. de Grammont has collected later evidence in his *Histoire d'Alger* (1887); and he discusses the origin of the name in a paper contributed to the Revue Africaine, No. 171. For the campaigns, *see* Ad. Jurien de la Gravière in *Les Corsaires barbaresques et la marine de Soliman le Grand* (1887), and *Doria et Barberousse* (1886). Hajji Khalifa, *History of the Maritime Wars of the Turks,* trans. by J. Mitchell for the Oriental Translation Fund (1831), is said to have been founded on evidence collected by order of the Sultan Suleiman.

BARBAROUX, CHARLES JEAN MARIE (1767–94), French revolutionist, was educated by the Oratorians of Marseille and became a successful lawyer. He was appointed secretary (*greffier*) to the commune of Marseille, and in 1792 was commissioned to go to the legislative assembly and demand the accusation of the directory of the department of Bouches-du-Rhone, as accomplice in a royalist movement in Arles. At Paris he was received in the Jacobin club and entered into relations with J. P. Brissot and the Rolands. It was at his instigation that Marseille sent to Paris the battalion of volunteers which contributed to the insurrection of Aug. 10 1792, against the king. Returning to Marseille he was elected deputy to the Convention by 775 votes out of 776 voting. From the first he posed as an opponent of the Mountain, accused Robespierre of aiming at the dictatorship (Sept. 25 1792), and proposed to break up the commune of Paris. Then he got the act of accusation against Louis XVI. adopted, and in the trial voted for his death "without appeal and without delay." During the final struggle between the Girondists and the Mountain, he refused to resign as deputy and rejected the offer made by the sections of Paris to give hostages for the arrested representatives. He succeeded in escaping, first to Caen, where he organized the civil war, then to Saint-Émilion, near Bordeaux. Discovered, he attempted to shoot himself, but was only wounded, and was taken to Bordeaux, where he was guillotined when his identity was established.

BIBLIOGRAPHY.—*See* Ch. Vatel, *Charlotte Corday et les Girondins* (1873); A. Aulard, *Les Orateurs de la Législative et de la Convention* (1906). Barbaroux's own *Mémoires* were published in 1822.

BARBARY or BARBARY STATES, part of Northern Africa bounded east by Egypt, west by the Atlantic, south by the Sahara and north by the Mediterranean, comprising Morocco, Algeria, Tunisia and Tripoli. The name comes from the Berbers, chief inhabitants of the region.



BY COURTESY OF THE BRITISH MUSEUM

THE BRITISH BATTLESHIP "MARY ROSE," CONVOYING FOUR MERCHANTMEN, BEATING OFF BARBARY PIRATE SHIPS

Reproduced after engraving by Winceslaus Hollar in Ogilby, "Africa," 1670

BARBARY APE, or MAGOT (MACACA SYLVANA), a tailless monkey inhabiting Algeria, Morocco and the rock of Gibraltar and referable to the group of macaques. It is light yellowish-brown above and yellowish-white below, with the naked part of the face flesh-coloured. It is terrestrial and goes about in droves.

BARBARY PIRATES. The power of the piratical coast population of northern Africa arose in the 16th century, attained

its greatest height in the 17th, declined gradually throughout the 18th and was extinguished only in the 19th century. From 1659 onwards the coast cities of Algeria and Tunisia, though nominally forming parts of the Turkish empire, were in fact anarchical military republics which chose their own rulers and lived by plunder. The maritime side of this long-lived brigandage was conducted by the captains, or *reises,* who formed a class or even a corporation. Cruisers were fitted out by capitalists and commanded by the *reises*. The treasury of the pasha or his successors, who bore the titles of Agha or Dey or Bey, received 10% of the value of the prizes. Bougie was the chief shipbuilding port. Until the 17th century the pirates used galleys, but Simon Danser, a Flemish renegade, taught them the advantage of using sailing ships. In the first half of the 17th century more than 20,000 captives were said to be imprisoned in Algiers alone. The rich were allowed to redeem themselves, but the poor were condemned to slavery. Their masters would not in many cases allow them to secure freedom by professing Mohammedanism. In the early part of the 19th century, Tripolitania (*q.v.*), owing to its piratical practices, was several times involved in war with the United States. After the general pacification of 1815, the British made two vain attempts to suppress Algerian piracy, which was ended only by the French conquest of Algiers in 1830.

BARBAULD, ANNA LETITIA (1743–1825), English poet and miscellaneous writer, was born at Kibworth-Harcourt, in Leicestershire, on June 20, 1743, and married Rochemont Barbauld, a Presbyterian minister. The Barbaulds set up a boarding-school at Palgrave, Suffolk, and Mrs. Barbauld's famous *Hymns in Prose* for children (1781), an excellent series of simple nature studies, were written for the pupils. The school was abandoned in 1785, and in 1802 the Barbaulds settled in London at Stoke Newington. Mrs. Barbauld died on March 9, 1825; her husband had died insane in 1808. Mrs. Barbauld's numerous works include a share in her brother Dr. Aikin's *Evenings at Home,* editions of Akenside and Collins, the excellent collection of *British Novelists* (50 vols. 1810) with biographical and critical notices. A collected edition of her works, with memoir, was published by her niece, Lucy Aikin, in two volumes in 1825.

See A. L. le Breton, *Memoirs of Mrs. Barbauld* (1874); G. A. Ellis, *Life and Letters of Mrs. A. L. Barbauld* (1874); and Lady Thackeray Ritchie, *A Book of Sibyls* (1883).

BARBECUE (Span. *barbacoa*), originally a framework on posts placed over a fire on which to dry or smoke meat; hence, a gridiron for roasting whole animals, and in Cuba an upper floor on which fruit or grain is stored. In the United States the word means an open air feast, either political or social, where whole animals are roasted; it also applies to the cooking of sliced meat or fish in a highly seasoned sauce.

BARBED WIRE. This is a protective variety of fencing wire which is barbed at regular intervals of 1½ to 6in. The ordinary barbed wire of commerce consists of two or three line wires twisted together with a fairly long lay or pitch, the barbed wires being tightly inter-woven and clinched at right-angles to the strand. In the United States, barbed wire for fencing was originally suggested to meet conditions existing in the western states, by reason of the large cattle-raising industry in sections where timber was scarce. Farmers set themselves to find a way by which wire could be used without being destroyed by the animals it was intended to confine, and barbed wire not unnaturally suggested itself. So immediately did this device find favour with the farmers of the United States, and, in fact all over the world, that the manufacture of wire was revolutionized.

The practical beginning of the industry, was in the patents issued to Joseph F. Glidden of Dekalb, Ill., in 1874 for barbed fence wire, and during the same year, to Joseph F. Glidden and Phineas W. Vaughan, for a machine to manufacture it. These inventions were the foundation of the system of patents under which barbed wire has been protected and sold. In fact the commonest form of two-strand wire with barbs fastened to one wire only still goes by the name of "Glidden" brand.

The development of the barbed wire industry has been very much accelerated by the introduction of mild steel. Iron wire, while it was highly resistant to corrosion, also had very great limitations both with regard to its tensile strength and other physical properties, and also because wire drawn from common iron could only be produced in comparatively short lengths. Fortunately, the qualities which puddled iron lacked were found in a high degree in steels manufactured by the open-hearth process.

Barbed and Meshed Wire.—The introduction of barbed wire met with some opposition both in the British Isles and America on humanitarian grounds, but ample and extended tests silenced this objection. Barbed wire is in wide use in the western states of America, although new types of meshed wire field fencing have been largely employed since 1899. Generally speaking, the use of barbed wire fencing in other countries has not been as extensive as in the western United States. While it has been used on a comparatively large scale in Argentina and Australia, both these countries use a much larger quantity of plain wire fence, and in Argentina there is an important consumption of high-carbon oval fence wire of great strength, which apparently forms the only kind of fence that meets the conditions in a satisfactory manner.

Approximate Production in Tons of Barbed Wire

Year.	United States.	British Isles.
1874	5	..
1880	40,000	..
1900	200,000	..
1924	200,000	9,700
1927	180,000	12,000

Barbed wire is usually shipped to customers on spools made of either timber and sheet iron or wire, each holding approximately 112 lbs. or 600yds. in length. A hole is provided through the centre of the spool for inserting a bar, on which the reel can revolve for unwinding the wire as it is put up. A 1cwt. reel ready

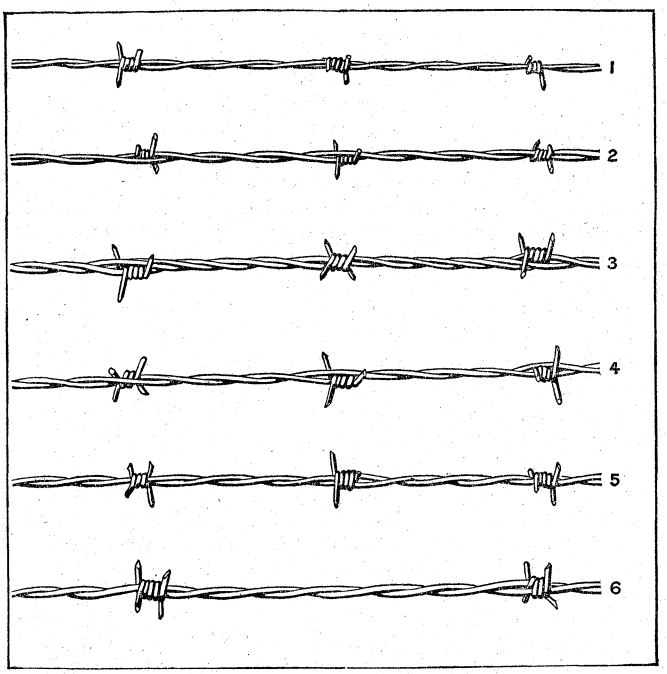


FIG. 1.—THE SIX TYPES OF BARBED WIRE IN GENERAL USE
Numbers 1, 2 and 3 serve agricultural purposes; number 4 was used by the British Army in trench warfare; numbers 5 and 6, the Iowa type, are employed on Australian sheep farms

for shipment carries a handle attached to the centre of the reel for carrying purposes, whilst a pulling handle is attached to the paying-out end of the reel so that the wire can be unrolled without danger of coming into contact with the barbs. After the wire is stretched in place, it is attached to the wooden posts by means of steel wire staples, ordinarily made from No. 9 galvanized wire.

Barbed wire fencing is now made in various patterns of which six kinds are shown (fig. 1). No. 1 is a hard high-tension line wire with barbs passing not only in between but around both wires

No. 2 is a Glidden type, this being made from ordinary mild steel wire with a barb wrapped around one wire only. No. 3 is of the heavy 3-ply Glidden type; whilst No. 4 is of the heavy 2-ply Glidden type. No. 5 is the 2-ply type with barbs wrapped in between and around the two wires; whilst No. 6 is a heavier kind of the same type but with barbs spaced at twice the distance.

Manufacture.—The wire employed is made of soft Thomas or Siemens-Martin steel and is drawn in a wire mill. Annealing, cleaning and galvanizing of the wire are done by a continuous process. The coil of wire is placed on a reel. The first end of the wire is fed longitudinally through an annealing medium (either red-hot lead or heated fire-brick tubes) of sufficient length to soften the wire. From the annealing furnace, the wire is fed longitudinally through a bath of muriatic acid, which removes the scale, and from the acid, after washing, the wire passes through a fluxing tank and then on through a bath of spelter, which is heated about 30 degrees above melting point. After being cooled by water, the wire is wound on suitable take-up blocks into finished coils. From 30 to 60 wires are passing simultaneously in parallel lines through this continuous galvanizing apparatus. The galvanizing gives the wire a bright finish and protects it from corrosion. The barbing and twisting together of the two or three longitudinal strand wires is done by automatic machinery.

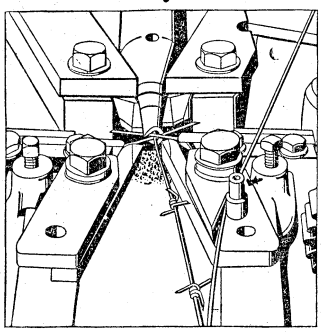


FIG. 2.—MAKING BARBED WIRE
The machine finger is about to twist the two line and two cross wires into a barb

A brief description of the manufacture of 2- and 4-point Glidden wire is as follows:—Two coils of wire on reels are placed behind the machine, designed to form the main or strand wires of the fence. One of the main wires passes through the machine longitudinally. One or two coils of wire are placed on reels at either side of the machine for making 2- or 4-point wire respectively. These wires are fed into the machine at right angles to the strand wire. At each movement of the feeding mechanism, when fabricating 2-point wire, one cross wire is fed forward. A diagonal cut forms a sharp point on the first end. The wire is again fed forward and instantly wrapped firmly around one strand wire and cut off so as to leave a sharp point on the incoming wire as before, while the bit of pointed wire cut off remains as a double-pointed steel barb attached firmly to the strand wire. This wire armed with barbs at regular intervals passes on through a guide, where it is met by a second strand wire—a plain wire without barbs. The duplex strand wires are attached to a take-up reel, which is caused to revolve and take up the finished barbed wire simultaneously and in unison with the barbing machine. In this way the strand wires are loosely twisted into a 2-ply strand, armed with barbs projecting at right angles in every direction. A barbed wire machine, under the best possible conditions, will produce about 2,000lb. of finished wire per day of eight hours.

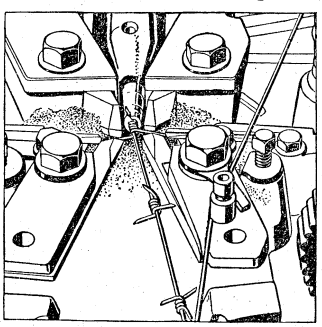


FIG. 3.—CUTTING THE BARBS
While the finger twists barbs, the cutters close on the wire to form the barb points

In England, where the use of barbed wire has also become common, the Barbed Wire act 1893 enacts that where on any land adjoining a highway barbed wire is used in such fashion as to be injurious to persons or animals, the local authority may require the occupier to abate the nuisance and on his failure to do so, may abate it themselves.

Barbed wire has come to be one of the most formidable defences that can be used in modern warfare, and in the World War of 1914–18 was used very extensively for entanglements and similar purposes. In some American states the use of barbed wire is regulated by law, but as a rule these laws apply to placing barbed wire on highways. (*See* WIRE.) (E. A. A.)

BARBEL (*Barbus barbus*), a Cyprinid fish of the rivers of central Europe, found also in Yorkshire and in the Trent and Thames. The mouth has four barbels, used as feelers to search for food. It attains a weight of 5olb. in the Danube. There are numerous species of *Barbus* in Africa and Asia, including the mahseer (*q.v.*).

BARBELLION, W.N.P., pen name of BRUCE FREDERICK CUMMINGS (1889–1919), English diarist and biologist, was born on Sept. 7, 1889, son of a journalist. He obtained a post at the Natural History Museum, South Kensington, and contributed articles on scientific subjects to scientific papers. He suffered from ill-health during his whole life in London, and after his marriage in 1915 with Miss Eleanor Benger, was told that his disease was disseminated sclerosis. He resigned his appointment in 1917, and died at Gerrard's Cross (Bucks.), on Oct. 22, 1919.

Barbellion's fame rests on the *Journal of a Disappointed Man* (1919), prepared by him from the entries in a diary which he had kept all his life. He himself describes his journal as "A self portrait in the nude;" and although it is possible that the circumstances of the author and his death six months after the publication had something to do with the great interest it excited, the book must be placed amongst the great autobiographical revelations in literature. His posthumous works were: *Enjoying Life, and Other Literary Remains* (1919); *A Last Diary* (1920).

BARBE-MARBOIS, FRANÇOIS, MARQUIS DE (1745–1837), French politician, was born at Metz. He began his public career as intendant of San Domingo under the old régime. At the close of 1789 he returned to France, and served the revolutionary government. He was twice arrested as a suspect and in 1797 was transported to French Guiana. Transferred to Oléron in 1799, he owed his liberty to Napoleon, after the 18th Brumaire. In 1801 he became councillor of state and director of the public treasury, and in 1802 a senator. In 1803 he negotiated the treaty by which Louisiana was ceded to the United States, and was rewarded by the First Consul with a gift of 152,000 fr. He changed his political colour with successive governments. Napoleon had made him president of the cour des comptes, and he retained his office under Louis XVIII.: he was minister of justice for a short time at the restoration after Waterloo, and then went into retirement. He was again president of the cour des comptes under Louis Philippe. He died on Feb. 12, 1837. He wrote: *Réflexions sur la colonie de Saint-Domingue* (1794), *De la Guyane, etc.* (1822), *Histoire de la Louisiane et la cession de cette colonie par la France aux États-Unis, etc.* (1828), and the story of his transportation after the 18th Fructidor in *Journal d'un déporté non jugé* (1834).

BARBER, one whose occupation it is to shave or trim beards, a hairdresser. In former times the barber's craft was dignified with the title of a profession, being conjoined with the art of surgery. In France the barber-surgeons were separated from the perruquiers, and incorporated as a distinct body in the reign of Louis XIV. In England barbers first received incorporation from Edward IV. in 1461. By 32 Henry VIII. c. 42, they were united with the company of surgeons, it being enacted that the barbers should confine themselves to the minor operations of blood-letting and drawing teeth, while the surgeons were prohibited from "barbery or shaving."

In 1745 barbers and surgeons were separated into distinct corporations by 18 George II. c. 15. The barber's shop was a favourite resort of idle persons; and in addition to its attraction as a focus of news, a lute, viol, or some such musical instrument was always kept for the entertainment of waiting customers. The barber's sign consisted of a striped pole, from which was suspended a basin, symbols the use of which is still preserved. The fillet round the pole indicated the ribbon for bandaging the arm in bleeding and the basin the vessel to receive the blood. Barber is from Lat. *barba,* beard.

See also BEARD, and *Annals of the Barber Surgeons of London* (1890).

BARBERINI, the name of a powerful Italian family, originally of Tuscan extraction, who settled in Florence during the

early part of the 11th century. They acquired great wealth and influence, and in 1623 Maffeo Barberini was raised to the papal throne as Urban VIII. He made his brother, Antonio, a distinguished soldier, and two nephews, cardinals, and gave to a third nephew, Taddeo, the principality of Palestrina. Great jealousy of their increasing power was excited among the neighbouring princes, and Odoardo Farnese, duke of Parma, made war upon Taddeo, and defeated the papal troops. After the death of Urban in 1644 his successor, Innocent X, showed hostility to the Barberini family. Taddeo fled to Paris, where he died in 1647; with him the family became extinct in the male line. His grand-niece, Cornelia, married Prince Giulio Cesare Colonna di Sciarra in 1728, who added her name to his own. On the death of Prince Enrico Barberini-Colonna the name went to his daughter and heiress, Donna Maria, and her husband, Marquis Luigi Sacchetti, who received the title of prince of Palestrina and permission to bear the name of Barberini. The fine Barberini palace and library in Rome give evidence of their wealth and magnificence. The ruthless way in which they plundered ancient buildings to adorn their own palaces is the origin of the saying, "Quod non fecerunt barbari, fecerunt Barberini."

See A. von Reumont, *Geschichte der Stadt Rom* (1868), iii, pp. 611–612, 615, 617, etc.; *Almanach de Gotha* (Gotha, 1902); J. H. Douglas, *The Principal Noble Families of Rome* (1905).

BARBERRY, any shrub of the genus *Berberis,* family (*Berberidaceae*). The common, Eurasian, *B. vulgaris* is naturalized in Great Britain and the eastern United States. It has long been grown as an ornamental, but, because it serves as a host plant for the destructive wheat rust, its culture is often prohibited.

Horticulturally the showy, often evergreen, species from China are much the most important. (*See* BERBERINE; MAHONIA.)

BARBER'S ITCH, known also as ringworm of the beard, is a communicable disease of the skin of the bearded region. The causes are molds (*Trichophyton cerebriforme* and *rosaceum*) which are usually transferred from person to person in the barber shop. The disease is characterized by nodules of varying sizes which occur on the jaw, chin and neck and which represent foci of inflammation in and about the hair follicles. The hair over them is stubby, and thin pus exudes from the follicles. In spite of the name, there is no itching. The skin is often reddened and sore, especially over the nodules. The diagnosis is confirmed by finding the fungus microscopically in the hairs. The disease is chronic and if it ends spontaneously there is considerable loss of hair. If treated it is curable and leaves no traces. Treatment consists in depilation, antiseptic ointments and X-ray. (*See* RINGWORM.)

BARBERTON, a district and a town in the Transvaal. The town, 25° 35′ S. and 31° 11′ E., is situated on the slopes of the De Kaap valley, and is overlooked by De Kaap, a peak of the Drakenberg. It is 2,825 ft. above sea level and is 136 mi. by rail from Lourenço Marques and 283 from Pretoria. The town grew as a consequence of the gold rush to the district, 1882–86, and quickly attracted a population of about 8,000. By 1887 the boom was past, and the town began to decline. Pop. (1936) 3,842 (1,441 whites). The town is lighted by electricity and has a good water supply. The district has developed along agricultural lines. It is one of the principal areas in South Africa for citrus fruit and cotton, and it produces considerable quantities of tobacco and of such subtropical fruit as pawpaws, mangoes and pineapples. Several thousand acres are under irrigation, and tomatoes are being grown for the winter markets of South Africa. The rainfall averages 31.7 in. per annum. Gold is still mined. Talc, nickel and asbestos are also worked in the vicinity. Malaria was formerly very severe and still occurs in the valleys.

BARBERTON, a manufacturing city of Summit county, Ohio, U.S.A., 6 mi. S.W. of Akron, on the Tuscarawas river. It is served by the Baltimore and Ohio, the Erie and the Pennsylvania railroads, and by a belt line to Akron. The population increased from 4,354 in 1900 to 18,811 in 1920, of whom 4,476 were foreign-born white, and was 23,934 in 1930 and 24,028 in 1940 by federal census. The principal manufactures are automobile tires, matches, high tension insulators and boilers. The output of its 29 establishments in 1937 was valued at $49,393,736.

BARBET, the general name for birds of the family Capitonidae, including about 9 genera and 72 species of small birds related to the woodpeckers and included in the order Piciformes. They inhabit the tropical regions of the world, but are absent from Australia. The plumage is usually predominantly green and the beak large and stout. They feed mainly on fruit and lay several white eggs in holes in trees. The blue-throated barbet (*Megalaima asiatica*), of eastern Asia, is the best-known in captivity. The family also includes the coppersmith (*q.v.*) and the South African tinker (*Pogoniulus pusillus*), the latter a small black, yellow and brown bird with a red cap. (G. F. Ss.)

BARBETTE, a platform inside a fortification raised sufficiently high for artillery placed thereon to be able to fire *en barbette,* viz., over the top of the parapet; also in warships a raised platform, protected by armour on the sides and top upon which guns are mounted *en barbette.* (Fr. diminutive of *barbe,* a beard).

BARBEY D'AUREVILLY, JULES AMÉDÉE (1808–1889), French man of letters, was born at Saint-Sauveur-le-Vicomte (Manche). His most famous novels are *Une Vieille Maîtresse* (1851), attacked at the time of its publication on the charge of immorality; *L'Ensorcelée* (1854), an episode of the royalist rising among the Norman peasants against the first republic; the *Chevalier Destouches* (1864); and a collection of extraordinary stories entitled *Les Diaboliques* (1874). Barbey d'Aurevilly is an extreme example of the eccentricities of which the Romanticists were capable, and to read him is to understand the discredit that fell upon the manner. He was literary critic of the *Pays,* and a number of his essays, contributed to this and other journals, were collected as *Les Oeuvres et les hommes du XIX.e siècle* (1861–65). Other literary studies are *Les Romanciers* (1866) and *Goethe et Diderot* (1880).

See also Alcide Dusolier, *Jules Barbey d'Aurevilly* (1862), a collection of eulogies and interviews; Paul Bourget, preface to d'Aurevilly's *Memoranda* (1883); Jules Lemaître, *Les Contemporains;* Eugène Grelé, *Barbey d'Aurevilly, sa vie et son oeuvre* (1902); René Doumic, in the *Revue des deux mondes* (Sept. 1902).

BARBEYRAC, JEAN (1674–1744), French jurist, the nephew of Charles Barbeyrac, a physician of Montpellier, was born at Béziers in Lower Languedoc. Migrating with his family into Switzerland after the revocation of the edict of Nantes, he studied jurisprudence at Geneva and then at Frankfurt-on-Main, and became professor of belles-lettres in the French school of Berlin. Thence, in 1711, he was called to be professor of history and civil law at Lausanne, and finally settled as professor of public law at Groningen. His fame rests chiefly on the preface and notes to his translation of Pufendorf's treatise *De Jure Naturae et Gentium.* In theory he follows closely Locke and Pufendorf; but he works out with great skill the theory of moral obligation, referring it to the command or will of God. He indicates the distinction, developed more fully by Thomasius and Kant, between the legal and moral qualities of action. The principles of international law he reduces to those of the law of nature, and combats many of the positions taken up by Grotius. He rejects the notion that sovereignty resembles property, and makes even marriage a matter of civil contract.

Barbeyrac also trans. into French, Grotius's *De Jure Belli et Pacis* (1724) dedicated to "Sa majesté Britannique, George I."; Cumberland's *De Legibus Naturae;* and Pufendorf's small treatise, *De Officio Hominis pères;* a history of ancient treaties contained in the *Supplément au grand corps diplomatique,* and the curious *Traité du jeu* (1709), in which he defends the morality of games of chance.

BARBICAN, an outwork for the defence of a gate or drawbridge; also a sort of penthouse or construction of timber to shelter warders or sentries from arrows or other missiles. The word is probably of Arabic or Persian origin.

BARBIER, ANTOINE ALEXANDRE (1765–1825), French librarian and bibliographer, became librarian successively to the Directory, to the Conseil d'État, and in 1807 to Napoleon, for whom he carried out a number of commissions. He had a share in the foundation of the libraries of the Louvre, of Fontainebleau, of Compiègne and Saint-Cloud; under Louis XVIII. he became administrator of the king's private libraries, but in 1822 he was deprived of all his offices. His *Dictionnaire des*

ouvrages anonymes et pseudonymes (1806–09; 3rd ed. 1872–79) is still an indispensable work of reference.

See also a notice by his son, Louis Barbier, and a list of his works prefixed to the 3rd ed. of the *Dict. des ouvrages anonymes et pseudonymes.*

BARBIER, HENRI AUGUSTE (1805–1882), French dramatist and poet, was born in Paris. Inspired by the revolution of July he poured forth a series of eager, vigorous poems, denouncing, crudely enough, the evils of the time. They are spoken of collectively as the *Iambes* (1831), though the designation is not strictly applicable to all. As the name suggests, they are modelled on the verse of André Chénier. The rest of Barbier's poems are forgotten, and when, in 1869, he received the long delayed honour of admission to the Academy, Montalembert expressed the general sentiment in his *Barbier? mais il est mort!*

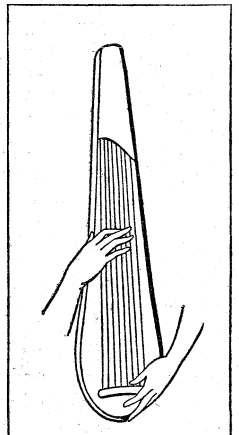
See Sainte-Beuve, *Portraits contemporains,* vol. ii.

BARBIERI, GIOVANNI FRANCESCO (otherwise called GUERCINO, from his squinting) (1591–1666), Italian historical painter, was born at Cento, near Bologna. His artistic powers were developed very rapidly, and at the age of seventeen he was associated with Benedetto Gennari (1550–1610), a well-known painter of the Bolognese school. In 1615 he removed to Bologna. His first style was formed after that of the Caracci; but the strong colouring and shadows employed by Caravaggio deeply impressed him, and for a considerable period his productions showed that painter's influence. Some of his latest pieces approach rather to the manner of his great contemporary Guido. He completed no fewer than 106 large altar-pieces for churches, and his other paintings amount to about 144. His most famous piece is thought to be the St. Petronilla, which was painted at Rome for Gregory XV. and is now in the Capitol. In 1626 he began his frescoes in the Duomo at Piacenza.

His brother, PAOLO ANTONIO BARBIERI (1603–49), was a celebrated painter of still life and animals.

See J. A. Calvi, *Life of G. F. Barbieri* (1808).

BARBITON or **BARBITOS,** ancient stringed instrument known to us from the Greek and Roman classics, but derived from Persia. Although in use in Asia-Minor, Italy, Sicily, and Greece, it is evident that the barbiton never won for itself a place in the affections of the Greeks of Hellas; it was regarded as a barbarian instrument affected by only those whose tastes in matters of art were unorthodox.



FROM SCHLESINGER, "INSTRUMENTS OF THE ORCHESTRA AND PRECURSORS OF THE VIOLIN FAMILY"

THE BARBITON, A MUSICAL INSTRUMENT ONCE POPULAR AMONG ANCIENT MEDITERRANEAN PEOPLES

In outline it resembled a large lute with a wide neck, and the seven or nine strings of the lyre. Although it probably underwent considerable modification at the hands of the Greeks, it retained until the end the characteristics of the lyre whose strings were plucked, whereas the rebab was sounded by means of the bow at the time of its introduction into Europe.

An instrument called barbiton was known in the early part of the 16th and during the 17th century. It was a kind of theorbo or bass-lute, but with one neck only, bent back at right angles to form the head. Robert Fludd gives a detailed description of it with an illustration. The people called it a theorbo, but the scholar having identified it with the instrument of classic Greece and Rome called it barbiton.

BARBITURIC ACID, a white, crystalline, organic chemical compound ($C_4H_4N_2O_3 \cdot 2H_2O$), prepared by condensing di-ethyl malonate and urea, is soluble in water, alcohol and ether. It forms salts with metals and these metal salts may be reacted with organic halogen compounds to form other compounds in which either one or two, as desired, of the hydrogen atoms of the original barbituric acid have been replaced by an organic radical. These same substituted compounds may be prepared directly by using a substituted derivative of di-ethyl malonate in the original condensation. Barbituric acid finds little use except as a starting material for the preparation of derivatives. Barbitone is sparingly soluble in cold water while sodium barbitone is very soluble. The dose of either is 3 to 10 grains. These two drugs are quickly absorbed and act rapidly. Within an hour or so of the administration by mouth of a therapeutic dose drowsiness is induced, and a satisfactory period of natural sleep should ensue. The effect lasts from six to twelve hours and no unpleasant after-effects should follow the taking of a single clinical dose.

Many other derivatives of barbituric acid have been introduced: *Luminal* or diphenyl barbituric acid and its sodium salt "Sodium luminal," dose 1½ to 5 grains. These drugs have also been used for warding off the convulsions of epilepsy and are given in doses of ½ to 1 grain once or twice daily for this purpose; *Proponal* or dipropyl barbituric acid, dose 2 to 6 grains as hypnotic; *Soneryl* or butyl-ethyl barbituric acid, dose 1 to 3 grains; *Dial* or di-allyl barbituric acid, dose 1 to 4½ grains; *Gardenal* or phenyl ethyl barbituric acid; *Phanodrom* or cyclo hexenyl barbituric acid.

Combinations of barbituric acid with other compounds are:—*Allonal,* a combination of allyl isopropyl barbituric acid with amidopyrin; *Veramon,* a combination of veronal and ethyl amido phenyl di-methyl pyrazolon; *Cibalgin,* a combination of dial and amidopyrin; *Beatol,* a combination of veronal with extracts of valerian and jusquiame; *Somnifene,* a mixture of veronal and allyl isopropyl barbituric acid.

The barbituric acid derivatives are powerful drugs, and it is most important that they should be taken only under medical advice. If these drugs are taken in doses exceeding the proper therapeutic dose poisonous effects may follow; thus, instead of sleep, deep loss of consciousness or coma may result. In this condition there is great danger of broncho-pneumonia (so called veronal pneumonia) which is a complication usually having a fatal termination.

The continued daily use of full therapeutic doses of barbituric acid compounds may be followed by symptoms of chronic poisoning such as headache, vertigo, severe mental depression and moral changes. The speech may become thick and articulation indistinct; the gait ataxic and reeling like that of alcoholic intoxication or cerebellar disease. Cerebral symptoms, such as drowsiness, visual hallucinations, delusions, squint, double vision, facial weakness, ptosis and nystagmus may occur. Skin rashes have been observed. Abnormal conditions of the urine such as the presence of albumen and casts have been described.

Drug Addiction (*q.v.*) may follow the continued daily therapeutic use of the barbituric acid group of drugs, and this is frequently accompanied by some of the symptoms above described.

The mental depression associated with persons addicted to the frequent use of barbituric acid compounds sometimes leads to the taking of a large overdose with fatal result. The returns of the registrar-general for England and Wales show from 1905 to 1925 a total of 257 cases of fatal poisoning from barbituric acid derivatives, most of these being cases of barbitone poisoning.

"Tolerance" to the barbituric acid group of drugs does not follow their continued use. It is therefore of great importance that the therapeutic dose should never be exceeded. In this respect these drugs differ from other addiction drugs, such as morphine and cocaine, where a remarkable tolerance may be established.

Fatal Dose.—In a healthy adult about 50 grains of barbitone probably represents the average minimum fatal dose. Cases of death have been recorded after taking much smaller doses, but in these other factors were usually present so that death was probably not entirely due to the drugs.

Regulations as to Sale.—On April 14, 1914, the barbituric acid group of drugs were placed under Part II. of the Schedule of Poisons. In 1918 they were placed under Part I. of the Poisons Schedule by order of the Privy Council. (W. H. WI.)

BARBIZON, a village, near the forest of Fontainebleau, France, which gave its name to the "Barbizon school" of painters, whose leaders were Corot, Rousseau, Millet and Daubigny, together with Diaz, Dupré, Jacque, Français, Harpignies and others. They put aside the conventional idea of "subject" in their pictures of landscape and peasant life, and went direct to the fields

and woods for their inspiration. The distinctive note of the school is seen in the work of Rousseau and of Millet, each of whom, after spending his early years in Paris, made his home in Barbizon. Unappreciated, poor and neglected, it was not until after years of struggle that they attained recognition and success. They both died at Barbizon—Rousseau in 1867 and Millet in 1875. It is difficult now to realize that their work, so unaffected and beautiful, should have been so hardly received. To understand this, it is necessary to remember the conflicts that existed between the classic and romantic schools in the first half of the 19th century, when the classicists, followers of the tradition of David, were the predominant school. The romantic movement, with Géricault, Bonington and Delacroix, was gaining favour. In 1824 Constable's pictures were shown in the Salon, and confirmed the younger men in their resolution to abandon the lifeless pedantry of the schools and to seek inspiration from nature. In those troubled times Rousseau and Millet unburdened their souls to their friends, and their published lives contain many letters, some extracts from which will express the ideals which these artists held in common, and show clearly the true and firmly-based foundation on which their art stands. Rousseau wrote, "It is good composition when the objects represented are not there solely as they are, but when they contain under a natural appearance the sentiments which they have stirred in our souls. . . . For God's sake, and in recompense for the life He has given us, let us try in our works to make the manifestation of life our first thought: let us make a man breathe, a tree really vegetate." And Millet—"I try not to have things look as if chance had brought them together, but as if they had a necessary bond between themselves. I want the people I represent to look as if they really belonged to their station, so that imagination cannot conceive of their ever being anything else. People and things should always be there with an object. I want to put strongly and completely all that is necessary, for I think things weakly said might as well not be said at all, for they are, as it were, deflowered and spoiled—but I profess the greatest horror for uselessness (however brilliant) and filling up. These things can only weaken a picture by distracting the attention toward secondary things." In another letter he says—"Art began to decline from the moment that the artist did not lean directly and naively upon impressions made by nature. Cleverness naturally and rapidly took the place of nature, and decadence then began. . . . At bottom it always comes to this: a man must be moved himself in order to move others, and all that is done from theory, however clever, can never attain this end, for it is impossible that it should have the breath of life." The ideas of the "Barbizon school" only gradually obtained acceptance, but its chief members now rank among the greater artists of their time.

See D. Croal Thomson, *The Barbizon School* (1891), with a list of French authorities; Jules Breton, *Nos peintres du siècle*, Paris, 1900.

BARBON, NICHOLAS (*c.* 1640–1698), English economist, probably the son of Praise-God Barbon, was born in London, studied medicine at Leyden, graduated M.D. at Utrecht in 1661, and was admitted an honorary fellow of the College of Physicians in 1664. He took considerable part in the rebuilding of London after the great fire of 1666, and has a claim to be considered the institutor of fire-insurance in England, which he started somewhere about 1680. He was M.P. for Bramber in 1690 and 1695. He founded a land bank which, according to contemporaries, was fairly successful and was united with that of John Briscoe in 1696. He died in 1698, and appointed John Asgill his executor, with instructions that none of his debts should be paid. His writings are interesting as expressing views much in advance of his time and very near akin to those of modern times on such important topics as value, rent, and foreign trade. Barbon anticipated to some extent the conclusions of Adam Smith on the division of labour and the theory of currency as expounded by Ricardo. The more important of his works were *Apology for the Builder; or a Discourse showing the Cause and Effects of the Increase of Building* (1685), in which he discussed the theory of rent; *A Discourse of Trade* (1690), which insisted that exports could only be paid for by imports; and *A Discourse Concerning Coining the New Money Lighter* (1696).

See Stephan Bauer, "Ein Beitrag zur Vorgeschichte der Klassischen Oekonomik," in Conrad's *Jahrbücher für Nationalökonomie, und Statistik*, vol. xxi. (Jena, 1890).

BARBON, BAREBONE or **BAREBONES, PRAISE-GOD** (*c.* 1596–1680), English leather-seller and Fifth Monarchy man from whom the "Barebones" Parliament derived its nickname, was minister to a congregation which assembled at his own house, "The Lock and Key," in Fleet street, where his preaching attracted large audiences. He wrote two books in support of paedobaptism, and his congregation had separated from a larger one of Baptists on that point of controversy. Later he belonged to the sect of Fifth Monarchy men. On Dec. 20, 1641, his house was stormed by a mob, and he narrowly escaped with his life. Barbon, who was a man of substantial property, was summoned by Cromwell, on June 6, 1653, as a member for London, to the assembly of nominees called after him in derision "Barebone's Parliament." He appears to have taken no part in the debates. In 1660 he showed great activity in endeavouring to prevent the Restoration. On March 31 he was obliged to sign an engagement to the council not to disturb the peace, and on Nov. 26, 1661, he was arrested, together with John Wildman and James Harrington, and was imprisoned in the Tower till July 27, 1662, when he was released on bail.

BARBOUR, JOHN (1316?–1395), Scottish poet, was born perhaps in Aberdeenshire, early in the 14th century, approximately 1316. In a letter of safe-conduct dated 1357, allowing him to go to Oxford for study, he is described as archdeacon of Aberdeen. He is named in a similar letter in 1364 and in another in 1368 granting him permission to pass to France, probably for further study at the university of Paris. In 1372 he was one of the auditors of exchequer, and in 1373 a clerk of audit in the king's household. In 1375 (he gives the date, an his age as 60) he composed his best known poem *The Brus*, for which he received, in 1377, the gift of ten pounds, and, in 1378, a life-pension of 20 shillings. Additional rewards followed, including the renewal of his exchequer auditorship. According to the obit-book of the cathedral of Aberdeen, he died March 13, 1395.

Considerable controversy has arisen regarding Barbour's literary work. If he be the author of the five or six long poems which have been ascribed to him by different writers, he adds to his importance as the father of Scots poetry the reputation of being one of the most voluminous writers in Middle English, certainly the most voluminous of all Scots poets.

(1) *The Brus*, in 20 books, and running to over 13,500 four-accent lines, in couplets, is a narrative poem with a purpose partly historical, partly patriotic. It opens with a description of the state of Scotland at the death of Alexander III. (1286) and concludes with the death of Douglas and the burial of the Bruce's heart (1332). The central episode is the battle of Bannockburn. Patriotic as the sentiment is, it is in more general terms than is found in later Scots literature. The king is a hero of the chivalric type common in contemporary romance; freedom is a "noble thing" to be sought and won at all costs; the opponents of such freedom are shown in the dark colours which history and poetic propriety require; but there is none of the complacency of the merely provincial habit of mind. The lines do not lack vigour; and there are passages of high merit, notably of the oft-quoted section beginning "A! fredome is a noble thing." Despite a number of errors of fact, notably the confusion of the three Bruces in the person of the hero, the poem is historically trustworthy, as compared with contemporary verse-chronicle, and especially with the *Wallace* of the next century. No one has doubted Barbour's authorship of the *Brus*, but argument has been attempted to show that the text as we have it is an edited copy, perhaps by John Ramsay, a Perth scribe, who wrote out the two extant texts, one being preserved in the Advocates' Library (now the National Library of Scotland), Edinburgh, and the other in the library of St. John's College, Cambridge, England. Extensive portions of the poem have been incorporated by Wyntoun (*q.v.*) in his *Chronicle*. The first printed edition extant is Charteris's (Edinburgh, 1571); the second is Hart's (Edinburgh, 1616).

(2) Wyntoun speaks (Chronicle III. iii.) of a "Treteis" which Barbour made by way of "a genealogy" of "Brutus lynagis"; and elsewhere in that poem there are references to the archdeacon's "Stewartis Oryginale." This "Brut" is unknown; but the reference has been held by some to be to (3) a Troy-book, based on Guido da Colonna's *Historia Destructionis Troiae*. Two fragments of such a work have been preserved in texts of Lydgate's *Troy-book*, the first in ms. Camb. Univ. Lib. Kk. v. 30, the second in the same and in ms. Douce 148 in the Bodleian library, Oxford. This ascription was first made by Henry Bradshaw, the librarian of Cambridge University; but the consensus of critical opinion is now against it.

(3) Yet another work was added to the list of Barbour's works by the discovery, in the university library of Cambridge by Henry Bradshaw, of a long Scots poem of over 33,000 lines, dealing with *Legends of the Saints*, as told in the *Legenda Aurea* and other legendaries. The *general* likeness of this poem to Barbour's accepted work in verse-length, dialect and style, and the fact that the lives of English saints are excluded and those of St. Machar (the patron saint of Aberdeen) and St. Ninian are inserted, made the ascription plausible. Later criticism, though divided, has tended in the contrary direction, and has based its strongest negative judgment on the consideration of rhymes, assonance, and vocabulary (see *Bibliography*).

(4) If Barbour be the author of the *Legends*, then (so does one conclusion hang upon another) he is the author of a Gospel story with the later life of the Virgin, described in the prologue to the *Legends* and in other passages as a book "of the birth of Jhesu criste" and one "quhare-in I recordit the genology of our lady sanct Mary."

(5) In recent years an attempt has been made to name Barbour as the author of the *Buik of Alexander* (a translation of the *Roman d'Alexandre* and associated pieces, including the *Vœux du Paon*), as known in the unique edition, *c.* 1580, printed at the Edinburgh press of Alexander Arbuthnot. The "argument" as it stands is nothing more than an exaggerated inference from parallel passages in the *Bruce* and *Alexander;* and it makes no allowance for the tags, epithets, and general vocabulary common to all writers of the period. Should the assumption be proved to be correct, and should it be found that the "*Troy fragments* were written first of all, followed by *Alexander* and *Bruce* or *Bruce* and *Alexander*, and that the *Legends* end the chapter," it will be by "evidence" other than that which has been produced.

For Barbour's life see *Exchequer Rolls of Scotland*, ii. and iii., *Registrum Episcopatus Aberdonensis* (Spalding Club); Rymer's *Foedera*.

BIBLIOGRAPHY.—(1) *The Brus* mss. and early editions *u.s.* Modern editions: J. Pinkerton (1790) (called by the editor "the first genuine edition," because printed from the Advocates' Library text, but carelessly); Jamieson (1820); Cosmo Innes (Spalding Club, 1856); W. W. Skeat (Early English Text Society, 1870–89; reprinted, after revision by the editor, by the Scottish Text Society, 1893–95). On the question of the recension of Barbour's text, *see* J. T. T. Brown, *The Wallace and The Bruce restudied* (Bonn, 1900). (2 and 3) *Troy Fragments*. C. Horstmann has printed the text in his *Legendensammlung* (*ut infra*). *See* Bradshaw, *Transactions of the Cambridge Antiquarian Society* (1866); the prolegomena in Horstmann's edition; Skeat, *Brus* (S.T.S. edit. *u.s.* pp. xlvi. *et seq.*); Köppel, "Die Fragmente von Barbours Trojanerkrieg," in *Englische Studien*, x. 373; Panton and Donaldson, *The Gest Historiale of the Destruction of Troye* (E. E. T. S. pt. ii. Introd. pp. x. *et seq.*); G. Neilson (*ut infra*); and J. T. T. Brown (*ut supra*) *passim*. (4) *Legends of the Saints*. C. Horstmann, who upholds Barbour's authorship, has printed the text in his *Barbours des schottischen Nationaldichters Legendensammlung nebst den Fragmenten seines Trojanerkrieges* (Heilbronn, 1881–82), and that of the legend of St. Machor in his *Altenglische Legenden. Neue Folge* (Heilbronn, 1881) pp. 189–208. A later edition by W. M. Metcalfe, who disputes Barbour's claim, appeared in 1896 (*Legends of the Saints in the Scottish Dialect of the Fourteenth Century*, Scottish Text Society). *See* the introduction to these editions; also Skeat and Köppel *u.s.*, and P. Buss, *Sind die von Horstmann herausgegebenen schottischen Legenden ein Werk Barberes?* (Halle, 1886) (cf. *Anglia* ix. 3, 1886). (5) For the Gospel-story evidence *see* Metcalfe, *u.s.* I. xxix. (6) On the *Alexander Book* and its assumed relationships, *see* G. Neilson, *John Barbour, Poet and Translator* (1900) (a reprint from the *Transactions of the Philological Society*); J. T. T. Brown *u.s.*, "Postcript," pp. 156–171; and *Athenaeum*, Nov. 17, Dec. 1 and 8, 1900, and Feb. 9, 1901.

(G. G. S.)

BARBUDA, an island in the British West Indies, 25m. north of Antigua, of which it is a dependency, in 17° 33′ N. and 61° 43′ W. Area 62 sq.m. Pop. 1,000. It is flat and well-wooded. On the western side is a large lagoon, separated from the sea by a reef of coral. The cultivated land is fertile, and the climate very healthy. The island was annexed by Great Britain in 1628 and granted to the Codrington family in 1680, who held it for more than 200 years. It is now Government property. Cotton is the leading product. Cattle, horses, mules and asses are bred, with the help of a government stock farm. A primary school managed by the Anglican authorities receives a government grant.

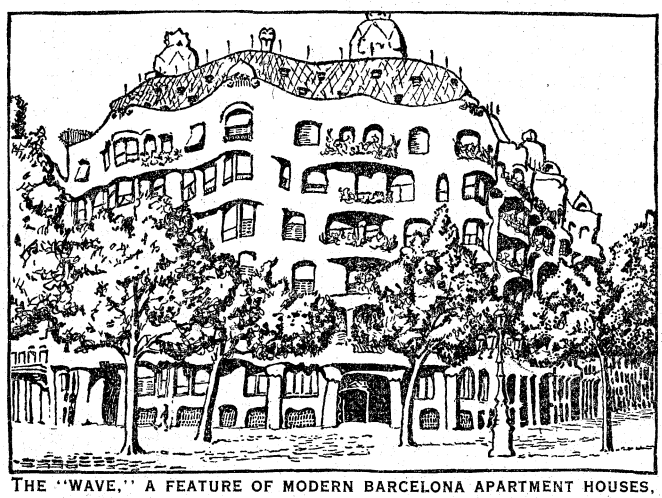
BARBUSSE, HENRI (1874–1935), French man of letters, was born in Paris, May 17, 1874. Educated at the Collège Rollin, he became a journalist. In 1910 he was editing the periodical *Je Sais Tout*, but found time to write novels, of which *Les Suppliants* (1903) and, in particular, *L'Enfer* (1908), an intense tragedy tinged with melodrama, won considerable success. He is known chiefly for a brutal piece of realism, *Le Feu* (1916), which won the Prix Goncourt in 1917 and remains one of the most unforgettable pictures of modern war. Later he became a correspondent of the socialist journal *L'Humanité* and devoted his time to preaching against war. Among his other works are *Clarté* (1919); *La lueur dans l'Abîme* (1920); and *Quelques coins du coeur* (1921); *Manifeste aux intellectuels* (1927).

BARCA (mod. EL MERG, pop. 3,000), in Cyrene, founded in the middle of the 6th century B.C. Rising quickly to importance it became a rival of Cyrene, and gave its name to the west of Cyrene's territory. Barca is said to have owed its origin to Greek refugees flying from the tyranny of Arcesilaus II. (*see* CYRENE), but it was rather Libyan than Greek at all times. A Persian force invited by Pheretima, mother of Arcesilaus III., in revenge for Barcan support of a rival faction, sacked it in 512 B.C. and deported a number of its inhabitants to Bactria. Under Ptolemaic rule it began to decline, like Cyrene, and its port Ptolemais (Tolmeta) took its place: but after the Arab conquest (A.D. 641) it became the chief place of the Cyrenaica for a time. Scanty remains of antiquity are visible. El Merg lies about ten miles from the coast on the crest of Jebel Akhdar, here sunk to a low and fertile downland. It is connected by rail with Bengasi (66m.).

BARCAROLLE or **BARCAROLE,** properly a musical term for the songs sung by the Venetian gondoliers, and hence for an instrumental or vocal composition, generally in 6-8 time, written in imitation of their characteristic rhythm. Famous examples are those of Chopin (one of his greatest works), Offenbach (the well-known number in *Les Contes d'Hoffmann*), and Mendelssohn (in his *Songs without Words*).

BARCELONA, a maritime province of N.E. Spain, formed in 1833 from districts of the then province, and earlier principality, of Catalonia. Pop. (1940) 1,931,875; area 3,033 sq.mi. The axis of the province is the valley of the Llobregat, about which its small regions are more or less symmetrically arranged. From the Sierra del Cadi to Berga, the Bergadá is a region of mountain pastures, and also of industry and agriculture in the high valleys, which combine fertility with some degree of mineral wealth. Berga, pop. (1940) 5,605 (mun., 6,468), with lignite mines and cement manufactures for which the Llobregat supplies water-power by canal, stands in front of the mountains, overlooking towards the south a monotonous zone of small plateaux and of truncated conical hills. The development of flat surfaces in this zone, which keeps the rainfall relatively low, is reflected in the regional names: *Plana de Vich*, the great stock-raising area in the east of the province, crossed by the river Ter, and *Plá de Bages*, in the west, the northern limit of viticulture in Barcelona. Between these regions is the *Llusanés*, while they are flanked in échelon by the mountainous *Guillerías*, famous in the annals of banditry, which stretches into the neighbouring province of Gerona, and by the arid *Segarra* in the west, which, with its stunted woods, is an inlier of the Segre depression. Variety of line and delicacy of tint mark the topography of the saline area to which the salt hills of Cardona, exploited since Roman times, belong. The importance of this area has been very greatly

increased by the discovery in 1912 of extensive potash deposits (sylvine and carnallite). On the south the surface of the zone, which descends gradually from 2,460 ft. at Berga, rises again more rapidly towards a mountain chain of which the culminating points are the Montsery (5,836 ft.) and the Montserrat (4,055 ft). The scarped southern face of this chain forms the northern wall of the undulating lowlands of the Panadés and Vallés,



THE "WAVE," A FEATURE OF MODERN BARCELONA APARTMENT HOUSES. IT IS AN ATTEMPT TO REFLECT THE TOWN'S SEAPORT ATMOSPHERE

and is cut by the gorge of the Llobregat, followed by the railway. Martorell, standing where the river Noya joins the Llobregat, commands the exit from the Panadés towards the south-east, but Villafranca, in the centre of the lowland, is the principal town of this region of vineyards and of winter pastures, which communicates with the sea also at Villanueva, the port of export for its wines. The Vallés, the granary of the province, whence the name of the capital Granollers, on the Besós, is also important industrially. In front of these lowlands extends the Catalan coastal chain, cut in segments by the Tordera, Besós and Llobregat, and ending in the southwest in the cliffs of the Garraf coast. By these cliffs the continuity of the low coastal zone is broken; the plain of Mataró and Arenys del Mar, with alluvia derived from the granitic section of the coastal chain between the Tordera and the Besós, and the plain of Barcelona, to Castelldefels in the west of the Llobregat delta, are separated from the small western plain of Villanueva.

The predominance of light soils suitable for viticulture brings Barcelona into the second position among Spanish provinces in acreage devoted to the vine, and the yield per acre is exceptionally high. Variety is the characteristic of the products of the soil, which include the orange and peach, ripened in the warm coastal valleys, the carob and almond, and the vegetables, cereals and fruits grown on the extraordinarily fertile and intensively cultivated alluvial flats. But the cities are dependent on other provinces for their supply of meat and wheat. The economic conditions are not very favourable to stock, but the province is one of the chief swine-raising provinces of Spain. Over 50,000 ac. are irrigated, and the *Acequia Condal,* drawing from the Besós, may be one of the oldest irrigation works in Spain; the standard of farming is very high in the minutely-subdivided and high-rented irrigated area. The wide extension of industry and the importance of the transit trade, both facilitated by the excellence of the means of communication, including the rural roads, give the province its chief character and are mainly responsible for the density of population (637.0 per sq.mi. in 1940), which is highest among the provinces of Spain, exceeding that of industrialized Vizcaya.

BARCELONA, formerly capital of Catalonia, and after 1833 capital of province of Barcelona in eastern Spain; seat of a bishop. Pop. (1940) 1,079,601 (mun., 1,081,175). The city and suburbs occupy an amphitheatre between the flood-plains of the rivers Llobregat and Besós, facing S.E. to the Mediterranean and backed by a section of the Catalonian coastal chain which forms a pyramid culminating in the Tibidabo (1,745 ft.). In easy communication by the valleys of the above rivers both with the structural depressions of the Panadés and the Vallés, lying behind the coastal chain, and with the lowlands to the north of the inner mountain chain, Barcelona lies both on the coastal road and at the end of its connections with interior communications. The fortified hill of Montjuich (574 ft.) rising from the sea to the southwest, separates the city from the mouth of the Llobregat. The entire amphitheatre is now urbanized. Country houses of wealthy merchants reach out to the slopes of the bounding hills from villages and townships which formerly lay in a ring round the city and have now been absorbed; the new quarter, *Ensanche,* with uniformly designed blocks of houses laid out in a rectangular scheme, welds these suburbs to the old city on the sea-front, which is now defined by the *Rondas,* occupying the ground where the fortifications once stood, and which is divided by the *Ramblas* into the older *Ciudad,* on the east, and the more modern *Arrabal,* on the west.

The special character of Barcelona lies in the association within a clearly delimited area of gardens of luxuriant vegetation, factories and other apparatus of industrial life, and the merchant shipping of a busy port.

The *Ciudad* is the old Barcelona, built round the Roman *Barcino* which stood on the *Monte Taber,* a narrow tongue of rather higher ground near the present cathedral. In the interior of the *Ciudad* are the architectural treasures left to Barcelona—the Plaza del Rey; the Gothic cathedral, with the tomb of Santa Eulalia, the patron saint of the city, and with magnificent 15th century stained glass windows; the church of Santa María del Mar and many public buildings.

The fine Plaza de Palacio, the centre of the city's maritime activities, and the Plaza Real, in the centre of the business area, lie inside, but near the edge of, the Ciudad; the Plaza de Catalonia, just outside and at the end of the Ramblas, is the chief centre of Greater Barcelona. The narrow, irregular streets of the old quarter were broken through in the 19th century by the Calle de Fernando VII and its continuations, and more recently by the Viá Layetana and other avenues.

The stream-bed which formerly bounded the *Ciudad* on the west was covered over in the first half of the 19th century and the interior wall dividing the *Ciudad* and the *Arrabal* gradually demolished; thus the Ramblas came into existence, now the chief artery of social life.

The *Arrabal,* although it has lain within the city bounds since 1350, was not built over until the second half of the 18th century.

The *Ciudad* and *Arrabal* were formerly surrounded by a strong line of ramparts, and dominated by a citadel on the northeast, erected in 1715 by Philip V; this restriction on development was removed by the destruction of the ramparts, authorized in 1854 and completed by 1868. In the later year, too, the citadel was destroyed during a revolt; the ground which it formerly covered was laid out in gardens on the occasion of the exhibition of 1888, and then became the city park. To the east, on the tongue of land that helps to form the port, the suburb of Barceloneta was laid out between 1752 and 1775 in rectangular blocks of uniform, two-storied houses by order of the Marqués de la Mina, the commandant of the port.

From 1864 onwards the rapidly increasing population of Barcelona poured out to the northwest, into the *Ensanche,* planned by the government engineer Cerdá. This quarter suffers, however, from the lack of organic connection both with the old town and with possible layouts for the outer areas. Beyond the *Ensanche,* the suburbs of Sans, Las Corts, San Gervasio, San Martín de Provensals and San Andrés de Palomar were added to the city between 1897 and 1904, the suburb of Horta, lying behind the projecting Montaña Pelada, before 1908, and that of San Vincente de Sarriá in 1922.

The Pedralbes palace, built by public subscription as a royal residence on the lower slopes of the hills near Sarriá, was presented to King Alfonso on the occasion of his visit to Barcelona in 1924. Communications within the municipal area were improved by the opening in Dec. 1924 of a tube railway, and in Dec. 1925 of a line of the Metropolitan railway, linking up the

suburbs of Gracia and San Gervasio. A series of other improvements were planned, which included the construction of a new terminal station of the M.Z.A. railway. Much of the hillside was converted into a fine park, with terraced gardens, an open air theatre and a stadium.

The educational institutions of Barcelona have from an early period been numerous and important. The university (Universidad Literaria), which was originally founded in 1430 by the magistracy of the city, and received a bull of confirmation from Pope Nicholas V in 1450, possessed at that time four faculties and 31 chairs all endowed by the corporation. It was suppressed in 1714, but restored in 1841, and occupied an extensive building in the new town. There are, besides, an academy of natural sciences, a college of medicine and surgery—confirmed by a bull of Benedict XIII in 1400—and an academy of fine arts.

The principal charitable foundations are the Casa de Caridad or house of charity, the general hospital, dating from 1401, and the foundling hospital. The principal civic and commercial buildings are the Casa Consistorial, a fine Gothic hall (1369–78), the Lonja or exchange (1383), and the Aduana or customhouse (1792).

At the seaward end of the Ramblas are the picturesque Atarazanas or arsenals, finished about 1243, and now marked for total destruction.

Remains of the former royal state of Barcelona are found in the Palacio Real of the kings of Aragon and the Palacio de la Reina.

Port.—The port of Barcelona, at first little more than an open roadstead, was improved in 1474 by the construction of a mole, the Moll de Santa Creu, but the harbour proper dates from the 17th century. It includes now an outer and inner harbour; the outer harbour is protected by two breakwaters of which the eastern was extended, and is entered by a channel 33 ft. deep; the inner harbour can usually provide accommodation alongside the quays for vessels drawing 24 to 27 ft. The floating dock is able to admit vessels of 10,000 tons.

From 1873 the work of extension and improvement was carried on systematically, with the addition of new quays, greater storage room, and better means for handling cargo. After 30 years of steady development, further plans were approved in 1903. At this time the port included an inner harbour, with a depth of 18 to 30 ft. at low tide, and an outer harbour with a depth of 20 to 35 ft.

Barcelona is located on several important international air routes.

As a commercial city, Barcelona is the centre for the entire industrial area of Catalonia, which has its warehouses here. As an industrial city, it is characterized both by the great variety of its manufactures and by the amount of almost domestic manufacture, carried out in small workshops.

The textile industry, especially the cotton industry, revived in 1746, is the most important, but the engineering works, including works for the construction of rolling stock for the railways, employ large numbers of people. Comestibles, raw materials and combustibles form the greater part of the imports, but this great manufactory also imports a considerable quantity of foreign manufactured goods.

The principal exports are wine, olive oil, silk, cork, sandals, fertilizers, woollen and cotton goods, paper, etc.

History.—During the Roman period *Barcino*, a town of the Lacetani, raised to the rank of a colony under the name of *Julia Faventia* (afterwards *Augudi* and *Pia*), gradually replaced *Tarraco* (Tarragona) as a seaport. The *Bardjaluna* of the Muslims, who captured it in 713, it became, after its reconquest by the Franks in 801, the chief town of the *Marca Hispanica* and, by the end of the 9th century, of the independent countship of Barcelona with recognized supremacy over its neighbours. The union in 1137 of Catalonia and Aragon was followed by the rise to political importance of the wealthy merchant class, from which were elected, at first exclusively, the members of the municipal council (*Conseil de Cent*) of Barcelona.

Barcelona now became one of the foremost trading cities of the Mediterranean, the rival of Genoa and Venice, and its maritime code, *Libro del Consulalo del Mar,* dating from the late 13th century, was for long widely recognized as authoritative.

By 1479, the date of the union of Aragon with Castile, the city had extended its direct jurisdiction by the technical inclusion within the municipality of protected areas scattered over eastern Spain, and exercised a virtual hegemony over the rest of the seaboard of Aragon; in municipal politics a democratic tradition had been established by the entry to the council, and final predominance there, of representatives of the popular classes; marked independence of the central authority had already been shown by the successful resistance of the city to John II of Aragon during the ten years ending in 1473.

The relations of Barcelona with the new central government were prejudiced by the monopoly of the American trade granted to Andalusia, which persisted until 1778. In 1640 a flirtation with France and the revival in favour of Louis XIV of the title of "Count of Barcelona" were illustrative of a tendency to play off a third party against Madrid rather than of any serious leanings towards France. During the War of the Succession Barcelona was taken in 1705 by the English under the earl of Peterborough, and the Archduke Charles was enthusiastically welcomed by the population, who paid the price of their enthusiasm when the *Conseil de Cent* was abolished by Philip V after the recapture of the city in 1714. By this and by the suppression of the Catalan *fueros* in general, relations with Madrid were further embittered. No permanent traces were left of the French occupation of Barcelona between 1809 and 1813. In the modern period since 1815, the history of Barcelona has been marked by episodes indicative of social, industrial or political unrest, the combination of different forms of unrest in one complex movement being characteristic of the city.

Specially serious were the uprisings of 1835, when 11 convents were destroyed and of the "tragic week" in 1909, when over 60 churches and religious buildings disappeared from the city's architectural inheritance.

The infantry committees of defense had their headquarters here in 1916, and it was here that the movement began which led to the establishment of the military directory in 1923. The evolution of the labour movement from the earlier, pacific phase of the General Workers' union (*Unión General de Trabajadores*), founded at the second Barcelona congress in 1888, to the phase characterized by the terrorist action of the *Sindicato único* led to the revolutionary strikes of 1919 and 1920. Barcelona was also the headquarters of the Catalonian separatist movement, and on Aug. 2, 1936, following the outbreak of civil war in Spain (*q.v.*), it became the seat of an autonomous Catalonian government. It was a main centre of government strength. Nationalist superiority in air and artillery strength caused the city to fall into rebel hands Jan. 26, 1939, almost without resistance. The fall of Barcelona, with its great industrial facilities, doomed the government cause and led to its final surrender in the following March.

Barcelona suffered from air attack during the war, notably a three-day raid in 1938.

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BARCELONA, a town and port of Venezuela, capital of the state of Anzoátegui, on the Neveri river, 3 mi. from its mouth and 12 mi. by rail from the port of Guanta, which competes with the river port in the trade of this district. Pop. (1941) 12,370. Having a mean annual temperature of 80° F., the town has the reputation of being unhealthful. There are saltworks and important coal deposits in its vicinity, the latter at Naricual and Capiricual, 12 mi. distant by rail. The adjacent country is fertile, and exports coffee, sugar, cattle and coal. The town dates from 1637, when it was situated at the foot of the Cerro Santo a few miles inland and was called Nueva Barcelona; it was moved to its present site in 1671. Its position at the point where the *llanos* come right to the sea makes it a natural outlet for a large district on the plains.

BARCELONNETTE, town, department of Basses-Alpes, southeast France. Pop. (1936) 2,573. Situated at a height of 3,717ft. on the right bank of the Ubaye river, it is in a fertile valley surrounded by villas, built by those who have made their fortune in Mexico, and are locally known as *les Américains.* The town itself is composed of a long street which is really the road from Grenoble to Cuneo over the Col de l'Argentière (6,545ft.). The town takes its name from the counts of Barcelona, to which family belonged Raymond Berenger IV., count of Provence, who refounded the town in 1231. It belonged to Savoy 1388–1713, since when it has belonged to France.

BARCLAY, ALEXANDER (*c.* 1476–1552), British poet, author of the *Ship of Fools.* His nationality is a matter of dispute, but William Bulleyn, who was a native of Ely, and probably knew him when he was in the monastery there, asserts that he was born "beyonde the cold river of Twede." At some time between 1493 and 1507, he became chaplain of the college of St. Mary Ottery, Devonshire. Here he made his version of Sebastian Brant's *Ship of Fools,* and even introduced his neighbours into the satire:

> For if one can flatter, and beare a Hauke on his fist,
> He shall be parson of Honington or Cist.

Later on he became a monk in the Benedictine monastery of Ely. In this retreat he probably wrote his eclogues, but in 1520, "Maistre Barkleye, the Blacke Monke and Poete" was desired to devise "histoires and convenient raisons to florisshe the buildings and banquet house withal" at the meeting between Henry VIII. and Francis I. at the Field of the Cloth of Gold. He at length became a Franciscan monk of Canterbury. It is presumed that he conformed with the change of religion, for he retained under Edward VI., the livings of Great Baddow, Essex, and of Wokey, Somerset, which he had received in 1546, and was presented in 1552 by the dean and chapter of Canterbury to the rectory of All Hallows, Lombard street, London. He died shortly after this last preferment, at Croydon, Surrey, where he was buried on June 10, 1552. All the evidence in Barclay's own work goes to prove that he was sincere in his reproof of contemporary follies and vice, and the gross accusations which John Bale brings against his moral character may be put down to his hatred of Barclay's cloth.



AFTER A WOODCUT IN SALLUST, PRINTED BY RICHARD PYNSON, LONDON, 1520

BARCLAY PRESENTING HIS TRANSLATION OF SALLUST TO HIS PATRON, THE DUKE OF NORFOLK

The *Ship of Fools* (*The Shyp of Folys of the Worlde,* first printed 1509) was the starting-point of a new satirical literature. It differs entirely from the allegorical satires of the preceding centuries. The figures are no longer abstractions; they are concrete examples of the folly of the bibliophile who collects books but learns nothing from them, of the evil judge who takes bribes to favour the guilty, of those eager to follow the fashions, of the priests who spend their time in church telling "gestes" of Robin Hood and so forth. The spirit of the book reflects the general transition between allegory and narrative, morality and drama. The poem is written in the ordinary Chaucerian stanza, and in language which is more modern than the common literary English of his day.

Certayne Ecloges of Alexander Barclay, Priest, written in his youth, were probably printed as early as 1513, although the earliest extant edition is that in John Cawood's reprint (1570) of the *Ship of Fools.* Barclay's pastorals contain many pictures of rustic life as he knew it. He describes, for instance, the Sunday games in the village, football, and the struggle for food at great feasts; but his eclogues were, like his Italian models, also satires on social evils.

His other works are: *The Castell of Laboure* (Wynkyn de Worde, 1506), from the French of Pierre Gringoire; the *Introductory to write and to pronounce Frenche* (Robert Copland, 1521); *The Myrrour of Good Maners* (Richard Pynson, not dated), a translation of the *De quatuor virtutibus* of Dominicus Mancinus; *Cronycle compyled in Latyn* by the renowned Sallust (Richard Pynson, no date), a translation of the *Bellum Jugurthinum; The Lyfe of the glorious Martyr Saynt George* (R. Pynson, *c.* 1530). *The Lyfe of Saynte Thomas,* and *Haython's Cronycle,* both printed by Pynson, are also attributed to Barclay, but on very doubtful grounds.

See T. H. Jamieson's edition of the *Ship of Fools* (1874), which contains an account of the author and a bibliography of his works; J. W. Fairholt's edition of *The Cytezen and Uplondyshman* (Percy Soc. 1847), which includes large extracts from the other eclogues; and Dr. Fedor Fraustadt, *Über das Verhältnis von Barclays Ship of Fools zu den lateinischen, französischen und deutschen Quellen* (1894).

BARCLAY, JOHN (1582–1621), Scottish satirist and Latin poet, was born at Pont-à-Mousson, where his father William Barclay held the chair of civil law. His mother was a Frenchwoman of good family. His early education was obtained at the Jesuit college. While there, at the age of 19, he wrote a commentary on the *Thebaid* of Statius. In 1603 he crossed with his father to London, but in 1605 he was again in Paris, where he married a French wife, Louise Debonaire. His *Sylvae,* however, was printed in London in 1606, and he remained in London until 1616. He then went to live in Rome, where he died.

His *Satyricon* (1603–14), a severe satire on the Jesuits, is modelled on Petronius. His best-known work is the *Argenis,* a long romance, with a monitory purpose, on the dangers of political intrigue. Most of the innumerable editions are supplied with a key to the characters and names of the story. It is of historical importance in the development of 17th century romance. Barclay's shorter poems, in two books, were printed in the *Delitiae Poetarum Scotorum* (Amsterdam, 1637, i. pp. 76–136). In the dedication to Prince Charles of England, he refers to his earlier publication, the *Sylvae.*

BIBLIOGRAPHY.—*See,* for the best account of Barclay, the preface by Jules Dukas in his bibliography of the *Satyricon* (1889). For the *Argenis, see* the dissertations by Léon Boucher (1874), and Dupond (1875). The *Icon Animorum* (the so-called 4th part of the *Satyricon*) was Englished by Thomas May in 1631 (*The Mirrour of Mindes, or Barclay's Icon Animorum*).

BARCLAY, JOHN (1734–1798), Scottish divine, left the Scottish Church in 1772 and founded congregations at Sauchyburn, Edinburgh, and London. His followers were sometimes called Bereans, because they regulated their conduct by a diligent study of the Scriptures (Acts xvii. 11). They hold a modified form of Calvinism.

His works, which include many hymns and paraphrases of the psalms, and a book called *Without Faith, without God,* were edited by J. Thomson and D. Macmillan, with a memoir (1852).

BARCLAY, ROBERT (1648–1690), an apologist of the Society of Friends, was born at Gordonstown, near Elgin, Scotland, on Dec. 23 1648, the son of Col. David Barclay (1610–86), who had served under Gustavus Adolphus. Robert was educated at the Scots college in Paris, and after his return to Scotland joined the Society of Friends. A public discussion on his *Theses Theologiae,* printed in English, Latin, French and Dutch, was held at Aberdeen (March 14 1675). Barclay's great work, *An Apology for the True Christian Divinity held by the Quakers* (1678), was written in defence of his *Theses,* and is the first reasoned analysis of Quaker doctrine. Barclay himself experienced to some extent the persecutions inflicted on the new society, and was several times thrown into prison. He travelled extensively in Europe (once with Penn and George Fox), and had several interviews with Elizabeth, princess palatine. In later years he had much influence with James II., who as duke of York had given to 12 members of the society, under the leadership of Penn, a patent of the province of East New Jersey, Barclay being made nominal governor (1682–88). He is said to have visited James with a view to making terms of accommodation with William of Orange, whose arrival was then imminent. He died on his estate at Ury, near Aberdeen, on Oct. 3 1690. His wife, née CATHERINE GORDON, who was also a Friend, lived until Dec. 14 1722.

BIBLIOGRAPHY.—*See* Barclay's collected works under the title of *Truth Triumphant* (1692; 2nd ed. 1717–18); and M. C. Cadbury, *Life of Robert Barclay* (1912).

BARCLAY, SIR THOMAS (1853–1941), English lawyer, was born in Dunfermline, Scotland, and after studying at the

universities of London, Paris and Jena, went to Paris as a correspondent of *The Times* in 1876. He was called to the bar (1881), and in 1882 resigned from *The Times* in order to study French law practice. From 1900 onwards he was constant in his advocation of cordial Franco-British relations. In 1903 and 1904 he visited the United States and advocated an Anglo-American treaty of arbitration and conciliation, and in Feb. 1905 visited Berlin, at the invitation of the Associated Chambers of Germany, with a view to promoting improved relations with that country. He was elected to parliament as Liberal member for Blackburn in 1910. Amongst his numerous publications on international law and relations may be mentioned: *Problems of International Practice and Diplomacy* (1907); *International Law and Practice* (1917); *New Methods for Adjustment of International Disputes* (1918); *Le Président Wilson et l'évolution de la politique étrangère des États-Unis* (1918). Barclay was knighted in 1904.

BARCLAY, WILLIAM (1546–1608), Scots jurist, born in Aberdeenshire in 1546. He was educated at Aberdeen university, went to France in 1573, and studied law under Cujas, at Bourges, where he took his doctor's degree. Charles III., duke of Lorraine, appointed him professor of civil law in the newly-founded University of Pont-à-Mousson, and also counsellor of state and master of requests. In 1603 he was obliged to quit France for England, having incurred the enmity of the Jesuits by his opposition to their proposal to admit his son John (*q.v.*) into their society. He was offered preferment by King James on condition of joining the Church of England. He refused, and returning to France in 1604, was appointed professor of civil law at Angers, where he died (1608). His principal works were *De Regno et Regali Potestate,* etc. (1600), a defence of the rights of kings, in which he refutes George Buchanan, "Junius Brutus" (Hubert Languet) and Jean Boucher; and *De Potestate Papae,* etc. (London, 1609), in opposition to the papal claim of temporal power which called forth a reply from Bellarmine; also commentaries on titles of the Pandects.

BARCLAY DE TOLLY, MICHAEL ANDREAS, called by the Russians MICHAEL, PRINCE BOGDANOVICH (1761–1818), Russian field-marshal, was born at Luhde-Grosshof, Livonia, on Dec. 27, 1761, of a Scottish family which had settled in Russia in the 17th century. He entered the Russian army at an early age. In the war of 1806 against Napoleon, Barclay took a distinguished part in the battle of Pultusk and was wounded at Eylau, where his conduct won him promotion to the rank of lieut.-general. In 1808 he commanded against the Swedes in Finland, and in 1809 by a rapid and daring march over the frozen Gulf of Bothnia he surprised and seized Umeo. In 1810 he was made minister of war, and he retained the post until 1813. In 1812 Barclay was given command of one of the armies operating against Napoleon. After he was defeated at Smolensk he resigned his command and took a subordinate place under the veteran Kutusov. Barclay was present at Borodino, but left the army soon afterwards. In 1813 he was re-employed in the field and took part in the campaign in Germany. After the battle of Bautzen he was reinstated as commander-in-chief of the Russian forces, and in this capacity he served at Dresden, Kulm and Leipzig. After the last battle he was made a count. He took part in the invasion of France in 1814 and at Paris received the bâton of a field-marshal. In 1815 he was again commander-in-chief of the Russian army which invaded France, and he was made a prince at the close of the war. He died at Insterburg, in Prussia, on May 26, 1818.

BARCLAYS BANK LIMITED. The history of Barclays Bank as a limited company dates from 1896, although many institutions now embodied in it had been established much earlier. The banking firms which took the lead in forming the limited company were Barclay, Bevan, Tritton, Ransom, Bouverie & Co., of London and Brighton (whose business was in existence prior to 1694), Gurney & Co. of Norwich (dating back to about 1650), and Jonathan Backhouse & Co. of Darlington (established in 1774). An agreement was entered into between these three firms for the formation of a joint stock company, while supplementary agreements were arranged with other firms, the combination, comprising 20 banks in all, being registered as Barclay & Company, Limited, with the head office at 54, Lombard street, London, upon which site the business of Barclay, Bevan, Tritton & Co. and its predecessors had been conducted since 1728. The first published balance sheet (1896) showed a paid-up capital of £2,000,000, a reserve of £1,000,000 and deposits of £26,170,423.

Further amalgamations quickly followed, mainly owing to the desire to extend the Bank's operations to practically all areas in England and Wales and to the need for keeping in line with the large scale amalgamations among industrial units, which, partly as a result of World War I, have been constantly taking place. No fewer than 80 banking firms and companies in all have been incorporated in Barclays Bank Limited, to which title the name of the undertaking was altered in 1917.

The first reference to the name of Barclay in connection with the Bank occurs in 1736, when Joseph Freame, son of John Freame—a goldsmith and the founder of the London business—took into partnership his brother-in-law, James Barclay and the family has been connected with the business ever since. The Barclays are descended from Robert Barclay of Ury, Scotland. The Bevan family are of Welsh origin. Timothy Bevan married the daughter of David Barclay, son of Robert Barclay of Ury, and became the father of Silvanus Bevan, who joined the Bank in 1767. The founder of the Gurney family came to England with William the Conqueror. It is recorded that Francis Gurney acted as banker in the reign of James I., and in 1775, John and Henry Gurney, descendants of Francis Gurney, established the Norwich Bank as a separate business, while a later partner—Richard Gurney—was associated by marriage with the Barclays of Lombard street. The Backhouses were linen and worsted manufacturers, who were doing a banking business in conjunction with their regular trade, before they started the Bank as a separate and independent institution in 1774.

Mr. F. A. Bevan, the first Chairman of Barclays Bank, was succeeded in 1917 by Mr. Frederick Craufurd Goodenough, who had been appointed Secretary on the incorporation of the Bank. Mr. W. Favill Tuke held office as Chairman from 1934 to 1936 when, upon his resignation, Mr. Edwin Fisher was elected in his place.

At the end of 1938, the total deposits of Barclays Bank Limited amounted to over £400,000,000.

BARCOCHEBA, BAR-COCHAB or **BAR KOKBA** ("son of a star"), the name given in Christian sources to the leader in the Jewish revolt against Rome in the time of Hadrian (A.D. 132–135). The name does not appear in the Roman histories. In Rabbinic sources he is called Bar (Ben) Coziba (son of deceit). At first the insurgents were successful, although they did not succeed in capturing Jerusalem; they struck coins in the name of Simeon, prince of Israel, and Eleazar the priest, and persecuted the Christians, who refused to join the revolt. But, under the command of Julius Severus, the strongholds which they had captured were successively reduced. The end came with the fall of Beth-thar (Bethar), (A.D. 135), where Barcocheba was slain.

See articles JEWS and PALESTINE: *History;* Eusebius *H.E.* iv. 6; Dio Cassius xix. 12–14; Schuerer, *Gesch. d. jüd. Volkes,* 3rd ed. i. 682 *et seq.;* Derenbourg, *Hist. de la Palest.,* 423 *et seq.* (distinguishes Barcocheba from Simeon); Schlattler, *Gesch. Israels,* 2nd ed. 303 *et seq.;* also art. *s.v.* "Bar Kokba" in *Jewish Encyc.* (S. Krauss).

BARD, a word applied to the ancient Celtic poets. The name itself is not used by Caesar in his account of the manners and customs of Gaul and Britain, but he appears to ascribe the functions of the bards to a section of the Druids. Later Latin authors, such as Lucan (*Phar.* i. 449), used the term *Bardi* as the recognized title of the national poets or minstrels among the peoples of Gaul and Britain. In Gaul, however, the institution soon disappeared. The known relics belong almost entirely to Wales and Ireland. In Wales the bards formed an organized society, with hereditary rights and privileges. The whole society of bards was regulated by laws, said to have been first distinctly formulated by Howel Dda, and to have been revised by Gruffydd ap Conan. At intervals great festivals were held, at which bards from the various districts met and contended in song, the umpires being generally the princes and nobles. Even after the conquest of Wales, these congresses or

Eisteddfodau continued to be summoned by royal commission, but from the reign of Elizabeth, the custom fell into abeyance. They have not been since summoned by royal authority, but were revived about 1822, and are held regularly at the present time. In modern Welsh, a bard is a poet whose vocation has been recognized at an Eisteddfod. In Ireland also the bards were a distinct class with peculiar and hereditary privileges. They appear to have been divided into three sections: the first celebrated victories and sang hymns of praise; the second chanted the laws of the nation; the third gave poetic genealogies and family histories.

See Ed. Jones, *Relics of the Welsh Bards* (1784); Walker, *Memoirs of the Irish Bards* (1786); Owen Jones, *Myvyrian Archaeology of Wales* (3 vols., 1801–07); W. F. Skene, *Four Ancient Books of Wales* (2 vols., 1868); P. W. Joyce, *Social History of Ancient Ireland* (2nd ed. 1913).

BARDAIṢĀN (b. A.D. 154), an early teacher of Christianity in Mesopotamia, whose works, saving possibly the *Hymn of the Soul* in the *Acts of Thomas*, have perished. Bardaiṣān founded a school which was soon branded as heretical.

BARD-HORSES, horses covered with defensive armour as in mediaeval times (Fr. *Barde*): "occasionally the horses were covered all over with mail, or linen stuffed and quilted like the gambeson and adorned with rich embroidery" (Grose, *Military Antiquities*). In Spain the term refers to pack-animals.

BARDOUX, AGÉNOR (1829–1897), French statesman, was a native of Bourges. In 1871 he was elected deputy of the National Assembly, and re-elected in 1876 and in 1877. In the chamber he was president of the group of the left centre, standing strongly for the republic but against anti-clericalism. After the *coup d'état* of May 16 1877, he was one of the leaders of the "363" (*see* FRANCE: *History*). In the republican chamber elected after May 16, he became minister of public instruction (Dec. 1877), and proposed various republican laws, notably on compulsory primary education. He resigned in 1879. He was not re-elected in 1881, but in Dec. 1882 was named senator for life. He wrote essays on *Les Légistes et leur influence sur la société française* (1878); *Le Comte de Montlosier et le Gallicanisme* (1881); and published in 1882 his *Dix Années de vie politique*.

BARDOWIEK, village, Prussian province of Hanover, Germany, 3m. N. of Lüneburg on the navigable Ilmenau. Founded (8th century) by Charlemagne as a bishop's see, it was the chief commercial city of North Germany till William the Lion destroyed it (1189). It derives its name from the Longobardi who came from the district. The Gothic church (*c.* 1400) includes remnants of a cathedral. The village is now purely agricultural.

BARDSEY, an island off the coast of Wales; area .7 sq.mi., pop. (1931) 54. This continuation of the hills of Caernarvonshire has been separated from the mainland by a submergence of Pleistocene date whereby a famous tide race that endangers navigation has been formed. As a refuge in the far west of Wales the island has gathered many legends. It is associated with a supposed descent of Merlin with the 13 treasures of Britain, and there are remains of a monastery ascribed to the early Celtic Church and in particular to S. Cadvan; it is said that the remnant of the monks after the distribution of Bangor Iscoed fled hither. With these traditions, it became a goal of pilgrimage in the middle ages and the pilgrim roads in Caernarvonshire leading to Aberdaron, the port of embarkation, are dotted with sacred wells and other features. It has a lighthouse and a few houses of fisher-farmers. Formerly it was ruled by a "king," but now has a "president." The island, nominally, has been counted in Lleyn rural district.

BAREBONE'S PARLIAMENT, in English history the name derisively given to the nominated parliament, summoned in the name of Cromwell after the expulsion of the Rump (April 20, 1653). At the fall of the "long parliament" some had advocated government through a nominated assembly, others through a smaller council. Cromwell inclined to the former view, and early in May letters were despatched in the name of the general and the council of the army to the Congregational Churches inviting suggestions of fit persons to sit in the new assembly. Answers had been received by the end of the month, and from the names submitted, the council of the army selected the final choice of 140 members—129 for England, 5 for Scotland, and 6 for Ireland. On July 4 the delegates met, assuming by a resolution of July 6 the name of parliament. The nick-name which has since tempered its dignity is derived from the name of one of its obscurer members—one Praise-God Barebone, or Barbon (*q.v.*).

From the first the members took a solemn view of their responsibilities, but their ardour for reform unhappily outran their ability for constructive thought. Sensible measures—such as the establishment of civil marriage before a justice of peace, the parochial registration of births, marriages and burials, and acts for the relief of creditors and the poor, and for the safe custody of lunatics—were countered by ill-advised attempts to abolish tithes, patronage, and the court of chancery, and, without any qualifications for the task, to codify the law. Cromwell was "more troubled now with the fool than with the knave." Reaction followed. The ideas afterwards embodied in "the Instrument of Government" had been first circulated at the time of the expulsion of the Rump. Revived privately in October, the plan was increasingly discussed in November. On Dec. 1, Cromwell rejected the draft containing the suggestion that he should take the title of king; his supporters, however, were determined to force his hand. On Dec. 12 a section of the parliament accused their opponents of destroying the clergy, the law and the property of the subject, and by a surprise motion resolved upon the abdication of the parliament. The majority thereupon waited on Cromwell and laid their resignation before him; while the recalcitrant minority was expelled from the house by the military. Next day Lambert produced "the Instrument of Government" (*q.v.*) which after two days' discussion established the system of Government which lasted until the Humble Petition and Advice (*q.v.*) of May 1657.

See H. A. Glass, *The Barbone Parliament* (1899); S. R. Gardiner, *History of the Commonwealth and Protectorate*, vol. ii. (1903).

BARÈGES, health resort of south-west France, department of Hautes-Pyrénées, in the valley of the Bastan, 25m. S.S.W. of Bagnères-de-Bigorre by road. Placed at a height of 4,100ft., it is a mere hamlet in the commune of Betpouey-Barèges, but is frequented from June-September for its nitrogenous waters and as a climbing-centre. The waters (90°–106°) first came into vogue after the visit of Mme. de Maintenon in 1677. Barèges was formerly much exposed to avalanches, but embankments and plantations have partly averted the danger. The light silk and wool fabric called *barège* takes its name from the place, where it was first made.

BAREILLY or **BARELI,** a city and district of British India in the Rohilkhand division of the United Provinces. The city is situated on the Ramganga river, 812m. N.W. from Calcutta by rail. Pop. (1941) 192,688. The principal buildings are two mosques built in the 17th century; a modern fort overlooking the cantonments; the railway station, which is an important junction on the Oudh and Rohilkhand line; the palace of the nawab of Rampur, and the Government college. Bareilly is the headquarters of a brigade. The chief manufactures are furniture and upholstery.

The district of Bareilly has an area of 1,591 sq. miles. It is a level country, watered by many streams, the general slope being towards the south. The soil is fertile and highly cultivated, groves of noble trees abound, and the villages have a neat, prosperous look. A tract of forest jungle, called the *tarai*, stretches along the extreme north of the district, and teems with large game, such as tigers, bears, deer, wild pigs, etc. The river Sarda or Gogra forms the eastern boundary of the district and is the principal stream. Next in importance is the Ramganga, which receives as its tributaries most of the hill torrents of the Kumaon mountains; and after it come the Deoha and the Gumti. The population in 1941 was 1,176,197. Many of the Mohammedan families in the district claim descent from the Yusafzai Afghans, called the Rohilla Pathans, who settled in the country about the year 1720. During the Mutiny of 1857 the Rohillas took a very active part against the English; and they have frequently distinguished themselves by fanatical tumults against the Hindus. The district is irrigated from the Rohilkhand system of Government canals.

BARENTS, WILLEM (d. 1597), Dutch navigator, was born about the middle of the 16th century. In 1594 he left Amsterdam with two ships to search for a north-east passage to eastern Asia. He reached the west coast of Novaya Zemlya, and followed it northward, being finally forced to turn back when near its northern extremity. In the following year he commanded another expedition of seven ships, which made for the strait between the Asiatic coast and Vaygach island, but was too late to find open water; while his third journey equally failed of its object and resulted in his death. On this occasion he had two ships, and on the outward journey sighted Bear island and Spitsbergen, where the ships separated. Barents' vessel, after rounding the north of Novaya Zemlya, was beset by ice and he was compelled to winter in the north; and as his ship was not released early in 1597, his party left her in two open boats on June 13, and most of its members escaped. Barents himself, however, died on June 30 1597. In 1871 the house in which he wintered was discovered, with many relics, which are preserved at The Hague, and in 1875 part of his journal was found.

See *The Three Voyages of Barents*, by Gerrit de Veer, translated by the Hakluyt Society (1876) from de Veer's text (1598).

BARENTS SEA, the eastern portion of the northernmost Arctic ocean, framed by north Norway, Finland and Russia on the south, by Novaya Zemlya on the east, by Franz Josef Land on the north, and by Spitsbergen and Bear island on the west. The English pioneer merchant-seamen, Willoughby and Chancellor (1553), sailed along the Murman coast of Russian Lapland and reached Kolguyef Island. The Dutch sailor Willem Barendsz (Barents) in 1594–97 crossed this sea several times, discovered Spitsbergen, and died on the east coast of Novaya Zemlya while wintering there. As the Barents Sea lies between lat. 70° and 80° N., the climate is very cold and only in the summer months and in the southern part of the sea can one sail without difficulty. Even in the height of summer the sea between Hope island (south-east of Spitsbergen) and Franz Josef Land is much encumbered with ice, which drifts southwards towards Bear island and westwards past South cape, Spitsbergen. The temperature of the air rarely goes far above 41° in summer, and in winter the cold is very severe with temperatures ranging from 14° to below zero. The water temperatures are more moderate and, even in winter, remain above 32° over considerable stretches of sea; this is true especially of the south side of the sea from North cape to the entrance into the White Sea, and here the water does not freeze, a fact which gives the Russian Murman coast special economic importance for Russia. Polyarnoe, on Kola fjord, is an ice-free harbour because the last remnants of the Gulf Stream bring to this coast salt and relatively warm water of Atlantic origin from the west coast of Norway. In the northern part, however, the water is mostly Polar, relatively fresh and very cold. This cold water reaches to the neighbourhood of Bear island and, when south winds bring relatively warm air to this region, extensive fogs are formed over this cold water.

Every year the importance of the Barents sea in the matter of fisheries is increasing. In the southern parts with their warmer water a number of marketable fishes are found on the sea floor. There are Russian fisheries in territorial waters on the coast but in the open sea the catches are made mostly by English, Scottish and German trawlers; and these work even in winter in spite of great difficulties due to storms, and the long darkness. The development of the steam trawler industry in the Barents sea and in Icelandic waters is partly due to the diminished returns from the fishing of the North sea. When fishermen are going to the Barents sea they usually say that they are going to the White sea, but the actual White sea is reserved for Russian fisheries. The most important fish in the Barents sea are cod, haddock and plaice, also Norway haddock, and in 1925 the Barents sea yielded 5% of the total amount of these fish caught in the fisheries of north-west Europe. The average proceeds of a trawler's journey in 1925 gave 22,000kg. in the North sea, 45,000kg. in the Iceland sea and 65,000kg. in the Barents sea. In view of their importance the fisheries of the Barents sea have been investigated scientifically along with survey of depths, bottom deposits, temperatures and currents and their biological relationships. A Norwegian (Nansen), Russians (Knipowitch and Breitfuss), and Germans (Mielck and Schulz) and others have led several expeditions, and there is a biological station at Polyarnoe. The chief port for journeys to the Barents sea is the Norwegian harbour of Vardö.

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BARÈRE DE VIEUZAC, BERTRAND (1755–1841), French revolutionary, was born at Tarbes, in Gascony, Sept. 10 1755, and practised as an advocate before the *parlement* of Toulouse until he was sent by the estates of Bigorre to the states-general in May 1789. In the states-general he attached himself to the Constitutional Party. At this time he was less known as a speaker than as the author of the reports in a paper which he published, the *Point du Jour*. After the king's flight to Varennes Barère joined the Republican Party, though he kept in touch with the duke of Orleans, to whose natural daughter, Paméla, he was tutor. He was a judge in the new court of cassation from Oct. 1791 to Sept. 1792, and in the National Convention was deputy for Hautes Pyrénées. In the convention he at first voted with the Girondists, and attacked Robespierre, "a pygmy who should not be put on a pedestal"; but at the king's trial he voted with the Mountain for death "without appeal and without delay," closing his speech with a phrase which ran through Paris: "The tree of liberty could not grow were it not watered with the blood of kings." Barère was chosen a member of the Committee of Public Safety (April 7 1793). He joined the Robespierre Party, played an important part in the great Committee of Public Safety established on July 7, and voted for the death of the Girondists. Barère seems to have been animated throughout the Revolution by considerations of expediency. On the 9th Thermidor (July 27 1794) Barère hesitated; then he drew up the report outlawing Robespierre. Nevertheless, in Germinal of the year III. (March 21–April 4, 1795), the Thermidorians decreed the accusation of Barère and his colleagues of the Terror, Collot d'Herbois and Billaud-Varenne, and he was sent to the Isle of Oléron. He was removed to Saintes, and thence escaped to Bordeaux, where he lived in concealment for several years. Barère was a secret agent under Napoleon I., exiled as a regicide at the Restoration, and a pensioner under Louis Philippe. He died, the last survivor of the Committee of Public Safety, on Jan. 13, 1841 (*see* also FRENCH REVOLUTION).

BIBLIOGRAPHY.—The *Mémoires de B. Barère . . . publiés par MM. H. Carnot . . . et David (d'Angers) . . . précédés d'une notice historique* (1824–44) are false, but contain valuable information; Carnot's *Notice*, which is very good, was published separately in 1842. *See* F. A. Aulard, *Les Orateurs de la Constituante* (1882); *Les Orateurs de la Convention* (2nd ed., 1905). Macaulay's essay on Barère (*Edinburgh Review*, vol. lxxix.) is eloquent, but incorrect.

BARETTI, GIUSEPPE MARC' ANTONIO (1719–1789), Italian critic, a member of the Johnson-Thrales circle, was born in Turin, and settled in London in 1751. With the exception of some years spent abroad between 1770 and 1776 the rest of his life was spent in London. He became acquainted with Johnson, Garrick and their circle, and was a constant visitor at Thrales's house in Streatham. He was brought to trial for murder in 1769, having stabbed a man who attacked him in the street, but was acquitted, Johnson and others giving evidence in his favour. His works include a *Dictionary and Grammar of the Italian Language* (1760), and *Lettere famigliari* (Eng. trans. 1770), highly praised by Johnson.

BARFLEUR, port of north-west France, department of Manche, 22½m. N.N.E. of Valognes. Pop. (1936) 1,065. In the middle ages Barfleur was one of the chief ports of embarkation for England. In 1120 the "White Ship," carrying Prince William, only son of Henry I., went down outside the harbour. About 2m. to the north is Cape Barfleur, with a lighthouse 233ft. high.

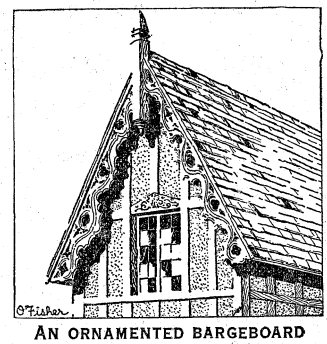
BARFURUSH (now renamed Barbul), a town in the Iranian province of Mazandaran, 36° 32′ N. and 52° 42′ E., situ-

ated in a low-lying district on the eastern side of the River Babil. It is on the highroad from Tehran to the coast and about 15 mi. distant from the roadstead of Meshed-i-Sar on the shore of the Caspian sea. The population is about 40,000, of whom nearly 1,000 are Jews. The Babil is crossed at Barfurush by a fine masonry bridge. The town obtained importance during the reign of Fath Ali Shah, although Abbas I had previously laid out a pleasure garden and summer palace south of the town, the remains of which bear the name of Bagh-i-Shah. Barfurush is the most populous town of the province owing to its flourishing trade. The bazaars, fully a mile in length, are crowded, but dark, and inferior to those in the great trading centres of Iran. Many streets are paved, and the houses being built largely of burnt brick give the town a handsome appearance. There are a number of fine Romanesque looking brick funeral towers of the 14th century in the neighbourhood.

The Babil is navigable for small craft up to Barfurush. At Meshed-i-Sar, the port of Barfurush and principal coast town of Mazandaran, steamers call weekly, anchoring in the roadstead and loading into river craft, as the bar is undredged. There is here a customs house, telegraph and post office, and a fishing station. The exports consist mainly of raw cotton, dried fruits, oranges and lemons, rice, hemp and flax, and nuts.

BARGAIN AND SALE, in common law, a contract whereby property, real or personal, is transferred from one person—called the bargainor—to another—called the bargainee—for a valuable consideration; but the term is particularly used to describe a mode of conveyance of lands. The disabilities under which a feudal owner very frequently lay gave rise to the practice of conveying land by other methods than that of feoffment with livery of seisin, that is, a handing over of the feudal possession. That of "bargain and sale" was one. Where a man bargained and sold his land to another for pecuniary consideration, which might be merely nominal, and need not necessarily be actually paid, equity held the bargainor to be seised of the land to the use of the bargainee. The Statute of Uses (1535), by converting the bargainee's interest into a legal estate, had an effect contrary to the intention of its framers. For subsequent history and as to lease and release *see* CONVEYANCE.

BARGEBOARD, also **VERGEBOARD,** as sometimes written, in architecture, the exposed board running down the slopes of a projecting gable roof: a false rafter. Bargeboards are frequently decorated; in the Tudor period in England, and in the late Gothic period throughout Europe, they became extremely rich decorative features.



AN ORNAMENTED BARGEBOARD
A typical late English Gothic bargeboard, showing decoration by means of pierced tracery

BARGES and **CANAL CRAFT.** The name barge was originally applied to a small sailing vessel, but afterwards came into general use for a flat-bottomed boat used for carrying goods on inland waterways. On canals, barges are usually towed, but are sometimes fitted with some kind of engine; the men in charge of them are known as bargees. On tidal rivers barges are often provided with masts and sails ("sailing barges"), or in default of being towed they drift with the current, guided by a long oar or oars ("dumb-barges"). Barges used for unloading, or loading, the cargo of ships in harbours are sometimes called "lighters" (from the verb "to light," to relieve of a load). A State barge was a heavy, often highly ornamented vessel used for carrying passengers on occasions of State ceremonials. The college barges at Oxford are houseboats moored in the river for the use of members of the college rowing clubs.

Owing to the fact that there are over 40 different canals and rivers in the United Kingdom with locks of varying size, it is necessary to construct barges of many different shapes and sizes to navigate them, ranging, on the canals, from 20 to 160 tons. On the Continent of Europe, in France and Belgium, it is possible to transport goods by canal at a much lower cost, for the locks are more or less standardized to enable barges of 260 to 280 tons to navigate nearly the whole of the waterways down to the principal sea ports.

Whereas most of the canal towing in bygone days was done by horses, the usual method now is either by steam or motor tug, or by barges fitted with semi-diesel engines, powerful enough to tow several other barges.

The common principle of all types of barges and lighters is to have as large a hatchway as possible and as small a deck area as possible, to save what is called "cupboard space" under deck in the hold, and to make for easy and quick handling, and therefore cheapness, in loading and discharging the cargoes.

The ordinary Thames river lighters range from 80 to 300 tons; in some instances they are 400 tons or more; on the Humber the craft carry from about 60 to 220 tons.

Barges worked in Antwerp and Rotterdam and the neighbouring rivers and docks are built up to 3,000 tons, which again makes for cheaper transport. These larger craft are built much lighter than English ones. As they are always afloat they need not be built so strongly as the barges that use English rivers, for the latter have to be strong enough to withstand loading and discharging whilst lying aground.

Thames lighters are a pattern to themselves, being "swim-ended" to assist the lighter's speed ("swim" meaning to glide). That is, the bottom of the lighter is turned up at both the forward and after ends to meet the deck at an angle of 35° to 40°; these ends are therefore called the forward swim and after swim, and the after swim has a "budget" (or what may be termed a "fixed rudder") worked down the centre, formed through the continuation of the keel plate to the extreme end of the swim; this is filled in up to the swim.

It is owing to this budget that these craft can navigate in a straight line whether being rowed (the lighterman's term is "to drive") or towed; a rudder becomes unnecessary. By a Thames regulation a tug must not tow more than six lighters, two abreast.

Many Types Needed.—The bargeowner, like the shipowner, has to fit his vessels to suit the trade of the times. Thus in the port of London we find barges fitted as insulator craft to load meat, butter, fruit, etc., out of the steamer that is fitted with refrigerators or chilling plant; while, again, there are tank barges fitted for the carriage of spirit. These craft have to be built and classed by Lloyds to pass the Port of London Authority rules. Then there are tank craft for vegetable oils, such as coconut or palm-kernel oil, which solidify when cold; these are fitted with steam coils to enable the oil to be heated for pumping when being discharged. The same applies to the tank craft used for heavy fuel oil and lubricating oil. Also special lighters are fitted with locking arrangements on their hatchways to protect dutiable goods; these have to be passed and licensed by the board of customs.

There is one point about the Thames-built wooden craft, both lighters and sailing barges, that is not found in other builds; the plank seams are always rabbited, that is, they have half lap joints fitted tight, which never need caulking. The steel barge, however, is rapidly displacing the wooden barge.

A large proportion of the craft on the Humber are rigged; and those fitted with the square sail are termed keels. Others, fitted with mainsail and foresail, are termed sloops. These are all fitted with leeboards the same as the Thames sailing barges. Prior to the World War quite a number of Humber craft, slightly larger than the sloops, and ketch rigged, used to work up and down to east coast sea ports and were called "billy boys," but these now seem to have been displaced by the Thames coasting barges.

Thames Sailing Barges.—The most interesting type of barge is no doubt the Thames sailing barge, which may be divided into two classes, the river sailing barge of say 80 to 180 tons, and the coasting sailing barge, which ranges up to 300 tons.

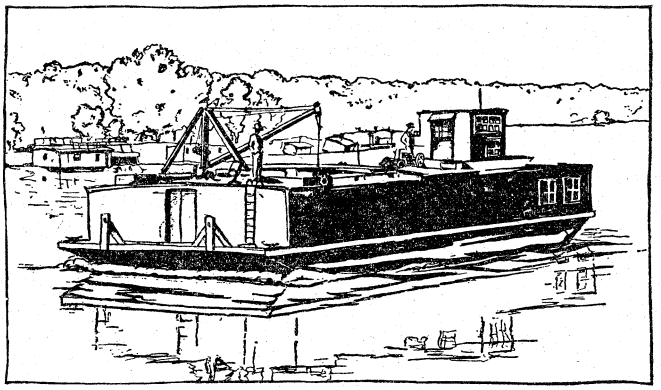
The river-craft ply in the Thames and estuary between Maidstone, Chatham, Faversham, Sittingbourne, and Southend to London. The coasting barges trade from London to the east and south coast ports, and all the near continental ports of Holland, Belgium, France and the Channel islands.

The coasting barges have replaced the schooner and ketch on the last-mentioned trade routes, as more economically worked vessels requiring fewer hands. A 300-ton barge requires only four hands against six or seven on a schooner of the same size. It is able to make a light passage without ballast, which a schooner cannot do, and draws three to four feet less water, which means that the coasting barge can get to a shallow berth, thus saving the cost of transshipment into smaller lighters and extra handling of goods.

The Thames coasting barge is sprit-sail rigged like the river barge, but whereas the river barges carry a mainsail, topsail, foresail, mizzen and flying jib, the coasting barge is rigged with a bowsprit to enable it to carry bowsprit jibs of various sizes to suit the weather conditions. Coasting barges also carry squaresails or balloon foresails, for running before the wind.

As will be seen from the pictures of the coasting barge, the sprit is a very long spar of about 60ft. or a trifle over, and about 13 to 14in. at the sling. It should also be noted that the main vangs (the stays from the sprit end are called vangs) are worked from the sprit-end down to the quarter, and the rolling vangs are worked from the sprit-end to a chain plate on the side, at about the fore end of the fore hatch, so that when a barge is sailing in a seaway the lee rolling vang is always hove tight, and thus saves the sprit from rolling inboard when in a wind, or gybing when running dead before the wind. It is not often that a sprit is carried away at sea if the vangs are properly attended to; there are more accidents with gaff sails in a seaway than with sprit sails. Coasting barges are built with more sheer, higher coamings and bulwarks, and with other improvements to make them more seaworthy.

The leeboards on sailing barges are carried abreast of the main mast, which is about one-third of the barge's length from the stem, and answer the same purpose as the keel of a sailing yacht or other round-bottom sailing vessel, which is to stop the barge making leeway when sailing on a wind or reaching. The lee leeboard is kept down and the weather leeboard is hove up. When a barge is running before the wind both leeboards are hove up as they are not needed. A sailing barge captain gets used to his craft very quickly, and often improves her sailing qualities by shifting the leeboards a little forward or aft as needed. Should his craft be faint headed (*i.e.*, one that falls away too far on a wind) he shifts the leeboards slightly forward, or should his craft be hard headed



BY COURTESY OF THE MINNEAPOLIS JOURNAL

THE MOTOR-PROPELLED STEEL BARGE "LA CROSSE," THE FIRST IN THE UPPER MISSISSIPPI TO SUPERSEDE THE WOODEN BARGES THAT WERE TOWED, OR DRIFTED WITH THE CURRENT

(*i.e.*, if his vessel wants to come up into the wind when on a tight sheet) he shifts them slightly aft. Here again the design of the barge is a large factor in her sailing qualities.

The skill of sailing barge designing is to be able to work a flat bottom out to the bow and stern with a fair chine line to both fore and after runs. This chine in itself, if carried out properly, is a great assistance to the barge when sailing to windward. The Thames sailing barges all have a transome stern.

The Motor Barge.—The question has often been asked why English barge-owners have not adopted semi-Diesel engines to as great an extent as the Continental barge-owner. Perhaps the greatest reason is that in the Thames and the Humber, such fine tidal rivers, under normal conditions the sailing barges or sloops can sail the journey in a tide, and lock in a dock or berth at a wharf by high water, whereas motor craft may do the journey two hours sooner but still have to wait until just before high water to dock or berth. In Holland, on the other hand, the canals are more suitable for the motor-barge and many small Dutch coasters are motor driven. Lighters lose a great deal of time waiting the convenience of ocean-going steamships.

American barge owners have followed the continental practice to some extent in the application of various motor drives, particularly in the use of the semi-Diesel engine. The most recent development is with the use of electric drives on barges operating in the Erie canal in New York State. Steel barges, with a cargo capacity of 2,800 tons, have been equipped with two 375 h.p., six-cylinder, four-cycle Diesel engines directly connected to a 250 k.w. generator operating at a speed of 250 revolutions per minute. An unusual feature is that both engines are installed with the axis of the crankshaft athwartships instead of longitudinally. The control of the barge, which can attain a speed of 10 m. per hour, is entirely in the hands of the captain in the pilot house. (W. J. E.)

BARGHEST, BARGUEST or BARGEST, the name given in the north of England, especially in Yorkshire, to a monstrous goblin-dog with huge teeth and claws. The Demon of Tedworth, the Black Dog of Winchester and the Padfoot of Wakefield all shared the characteristics of the Barghest of York. In Wales its counterpart was Gwyllgi, "the Dog of Darkness." In Lancashire the spectre-hound is called Trash or Striker; in Cambridgeshire and on the Norfolk coast, Shuck or Shock; in the Isle of Man Mauthe Doog. A Welsh variant is the *Cwn Annwn,* or "dogs of hell." The barghest was essentially a nocturnal spectre regarded as a portent of death. The derivation of the word barghest is disputed. "Ghost" in the north of England is pronounced "guest" and the name is thought to be *burh-ghest,* "town-ghost." Others explain it as Ger. *Berg-geist,* "mountain demon," or *Bar-geist,* "bear-demon," in allusion to its alleged appearance at times as a bear.

See Wirt Sikes, *British Goblins* (1880); *Notes and Queries,* first series, ii. 51; Joseph Ritson, *Fairy Tales* (1831), p. 58; *Lancashire Folklore* (1867); Joseph Lucas, *Studies in Nidderdale* (Pateley Bridge, 1882).

BARGIEL, WALDEMAR (1828–1897), German composer, was born in Berlin on Oct. 3, 1828, and died there on Feb. 23, 1897. He was a step-brother of Clara Schumann and studied at the Leipzig conservatoire. After teaching for some time in Berlin and Cologne he went to Rotterdam as conductor in 1865, and in 1874 returned to Berlin to teach at the high school for music there. As composer, Bargiel was a disciple of Schumann. He wrote a symphony in C, some choral music, and chamber music.

BAR GOLD, gold in the form of ingots. (*See* GOLD.)

BARHAM, RICHARD HARRIS (1788–1845), English humourist, better known by his *nom de plume* of THOMAS INGOLDSBY, was born at Canterbury on Dec. 6, 1788, and died in London on June 17, 1845. At seven years of age he lost his father, who left him a small estate, part of which was the manor of Tappington, so frequently mentioned in the *Legends.* At nine he was sent to St. Paul's school, but his studies were interrupted by an accident which shattered his arm and partially crippled it for life. In 1807 he entered Brasenose college, Oxford; in 1813 he was ordained and took a country curacy; he married in the following year, and in 1821 removed to London on obtaining the appointment of minor canon of St. Paul's cathedral. Three years later he became one of the priests in ordinary of the king's chapel royal, and was appointed to a city living. On the establishment of *Bentley's Miscellany* in 1837 he began to furnish the series of metrical tales known as *The Ingoldsby Legends.* In variety and whimsicality of rhymes these verses have hardly a rival since the days of *Hudibras.* But beneath this obvious popular quality there lies a store of solid antiquarian learning, the fruit of patient, enthusiastic research, in out-of-the-way old books.

Barham's life was grave, dignified and highly honoured. His sound judgment and his kind heart made him the trusted counsellor, the valued friend and the frequent peacemaker; and he was intolerant of all that was mean and base and false.

A short memoir, by his son, was prefixed to a new edition of *Ingoldsby* in 1847, and a fuller *Life and Letters,* from the same hand, was published in 1870.

BAR HARBOR, incorporated town in Hancock county, Maine, U.S.A., about 115 mi. N.E. of Portland. The population of the town in 1940 was 4,378.

On Mt. Desert island, the town is a fashionable summer resort. It is the home of Acadia national park and is host to thousands of visitors who come to enjoy the modern motor roads and the drive to the summit of Cadillac mountain, the highest peak on the Atlantic seaboard.

BAR-HEBRAEUS or ABU'L-FARAJ (1226–86), a maphriān or catholicus of the Jacobite (Monophysite) Church, he wrote in Syriac and Arabic numerous and elaborate treatises on theology, philosophy, science and history. The son of a physician of Jewish descent, Bar-Hebraeus was born at Malatiah on the upper Euphrates. In 1246 he was ordained at Tripolis as Jacobite bishop of Gūbās near Malatiah, and a year later was transferred to the neighbouring diocese of Lakabhīn, whence in 1253 he passed to be bishop of Aleppo. In 1264 he was promoted by the patriarch Ignatius III. to be maphriān—the next rank below that of patriarch. It is mainly as an historian that Bar-Hebraeus interests the modern student. His great historical work—the Syriac *Chronicle*—is made up of three parts. The first[1] is a history of secular events from the creation to his own time, and in its later portions gives valuable information regarding the history of south-east Europe and western Asia. A compendium in Arabic of this secular history was made by Bar-Hebraeus under the title *al-Mukhtasar fi'd-Duwal* (Compendious History of the Dynasties). The second and third parts[2] of the *Chronicle* deal with the history of the church, the second being mainly concerned with the patriarchate of Antioch, and the third with the eastern branch of the Syrian Church. Of special value to theologians is the *Auṣar Rāzē* (Storehouse of Secrets), a critical and doctrinal commentary on the text of the Scriptures, *see* J. Göttsberger, *Bar-Hebräus und seine Scholien zur heiligen Schrift* (Freiburg i. B. 1900).

See W. Wright's *Syriac Literature,* p. 268–281. Bar-Hebraeus's more important works are:—(1) *Kĕthābhā dhĕ-Bhābhāthā* (Book of the Pupils of the Eyes), a treatise on logic or dialectics; (2) *Hēwath Hēkhmēthā* (Butter of Wisdom), an exposition of the whole philosophy of Aristotle; (3) *Sullāḳā Haunānāyā* (Ascent of the Mind), a treatise on astronomy and cosmography, edited and translated by F. Nau (1899); (4) various medical works; (5) *Kĕthābhā dhĕ-Ṣemḥē* (Book of Rays), a treatise on grammar; (6) ethical works; (7) poems; (8) *Kĕthābhā dhĕ-Thunnāyē Mĕghaḥḥĕkhānē* (Book of Entertaining Stories), edited and translated by E. A. W. Budge (1897).

BARI (anc. BARIUM), an archiepiscopal see in Apulia, Italy, capital of province of Bari, on a small peninsula, 69 mi. N.W. of Brindisi by rail. Pop. (1815) about 15,000; (1901) 77,478; (1936) 162,238 (town); 197,918 (commune). The closely-built old town is on the peninsula to the north, and the new town to the south is laid out rectangularly. The former contains the cathedral of S. Sabino, begun in 1034, destroyed in 1156, and rebuilt in 1170–78: the exterior preserves in the main the fine original architecture, notably the dome and campanile; the church of S. Nicola was founded in 1087 to receive the relics of this saint, brought from Myra in Lycia, and now beneath the altar in the crypt. The façade is fine, and the interior, divided into three naves by columns, with galleries over the aisles, has fortunately not been restored. The church is one of the four Palatine churches of Apulia (the others being the cathedrals of Acquaviva and Altamura, and the church of Monte S. Angelo sul Gargano). The small church of S. Gregorio belongs also to the 11th century. The castle, built 1233–40 by Frederick II., and strengthened in the 16th century, lies on the west side of the old town. The old harbour lies on the east side of the peninsula, and the new on the west. In 1930 a yearly fair, the Fiera del Levante, was inaugurated in Bari to strengthen Italy's ties with the Balkans and the near east. In the fair of 1937, 3,137 Italians and 1,624 foreigners took part. Bari is the home port of the Puglia line. In the new town is the Ateneo, containing the provincial museum, with pre-Hellenic collections, and a large theatre.

Bari is the seat of command of the IX. Army Corps, and the most important commercial town in Apulia. It manufactures olive-oil, soap, carbon sulphide, tiles, "oriental" carpets and playing-cards, and has a large iron foundry and important flour-mills. In Roman times Barium was the junction between the coast road and the Via Traiana. Its harbour, mentioned as early as 180 B.C., was the principal one of the district, as at present, and was the centre of a fishery. It became in 852 a seat of Saracen power, and in 885 the residence of the Byzantine governor of Apulia. In 1071 it was captured by Robert Guiscard. Some of the Norman crusaders crossed thence to Constantinople in 1096–97. In 1156 it was razed to the ground but acquired new prosperity under Frederick II. After this it was under various masters, last of all the Sforzas (1464–1557), and after the death of Bona Sforza, widow of Sigismund I. of Poland, it was assigned to Naples by arbitration of the Emperor. (*See* F. Carabellese, *Bari* [Arti grafiche, Bergamo, 1909]—well illustrated.)

BARIBA, a well-proportioned, long-headed people located in northern Dahomey (Parakou, Nikki, Kandi and the Atakora district of southern upper Volta). Their language is related to Kabre. They are independent and warlike, are cultivators and cattle-raisers, employing Fulani herdsmen. They live in extended family groups in walled villages, subject to a paramount chief.

See Delafosse, *Haut Sénégal Niger* (1912).

BARILI, a municipality (with administrative centre and 21 barrios or districts) of the province and island of Cebu, Philippine Islands, on the Barili river, 2m. from its mouth and about 35m. S.W. of Cebu, the capital. Pop. (1939), 29,247, of whom 14,059 were males (one white). The school population in 1939 numbered 10,323, of whom 25·7% attended school. The municipality is the commercial centre of the greatest corn-producing district in the Philippines. Coco-nuts, abacá (Manila hemp) and various other products are also raised. The vernacular is Cebu-Bisaya. The number of parcels of land declared for taxation in 1938 was 7,215.

BARILLA, an impure soda, formerly used for the making of soda, soap and glass, but now employed very little. It was obtained from the ashes of the fleshy plant (*Salsola Soda*), called in Spanish *barrilla,* grown specially for this product along seashores in Mediterranean countries.

BARING, the name of a family of English financiers and bankers. The firm of Baring Brothers was founded by FRANCIS BARING (1740–1810), whose father, John Baring, son of a Lutheran minister at Bremen, had come to England and started a cloth manufactory at Larkbear, near Exeter. Francis Baring was born at Larkbear, April 18, 1740. In 1770, in conjunction with his brother John, Francis Baring established a banking-house in London, and before he died, in 1810, had so developed the business that he was regarded as the first merchant in Europe. He was for many years a director of the East India Company, and chairman in 1792–93, receiving a baronetcy for his services. From 1784–1806 he sat almost continuously in parliament as a Whig. He left five sons, of whom the eldest, SIR THOMAS BARING (1772–1848), was a well-known art-patron and collector. The control of the business passed to his second son, ALEXANDER (1774–1848), better known as Lord Ashburton. (*See* ASHBURTON, ALEXANDER BARING.) After the death of Lord Ashburton in the year 1848 the affairs of the house were managed by THOMAS BARING (1799–1873), the son of Sir Thomas Baring. Thomas Baring represented Huntingdon in parliament from 1844 till his death. His elder brother, Sir FRANCIS THORNHILL BARING (1796–1866), sat for Portsmouth from 1826–65. From 1839–1841 he was chancellor of the exchequer, and from 1849–52 first lord of the Admiralty. In 1866 he was created Baron Northbrook, the barony being converted in 1876 into an earldom in favour of his eldest son, Thomas George Baring (1826–1904). The latter, the 1st earl of Northbrook, is best remembered as viceroy of India, which

[1] Bedjan (Paris, 1890).
[2] Edited and translated by Abbeloos and Lamy (Louvain, 1872–77).

office he held from 1872–76, but his last public position was first lord of the Admiralty (1880–85). With the death of Thomas Baring, Edward Charles Baring (1828–97), son of Henry Baring, M.P., and grandson of Sir Francis Baring, became head of the firm of Baring Brothers, and in 1885 was raised to the peerage as Baron Revelstoke. The house of Baring then stood at the height of its prosperity. During the following years a large amount of English capital was advanced to the Argentine Republic, Barings undertaking the loans and guaranteeing the interest. Through the continued default of the Argentine government, Barings became seriously involved, their heavy obligations precipitating a general financial crisis. Towards the end of 1890 it became known that the firm was on the eve of suspending payment, with liabilities amounting to £21,000,000. The prompt action of the Bank of England, which in conjunction with the leading joint-stock banks of the United Kingdom took over these liabilities, averted further disaster, and the firm of Baring Brothers was subsequently reorganized as a limited company with a capital of £1,000,000. Besides those already referred to, various other members of the Baring family have achieved public distinction, notably Charles Baring (1807–79), bishop of Durham, and Evelyn Baring, 1st Earl of Cromer (*q.v.*).

See Sir B. Mallet, *The Earl of Northbrook, A Memoir* (1908); his *Correspondence* was edited by his son, the earl of Northbrook (1905).

BARING, MAURICE (1874–1945), English diplomat and author, the 4th son of the first Lord Revelstoke, was born in London, on April 27, 1874. Educated at Eton and Trinity college, Cambridge, he entered the diplomatic service in 1898, but resigned in 1904, and took to journalism. He acted as correspondent for the *Morning Post* in Manchuria (1904), Russia (1905–08), and Constantinople (1909); and for *The Times* in the Balkans (1912). During World War I he worked on the staff of the R.F.C., and his *R.F.C.H.Q., 1914–18* (1920) is an account of his experiences. Besides various volumes of poems, parodies and critical essays, Baring wrote several novels, including *Cat's Cradle* (1925) and *Daphne Adeane* (1926), and published works on Russia, such as *The Russian People* (1911) and *The Mainsprings of Russia* (1914); in 1924 he edited the *Oxford Book of Russian Verse*. Other works by Baring are: *Gaston de Foix* (1903); *Letters from the Near East* (1909); *Diminutive Dramas* (1919); *The Coat without Seam* (1929); *In the End is my Beginning* (1931); *Sarah Bernhardt* (1933); *Unreliable History* (1935); his *Poems* were published in two collections (1918 and 1920), and Messrs. Heinemann published a uniform edition of his works (1925). Baring died Dec. 15, 1945, at Beauly, Scotland.

BARING-GOULD, SABINE (1834–1924), English novelist, was born at Exeter. After graduating at Clare college, Cambridge, he travelled, and later became in 1864 curate of Horbury, Yorkshire; then perpetual curate of Dalton, in the same county, in 1867; and in 1871 rector of East Mersea, Essex. On his father's death in 1872 he inherited the estate of Lew Trenchard, North Devon, where his family had been settled for nearly three centuries, and he exchanged his Essex living for the rectory of Lew Trenchard in 1881. He wrote books on many subjects—fiction, travel, history, folk-lore, religion, mythology, from 1854 onwards. His novel *Mehalah* (1880), the scene of which is laid on the east coast of England, was an excellent story.

Among others were *John Herring* (1883), a tale of the west country; *Court Royal* (1886); *Red Spider* (1887); *The Pennycomequicks* (1889); *Cheap Jack Zita* (1893); and *Broom Squire* (1896), a Sussex tale. His popular contributions to the study of topography, antiquities and folk-lore included: *Book of Were-wolves* (1865), *Curious Myths of the Middle Ages* (1866), *Curious Survivals* (1892). He produced many volumes of sermons and popular theology, and edited (1871–73) *The Sacristy*, a quarterly review of ecclesiastical art and literature.

See his *Early Reminiscences* (1923).

BARINGO, a lake in Kenya Colony, 0° 46′ N., 36° 15′ E.; situated 3,150 ft. above sea-level. It can best be reached from the railway at Nakuru, 78 miles away. The lake is about 18 miles long by 10 broad. It occupies a portion of the floor of the eastern branch of the Rift Valley, and has no outlet. To the north are the Karosi Hills; to the east the ground rises in terraces to the top of the Laikipia escarpment, while on the western side of the valley are the Kamasia mountains. The lake is fed by several small streams from the neighbouring hills. The Tigrish and the Nyuki flow in from the south, through a low marshy country, which yields good crops of maize. The existence of the lake was first reported about 1850 by two German missionaries, Krapf and Rebmann. The first European to see it was Joseph Thomson in 1883. Native tradition says that the lake formerly occupied a much larger area.

BARISAL, a town of British India, Dacca division, headquarters of Bakarganj district in Bengal, on a river of the same name. Pop. (1941) 61,316. It is a centre of river trade, on the steamer route through the Sundarbans from Calcutta to the Brahmaputra. Barisal has given its name to a curious physical phenomenon, known as the "Barisal guns," the cause of which has not been satisfactorily explained. These are noises, like the report of cannon, frequently heard in the vicinity of Barisal and elsewhere which appear to come from the direction of the sea.

BARI-SPEAKING TRIBES. The territory of the Bari-speaking tribes lies to the south of the Dinka country, E. Africa, on both banks of the river and in form approaching a rectangle some 160m. in length extending southwards from lat. 6° 5′ N. and having a maximum breadth of some 90 miles. On the eastern bank it constitutes a relatively narrow strip, its southern extreme marching with the Madi, while eastward from north to south it borders upon the Beir and the Lotuko. The Bari-speaking tribes of this, the eastern, bank of the Nile are the Shir and the Bari proper, using the latter term in its restricted tribal sense. There are also Shir and Bari to the west of the Nile, and to the south of these the Kuku, while other Bari-speaking peoples lying west of these riverain tribes include, from north to south, the Mandari, the Nyambara, the Fajelu, the Nyefu and the Kakwa.

The true Bari of the eastern bank are dolichocephals, with a cephalic index averaging 73·5, and with a skin as dark as that of the Dinka. They are moderately tall, with an average stature of about 67½in. but "very tall" men are not uncommon. In contradistinction to these, the Bari-speaking tribes of the west bank are mesaticephalic, and with the exception of the Mandari, who border on the Dinka and who have an average stature of nearly 69in., they are some 3in. shorter than the Bari of the eastern bank. The Bari dialects belong to the Bari-Masai sub-group of the Niloto-Hamitic group, their fellows within the sub-group being in the Sudan, Lotuko and in Kenya, Masai.

The social organization of the Bari is into a number of exogamous clans with male descent, and there are certain prohibitions, for the most part connected with animals or food, which each clan should observe. Knowledge with regard to the regulation of public life among the Bari is far from complete; there seems to be a rather complicated system, for besides chiefs and commoners there is a class that may provisionally be termed serfs. Chiefs are of two classes, rain-chiefs and "fathers of the land" (to translate literally the native term for the second class) who are specially concerned with cultivation and the safeguarding of the crops by magical means. The rainmaker is supreme in matters concerning rain, his office being hereditary and passing to his eldest son or in default to a sister's son. Generally each rainmaker and "father of the land" has a medicine-man attached to him, functions of the latter being those of the witch-doctor of the usual African type. (C. G. S.)

BARITONE or **BARYTONE,** a musical term for the male voice whose range lies between those of the tenor and of the bass (Ital. *baritono,* from Gr. *βαρύτονος* deep sounding); also the name of an obsolete stringed instrument like the viola da gamba and of the small B♭ or C saxhorn.

BARIUM, one of the metallic chemical elements included in the group of the alkaline earths (symbol, Ba, atomic number 56, atomic weight 137·37 [O=16]). It takes its name from the Greek *βαρύς* (heavy) on account of its presence in barytes or heavy spar which was first investigated in 1602 by V. Casciorolus, a shoemaker of Bologna, who found that after ignition with combustible substances it became phosphorescent, and on this account it was frequently called Bolognian phosphorus. In 1774 K. W. Scheele, in examining a specimen of pyrolusite, found a new

substance to be present in the mineral, for on treatment with sulphuric acid it gave an insoluble salt which was afterwards shown to be identical with that contained in heavy spar. Barium occurs chiefly in the form of barytes or heavy spar, $BaSO_4$, and witherite, $BaCO_3$, and to a less extent in baryto-calcite, baryto-celestine, and various complex silicates. The metal is difficult to isolate; Sir H. Davy tried to electrolyse baryta, but was unsuccessful; later attempts were made by him using barium chloride in the presence of mercury. In this way he obtained an amalgam, from which on distilling off the mercury the barium was obtained as a silver white residue. R. Bunsen in 1854 electrolysed a thick paste of barium chloride and dilute hydrochloric acid in the presence of mercury, at 100°C., obtaining a barium amalgam, from which the mercury was separated by a process of distillation. A. N. Guntz reduced barium oxide by aluminium powder at 1200°C.; and C. Matignon reduced it in a vacuum at the same temperature by means of ferrosilicon (95% Si), barium of 98·5% purity distilling over. The metal when freshly cut possesses a silver white lustre, is a little harder than lead, and is extremely easily oxidized on exposure; it is soluble in liquid ammonia, and readily attacks both water and alcohol. Its specific gravity is 3·78.

Three oxides of barium are definitely known—the monoxide, BaO, the peroxide, BaO_2, and a suboxide, obtained by heating BaO with magnesium in a vacuum to 1100°C. An oxide BaO_4 has also been described. The monoxide is formed when the metal burns in air, but is usually prepared by the ignition of the nitrate, oxygen and oxides of nitrogen being liberated. It can also be obtained by the ignition of an intimate mixture of the carbonate and carbon or barium carbide. It is a greyish coloured solid, which combines very energetically with water to form the hydroxide, much heat being evolved during the combination; on being heated in a current of oxygen it forms the peroxide, which at higher temperatures breaks up again into the monoxide and oxygen. The hydride, BaH_2, is obtained by direct combination at high temperatures; it is volatile and less stable than calcium or strontium hydrides.

Barium hydroxide, $Ba(OH)_2$, is a white powder that can be obtained by slaking the monoxide with the requisite quantity of water, but it is usually made on a large scale by heating heavy spar with small coal whereby a crude barium sulphide is obtained. This sulphide is then heated in a current of moist carbon dioxide, barium carbonate being formed, $BaS+H_2O+CO_2=BaCO_3+H_2S$, and finally the carbonate is decomposed by a current of superheated steam, $BaCO_3+H_2O=Ba(OH)_2+CO_2$, leaving a residue of the hydroxide. It is also made by electrolysing a barium chloride solution, using a mercury cathode. Barium hydroxide is moderately soluble in cold water, readily soluble in hot water, the solution possessing an alkaline reaction and absorbing carbon dioxide readily. The solution, known as *baryta-water*, finds an extensive application in practical chemistry, being used in gas-analysis for the determination of the amount of carbon dioxide in the atmosphere; it is also used in organic chemistry as a mild hydrolysing agent. E. Fischer has used it as a condensing agent in the preparation of α- and β-acrose from acrolein dibromide. A saturated solution of the hydroxide deposits on cooling a hydrated form, $Ba(OH)_2,8H_2O$, as colourless quadratic prisms, which on exposure to dry air lose seven molecules of water of crystallization. It is used as a depilatory in tanning.

Barium peroxide, BaO_2, can be prepared as shown above, or in the hydrated condition by the addition of excess of baryta-water to hydrogen peroxide solution, when it is precipitated in the crystalline condition as $BaO_2·8H_2O$. These crystals on being heated to 130°C. lose water of crystallization and leave a residue of the anhydrous peroxide. In the Brin process for the manufacture of oxygen, barium dioxide was formed by heating barium monoxide with air at 700°C. under pressure, and decomposed by lowering the pressure. (This process has been superseded by the fractionation of liquid air.) It is a white powder which is readily decomposed by dilute acids with the production of hydrogen peroxide.

Barium chloride, $BaCl_2·2H_2O$, can be obtained by dissolving witherite in dilute hydrochloric acid, and also from heavy spar by ignition in a reverberatory furnace with a mixture of coal, limestone and calcium chloride, the barium chloride being extracted from the fused mass by water, in which it is readily soluble; it is almost insoluble in concentrated hydrochloric acid and in absolute alcohol. It can be obtained in the anhydrous condition by heating it gently to about 120°C. It has a bitter taste and is a strong poison. Barium bromide is prepared by saturating baryta-water, or by decomposing barium carbonate, with hydrobromic acid. It crystallizes as $BaBr_2,2H_2O$, isomorphous with barium chloride. Barium bromate, $Ba(BrO_3)_2$, can be prepared by the action of excess of bromine on baryta-water. It crystallizes in the monoclinic system, and separates from its aqueous solution as $Ba(BrO_3)_2·H_2O$. On being heated it begins to decompose at 260–265°C. Barium chlorate, $Ba(ClO_3)_2$, is obtained by adding barium chloride to sodium chlorate solution; on concentration of the solution sodium chloride separates first; after further evaporation barium chlorate crystallizes out and can be purified by recrystallization. It can also be obtained by suspending barium carbonate in boiling water and passing in chlorine. It crystallizes in monoclinic prisms of composition $Ba(ClO_3)_2,H_2O$, and begins to decompose on being heated to 250°C. Barium iodate, $Ba(IO_3)_2$, is obtained by the action of excess of iodic acid on hot caustic baryta solution or by adding sodium iodate to barium chloride solution. It crystallizes in monoclinic prisms of composition $Ba(IO_3)_2,H_2O$, and is only very sparingly soluble in cold water.

Barium carbide, BaC_2, is prepared by a method similar to that in use for the preparation of calcium carbide (*see* ACETYLENE). Barium sulphide, BaS, is obtained by passing sulphuretted hydrogen over heated barium monoxide, or better by fusion of the sulphate with small coal. It is a white powder which is readily decomposed by water with the formation of the hydroxide and hydrosulphide. The phosphorescence of the sulphide obtained by heating the thiosulphate is much increased by adding traces of uranium, bismuth or thorium salts before ignition.

Barium sulphate, $BaSO_4$, is the most abundant of the naturally occurring barium compounds (*see* BARYTES) and can be obtained artificially by the addition of sulphuric acid or any soluble sulphate to a solution of a soluble barium salt, when it is precipitated as an amorphous white powder of specific gravity 4·5. It is practically insoluble in water (about two parts per million at 15°C.), and is only very slightly soluble in dilute acids; it is soluble to some extent, when freshly prepared, in hot concentrated sulphuric acid, and on being cooled the solution deposits crystals of composition $BaSO_4·H_2SO_4$. It is used as a pigment under the name of "permanent white" or *blanc fixe*, and with zinc sulphide in "lithopone." It is also used for weighting paper.

Barium nitride, Ba_3N_2, is obtained as an orange-yellow mass by passing nitrogen over heated barium amalgam or over the metal at 260°–600°C., or by heating the amide, $Ba(NH_2)_2$, in a vacuum at 400°–450°C. It is decomposed by water, and on being heated in a current of carbonic oxide forms barium cyanide (L. Maquenne), giving ammonia and baryta. Barium amide, $Ba(NH_2)_2$, is obtained by heating the metal in a current of dry ammonia at 200°C. or from a solution of a barium salt and potassamide in liquid ammonia. Barium dissolves in liquid ammonia to give a deep blue solution of $Ba(NH_3)_6$.

Barium nitrate, $Ba(NO_3)_2$, is prepared by dissolving either the carbonate or sulphide in dilute nitric acid, or by mixing hot saturated solutions of barium chloride and sodium nitrate. It crystallizes in octahedra, having a specific gravity of 3·2, and melts at 597°C. It is decomposed by heat, and is largely used in pyrotechny for the preparation of green fire. Barium carbonate, $BaCO_3$, occurs rather widely distributed as witherite (*q.v.*), and may be prepared by the addition of barium chloride to a hot solution of ammonium carbonate, when it is precipitated as a dense white powder of specific gravity of 4·3, almost insoluble in water. It is much more stable towards heat than calcium or strontium carbonates.

Barium and its salts can be readily detected by the yellowish-green colour they give when moistened with hydrochloric acid and heated in the Bunsen flame, or by observation of their spectra, when two characteristic green lines are seen. In solution, barium salts may be detected by the immediate precipitate they give on the addition of calcium sulphate (this serves to distinguish barium

salts from calcium salts), and by the yellow precipitate of barium chromate formed on the addition of potassium chromate. Barium is estimated quantitatively by conversion into the sulphate. For the relation of barium to radium, *see* RADIUM.

BARK-CLOTH, cloth made of the inner bark of trees, soaked, and beaten out with a club to the required thickness, is essentially both in origin and in use a tropical and sub-tropical material, its manufacture and use being found from the Congo across Africa (including Madagascar); from the Malay peninsula through Indonesia and Melanesia to Easter island, reaching its highest perfection in Polynesia; and in the tropical regions of Central and South America. It is being ousted everywhere by the introduction of native or imported cloth, and among many tribes the art of making it is already lost. There is evidence of a far wider distribution in former times. In India the Laws of Manu ordained that a Brahman purposing to end his life in religious meditation in the forests should clothe himself in skins or bark-cloth; it is still made in the Garo hills and before the introduction of imported cotton clothes it was the usual dress of the Vedda of Ceylon. A Kayan of Borneo reverts to a strip of bark-cloth when in mourning; and in the Belgian Congo, if a Bushongo woman has lost several children, she puts on a mourning robe of bark-cloth. Folk tales of the Bushongo fix the traditional date (about 780) when bark-cloth garments superseded complete nudity. Among the Yao of Nyassaland the girls are dressed in bark-cloth during their initiation ceremonies. It was once made in New Zealand where the paper mulberry, not being indigenous, was cultivated, but both trees and industry are now dead.

The making of bark-cloth depends on several factors—the need of clothing, the existence of trees with suitable fibrous inner bark, and the discovery that this could be beaten out into "cloth." In Central America bark-cloth is common on the Mosquito coast; it provides loin-cloths for the men, skirts for the women and long sleeveless mantles for both sexes as waterproofs. In Brazil the "shirt tree" (a *Lecythis* allied to the "monkey-pot") provides a bark which needs little or no preparation. A length of the stem four or five feet long is cut off, the bark is peeled off in one piece, soaked, and with two holes cut for the arms, the shirt is made. But the typical bark-cloth trees are absent from the South American forests; the less civilized natives wear no clothing, while among the more civilized cotton weaving is universal. In Africa there are numerous kinds of *Ficus* which have suitably fibrous bark. Bark-cloth was the natural clothing and an important industry in Uganda up to the middle of the 19th century. It was man's work to plant and cultivate the bark-cloth trees and make the cloth, which was used both for their ample garments and for draping the house walls, and for fines. A thick kind was also used for bed-clothes; several layers one on the top of the other two or three feet high made excellently springy beds for kings and chiefs. The "paper mulberry" (*Broussonetia papyrifera*), which is extensively cultivated in the East for paper making, grows wild in Burma, China and most of Oceania, and various kinds of *Ficus* (*F. prolixa, F. tinctoria, F. bengalensis,* the banyan tree, and *F. religiosa,* the "sacred fig tree") as well as the breadfruit tree (*Artocarpus incisa*) are used for making bark-cloth in the islands of the Indian and Pacific oceans.

The method of making bark-cloth differed very little in the various islands. A suitable length of branch or sapling was cut, the outer bark was scraped with a shell, and the inner strips, several feet long and an inch to a few inches wide, were left to soak in water. When thoroughly soaked the strips were beaten out on a flat, hollow log with a grooved wooden mallet, frequent wetting and continuous beating felting the fibres together (occasionally gum was used) until a piece of the required size was made. In Tahiti a bale was often 200yd. long, and a yard wide, and the wealth of a chief was estimated by the number of bales hanging from his palace roof. In Fiji a man would wind 200yd. round and round his body as a display of wealth. The cloth was variously coloured according to the bark used, *Ficus* becoming dark brown, breadfruit lighter brown, and paper mulberry beautifully white when dried and bleached. The common cloth was often dyed with casuarina bark, but the better kinds were decorated with patterns, either sketched out and painted on by the artist, impressed by pressing leaves or flowers in the dye (Tahiti), or (in Samoa and Fiji) printed with printing boards, or by blocks made of strips of cane or midribs of palm leaves stitched on to the piece of leaf. Stencilling was found in Fiji alone. The making of *tapa* was woman's work, from princess to peasant.

In Uganda, the bark was peeled off the living tree, the third or fourth barks being usually the best, though a tree would continue to provide fresh barks for 30 or 40 peelings. There it was exclusively men's work, and though the beating on a hollow log was similar the beater was of a different shape. Moreover, the patterns so characteristic of Polynesian *tapa* do not occur in Africa, where any decoration is rare, though the women sometimes added patterns, the princesses of Toro tracing designs with their own blood. Different trees yielded differently coloured cloth, the common kind, when exposed to the sun, colouring light brown and better kinds terracotta. A special tree was grown to provide pure white bark-cloths to be used at the king's coronation.

BIBLIOGRAPHY.—P. Hambruch, *Oceanische Rindenstoffe* (Oldenburg, 1926) gives a summary of the Pacific industry. For a review of this and further references, as well as a description from the Garo hills, see *Man* 5, 6 (1927). For Uganda *see* J. Roscoe, *The Baganda* (1911) and *The Banyankole* (1924).

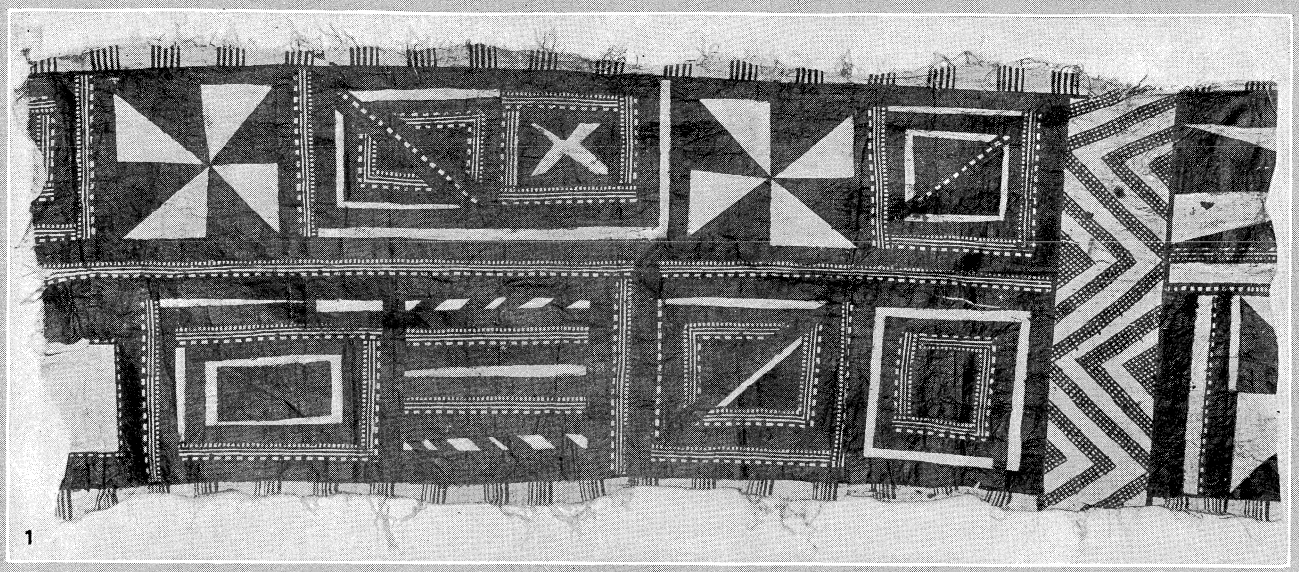
BARKER, EDMUND HENRY (1788–1839), English classical scholar, was born at Hollym, Yorkshire, England, and died in London on March 21 1839. He entered Trinity college, Cambridge, as a scholar in 1807, but left the university without a degree, being prevented by religious scruples from taking the oath then required. After acting as amanuensis to the famous Samuel Parr, he married and settled down at Thetford, Norfolk, where he lived for about 25 years. In later life he became involved in a law-suit which exhausted his means. In 1837–38 he was a prisoner for debt in the King's Bench and in the Fleet. Barker was one of the first commentators to write notes in English instead of Latin. He conceived the design of a new edition of Stephanus's *Thesaurus Graecae Linguae.* The work was undertaken by A. J. Valpy, and it was understood that Barker was the responsible editor. It was completed in 12 vols. (1816–28) without Barker's name. Severe criticisms of the earlier parts in the *Quarterly Review* (1820) were answered by Barker in his *Aristarchus Anti-Blomfieldianus.* He also published notes on the *Etymologicum Gudianum,* and collaborated with Prof. Dunbar, of Edinburgh, in a Greek and English Lexicon (1831). The *editio princeps* (1820) of the treatise attributed to Arcadius, Περὶ τόνων, was published by him from a Paris ms. Continental scholars entertained a more favourable opinion of him than those of his own country. He expressed contempt for the minute verbal criticism of the Porsonian school, in which he was himself deficient.

An account of his life will be found in the *Gentleman's Magazine* for May 1839; *see* also *Notes and Queries* (6th series, xii. p. 443), where a full list of his works is given.

BARKER, SIR HERBERT ATKINSON (1869–), British manipulative surgeon, was born in Southport, Lancs., April 21, 1869. At an early age he showed an aptitude for manipulative surgery and in 1889 was placed under the tutorship of J. Atkinson. On the latter's death in 1904, Barker took over the practice, specializing in the correction of abnormalities of the joints by manipulation, and the cure of derangements of knee cartilages and flat-foot. Although he performed a large number of successful operations the medical profession refused to admit him officially to their ranks; Dr. Axham was struck off the English Medical Register for acting as his anaesthetist; and during the World War Barker's offer to give free treatment for joint and bone affections to officers and soldiers was rejected, owing to the opposition of the British army medical authorities. He was knighted, however, in 1922, as the result of a memorial to the prime minister signed by many distinguished surgeons. In 1925 he retired from his practice and went to live in Italy. His works consist principally of articles in various periodicals. In 1927 he published his memoirs, *Leaves from My Life.* (*See* MANIPULATIVE SURGERY.)

BARKER'S MILL, a mechanical contrivance invented by a Dr. Barker about the end of the 17th century. It consisted of

BARK-CLOTH



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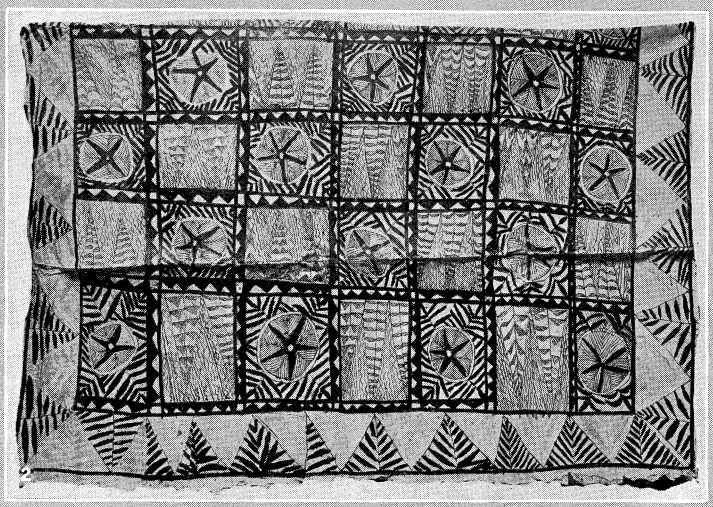

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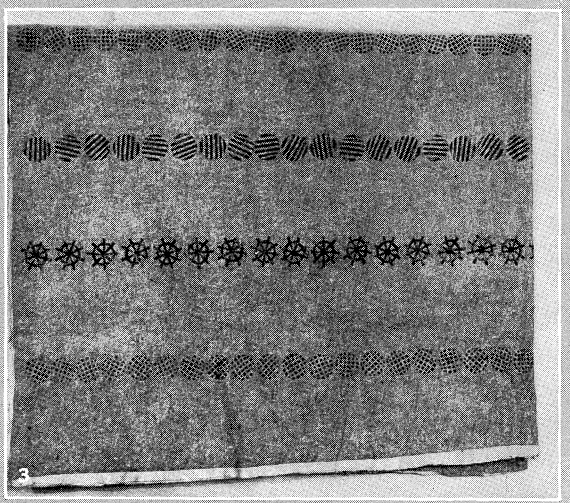

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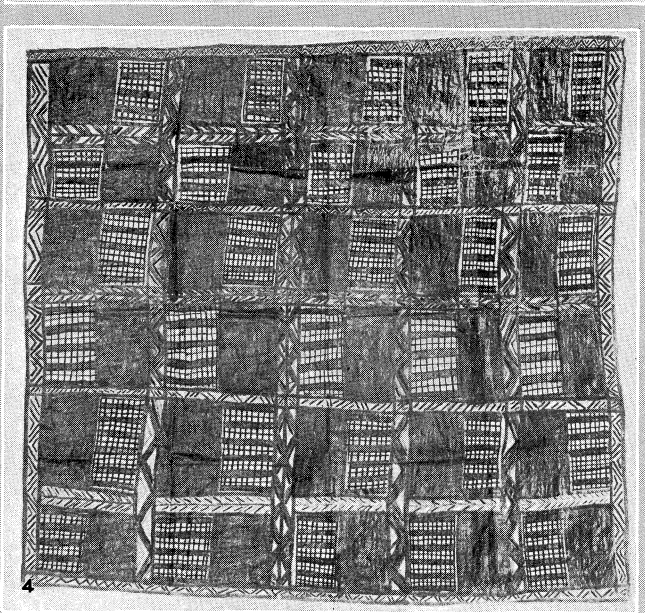

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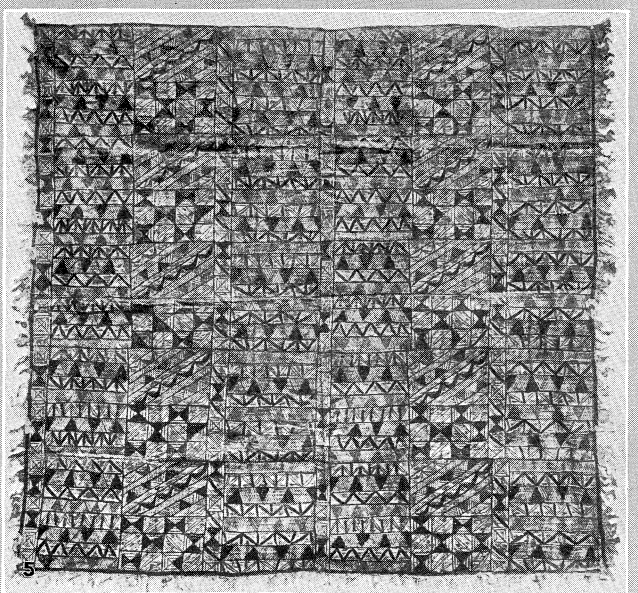

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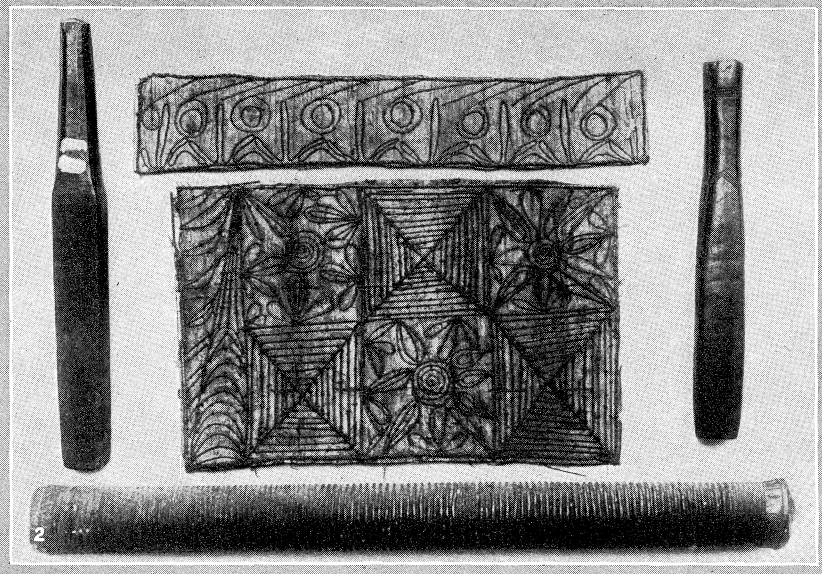
BY COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY

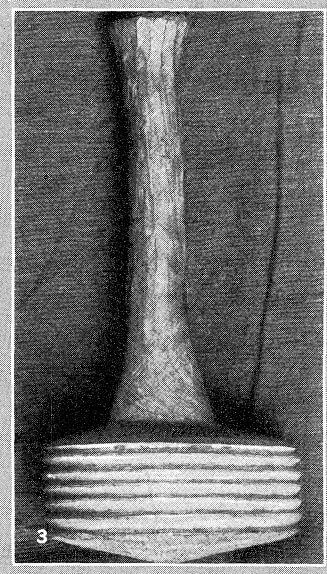
DESIGNS OF BARK-CLOTH MADE IN THE TROPICAL REGIONS

1. A Fiji Island design
2. A Samoan pattern which was apparently suggested by imported calico
3. A Tapa pattern beaten out in the Hawaiian Islands
4. A Tapa pattern from the Fiji Islands
5. A Tapa pattern from the Island of Samoa

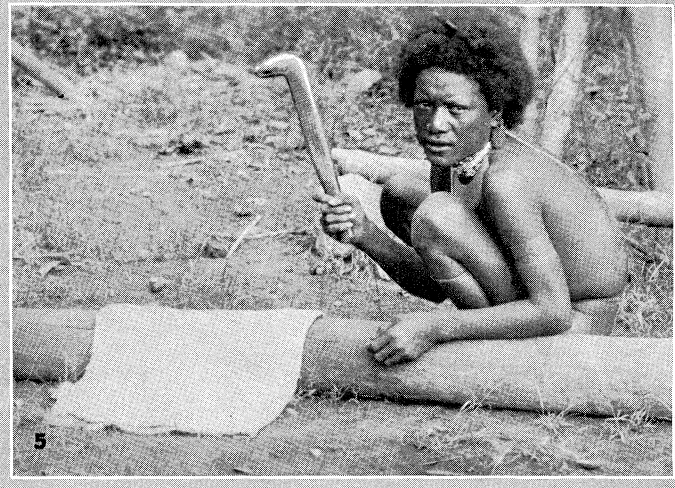
BARK-CLOTH











BY COURTESY OF (2) THE AMERICAN MUSEUM OF NATURAL HISTORY

NATIVE WOMEN MAKING BARK-CLOTH OR TAPA AND IMPLEMENTS USED IN DOING SO

1. Native woman outlining designs for painting on a strip of tapa, which is spread out on the grass in front of their houses
2. Sections of tapa showing it in its finished and decorated state and the implements used in making tapa
3. A wooden beater used by the natives of the Uganda region, in Africa, in making their bark-cloth, a section of which is shown behind the beater
4. Tongan women, of the Samoan region, beating the strips of tapa on a log with rude implements
5. A native of New Guinea preparing a strip of bark-cloth for a belt

a hollow vertical cylinder, provided with a number of horizontal arms fitted with lateral apertures; the contrivance was mounted so as to rotate about the vertical axis. By allowing water to enter the vertical tube, a rotation, due to the discharge through the lateral orifices, was set up.

BARKING, a municipal borough in the Romford parliamentary division of Essex, England, on the river Rodding near its junction with the Thames, 8 mi. E. of London on the L.M.S. and Metropolitan District Rys. Pop. (1938) 76,790. Area 6.5 sq.mi. Barking was celebrated for its nunnery, one of the oldest and richest in England, founded about 670 by Erkenwald, bishop of London, and restored in 970 by King Edgar, about 100 years after its destruction by the Danes. The ancient market-house has now been destroyed. Barking is a bishopric suffragan in the diocese of Chelmsford and its church of St. Margaret is Norman with Perpendicular additions. The Gas, Light and Coke company's works at Beckton are in the parish, also extensive rubber works. There are also chemical works, and some shipping trade, principally in timber. Barking was incorporated in 1931.

BARKLA, CHARLES GLOVER (1877–1944), British scientist, was born June 7, 1877, at Widnes, Lancashire, the son of John Martin Barkla, secretary of the Atlas Chemical Co. He was educated at Liverpool institute; University college, Liverpool; and Trinity and King's colleges, Cambridge. In 1902 he became Oliver Lodge fellow of Liverpool university, and demonstrator and assistant lecturer in physics, 1905. In 1907 he was lecturer in advanced electricity, and from 1909–13 Wheatstone professor of physics in the University of London (King's college). He was then appointed (1913) professor of natural philosophy at the University of Edinburgh. He became Bakerian lecturer at the Royal society 1916, and Hughes medallist of the same society in the following year. In 1917 he was awarded the Nobel prize for physics. He wrote numerous papers on electric waves and X-rays. Barkla died Oct. 23, 1944.

BARKLY EAST, a town in South Africa, 5,900 ft. above sea level; situated on the Kraai and Lange Kloof rivers, 98 mi. by rail from Aliwal North. The population in 1936 was 2,615 (Europeans 1,043; non-Europeans 1,572). Barkly East, which is named after Sir Henry Barkly, governor of the Cape 1870–77, is the centre of a district of the same name.

The surrounding country is mountainous, and some of the neighbouring peaks of the Drakenberg reach about 10,000 ft. The climate is healthful, and local pasture is very suitable for sheep breeding.

BARKLY TABLELAND. A tract of country about 300 mi. long in the northeast portion of Northern Territory, Australia. It lies in latitude 19° S.; and though it has a perceptible slope to the Gulf of Carpentaria it has no very obvious boundaries elsewhere. However, it is rather well-marked by the character of the vegetation, since it forms a belt of good pastoral country between the desert to the south and the poor stock-lands bordering the gulf. Its elevation is about 900 ft. above sea level, and it contains many well-known cattle stations, such as Brunette Downs.

BARKLY WEST, a town of the Cape province, South Africa, 21 mi. north of Kimberley, and chief town of a district of the same name in Griqualand West. It is built on the right bank of the Vaal river, here spanned by a bridge. Pop. (1936) 1,819, including 455 whites. Originally called Klipdrift, the town was first founded by the diggers after the discovery in 1867 of diamonds along the valley of the Vaal, and it had for some time a large floating population. On the discovery of the "dry diggings" at Kimberley the majority of the diggers went there. Barkly West remains, however, the centre of the river diggings, which are scattered along the river banks for about 70 mi. The diamonds are noted for their purity and lustre. The Barkly West electoral division is divided into the fiscal districts of Barkly West, Hay and Herbert. (*See* GRIQUALAND EAST AND GRIQUALAND WEST.)

BARLAAM AND JOSAPHAT. The life of Barlaam and Joasaph (or Josaphat) is a hagiographical legend, found among the writings of St. John of Damascus. It owes its interest and importance to the fact that parts of it correspond to the legend of the Buddha. It begins with the story of an Indian king Abenner, who was idolatrous and persecuted the Christians, especially the monks. A son was born to him and named Joasaph. At the birthday feast some 55 astrologers prophesied his greatness as a king, but one of them said he would be great not in his father's kingdom, and would accept the Christian religion. The king therefore had him enclosed in a beautiful palace, so that he should know nothing of the ills of life; but as the prince by being shut up was afflicted, he was at last allowed to go out, and in spite of precautions he saw a maimed man and a blind man. Later on he saw an old man, and learned that nothing but death would relieve his misery. At this he was distressed, but disguised his grief from his father.

So far the story corresponds closely with the legend of the Buddha's youth, but at this point it diverges, and the rest of the narrative is quite different. The prince was visited by a disguised monk, Barlaam, who instructed him in the Christian doctrine, and finally baptized him. His father tried to reconvert him by holding a public dispute between idolaters and Christians, but failed, and then vainly employed Theudas, a magician, to convert the prince by means of evil spirits and women. Then in despair he divided the kingdom with his son, but after four years was converted and died. Thereupon Joasaph abdicated, made Barachias king, and went to the wilderness to find Barlaam. On the way the devil tempted him with memories of his former glory, and with visions of beasts and monsters. (Here is probably another reminiscence of a Buddhist incident, the temptation by Māra.) He found Barlaam after two years, and they lived the rest of their lives in the wilderness. After the death of Joasaph the bodies of both were removed with great pomp by the king to his own country.

The problem of the relationship of this legend to the Buddha's life has increased in complexity with successive discoveries. The resemblances were early noticed, but were brought into prominence by Liebrecht in 1860. Independent versions of the story have since been discovered, and make it probable that the Indian original was translated into some form of middle Persian and then into Greek as early as the 6th century A.D., and hence before the Mohammedan period. Still more recently fragments of a Manichaean version have been discovered by von Le Coq in Central Asia. It is held by P. Alfaric that the Christian story came through a Manichaean channel, but that there must have been still another intermediate link, which is now lost.

The exact Indian original has never been discovered. There are at least three lives of Buddha, the Sanskrit *Lalita-vistara,* the Chinese version of a Sanskrit work translated into English by Beal as *The Romantic Legend of Sâkya Buddha,* and the Pāli introduction to the Jātaka (*see* JĀTAKA). None of these can be put earlier than the 3rd century A.D. The form of the name Joasaph, which is a corruption of the youthful Buddha's title *Bodhisattva,* shows that the original was in Sanskrit, not Pāli, in which the *v* disappears. Yet the story of the prophecy at the birth of the prince corresponds more closely with the Pāli than with the Sanskrit. A peculiarity of the Greek is the insertion of parables related by characters in the tale. This is a distinctly Indian feature, but none of these tales is found in the existing lives of Buddha, and it is probable that the Indian original which reached Persia was a still earlier version which has disappeared. It is inexact to say that Barlaam and Josaphat have ever been canonized. They are recorded in the Roman Martyrology under Nov. 27 on the authority of John of Damascus, and Joasaph alone in a Synaxarion of the Greek Church under Aug. 26. The wide ramifications of the story in mediaeval European literature have been traced by Braunholtz and Jacobs.

The Greek text with English translation is given in *Barlaam and Ioasaph,* by G. R. Woodward and H. Mattingly (1914); E. Kuhn, *Barlaam und Joasaph, eine bibliographisch-literargesch. Studie* (München, 1897); E. Braunholtz, *Die erste nichtchristliche Parabel des Barlaam und Josaphat* (Halle, 1884); J. Jacobs, *Barlaam and Josaphat* (1896); *Baralâm and Yĕwâsĕf,* Ethiopic text. ed. and trans. by Sir E. A. W. Budge (1923); the latest results are summarized by P. Alfaric, "La vie chrétienne du Bouddha," in *Journal Asiatique* (Sept.-Oct., 1917). (E. J. T.)

BAR-LE-DUC, a town, France, capital of the department of Meuse, 50 mi. E.S.E. of Châlons-sur-Marne, on the railway between that town and Nancy. Pop. (1936) 16,341. Bar-le-Duc was at one time the seat of the countship, later the duchy, of Bar. Though probably ancient it was important only when it became the residence of the 10th century counts. The modern town extends along the narrow valley of the Ornain shut in by wooded or vine-clad hills. On the northeast is the canal from the Marne to the Rhine, on the southwest the Canal des Usines with the upper town (Ville Haute) on the left bank. The Ville Haute has houses of the 15th, 16th and 17th centuries and the remains of the château of the dukes of Bar, dismantled in 1670, and of the church of St. Pierre (14th and 15th centuries). The lower town contains the official buildings. The town served as an important base for the southern quadrant of the western front during World War I. Industries include iron-founding and manufacture of machinery, corsets, hosiery, flannel goods, jam, wallpaper and brewing, cotton-spinning, weaving various mixed fabrics, leather dressing and dyeing. Wine, brandy, beer, leather, timber and iron are important in trade. Bar-le-Duc has tribunals of first instance and of commerce, a board of trade arbitrators, a chamber of commerce, and an art museum.

BARLETTA (anc. Barduli), episcopal see, Apulia, Italy, on the east-southeast coast, province of Bari, 34½ mi. W.N.W. of Bari by rail. Pop. (1936) town 51,597, commune 52,386. It has a Romanesque cathedral begun about 1150, a Gothic church of S. Sepolcro (13th century), and a castle (13th century), remodelled in 1532–37. It is a centre of the wine trade. In the neighbourhood, during the siege of Barletta by the French in 1503, a combat took place between 13 picked knights of Italy and France, which resulted in favour of the former; it has been celebrated by Massimo d'Azeglio in his *Disfida di Barletta.*

BARLEY. Barley, a member of the grass family, is one of the important cereals. The grain is used largely as animal feed, although appreciable quantities are used as malt and human food. It is an annual with winter and spring varieties and, as in wheat, the grain is produced in a terminal spike. Barley evidently was one of the first cereals cultivated. Grains of six-rowed barley were discovered in the pile dwellings of Switzerland and in Egypt dating from predynastic and early dynastic periods.

The origin of barley is still obscure. Some believe that cultivated barley was derived from *Hordeum spontaneum,* a wild annual species found in dry situations in southwestern Asia. Except for a brittle rachis this wild plant resembles cultivated two-rowed barley in other characters. A recently discovered six-rowed type with a brittle rachis is thought by others to be the original form.

Barley is cultivated in all temperate regions of the world, as well as in Asia Minor, Egypt, North Africa, India and other subtropical countries. It has been grown at the extreme northern limits of cultivation, near the arctic circle and often within it, reaching latitude 71° N. in Norway and 70° N. in Finland, where adapted strains mature in the short period of 60 to 70 days. In northern India and Tibet it is cultivated up to an elevation of 14,000 ft. and still farther south it is grown in the highlands of Abyssinia. A great diversity of types makes it possible for barley to grow under many conditions. The greatest acreage is found where the growing season of 90 days or more is cool. Hot, humid weather is unfavourable, but abundant sunshine during ripening and harvest adds much to the quality of the grain.

Winter barleys are grown only in regions with mild winters, since they are not winterhardy. The plant has a fibrous root system, and permanent roots arise from the crown near the soil surface. The straw, consisting of 5 to 7 internodes, is hollow except at the nodes. Usually the straw is shorter, the leaf is wider and the auricle at the junction of the leaf blade and sheath is much more prominent than in other small grains. The central axis or rachis of the barley spike is notched on opposite sides throughout its length. At each notch or node of six-rowed barley there are three spikelets, each containing a single fertile floret, which is either awned or hooded. The barley spikelet consists of a pair of narrow glumes arising near the base of the spikelet, while the pistil and 3 stamens are surrounded by a lemma and a palea. The lemma, which is on the dorsal side, extends into a long awn or a hood, although a few strains have neither awns nor hoods. The rachilla is a short bristle-like structure located at the base of the palea.

Cultivated varieties of barley occur mainly in two species, viz.: six-rowed barley (*Hordeum vulgare*) and two-rowed barley (*H. distichon*). In six-rowed barley all three flowers of a group of spikelets are fertile. There are several other less important species. *H. intermedium* with six rows of kernels has smaller lateral kernels than is normal and lacks awns or hoods on lateral spikelets. The lateral florets of common two-rowed barley are awnless and usually sterile. There are two rows of kernels in *H. deficiens* which has side florets further reduced so that only glumes and rachilla are present. The Abyssinian intermediate type has an irregular occurrence of lateral kernels and combines fertility characters of both the six-rowed and the two-rowed deficiens types. Some strains approach the six-rowed type, in which nearly all lateral florets are fertile. Other strains have occasional lateral florets that are fertile. The remaining lateral florets are much reduced, as in the *deficiens* type. Cultivated barleys self-pollinate and their species hybrids are fertile.

Varieties and strains of barley vary in length of spikes and length of rachis internodes. When the rachis internodes are short, or about 2 mm. in length, there are usually six distinct rows of kernels and the spike is rather dense in appearance. Dense spikes usually stand erect and have widely spreading awns. Intergradations in head density are numerous. Common nodding six-rowed barley has narrow spikes, longer heads, longer internodes varying in length from 3 to 5 mm. and the kernels lie closer to the rachis. In these the side spikelets of two opposite sets lean toward each other and partly overlap, thus giving the illusion of a spike with four rows, as in strains of Manchuria barley. Wide variability in head density also occurs in two-rowed barley. The very dense-headed type is represented by Fan or Peacock barley, which has wide erect spikes and widely spreading awns. In *H. distichon* var. *nutans,* the spike is narrow, lax and nodding and bends over when ripe. Some of the better malting varieties occur in this group, such as Chevalier, Hanna and Hannchen.

Several other characteristics are useful in classifying barley. In hulled barley, the lemma and palea are fused with the true grain or caryopsis, while the grain threshes free in naked forms as in wheat. Most of the important strains of barley have either blue or white grains. The lemma and palea as well as the pericarp may be white, red, purple or black. The degree and length of pubescence varies on glumes and edges of the rachis. Rachilla hairs may be either long or short, and this characteristic is valuable in distinguishing strains of threshed grain. Kernels of some of the North African six-rowed strains are very large; those of the Manchuria type are smaller; and those of the Peatland type are still smaller. Variability occurs in the number of barbs present on the upper part of the lemma, from none to many. Different combinations of these characters give many varieties, but fertility, the adherence of hulls, type of lemma appendage and colour are some of the more important classification characters.

The straw of barley is of little economic value and is used on the farm chiefly as litter or as feed for stock. Large quantities of the grain are utilized in the preparation of malt for the manufacture of beer, spirits, production of commercial alcohol and in connection with many food products. For these purposes the grain should be plump, bright-coloured, free from disease, of high germination capacity and rich in starch. Distiller's malts are made from thinner-kerneled barleys, which usually have greater enzyme production. About 2,000,000 bu. of this type of malt were consumed monthly in the United States in 1943 for making industrial alcohol for synthetic rubber and munitions. Regarded either from the agricultural or the economic point of view, there are two classes of barley, one described as "malting" and the other as "feeding." No definite line can be drawn between the two classes.

A porous loaf cannot be made from barley flour since it contains little or no gluten similar to that in wheat flour; nevertheless, in many countries barley is an important article of human diet. The rounded grains of "pearl barley" used in soups is ob-

tained by grinding away the husk. In India, Tibet and some parts of Europe barley is a valuable food, while the naked barleys take second place to rice as a food in Japan.

Cultivation.—The cultivation and management of the barley crop requires care. Although moderate rainfall is required, the soil should be well drained. Clay loam or fine silt soils with sufficient phosphorus and potash and not an excess of nitrogen produce good malting barley. When too much nitrogen is present, plants produce rank growth and lodge easily. Under these conditions the grain is poorly filled, dark-coloured and poor in malting quality. Barley used for malting is grown primarily east of the Missouri river in the United States. In the British Isles malting barley is grown on light, calcareous and sandy loam soils in warm districts.

Barley should have a firm and well-prepared seed bed. Seed is sown usually with a grain drill in order to secure uniformity in depth and distribution. Seeding at the rate of about 2 bu. per ac. usually is done as early as possible in the spring. The rate of sowing in the British Isles varies from 2 to 3 bu. per ac. according to the date of sowing, which is generally in February and March.

Barley produced in the United States is mostly of the six-rowed type. In California, strains of the coast type predominate. Trebi, a feed barley, is grown in several of the northern states and in Canada. The Manchurian type is well adapted to the upper Mississippi valley, but it has been partly supplanted by the smooth-awned strains Wisconsin Barbless and Velvet. In south central Canada the Manchurian type also is well adapted. Winter barley culture occurs to some extent in the southern states. There the crop may be grazed during the fall and winter and later harvested for the grain. Winter barley is sown in September and October at the approximate rate of 2 bu. to the ac.

Various insect pests, such as wireworm, Hessian fly, frit fly, chinch bug and aphides damage the barley crop. Among parasitic fungi attacking barley are *Helminthosporium* spp. and three kinds of smut (*Ustilago* spp.), which destroy the spikelets. Other diseases serious at times are mildew (*Erysiphe graminis hordei*), leaf rust (*Puccinia anomala*), stem rust (*Puccinia graminis*), leaf scald (*Rhynchosporium secalis*) and the foot rots. Fusarium blight, or scab (*Gibberella saubinetti*), which shrivels the grain and makes it unfit for hog feed, may be serious in the upper Mississippi valley.

Plant breeders have attempted to increase barley yields of desirable quality grain by improving such characters as stiffness of straw, earliness, shattering, disease resistance, winterhardiness and industrial quality. In the British Isles various hybrids have been produced for stiff straw and good yield, examples of which are Sprat-Archer and Plumage-Archer. In the United States diseases are important in the more humid areas especially, and by hybridization considerable effort is made to produce adapted strains with disease resistance. Smooth-awned varieties of hybrid origin increased the popularity of barley culture.

Production and Trade.—Cultivated barley is widely distributed. In 1939 one-fifth of the total acreage was in the U.S.S.R. Following in order of comparative acreage were the United States, China, India, Canada, Germany, Morocco, Spain, Algeria, Poland and Chosen.

Nearly all the barley grown in Great Britain is in England and Wales, Scotland having less than 10% of the total acreage. Great Britain grew approximately 2,250,000 ac. in 1890, but this acreage was reduced to 1,250,000 by 1939. Annual production is ordinarily about 1,000,000 tons, of which three-fifths are grown in the eastern and northeastern counties. The average acre yield of grain is about 26 bu. in the British Isles (40.6 bu. in 1938), with 15 to 20 cwts. (about one ton) of straw.

Production of barley in the U.S. averaged 226,000,000 bu. (5,424,000 tons) annually in the 10-year period 1931–40; in 1942 production was estimated at 426,000,000 bu. (10,224,000 tons), grown on 16,782,000 ac. The average for the 10-year period 1930–1939 shows that Minnesota, California, North and South Dakota and Wisconsin were the chief producing states. During 1939–43 production increased appreciably in Nebraska, Kansas and the Dakotas. The average grain yield per ac. was estimated at 25.4 bu. in the United States for 1942 and at 22 bu. in Canada for 1941.

Importation of barley into Great Britain and North Ireland in 1938 amounted to approximately 46,376,000 bu. (1,113,000 tons) as compared with 39,894,000 bu. (957,000 tons) in 1935. The chief sources of supply were the United States, Canada and South America. The soviet union, which before World War I exported large quantities, began about 1924 to come back into the trade and by 1938 exported 18,655,000 bu. Other countries with large exports in 1938 were Canada (17,446,000 bu.), the United States (16,130,000 bu.), Poland (10,932,000 bu.) and Argentina (9,708,000 bu.). Next to the United Kingdom in total imports of barley in 1938 was Germany (20,962,000 bu.), followed by Belgium (19,384,000 bu.), the Netherlands (10,604,000 bu.) and Switzerland (6,779,000 bu.). After the beginning of World War II, international trade in barley was greatly reduced. (H. L. Ss.)

BARLEY-BREAK, an old English country game frequently mentioned by the poets of the 17th and 18th centuries. It was played by three pairs composed of one of each sex, who were stationed in three bases or plots contiguous to each other. The couple occupying the middle base, called *hell* or *prison,* endeavoured to catch the other two, who, when chased, might *break* to avoid being caught. If one was overtaken, he and his companion were condemned to *hell.* From this game was taken the expression "the last couple in hell," often used in old plays.

BARLEY-CORN, a grain of barley, and thus a measure taken from the length of a grain of barley, three of which (sometimes four) were considered to make up an inch. The barley-corn has been personified as representing the malt liquor made from barley, as in Burns's song "John Barleycorn."

BARLOW, JOEL (1754–1812), American poet and politician, was born in Redding, Conn., on March 24, 1754. He graduated at Yale in 1778, did post-graduate work there, and was for three years a chaplain in the Revolutionary army. In July 1784 he established at Hartford, Conn., a weekly paper, the *American Mercury,* with which he was connected for a year. In 1786 he was admitted to the bar. At Hartford he was a member of the group of young writers known as the "Hartford Wits." He contributed to the *Anarchiad,* a series of satirico-political papers, and in 1787 published a long and ambitious poem, *The Vision of Columbus,* which gave him a considerable literary reputation. In 1788 he went to France as the agent of the Scioto Land company, which later failed, and in 1789 he induced the company of Frenchmen who ultimately founded Gallipolis, Ohio, to emigrate to America. In Paris he became a liberal in religion and an advanced republican in politics. He was a member of the London Society for Constitutional Information; published various radical essays, including a volume entitled *Advice to the Privileged Orders* (1792), which was proscribed by the British Government; and was made a citizen of France in 1792. On a mission to Algiers in 1795–97 he secured the release of American prisoners held for ransom and negotiated a treaty with Tripoli. He returned to America in 1805, with a fortune which he had made abroad, and lived near Washington, D.C., until 1811, when he became American plenipotentiary to France, charged with negotiating a commercial treaty with Napoleon and with securing the restitution of confiscated American property, or indemnity therefor. In this capacity he became involved in the retreat of the French army from Russia and, overcome by exposure, died at the Polish village of Zarnowiec on Dec. 24, 1812.

In 1807 Barlow had published in a sumptuous volume, the *Columbiad,* an enlarged edition of his *Vision of Columbus,* more pompous even than the original. The poem for which he is now best known is his mock-heroic *Hasty Pudding* (1793), a graceful, pleasantly humorous pastoral poem. He published also religious verse, *The Conspiracy of Kings: A Poem Addressed to the Inhabitants of Europe from Another Quarter of the Globe* (1792), and *A View of the Public Debt, Receipts and Expenditures of the United States* (1800). His political writings in collected form went through several editions in his lifetime. *See* C. B. Todd's *Life and Letters of Joel Barlow* (1886); and "The Literary Strivings of Mr. Joel Barlow," in M. C. Tyler's *Three Men of Letters* (1895).

BARLOW, PETER (1776–1862), English writer on pure and applied mathematics, was born at Norwich. In 1806 he was appointed mathematical master in the Woolwich Academy, and filled that post for 41 years. In 1823 he was made a fellow of the Royal Society, and two years later received the Copley medal. He studied especially steam locomotion, and sat on the railway commissions of 1836, 1839, 1842, 1845. He received many distinctions from British and foreign scientific societies. Barlow's principal works are: *Elementary Investigation of the Theory of Numbers* (1811); *New Mathematical and Philosophical Dictionary* (1814); *Essay on Magnetic Attractions* (1820). The investigations on magnetism led to the important practical discovery of a means of rectifying or compensating compass errors in ships.

BARM, the scum formed on the top of malt liquor when fermenting; yeast used to leaven bread, or to set up fermentation in liquor. *See* YEAST; FERMENTATION; BREWING.

BARMECIDES, better, BARMAKIDS, a noble Persian family which attained great power under the Abbasid caliphs. Barmak, the founder of the family, was a Parsi. According to tradition, his wife was taken for a time into the harem of Abdallah, brother of Kotaiba, the conqueror of Balkh, and became the mother of Khalid b. Barmak the Barmecide. Barmak subsequently (about A.D. 736) rebuilt and adorned his native city of Balkh after the rebellion of Harith. The family prospered, and his grandson Yaḥyā b. Khalid was the vizier of the caliph Mahdo and tutor of Harūn al-Rashid. His sons Fadl and Ja'far (the Giafar of the *Arabian Nights*) both occupied high offices under Harūn. *See* further CALIPHATE, section C. §§ 4, 5. The expression "Barmecide feast," to denote an imaginary banquet, is drawn from one of the tales ("The Barber's Tale of his Sixth Brother") in the *Arabian Nights,* in which a series of empty dishes is served up by one of the Barmecides to a hungry man, to test his sense of humour (*see* edition by L. C. Smithers, 1894, vol. i, 317).

BARMEN, a former German city in the Prussian Rhine province. Pop. (1925) 187,239. It was in 1929 joined with Elberfeld (*q.v.*) to form the city of Wuppertal, pop. (1939) 398,099. The city stretches 4 mi. along the narrow valley of the Wupper. High wooded hills surround it. Those lying south are laid out in public grounds. It is divided into Upper, Middle and Lower Barmen. Interesting buildings include the *Ruhmeshalle*, which contains the town library, a picture gallery, the town hall, a theatre and the birthplace of Friedrich Engels (*q.v.*). There are several high-grade schools. Barmen was one of the most important manufacturing centres of Germany. The development of its commercial activity dates from the beginning of the 19th century. Ribbonweaving was the chief industry; cotton and cloth goods, lace, braids, steel wares, chemicals (Bemberg), buttons, rugs and pianos were also made. The printfields and dyeworks were long famous (since 1784) for their Turkey-red, but it has been superseded by the chemical alizarin dye since 1870. Its export trade, particularly to the United States, was considerable. Barmen, although mentioned in chronicles in the 11th century, did not attain civic rights until 1808, when it was formed into a municipality by the grand duke of Berg.

BARMOTE COURT (also BERGHMOTE, BARGHMOTE, BARGEMOTE, BARMOOT), a court held in the lead-mining districts of Derbyshire, England, for the purpose of determining the customs peculiar to the industry and for the settlement of disputes arising in connection therewith. Barmote courts are of very ancient origin, having been in existence in the reign of Edward I. Their jurisdiction extends both to the crown lands in the duchy of Lancaster and to those under individual ownership, comprising seven clearly defined districts. Owing to the progress in modern mining, many of the customs and much of the procedure became obsolete, and their powers were regulated by the High Peak Mining Customs and Mineral Courts Act 1851. An appeal from the jurisdiction of the courts lies by way of *certiorari.*

BARMOUTH (Abermaw, mouth of the Maw, or Mawddach) is a seaside town and urban district on the north bank of the Mawddach estuary, Merionethshire, Wales. Pop. (est. 1938) 2,139. Area, 2.6 sq.mi. It is on the coast route of the old Cambrian (now G.W.R.) line, with connections via Dolgelly to the Welsh border. The railway facilities and the fine scenery have made it a well-known summer resort. New sea defense works with a promenade 1¼ mi. long were opened by David Lloyd George in 1933.

BARNABAS, the surname given by the apostles (Acts iv. 36, possibly in distinction from Joseph Barsabbas, Acts i. 23) to Joseph, "a Levite, a man of Cyprus by birth," who, though not of the Twelve, came to rank as an apostle (Acts xiv. 4, 14, I Cor. ix. 6; *see* APOSTLE). The Greek rendering of this Semitic *sobriquet* means "son of consolation" (A.V.) or "son of exhortation" (R.V.), the latter best suiting his "prophetic" or inspired manner of speaking (Acts xiii. 1). Its etymology is not yet cleared up. But it seems best to assume some Aramaic form equivalent to the Greek. That Barnabas' "exhortation" was of the inspiriting and cheering kind, and so "built up" faith (*cf.* Acts ix. 31, xv. 32, I Cor. xiv. 3, Phil. ii. 1), is most probable (*see* Acts xi. 22 *seq.*). His power lay in a loving heart ("a good man," xi. 24), with divinely sympathetic insight into persons (ix. 27) and true religion (xi. 23 *seq.*). His generous nature took effect also in meeting the bodily needs of his fellows (iv. 36 *seq.*).

Yet we must beware of regarding Barnabas merely as a fine character; he plays too big a part in the early Church for any such limitation. Only a man of insight and authority would have been sent by the Jerusalem Church to inspect and judge of the new departure at Antioch (Acts xi. 22), where momentous issues were involved. Before long he called in the aid of his friend Saul to cope with the new and expanding situation (25 *seq.*). Next, after their joint visit or visits to Judaea and Jerusalem (Gal. ii. 1 *seq.;* Acts xi. 30, xii. 25) (*see* PAUL), we get a glimpse of him as still chief among the "prophets and teachers" of the Antiochene Church, and as called by the Spirit, along with Saul, to initiate a yet wider mission of the Gospel, in regions beyond Syria (xiii. 1–3). He led the way to his native Cyprus; but in the struggle with the magician, Bar-Jesus (xiii. 7 *seq.*), Saul came so decisively to the front, that henceforth he takes the lead (*see* xiii. 13, "Paul and his company," and note the turning back of Mark, the kinsman of Barnabas). Barnabas' vacillation at Antioch (Gal. ii. 11 *seq.*, whether it preceded or followed the mission in Acts xiii.–xiv.), shows that, while gifted with true intuitions, he was less strong in thinking out his position to all its issues on principle. But what he did see with full conviction, he was staunch in upholding; witness his support of Gentile freedom from the obligation of circumcision at the Jerusalem conference (Acts xv.).

When Barnabas sails away with Mark to resume work in Cyprus, the mists of history close about him. Only now and again do we catch fugitive glimpses of him and his work (I Cor. ix. 6, Col. iv. 10). Tradition, which early regards him as one of the Seventy (Clem. Alex.), carries him, plausibly enough, to Alexandria (*Clem. Hom.* i. 8, ii. 4; *cf.* the ascription to him of the Alexandrine *Epistle of Barnabas*), and even to Rome (*Actus Petri Vercell.* c. 4, *Clem. Recog.* i. 7, *cf. Hom.* i. 7) not to say Milan. The date of his death is uncertain, but probably fell before Acts was written (*c.* A.D. 75–80).

See W. Cunningham, *Epistle of Barnabas,* pp. xlvii.–lxii.; O. Braunsberger, *Der Apostel Barnabas, sein Leben* . . . (Mainz, 1876); articles *s.v.* in *Ency. Biblica* and Hastings' *Dictionary of the Bible.*

(J. V. B.)

BARNABAS, EPISTLE OF. The epistle is one of "The Apostolic Fathers." It stands at the end of the 4th century *Codex Sinaiticus* of the New Testament, in a sort of appendix. This means that it once enjoyed quasicanonical authority, a fact borne out by Clement, Origen and Eusebius (*H.E.* iii. 25). Internal evidence refutes its ascription to Barnabas; nor does the epistle itself make any such claim.

"That Alexandria, the place of its earliest reception, was also the place of its birth, is borne out by the internal evidence of style and interpretation, which is Alexandrian throughout." So wrote Lightfoot. But neither its "Alexandrianism" nor its "astonishing familiarity with the Jewish rites" (Kohler in the *Jewish Encycl.*) proves this; still less that "the writer seems to have been a converted Jew." For, apart from seeming blunders in Jewish matters, he classes himself with his readers as formerly

idolaters (xvi. 7, *seq.*). It is enough, then, to regard him as in close contact with Judaism. He seems also to have just visited his readers as a stranger, probably from Alexandria, or (i. 2–4) from Syria, the older home of Christianity, where also "the Two Ways" which he cites probably originated. He used his greater experience on the subject to warn his readers against all compromise between Judaism and the Gospel. He goes so far as to deny any historical connection between the two. The Divine oracles had ever pointed to the Christian Covenant, and had been so understood by the men of God in Israel, whereas the apostate people had turned aside to keep the ceremonial letter of the law at the instigation of an evil angel (ix. 4). He takes in succession the typical Jewish institutions—Circumcision, Foods, Ablutions, Covenant, Sabbath, Temple—showing their spiritual counterpart in the New People and its ordinances, and that the Cross was prefigured from the first. Such insight (*gnosis*) he regards as the mark of mature Christian faith. The burden of his epistle is, "Let us become spiritual, a perfect temple unto God" (iv. 11); and that not only by theoretic insight, but also by practical wisdom of life. To enforce this he passes to "another sort of *gnosis* and instruction" (xviii. 1) *viz.*, the precepts of the "Two Ways," cited in a slightly different form from that in the first part of the *Didaché* or *Teaching of the Apostles*. The modifications are all in a more spiritual direction, in keeping with the evangelic spirit which pervades even the allegorical ingenuities of the epistle.

Its date has been much debated. But Lightfoot's reading of the apocalyptic passage in ch. iv.—as modified by Sir W. M. Ramsay—points clearly to the reign of Vespasian (A.D. 70–79). Thus it is the earliest of the Apostolic Fathers.

BIBLIOGRAPHY.—Besides collected editions of the Apostolic Fathers, *e.g.*, that of Gebhardt and Harnack and of F. X. Funk (2nd ed., 1901), *see* O. Braunsberger, *Der Apostel Barnabas, u. der ihm beigelegte Brief* (Mainz, 1876); W. Cunningham, *Epistle of Barnabas* (1877); E. Reuss, *Théologie chrétienne*, vol. ii., also Lightfoot's fragmentary essay in his *Clement of Rome*, ii. 503–512. *See* also APOCRYPHAL LITERATURE. (J. V. B.)

BARNABAS, GOSPEL OF. We read in antiquity (*e.g.*, in the *Decretum Gelasii*) of an apocryphal Gospel of Barnabas. (*See* APOCRYPHAL LITERATURE.) Traces of it may survive in a later book with this title, probably embodying materials partly Gnostic in character and origin (trans. by L. Ragg, Oxford, 1907). It seems "a forgery of the 15th century at earliest, written in Italian by a renegade from Christianity to Islam" (M. R. James, *The Apoc. N.T.*, p. xxvi.).

BARNABITES, a religious order ecclesiastically known by the name of "Clerics Regular of St. Paul," founded in 1530 by Antonio Maria Zaccaria (1502–1539, canonized 1897) and confirmed as an order by the Vatican in 1535 and 1579. In addition to monastic devotion, their vocation included education and missionary work among the multitudes reduced to material and moral misery by the contemporary wars. They were also committed to special study of the Pauline Epistles. In 1538 the order acquired the ancient church of St. Barnabas in Milan (hence the name by which it is commonly known). It has never spread widely. There are 20 monasteries in Italy and a few in Austria, Belgium and Spain.

BARNABY, SIR NATHANIEL (1829–1915), English naval architect, was born at Chatham on Feb. 25, 1829, and died at Lewisham on June 15, 1915. From 1854 to 1885 Barnaby was employed in the constructive department of the Admiralty, during which time he took an active part in the great changes in naval construction, iron taking the place of wood, and steel of iron, as the material for shipbuilding, in his time. In 1864 he was appointed Assistant Naval Constructor, and in 1870, on the resignation of Sir Edward Reed, chief Constructor, Barnaby was made President of a Council of Construction, and in 1872 definitely received the title of Chief Naval Architect, afterwards changed to that of Director of Naval Construction. In 1885 he was made a K.C.B., but in that year he was obliged to retire from public service, on account of ill health. Barnaby contributed articles on the *Navy* and *Shipbuilding* to the 9th edition of the *Encyclopædia Britannica*. He was one of the founders of the Institution of Naval Architects, and contributed to its *Transactions*, besides writing, among other works, *Abridgments of Specifications Relating to Shipbuilding, etc., from 1618 to the Present Time* (1862), and *Naval Development in the 19th Century* (1902).

BARNACLE, the common name for marine crustaceans of the order Cirripedia. Originally, the name was given to the stalked barnacles (Lepadidae of C. Darwin), which attach themselves in great numbers to driftwood and other objects floating in the sea and are one of the chief agents in the fouling of ships' bottoms during long voyages. The sessile barnacles (Balanidae of Darwin) or "acorn-shells" are found in myriads, encrusting the rocks between tidemarks on all coasts. One of the most extraordinary and persistent myths of mediaeval natural history was the cause of transferring to these organisms the name of the barnack or barnacle goose (*Branta leucopsis*). This bird is a winter visitor to Britain and, its arctic nesting places being then unknown, it was fabled to originate within the shell-like fruit of a tree growing by the seashore, usually represented in the guise of a barnacle of the genus *Lepas*. Even after the scientific study of zoology had replaced the tales of mediaeval writers, the barnacles were classed with the Mollusca, some of which they resemble in external appearance. It was not till J. Vaughan Thompson demonstrated, in 1830, their development from a free-swimming and typically Crustacean larva that it came to be recognized that, in Huxley's graphic phrase, "a barnacle may be said to be a Crustacean fixed by its head and kicking the food into its mouth with its legs." For a systematic account of the barnacles and their allies, *see* CIRRIPEDIA; CRUSTACEA. (W. T. C.)

BARNACLE PAINT or **ANTI-FOULING MARINE PAINT:** *see* PAINT.

BARNARD, LADY ANNE (1750–1825), author of the ballad "Auld Robin Gray," the eldest daughter of James Lindsay, 5th earl of Balcarres, married in 1793 Andrew Barnard, who became colonial secretary at the Cape of Good Hope. Thither the Barnards went in March 1797, Lady Anne remaining at the Cape until Jan. 1802. A series of letters written by Lady Anne to Henry Dundas, then secretary for war and the colonies, was published in 1901 under the title *South Africa a Century Ago*. "Auld Robin Gray" was written by her in 1772 to music by the Rev. William Leeves (1748–1828).

See the memoir by W. H. Wilkins, together with the original text of "Auld Robin Gray," prefixed to *South Africa a Century Ago*.

BARNARD, EDWARD EMERSON (1857–1923), American astronomer, was born in Nashville, Tenn., on Dec. 16, 1857. He began his studies alone in boyhood. In 1887 he graduated at Vanderbilt university, after having charge of the observatory there for four years. In 1887 he was appointed astronomer at Lick Observatory, and from 1895 until his death he was professor of practical astronomy and astronomer of Yerkes Observatory, at the University of Chicago. He accompanied the U.S. Naval Observatory Eclipse Expedition to Sumatra (1901). His contributions to observational astronomy were numerous and important. In celestial photography he obtained excellent results and discovered 16 comets, Jupiter's fifth satellite and the star with the greatest known motion (1916). He was associate editor of the *Astronomical Journal* and the author of *Micrometrical Observations of Eros Made During Opposition of 1900–1901*.

A bibliography may be found in J. A. Parkhurst's "Edward Emerson Barnard," in *National Academy of Sciences—Report*, pp. 49–53 (1923). For further biographical material consult: *Royal Astronomical Society*, Monthly Notices, vol. lxxxv., pp. 221–225; Robert G. Aiken's "Edward Emerson Barnard (1857–1923)" in *Astronomical Society of the Pacific*, vol. xxxv., pp. 87–94.

BARNARD, FREDERICK AUGUSTUS PORTER (1809–1889), American scientist and educator, was born in Sheffield (Mass.), on May 5, 1809. In 1828 he graduated at Yale. He was then in turn a tutor at Yale, a teacher (1831–32) in the American asylum for the deaf and dumb, Hartford (Conn.), and a teacher (1832–38) in the New York Institute for the Instruction of the Deaf and Dumb. From 1838 to 1848 he was professor of mathematics and natural philosophy, and from 1848–54 was professor of chemistry and natural history in the University of Alabama, also filling for two years the chair of English literature. In 1854 he was ordained as deacon in the Protestant Episcopal

Church. In the same year he became professor of mathematics and natural philosophy in the University of Mississippi, of which institution he was chancellor from 1856 until the outbreak of the Civil War, when, his sympathies being with the North, he resigned and went to Washington. There for some time he was in charge of the map and chart department of the U.S. coast survey. In 1864 he became the tenth president of Columbia college (now Columbia university) in New York city, which position he held until the year before his death, his service thus being longer than that of any of his predecessors. During this period the growth of the college was rapid; new departments were established; the elective system was greatly extended; more adequate provision was made for graduate study and original research, and the enrolment was increased from about 150 to more than 1,000 students. Barnard strove to have educational privileges extended by the university to women as well as to men, and Barnard college, for women (*see* COLUMBIA UNIVERSITY), established immediately after his death, was named in his honour. He died in New York city on April 27, 1889. Barnard was a versatile man, of catholic training, a classical and English scholar, a mathematician, a physicist and a chemist, a good public speaker, and a vigorous but somewhat prolix writer on various subjects, his annual reports to the board of trustees of Columbia being particularly valuable as discussions of educational problems. Barnard was the editor-in-chief in 1872 of *Johnson's Universal Cyclopaedia.* He published a *Treatise on Arithmetic* (1830); an *Analytical Grammar with Symbolic Illustrations* (1836); *Letters on College Government* (1855); *History of American Coast Survey* (1857); *Recent Progress of Science* (1869); and *Metric System of Weights and Measures* (1871).

For biography *see* John Fulton's *Memoirs of Frederick A. P. Barnard* (1896); "Frederick A. P. Barnard," *Science,* new series, vol. x. (1899); and "Frederick A. P. Barnard," *A History of the First Half-century of the National Academy of Sciences, 1863–1913* (1913).

BARNARD, GEORGE GREY (1863–1938), American sculptor, was born at Bellefonte (Pa.), on May 24, 1863. He first studied at the Art institute, Chicago, and in 1883–87 worked in P. T. Cavelier's atelier at Paris. He lived in Paris for 12 years, returning to America in 1896; and with his first exhibit at the Salon of 1894 he scored a great success. His early works include "The Boy" (1885); "Brotherly Love," sometimes called "Two Friends" (1887); the allegorical "Two Natures" (1894, in the Metropolitan museum, New York city); "The Hewer" (1902, at Cairo, Ill.); and "Great God Pan" (in Central park, New York city). In 1912 he completed his two groups of 31 statues for the Pennsylvania capitol at Harrisburg. His bronze statue of Lincoln, heroic in size and the subject of bitter controversy, was unveiled in Lytle park, Cincinnati, in 1917. Prominent critics denounced it, Robert T. Lincoln, son of Abraham Lincoln, objected to the placing of replicas in London and Paris, and the National Academy of Design issued a formal protest. On the other hand, many admirers of Lincoln, including Miss Tarbell, his biographer, and Theodore Roosevelt, warmly praised it. Most notable among Barnard's later works are "Rising Woman" (1918) and "Adam and Eve" (1923), both in marble and purchased by J. D. Rockefeller, Jr.; "A Monument to Democracy" (1920), containing 400 figures in plaster; and "Let There Be Light," a bronze statue of heroic size, for Louisville (Ky.) (1925).

BARNARD, HENRY (1811–1900), American educationalist, was born in Hartford, Conn., Jan. 24, 1811. He graduated at Yale in 1830, and in 1835 was admitted to the Connecticut bar. In 1837–39 he became a member of the Connecticut legislature, effecting in 1838 the passage of a bill, framed and introduced by himself, which established a board of "commissioners of common schools" in the State, as secretary of which he worked indefatigably till its abolition in 1842. In 1843 he was appointed by the governor of Rhode Island agent to examine the public schools of the State, his work resulting in the reorganization of the school system two years later. He was the first commissioner of public schools there (1845–49), and then returned to Connecticut, where he was for some years "superintendent of common schools" and principal of the State normal school at New Britain. From 1859 to 1860 he was chancellor of the university of Wisconsin and agent of the board of regents of the normal school fund: in 1866–67 he was president of St. John's college, Annapolis, Md., and from 1867 to 1870 he was the first U.S. commissioner of education, in which position he laid the foundation for the subsequent useful work of the bureau of education. His chief service to the cause of education, however, was rendered as the editor of the *American Journal of Education.* He also edited the *Connecticut Common School Journal* and the *Journal of the Rhode Island Institute of Instruction.* He died at Hartford, Conn., on July 5, 1900. Among American educational reformers Barnard is entitled to be classed with Horace Mann of Massachusetts.

See a biographical sketch by A. D. Mayo in the *Report of the Commissioner of Education for 1896–97,* further tributes in the *Report* for 1902, W. S. Monroe's *Educational Labours of Henry Barnard* (1893) and his *Bibliography of Henry Barnard* (1897); also the article in the *Cyclopedia of Education* and B. C. Steiner's *Life of Henry Barnard* in the *Bulletin of the Bureau of Education,* No. 8 (1919).

BARNARD, JOHN, English musician, was a minor canon of St. Paul's in the reign of Charles I. He was the first to publish a collection of English cathedral music—*The First Book of Selected Church Music* (1641). It contains some of the finest 16th-century masterpieces by Tallis, Gibbons, Byrd, Morley and others. The only known complete copy of the book is in the British Museum.

BARNARD, JOSEPH EDWIN (1870–), British physicist, born in London, achieved considerable success in the science of microscopy. He carried out valuable work at the National Institute for Medical Research, Hampstead, London, where he was in charge of the department of applied optics, by co-operating with Dr. Gye in the demonstration in 1925 of the existence of the cancer virus. He held in addition the post of lecturer at King's college, London, and was president and honorary secretary of the Royal Microscopical Society, London. He was elected F.R.S. in 1924.

BARNARD CASTLE, urban district, Durham, England, 17 mi. W. of Darlington by a branch of the London and North-Eastern railway. Pop. (1938) 3,940. Area .9 sq.mi. It is beautifully situated on the steep left bank of the Tees. There are a few picturesque old houses, and a fragment of an Augustinian convent, but the building of chief interest is the castle, which gives the town its name, and is the principal scene of Sir Walter Scott's *Rokeby.* As part of the lordship of Gainford, Barnard Castle is said to have been granted by William Rufus to Guy de Baliol. Bernard, or Barnard, probably the son of Guy, built the castle, and called it after himself, Barnard Castle. To the men of the town which grew up outside the castle walls he gave a charter making them burgesses. Other confirmation charters were granted to the town by Hugh, John, and Alexander de Baliol. After forfeiture by John de Baliol (1296) it was claimed by the bishop of Durham but the claim was denied by the crown which granted it to the Beauchamps, from whom it passed to the crown by marriage of Anne Nevill with Richard III.

Tanning leather was formerly one of the chief industries of the town. In the vicinity are Egglestone abbey, beautifully situated on the Yorkshire bank of the river, and the massive 14th century castle of Raby to the north-east. The corn-market and the manufacture of shoe thread were formerly important.

BARNARD COLLEGE: *see* COLUMBIA UNIVERSITY; WOMEN, EDUCATION OF.

BARNARDO, THOMAS JOHN (1845–1905), English philanthropist, and founder and director of homes for destitute children, was born at Dublin, Ireland. His father was of Spanish origin, his mother being an Englishwoman. He studied medicine at the London hospital, and later at Paris and Edinburgh. His medical work in the east end of London during the epidemic of cholera in 1865 so impressed him with the great numbers of homeless and destitute children in the cities of England that he gave up his early ambition of foreign missionary labour, and began what was to prove his life's work. The first of the "Dr. Barnardo's Homes" was opened in 1867 in Stepney Causeway, London, where are still the headquarters of the institution. From

that time the work steadily increased until, at the time of the founder's death, there were established 112 district "Homes," besides mission branches, throughout Great Britain. The object for which these institutions were started was to search for and to receive waifs and strays, to feed, clothe, educate, and, where possible, to give an industrial training suitable to each child. In 1872 was founded the girls' village home at Barkingside with its own church where Barnardo himself was buried and in 1901, through the generosity of E. H. Watts, a naval school was started at North Elmham, near Norwich, to which boys are drafted from the homes to be trained for the navy and the mercantile marine. Perhaps the most useful of all the varied work instituted by Barnardo is the emigration system and the fact that in Canada less than 2% of the many thousands of children sent out proved failures confirmed Barnardo's conviction that "if the children of the slums can be removed from their surroundings early enough, and can be kept sufficiently long under training, heredity counts for little, environment for almost everything." In 1899 the various institutions and organizations were legally incorporated under the title of "The National Association for the reclamation of Destitute Waif Children," but the institution has always been familiarly known as "Dr. Barnardo's Homes." Barnardo laid great stress on the religious teaching of the children under his care. Each child is brought up under the influence and teaching of the denomination of the parents, but the children of Jewish and Roman Catholic parentage are, where possible, handed over to the care of the Jewish Board of Guardians in London, and to Roman Catholic institutions, respectively. From the foundation of the homes in 1867 to the date of Barnardo's death, nearly 60,000 children had been rescued, trained and placed out in life. Barnardo died of angina pectoris in London, and was succeeded by Dr. William Baker, formerly the chairman of the council. Barnardo was the author of many books dealing with the charitable work to which he devoted his life.

His biography (1907) was written by his wife (the daughter of William Elmslie) and J. Marchant. The periodicals and leaflets describing the activities of the homes are published at the central office of the Charity at Stepney Causeway.

BARNATO, BARNETT (1852–1897), English speculator, the son of a Jewish shop-keeper, Isaac Isaacs, was born in Aldgate, London, in 1852. In 1873 he joined his elder brother, Henry, in Kimberley, where the latter had gone, to trade in diamonds. When Isaacs arrived there he changed his name to Barnato, and set up a small store, but soon joined his brother's business; by 1876 he had saved enough to buy his first claim in the Kimberley Diamond Mine, and in 1881 he floated his first company. His ambition to unite all the companies in Kimberley under a single organization led at first to rivalry and finally to amalgamation (1888) with Cecil Rhodes, who had succeeded in consolidating the De Beers Mining companies. In the same year "Barney Barnato"—as he was called—was elected by Kimberley to a seat in the Cape Colony House of Assembly. In 1889 he established a gold mining company on the Rand, and, soon after, floated the Barnato Consolidated Mines Company and the Barnato Bank, while in 1895, he organized the last great boom in gold mines in the Rand. On June 14, 1897, he committed suicide by jumping from a vessel at sea.

See H. Raymond, *B. I. Barnato; A Memoir* (1897).

BARNAUL, a town in the Siberian area of the Russian Republic, on the railway from Novo-Sibirsk to Semipalatinsk, at the junction of the river Barnaulka and the river Ob. Lat. 53° 23′ N., long. 83° 40′ E., alt. 480 ft. Population (1939) 148,129. Average rainfall per annum 10.1 in., with a maximum in July and August. Average temperature Jan. −22° F., July 67.1° F. A. Demidov, to whom there is a monument, founded the city in 1730. Barnaul is the administrative centre of the Altai mining district: the first Russian mine was opened at Kolyvan in 1727, and the second at Barnaul in 1739. The Altai mines produce coal, gold and iron (especially in the Kuznetsk area) and silver, copper, lead and zinc in the Altai proper. The town is also an agricultural centre and has a storage plant for Siberian butter and eggs: it exports wax and honey from the numerous bee-keeping centres and has a goods exchange. Barnaul, with its navigable river (the Ob) and its railway, is a collecting point for the wheat, oats, barley, buckwheat and potatoes grown in the province, and for cattle, sheep, goats and swine. It has smelting, glass-making, bell founding and other manufactures. In 1841 a meteorological observatory was established; there are also a mining school, and geological and zoological museums. Many of the Russian inhabitants are descendants of religious and political exiles.

BARNAVE, ANTOINE PIERRE JOSEPH MARIE (1761–1793), one of the greatest orators of the first French Revolution, was born at Grenoble in Dauphiné, Oct. 22 1761. Dauphiné was one of the first of the provinces to feel the excitement of the coming revolution; and Barnave was foremost to give voice to the general feeling, in a pamphlet entitled *Esprit des édits enregistrés militairement le 20 mai 1788.* He was immediately elected deputy, with his father, to the states of Dauphiné, and took a prominent part in their debates. A few months later he was chosen deputy of the *tiers état* for his native province. He soon made an impression on the Assembly, became the friend of most of the leaders of the popular party, and formed with Adrien Duport and Alexandre Lameth (*q.v.*) the group known during the Constituent Assembly as "the triumvirate." He took part in the conference on the claims of the three orders, drew up the first address to the king, and supported the proposal of Sieyès that the Assembly should declare itself National. Until 1791 he was one of the principal members of the club known later as the Jacobins, of which he drew up the manifesto and first rules (*see* JACOBINS).

Though a passionate lover of liberty, he hoped to secure the freedom of France and her monarchy at the same time. With the one exception of Mirabeau, Barnave was the most powerful orator of the Assembly. He advocated the suspensory veto, and the establishment of trial by jury in civil causes, but voted with the Left against the system of two chambers. His conflict with Mirabeau on the question of assigning to the king the right to make peace or war (May 16–23 1791) was one of the most striking scenes in the Assembly. In Aug. 1790, after a vehement debate, he fought a duel with J. A. M. de Cazalès, in which the latter was slightly wounded. About the close of Oct. 1790 Barnave was called to the presidency of the Assembly. On the arrest of the king and the royal family at Varennes, while attempting to escape from France, Barnave was one of the three appointed to conduct them back to Paris. On the journey he was affected by the mournful fate of Marie Antoinette, and in one of his most powerful speeches he maintained the inviolability of the king's person. His public career ended with the close of the Constituent Assembly, and he returned to Grenoble at the beginning of 1792. His sympathy and relations with the royal family, to whom he had submitted a plan for a counter-revolution, brought on him suspicion of treason. Denounced (Aug. 15, 1792) in the Legislative Assembly, he was arrested and imprisoned for ten months at Grenoble, then transferred to Fort Barraux, and in Nov. 1793 to Paris. The nobility of his character was proof against the assaults of suffering. "Better to suffer and to die," he said, "than lose one shade of my moral and political character." On Nov. 28 he appeared before the Revolutionary Tribunal. He was condemned on the evidence of papers found at the Tuileries and executed the next day.

Barnave's *Oeuvres posthumes* were published in 1842 by Bérenger (de la Drôme). *See* F. A. Aulard, *Les Orateurs de l'assemblée constituante* (1882).

BARNBY, SIR JOSEPH (1838–1896), English musical composer and conductor, son of Thomas Barnby, an organist, was born at York Aug. 12, 1838. He was a chorister at York minster from the age of seven, was educated at the Royal Academy of Music under Cipriani Potter and Charles Lucas, and was appointed in 1862 organist of St. Andrew's, Wells street, London. In 1871 he was appointed, in succession to Gounod, conductor of the Albert Hall Choral Society, a post which he held till his death. In 1875 he was precentor and director of music at Eton, and in 1892 became principal of the Guildhall School of Music and was knighted. His works include 246 hymn-tunes, as well as some part-songs (among them the popular "Sweet and Low"), and some pieces for the organ. He died in London Jan. 28, 1896.

BARNES, BARNABE (*c.* 1568–1609), English poet, fourth son of Dr. Richard Barnes, bishop of Durham, was entered in 1586 at Brasenose college, Oxford, where Giovanni Florio was his servitor, and in 1591 went to France with the earl of Essex, who was then serving against the prince of Parma. On his return he published *Parthenophil and Parthenophe, Sonnettes, Madrigals, Elegies, and Odes* (ent. on Stationers' Register, 1593), dedicated to his "dearest friend," William Percy, who contributed a sonnet to the eulogies prefixed to a later work, *Offices. Parthenophil* was possibly printed for private circulation, and the copy in the duke of Devonshire's library is believed to be unique. Barnes was well acquainted with the work of contemporary French sonneteers, to whom he is largely indebted, and he borrows his title, apparently, from a Neapolitan writer of Latin verse, Hieronymus Angerianus. *Parthenophil* abounds in passages of great freshness and beauty, although its elaborate conceits are sometimes over-ingenious and strained. Barnes took the part of Gabriel Harvey and even experimented in classical metres. He has been claimed by some scholars as the "rival poet" of Shakespeare's sonnets, and even as the author of some of them.

Other works by Barnes are: *A Divine Centurie of Spirituall Sonnetts* (1595); two plays: *The Divil's Charter* (1607), and *The Battle of Evesham* (or Hexham), now lost; and a prose treatise, *Offices enabling privat Persons for the speciall service of all good Princes and Policies* (1606). His *Parthenophil* and *Spirituall Sonnetts* were edited by Dr. A. B. Grosart in a limited issue in 1875; *Parthenophil* was included by Prof. E. Arber in vol. v. of *An English Garner; see* also the new edition of *An English Garner* (*Elizabethan Sonnets,* ed. S. Lee, 1904, pp. lxxv. *et seq.*). Prof. E. Dowden contributed a sympathetic criticism of Barnes to *The Academy* of Sept. 2, 1876.

BARNES, ERNEST WILLIAM (1874–), British divine, was born on April 1, 1874, and was educated at King Edward's school, Birmingham, and at Trinity college, Cambridge, where he had a brilliant career, being bracketed second wrangler in 1896 and elected in 1898 to a fellowship of his college. Ordained deacon in 1902 and priest in 1903, he held various appointments at Trinity college, Cambridge, becoming tutor in 1908. He wrote many valuable papers on mathematics and in 1909 was elected F.R.S. In 1915 he was appointed Master of the Temple and in 1918 canon of Westminster. He rapidly acquired a reputation as a vigorous and broadminded preacher and in his sermons discussed either evolution and science, or the more homely aspects of Christianity, with equal candour and individuality. In 1924, on the recommendation of Mr. Ramsay MacDonald, Canon Barnes was appointed bishop of Birmingham. In this capacity his "advanced" views, and in particular his refusal to sanction the practice of the reservation of the Sacrament which he considered contrary to the spirit of the Prayer Book and likely to foster "superstition" rather than "mysticism" led to sharp controversy with the Anglo-Catholic elements of his diocese and to wide discussion. The controversy was revived in an acute form in 1927 when a procession entered St. Paul's cathedral, where the bishop was preaching, to make a public protest against his views.

BARNES, JOSHUA (1654–1712), English scholar, was born in London on Jan. 10, 1654. Educated at Christ's Hospital and at Emmanuel College, Cambridge, he was in 1695 chosen regius professor of Greek. One of his first publications was entitled *Gerania; a New Discovery of a Little Sort of People, anciently discoursed of, called Pygmies* (1675), a whimsical sketch to which Swift's *Voyage to Lilliput* possibly owes something. Among his other works are a *History of that Most Victorious Monarch Edward III.* (1688), in which he introduces long and elaborate speeches into the narrative; editions of Euripides (1694) and of Homer (1711), also one of Anacreon (1705) which contains titles of Greek verses of his own which he hoped to publish. He died on Aug. 3, 1712, at Hemingford, near St. Ives, Hunts.

BARNES, ROBERT (1495?–1540), English reformer and martyr, born about 1495, was educated at Cambridge, where he was a member, and afterwards prior of the convent of Austin Friars, and graduated D.D. In the year 1526, he was brought before the vice-chancellor for preaching a heterodox sermon, and was subsequently examined by Wolsey and four other bishops. He was condemned to abjure or be burnt; and preferring the former alternative, was committed to the Fleet prison and afterwards to the Austin Friars in London. He escaped thence to Antwerp in 1528, and also visited Wittenberg, where he made Luther's acquaintance. He also came across Stephen Vaughan, an agent of Thomas Cromwell and an advanced reformer, who recommended him to Cromwell: "Look well" he wrote, "upon Dr. Barnes' book. It is such a piece of work as I have not yet seen any like it. I think he shall seal it with his blood" (*Letters and Papers of Henry VIII.* v. 593). In 1531 Barnes returned to England, and became one of the chief intermediaries between the English Government and Lutheran Germany. In 1535, he was sent to Germany, in the hope of inducing Lutheran divines to approve of Henry's divorce from Catherine of Aragon, and four years later he was employed in negotiations connected with Anne of Cleves' marriage. The policy was Cromwell's, but Henry VIII. had already, in 1538, refused to adopt Lutheran theology, and the statute of Six Articles (1539), followed by the king's disgust with Anne of Cleves (1540), brought the agents of that policy to ruin. An attack upon Bishop Gardiner by Barnes in a sermon at St. Paul's Cross was the signal for a bitter struggle between the Protestant and reactionary parties in Henry's council, which raged during the spring of 1540. Barnes was forced to apologize and recant; and Gardiner delivered a series of sermons at St. Paul's Cross to counteract Barnes' invective. But a month or so later Cromwell was made earl of Essex, Gardiner's friend, Bishop Sampson, was sent to the Tower, and Barnes reverted to Lutheranism. It was a delusive victory. In July, Cromwell was attainted, Anne of Cleves was divorced, and Barnes was burnt (July 30, 1540). He also had an act of attainder passed against him, a somewhat novel distinction for a heretic, which illustrates the way in which Henry VIII. employed secular machinery for ecclesiastical purposes, and regarded heresy as an offence against the State rather than against the Church. Barnes was one of six executed on the same day: two, William Jerome and Thomas Gerrard, were, like himself, burnt for heresy under the Six Articles; three, Thomas Abel, Richard Fetherstone and Edward Powell, were hanged for treason in denying the royal supremacy. Both Lutherans and Catholics on the Continent were shocked. Luther published Barnes' confession with a preface of his own as *Bekenntnis des Glaubens* (1540), which is included in Walch's edition of Luther's *Werke,* xxi. 186.

See *Letters and Papers of Henry VIII.,* vols. iv.–xv., *passim;* Wriothesley's *Chronicle;* Foxe's *Acts and Monuments* (ed. G. Townsend); Burnet's *Hist. of the Ref.* (ed. Pocock); Dixon's *Hist. of the Church;* Gairdner's *Church in the XVIth Century;* Pollard's *Henry VIII. and Cranmer;* Herzog-Hauck, *Realencyklopädie,* 3rd edition.

BARNES, THOMAS (1785–1841), British journalist. Educated at Christ's hospital and Pembroke college, Cambridge, he was appointed (1817) editor of *The Times,* a position which he held until his death, when he was succeeded by Delane.

BARNES, WILLIAM (1800–1886), the Dorsetshire poet, was born on Feb. 22 1800, at Rushay, near Pentridge, in Dorsetshire, the son of John Barnes and Grace Scott, of the farmer class. He was a delicate child, in direct contrast to a strong race of forbears, and inherited from his mother a refined, retiring disposition and a love for books. He went to school at Sturminster Newton, where he was considered the clever boy of the school; and when a solicitor named Dashwood applied to the master for a quick-witted boy to join him as pupil Barnes was selected for the post. He worked with the village parson in his spare hours at classics and studied music under the organist. In 1818 he left Sturminster for the office of one Coombs at Dorchester, where he continued his evening education with another kindly clergyman. He also made great progress in the art of wood-engraving, and with the money he received for a series of blocks for a work called *Walks about Dorchester* he printed and published his first book, *Orra, a Lapland Tale,* in 1822. In the same year he became engaged to Julia Miles, the daughter of an excise officer. In 1823 he took a school at Mere in Wiltshire, and four years later married and settled in Chantry House, a fine old Tudor mansion in that town. He moved his school to Dorchester in 1835 and continued to conduct it until 1862, although he had become vicar of Whitcombe in 1847. From 1862 onwards he was rector of

Winterborne Came, where he died on Oct. 7, 1886. In 1833 he began his poems in the Dorsetshire dialect, among them the two eclogues "The 'Lotments" and "A Bit o'Sly Coorten," in the pages of the local paper. His volumes of verse are *Poems of Rural Life in the Dorset Dialect,* two series 1844 and 1862, *Hwomely Rhymes* (1859), and *Poems of Rural Life in Common English* (1868). They were collected in a single volume in 1879. His poetry is essentially English in character; no other writer has given quite so simple and sincere a picture of the homely life and labour of rural England.

Barnes was a lifelong student of philology and published in 1854 a *Philological Grammar,* in which he drew examples from more than 60 languages. His original and suggestive books on the English language, which are valuable in spite of their eccentricities, include *Se Gefylsta: an Anglo-Saxon Delectus* (1849); *Tiw* (1862); *A Grammar and Glossary of the Dorset Dialect* (1864); *An Outline of English Speech-Craft* (1878); and *A Glossary of the Dorset Dialect* (Dorchester, 1886).

BIBLIOGRAPHY.—See *The Life of William Barnes, Poet and Philologist* (1887), by his daughter, Lucy E. Baxter, who is known as a writer on art by the pseudonym of Leader Scott, and a notice by Thomas Hardy in the *Athenaeum* (Oct. 16, 1886).

BARNES, a residential suburb of London and a municipal borough in the parliamentary borough of Richmond, Surrey, England, on the south bank of the river Thames. It is served by the Southern railway and the London Passenger Transport board. Pop. (est. 1938) 40,960. Area 4.14 sq.mi. At the time of Domesday, Barnes (Berne) formed part of the manor of Mortlake and was held by the dean and canons of St. Paul's, who still have the rights of the manor in Barnes common (126 ac.). Barn Elms, the chief house in the district, is the club house of the Ranelagh club. Near Barn Elms was formerly another house where meetings were held of the celebrated Kitcat club, founded at the end of the 17th century. Many of the Kitcat portraits, including that of Jacob Tonson, the founder, by Hogarth, are in Barn Elms. The town was incorporated in 1932.

BARNESVILLE, an incorporated village of Belmont county, Ohio, U.S.A., in the eastern part of the state, 20 mi. from the Ohio river, on the Baltimore and Ohio railroad. The population was 4,602 in 1930 and 5,002 in 1940. Coal is mined near by, and the raising of Jersey cattle is one of the industries in which the region specializes. Among the many manufactures of the village are cut glass, car wheels, canned and condensed milk, paper boxes, underwear and dairying.

BARNET, residential district, Hertfordshire, England; 10 mi. N. of London, served by the L.N.E. Ry. and after 1940 by the London Passenger Transport board. The three chief divisions are as follows:—(1) CHIPPING OR HIGH BARNET, a market town and urban district (Barnet). Pop. (1938) 21,320. Area 6.7 sq.mi. The second epithet denotes its position on a hill; the first derives from the market ("cheaping") granted to the abbots of St. Albans by Henry II. An obelisk marks the field of a battle fought during the Wars of the Roses. There are paper works and metal works in the neighbourhood. The town is on the Great North road on which it was formerly an important coaching station; a large annual horse fair is still held. The Barnet By-Pass road runs near the town. (2) EAST BARNET, 2 mi. south of Chipping Barnet, has a church containing specimens of Norman architecture. This region is a residential area for London. Pop. of urban district (1938) 32,830. Area 4.1 sq.mi. (3) NEW BARNET lies 1 mi. east by south from Chipping Barnet. FRIERN BARNET, urban district, Middlesex, lies 3 mi. south of Chipping Barnet. Pop. (1938) 27,120. Area 2.1 sq.mi. The prefix recalls the former lordship of the manor held by the friary of St. John of Jerusalem in Clerkenwell, London. A comprehensive planning scheme was placed in operation in this district, which is residential for London, but has many workers in wood and metal. (X.)

Battle of Barnet.—The battle fought at Barnet between Yorkists and Lancastrians on April 14, 1471, actually decided the issue of the long-protracted English Wars of the Roses, though it was not until Tewkesbury, three weeks later, that the last effort of the Lancastrian forces was crushed. After Barnet the Yorkist Edward IV entered the capital as king, leaving his powerful enemy, Warwick the kingmaker, dead upon the field, and the subsequent murder in the Tower of London of the rightful sovereign, Henry VI, made his throne secure. Edward had been driven from the country the previous year. He landed with a small expedition on the Yorkshire coast, whereupon it became between Yorkists and Lancastrians a contest of march and manoeuvre to reach London first. Edward arrived before the city walls on April 11, and by treachery within, the gates were opened to him. He stayed only two days, to pray at St. Paul's for victory and to take out the feeble Henry VI as a hostage in his camp, after which he doubled back to find the Lancastrian army, led by Warwick, drawn up for battle facing London, upon a plain "half a mile from Barnet" (*Paston Letters*). The battlefield can be accurately identified as Hadley Green.

The battle took place on the morning of Easter day, in dense mist, the armies closely confronting one another. Edward had moved his troops forward at nightfall, determined that his enemy should not escape. Fortune at the outset favoured the Lancastrians. The Earl of Oxford and Lord Montagu, commanding a strong body of horse, crushed the Yorkist left wing, driving the force before them off the field and back through Barnet town towards Enfield Chase. The first news received in London was that the Yorkist cause was lost. The pursuit was carried too far, and the soldiers stayed to plunder. Oxford, guided by the noise of battle, led his troops back, and wheeling in the fog after having reissued from the houses of Barnet, he suddenly found himself brought up against a strong body of archers, who shot into his ranks. It was the Lancastrian centre, largely composed of the Duke of Somerset's retainers. Much execution was done before the mistake was realized, and when at length recognition was made each party suspected treacherous desertion to the Yorkists in the other, and the fratricidal killing continued. Edward, informed of the cause of the mêlée on his front, launched his reserves in full strength against the Lancastrians' confused ranks, which were pierced and broken. Somerset, now convinced of treachery, fled with the Lancastrian centre in one direction, Oxford in another, leaving the Earl of Warwick and the left wing to be surrounded and cut down by the exultant Yorkists. Edward hurriedly made for London, having ordered that no quarter should be given to the common soldiers in the pursuit. An obelisk on Hadley Green marks the traditional spot where Warwick fell. Sir John Paston, who fought with the Lancastrians, computed the killed on both sides at "more than a thousand." (W. G. B.)

BARNETT, JOHN (1802–1890), English musical composer, son of a Prussian named Bernhard Beer, who changed his name on settling in England as a jeweller, was born at Bedford, July 15, 1802, and at the age of 11 sang on the Lyceum stage in London. In 1834 he published a collection of his songs, *Lyrical Illustrations of the Modern Poets.* His *Mountain Sylph*—the musical drama with which his name is chiefly connected—was well received at the Lyceum on Aug. 25, 1834; it was followed by *Fair Rosamund* in 1837, and, after an interval spent in study at Frankfurt, by *Farinelli* in 1839. After an unsuccessful attempt to establish opera at the St. James's theatre (1839) Barnett settled as a singing master at Cheltenham. He died on April 16, 1890.

His nephew, JOHN FRANCIS BARNETT (1837–1916), son of John's brother, Joseph Alfred, also a professor of music, was an accomplished pianist, and also a composer. His most important work, an oratorio, *The Raising of Lazarus,* was written in 1873, and produced at Hereford in 1876.

BARNETT, SAMUEL AUGUSTUS (1844–1913), English clergyman and social reformer, born at Bristol on Feb. 8, 1844, the son of Francis Augustus Barnett, an iron manufacturer, visited, after leaving Wadham college in 1866, the United States. Next year he became curate of St. Mary's, Bryanston Square, and in 1872 vicar of St. Jude's, Whitechapel. In the next year he married Henrietta Octavia Rowland, a co-worker with Miss Octavia Hill. Mr. and Mrs. Barnett toiled for the poor of their parish, opening evening schools for adults, providing music and other entertainment, serving on the board of guardians and the school committees, and discouraging outdoor relief, as tending to pauperization; the conditions of indoor relief were improved, and various charities co-ordinated, with the help of the Charity Organization society and the board of guardians. In 1875 Arnold Toynbee paid a visit, the first of many, to Whitechapel, and Mr. Barnett, who kept in touch with Oxford, formed in 1877 a committee to organize university extension in London, his assistants being Leonard Montefiore, a young Oxford man, and Frederick Rogers, a member of the vellum binders' trade union. The committee received much support, and in October four courses of lectures, one by Dr. S. R. Gardiner on English history, were given. The Barnetts also furthered the building of model dwellings, the establishment of the children's country holiday fund and annual loan exhibitions of fine art at the Whitechapel gallery. In 1884 an article by Mr. Bar-

nett in the *Nineteenth Century* on University Settlements, led in July to the formation of the University Settlements Association; Toynbee Hall was founded at a meeting in Balliol college (1884): Mr. Barnett was its first warden. He was select preacher at Oxford (1895–97) and at Cambridge (1900); he became canon of Bristol in 1893, but retained his wardenship of Toynbee Hall. In June 1906 he was made a canon of Westminster and when in December he resigned the wardenship of Toynbee Hall the position of president was created for him. He died on June 17, 1913. Among Canon Barnett's works is *Practicable Socialism* (1888, 2nd ed. 1894), written with the aid of his wife, who after his death was created for her great public services a D.B.E. Dame Henrietta has written her husband's life (2 vols. 1918).

BARNEVELD, a town in the province of Gelderland, the Netherlands, famous for its raising of chickens and export of eggs. Pop. (1940) 15,556. The mediaeval castle of Schaffelaar, belonging to the baronial family of Van Nagell, is there.

BARNFIELD, RICHARD (1574–1627), English poet, was born at Norbury, Staffs, and baptized on June 13, 1574. In 1589 he went to Brasenose college, Oxford, where he graduated in 1592. His first work, *The Affectionate Shepherd,* was published in 1594; a second volume, *Cynthia, with certain Sonnets,* followed it two months later. "Cynthia" itself, a panegyric on Queen Elizabeth, claimed to be "the first imitation of the verse of that excellent poet Maister Spenser in his Fayrie Queene." In 1598 Barnfield published his third and last volume, *The Encomion of Lady Pecunia,* of which a second edition appeared in 1605. Thereafter, he lived as a country gentleman on his estate of Dorlestone, Staffs, where he died.

The most interesting fact about Barnfield is his connection with Shakespeare, whose earliest imitator he may be said to have been. The sonnets published in his second volume are closer to Shakespeare's sonnets in manner than any others of the Elizabethan age, while two of the poems in his third volume—the sonnet "If Music and sweet Poetry agree" and the ode beginning "As it fell upon a day," both of which appeared in *The Passionate Pilgrim* in 1599—were long believed to be Shakespeare's work.

BIBLIOGRAPHY.—Barnfield's complete poems were first edited by Grosart in 1876 for the Roxburgh club. An edition by Edward Arber was published in 1883.

BARNIM, the name of thirteen dukes who ruled over divisions of the duchy of Pomerania. The following are the most important:

BARNIM I (*c.* 1209–1278), called the *Good,* was the son of Bogislaus II, duke of Pomerania-Stettin, and succeeded to this duchy on his father's death in 1220. In 1250 he was compelled to recognize the supremacy of the margrave of Brandenburg. Barnim introduced German settlers and customs into the duchy, founded many towns, and was extremely generous toward ecclesiastical foundations.

BARNIM III (*c.* 1303–1368), called the *Great,* was the son of Otto I, duke of Pomerania-Stettin, and took a prominent part in the defense and government of the duchy before his father's death in 1344. A victory gained by him in August 1332 freed Pomerania for a time from the vexatious claim of Brandenburg to supremacy over the duchy, which, moreover, he extended by conquest. Barnim assisted the emperor Charles IV in his struggle with the family of Wittelsbach.

BARNIM XI (1501–1573), son of Bogislaus X, duke of Pomerania, became duke on his father's death in 1523. He ruled for a time in common with his elder brother George; and after George's death in 1531 he shared the duchy with his nephew Philip I, retaining for himself the duchy of Pomerania-Stettin. In 1529 a treaty was made which freed Pomerania from the supremacy of Brandenburg on condition that if the ducal family became extinct the duchy should revert to Brandenburg. Barnim adopted the Lutheran doctrine and joined the league of Schmalkalden, but took no part in the subsequent war. But he was compelled to accept the *Interim,* issued from Augsburg in May 1548. In 1569 Barnim handed over his duchy to his grandnephew, John Frederick.

BARNIM, a district in Germany, between the Spree, the Oder and the Havel, which was added to the mark of Brandenburg during the 13th century.

BARN MACHINERY: *see* PROCESSING MACHINERY.

BARNSLEY (BLACK or properly BLEAK BARNSLEY), parliamentary and county borough, West Riding of Yorkshire, England, 15 mi. N. of Sheffield. Pop. (1891) 35,427; (est. 1938) 71,487. Area 12.2 sq.mi. It is served by the L.M.S. and L.N.E railways, and situated on rising ground west of the river Dearne and in the old parish of Silkstone, which has become an important local name.

In Domesday Ilbert de Lacy held Barnsley by gift of William the Conqueror as part of the honour of Pontefract, and the overlordship remained in his family until the reign of Stephen, when it was granted by Henry de Lacy to the monks of Pontefract. In 1249, Henry III granted the prior and convent of Pontefract a market every Wednesday at Barnsley, and a fair on the vigil and feast of St. Michael and two following days, and Henry VIII granted them a new fair on the day of the Conversion of St. Paul and two following days. The Wednesday market is still held. The monastery evidently also held another fair there called St. Ellen's fair, for in 1583 Queen Elizabeth granted this fair and St. Paul's fair and the market "lately belonging to the dissolved monastery of Pontefract" to one Henry Burdett and his sons. Before 1744 the chief industry had been wire drawing, but this trade began to decrease about the end of the 18th century just as the linen trade was becoming important. Barnsley's later development was due to its being in the centre of the south Yorkshire coal field. The coal was used locally in textile mills and much exported, with coke, to London. The majority of workers in Barnsley are still employed in the coal mines. Iron, steel, and glass are important subsidiary industries, and there are also bleachfields, printfields and sawmills. The town has connections with the Aire and Calder Navigation system of canals. The parish church of St. Mary was built in 1821 on an early site; the free grammar school dates from 1665, and a philosophical society was founded in 1828. The park was presented in 1862 by the widow of Joseph Locke, M.P. Near the town is Monk Bretton priory, a Cluniac foundation of 1157 retaining a Perpendicular gatehouse, some Decorated domestic remains and fragments of the church. Barnsley was incorporated in 1869 and made a county borough in 1912. It was extended in 1921 and 1938. Since 1918 Barnsley, together with some outlying urban districts, has returned one member to parliament. There are modern municipal offices, a mining and technical college, a central clinic and a children's home.

BARNSTABLE, a seaport town and the county seat of Barnstable county, Mass., U.S.A., extending across Cape Cod. It is served by the New York, New Haven and Hartford railroad. The population in 1940 was 8,333.

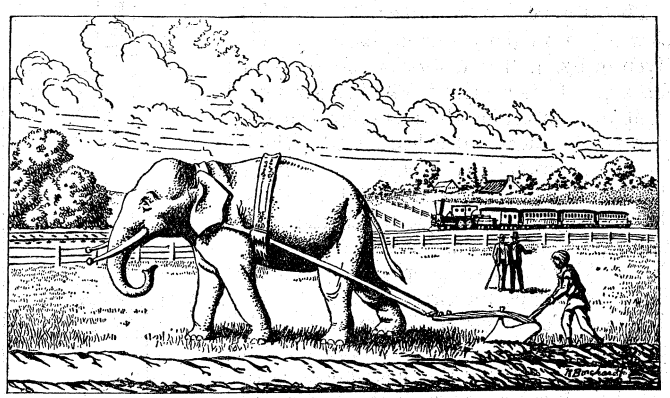
Cranberries are cultivated extensively, and the fishing industry, including the raising of Cotuit oysters, is important. The principal economic interests, however, centre around the entertainment of summer visitors. Hyannis, the largest village and general business centre for the whole cape, is the seat of a state normal school (established 1897) and of the Cape Cod hospital (1920). Each of the 14 villages has its own public library and public hall.

Barnstable was settled and incorporated in 1639. It was the birthplace of James Otis and Lemuel Shaw.

BARNSTAPLE, seaport and municipal borough, near the N. coast of Devonshire, England. Pop. (est. 1938) 14,680. It stands on the estuary of the Taw, here crossed by a stone bridge of 16 arches said to date from the 12th or 13th century. Barnstaple (Berdestaple, Barnstapol, Barstaple, also Barum) ranks among the most ancient of royal boroughs. As early as Domesday, where it is several times mentioned, there were 40 burgesses within the town and nine without, who rendered 40s. Tradition claims that King Athelstan threw up defensive earthworks here, but the existing castle is attributed to Joel of Totnes, who held the manor during the reign of William the Conqueror and also founded a Cluniac priory, dedicated to St. Mary Magdalene. From this date the borough and priory grew up side by side, but each preserved its independent privileges and rights of government until the dissolution of the latter in 1535. The earliest authenticated charter

is that of Henry I., which was confirmed in a charter of Henry II. stating that the burgesses should have customs similar to those granted to London. A charter of 1556 added some new privileges, one of 1610 increased the number of chief burgesses to 25, and this charter held force until the Municipal Corporation Act of 1835. Barnstaple was once famous for its woollen trade, now entirely declined, and as early as the reign of Edward III. it was an important naval port. The Friday market and the annual four days' fair in September are held by immemorial prescription. The grammar school was founded in the 14th century. There are also some curious Jacobean almshouses. The harbour admits only small coasting vessels. The town manufactures lace and gloves, and has extensive potteries and foundries. Cabinet making and some boatbuilding are carried on. The town is served by the G.W.R. and the S.R.; Barnstaple junction is a considerable station on the latter. The borough is under a mayor, six aldermen and 18 councillors. Area 3.7 sq.mi. It is in the Barnstaple parliamentary county division.

BARNUM, PHINEAS TAYLOR (1810–1891), American showman, was born in Bethel, Conn., on July 5, 1810, his father being an innkeeper and storekeeper. Barnum first started as a storekeeper, and was also concerned in the lottery mania then prevailing in the United States. After failing in business, he started in 1829 a weekly paper, *The Herald of Freedom,* in Danbury. In 1835 he began his career as a showman, with his purchase and exploitation of a coloured woman, Joyce Heth, reputed to have been the nurse of George Washington, and to be more than 160 years old. With this woman and a small company he made well advertised and successful tours in America till 1839, though Joyce Heth died in 1836, when her age was proved to be not more than 70. After a period of failure, he purchased Scudder's American Museum, New York, in 1841. Here he made a special hit by the exhibition, in 1842, of Charles Stratton, the celebrated "General Tom Thumb" (*see* DWARF). In 1850 he toured America with Jenny Lind, who was engaged to sing at $1,000 a night for 150 nights, all expenses being paid by the *entrepreneur.* In 1871 he established the "Greatest Show on Earth," a travelling amalgamation of circus, menagerie and museum of "freaks," etc. This show, incorporated in the name



ELEPHANTINE AGRICULTURE, A BARNUM METHOD OF ADVERTISING
In order that his circus might not be forgotten while it was in winter quarters at Bridgeport, Conn., Barnum had a man dressed in oriental costume daily to plough a field by elephant power. The field was within sight of a railroad and the ploughing was done only when a train went past

of "Barnum, Bailey and Hutchinson," and later as "Barnum and Bailey's" toured all over the world. In 1907 the business was sold to Ringling Brothers. Barnum wrote several books, such as *The Humbugs of the World* (1865), *Struggles and Triumphs* (1869), and his *Autobiography* (1854, and later editions). He died on April 7, 1891.

BIBLIOGRAPHY.—Morris R. Werner, *Barnum* (1923); Harvey W. Root, *The Unknown Barnum* (1927).

BAROCCHIO or **BAROZZI, GIACOMO,** called DA VIGNOLA (1507–1573), Italian architect, was born at Vignola in the Modenese territory on Oct. 1, 1507, and died in Rome on July 7, 1573. In 1564 he succeeded Michelangelo as the architect of St. Peter's, and executed various portions of that fabric, besides works in Rome. Designs for the Escorial were supplied by him. He is the author of a work on the *Five Orders of Architecture* (Rome, 1563), and one on *Practical Perspective* (Rome, 1583).

BAROCCI or **BAROCCIO, FEDERIGO** (1528–1612), Italian painter, was born and died at Urbino. He studied under Battista Franco at Urbino, copied some works by Titian at Pesaro, and in 1548 went to Rome, where he came under the influence of Raphael. His best works are "The Visitation of the Virgin Mary to Elizabeth" and the "Presentation in the Temple," painted for the Chiesa Nuova in Rome.

BAROCCO, a variant spelling of the word baroque (*see* BAROQUE ARCHITECTURE) indicating generally the late and luxurious Renaissance styles.

BARODA, one of the most important of Indian States, associated with the province of Bombay, but in direct relations with the governor-general. It is divided into five district blocks: (1) the southern district of Navsari near the mouth of the Tapti river, and mostly surrounded by British territory; (2) central district north of the Narbada, in which lies Baroda, the capital city; (3) to the north of Ahmedabad, the district of Mehsana; (4) to the west, in the peninsula of Kathiawar, the districts of Amreli; and (5) Okhamandal, formed of scattered tracts of land. Total area 8,236 sq.mi. Pop. (1941) 2,855,010.

The princes of Baroda were one of the chief branches of the 18th century Mahratta confederacy. About 1721 one Pilaji gaekwar carved a fertile slice of territory out of Gujarat, and afterwards received the title of "Leader of the Royal Troops" from the peshwa. In 1800 the inheritance descended to a prince feeble in body and almost idiotic in mind. British troops were sent in defense of the hereditary ruler against all claimants; a treaty was signed in 1802, by which his independence of the peshwa and his dependence on British Government was secured. For some time the history of the gaekwars was very much the same as that of most territorial houses in India: an occasional able minister, more rarely an able prince; but, on the other hand, a long dreary list of incompetent heads, venal advisers and taskmasters oppressive to the people. In 1874 an attempt at poisoning the British resident led to the gaekwar Malhar Rao being formally accused of the crime and tried by a mixed commission. The result of the trial (1875) was a failure to obtain an unanimous verdict on the charge of poisoning; the viceroy, Lord Northbrook, however, decided to depose Malhar Rao on the ground of gross misgovernment, the widow of his brother and predecessor, Khande Rao, being permitted to adopt an heir from among the descendants of the founder of the family. During the boy's minority the state was for eight years under the charge of Sir T. Madhava Rao, formerly diwan of Travancore, one of the ablest and most enlightened of Indian statesmen. The result was a conspicuous success. The gaekwar repeatedly visited Europe in company with his wife. In 1887 Queen Victoria conferred upon him at Windsor the insignia of G.C.S.I., and in 1892 upon his wife the Imperial order of the crown of India.

The gross revenue of the State is nearly one and a quarter million sterling. In 1901 the State currency of Babashai rupees was withdrawn, and the British rupee was introduced. The regular military force consists of a field battery, with several regiments of cavalry and battalions of infantry. In addition, there is an irregular force of horse and foot. Compulsory education has been carried on experimentally since 1893 in the Amreli division with apparent success, the compulsory age being 7 to 12 for boys and 7 to 10 for girls. Special measures are also adopted for the education of low castes and aboriginal tribes. There is a female training college under a Christian lady superintendent. The Kala Bhavan, or technical school, has departments for drawing, carpentry, dyeing, weaving and agriculture. There is also a State museum under a European director and a State library.

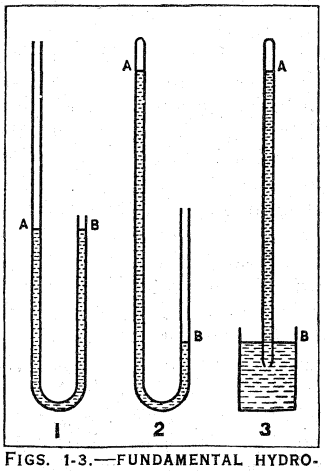
The city of Baroda is situated on the river Viswamitri, a station on the Bombay and Baroda railway, 245m. N. of Bombay by rail. **Pop. (1941) 153,301.** The whole aspect of the city has been changed by the construction of handsome public buildings, the laying-out of parks and the widening of the streets. An excellent water-supply is provided from the Ajwa lake. The canton-

ments, garrisoned by a native infantry regiment, are under British jurisdiction, and have a population of 4,000. The city contains a college and many schools. The chief hospitals are called after the countess of Dufferin, Sayaji Rao and Jamnabai, the widow of Khande Rao.

BAROJA, PÍO (1872–), Spanish novelist, was born at San Sebastian. Impersonal, pessimistic and chillingly intellectual, Baroja deals by preference with the rebels and pariahs of the world. He attempts no idealization: his works are even, at times, reminiscent of the picaresque novel. His style is direct and unpolished: his matter rarely fails to interest. Among his best known works are *La Lucha por la Vida* (1904), *La Tierra Vasca* (1909), and *Las Ciudades* (1920). Latterly he has been engaged upon a long series of historical episodes, entitled *Memorias de un hombre de acción,* whose hero is the historical personage Eugenio de Aviraneta.

BAROMETER. The earliest forms of barometer were developed from the well known experiment performed in 1643, by Torricelli, who, conceiving the idea that the atmosphere had weight, used a mercury column long known, after him, as the "Torricelli tube," for the purpose of demonstrating the existence and magnitude of the atmospheric pressure.

Fundamental Principles.—In the measurement of pressure differences the fundamental idea is to balance this difference against a column of liquid whose weight is known in terms of its height, density and the value of gravity acting upon it. The principle is familiar, and sufficiently well indicated in the diagrams, figs. 1, 2 and 3, in which the weight of the liquid column between the levels A and B balances the differences of air pressures on the two liquid surfaces A and B. By closing the end of the tube above A in fig. 1, and completely exhausting the space in the tube above A of all gas and vapour (except the vapour of the liquid), the liquid column can be used to measure the pressure of the air at the level B, and the manometer of fig. 1 becomes the barometer of fig. 2. The present forms of liquid barometer for measuring atmospheric pressures are based on the principle of fig. 2 or fig. 3.



FIGS. 1-3.—FUNDAMENTAL HYDROSTATIC PRINCIPLE OF MEASURING PRESSURE

Mercury is practically the only liquid that can be used conveniently in barometers which measure atmospheric pressures. Owing to its high specific gravity the barometric column is not unduly long. The vapour pressure of mercury is so small that its effect can ordinarily be neglected in the measurement of atmospheric pressures.

There is an alternative type of barometer, called the aneroid (or non-liquid) barometer, which is dependent on the elastic properties of a thin flexible-walled evacuated capsule in combination with a stiff spring. The credit for the invention of the aneroid is usually given to Vidi, who patented his instrument in 1845, but similar instruments were in use much earlier. This instrument is not susceptible of the same high order of accuracy as a mercurial barometer, but it offers the advantage of considerably greater portability.

Units of Measurement of Pressure.—Until comparatively recently it was the usual practice to graduate barometers in inches or millimetres, or in both units. There is, however, a third unit which is now frequently employed in the case of barometers used for meteorological work. This unit is the *bar,* defined as the pressure of one million dynes per sq.cm. The *bar* is a unit of pressure, but it appears on the scale of a meteorological barometer as a pseudo-unit of length, in such a way that the barometric height, when measured in this unit and corrected to suitable standard conditions, is ultimately expressed in true units of pressure.

It sometimes becomes necessary, *e.g.,* in gasometry, to reduce experimental results so as to relate to some standard pressure, and for this purpose the pressure of a *standard atmosphere* has been defined as the pressure due to the weight of 760mm. of mercury at 0°C. under standard gravity.

The expression "standard atmosphere" is to some extent ambiguous. While this definition holds good generally for physical and chemical purposes, the meteorologist is inclined, at least for some purposes, to regard his standard atmosphere as 1 *bar,* which is approximately 750mm. of mercury. However, among American chemists and physicists the *bar* is defined as 1,000,000 times smaller than this value.

Chief Types of Mercurial Barometer.—The different types of mercurial barometer vary largely with the method employed to measure the difference in height between the levels, A and B, shown in figs. 2 and 3. Both these levels change with variation of pressure. One of the earliest ideas was to make the level B (fig. 3) in the reservoir adjustable to the zero of a fixed scale which is used to give a direct reading of the level of A above B. A serviceable barometer of this type was devised early in the 19th century and is known as Fortin's barometer. It is still in ordinary use. Alternatively the scale itself may be made adjustable so that its zero is raised or lowered to the level B of the mercury in the reservoir, the final reading of the barometric height being taken at A as before. This type, an example of which is Newman's barometer, introduced in 1840, is not very extensively used.

A third type of instrument, introduced at a somewhat later date, avoids the direct use of a scale zero and gives a reading of the barometric height by means of a single setting. This type is known as a Kew pattern barometer, and makes use of the fact that changes in pressure produce proportionate changes in the level A. By using a scale with an appropriate contracted spacing, the instrument can be compensated so as to allow for the changes in level B of the mercury in the reservoir. This general type of instrument was originally devised for use at sea, but it is now also in frequent service on land.

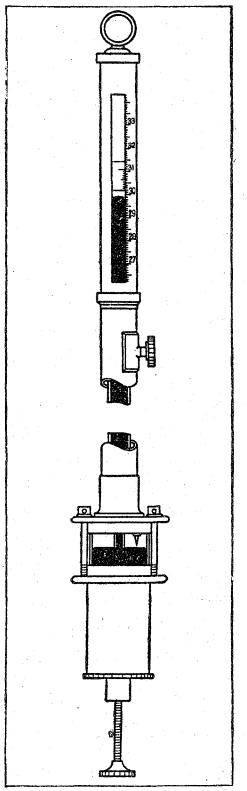


FIG. 4.—MERCURY BAROMETER (FORTIN TYPE)

The Fortin Barometer.—A general view of a modern Fortin barometer is given in fig. 4. The distinctive features of this type of instrument is Fortin's arrangement for controlling the lower level of the mercury by means of a leather bag which forms the lower part of the reservoir of the barometer. Incidentally by this means, the mercury can be made to fill the tube and cistern of the instrument if desired, thus making the barometer easily portable. Fig. 5 illustrates the present form of design of a Fortin cistern, from which the mercury has been removed. The normal procedure in reading this instrument is to use the adjusting screw at the lower end of the barometer in order to raise the mercury in the reservoir so as just to touch an ivory point which is fixed to the ceiling of the cistern and serves as the zero of the barometer. The barometric height is then determined by reading the level of the highest part of the mercury column by means of the scale and vernier. The temperature of the barometer should also be recorded. Provision is made for ensuring a complete and quick communication of the external atmosphere with the interior of the cistern. The glass barometer tube, necessarily closed at the upper end, which is usually about 33in. above the fiducial point, is in England usually made of lead glass. It is surrounded by a metal sheath, suitably slotted in order to admit of viewing the summit of the mercury column in the glass tube. On this sheath is engraved the scale used for reading the barometer. The slots in the sheath provide a run for the vernier

slide used in reading the top of the barometric column. The bore of the tube may vary from $\frac{1}{4}$in. to $\frac{3}{4}$in. in different instruments. The length of the graduated scale on the sheath depends on the station at which the barometer is to be used. At sea-level the maximum range of variation in atmospheric pressure is from 31·1 to 27·3in. of mercury. Consequently for use at stations near sea-level a nominal working range of about 31 to 27in. (790 to 690mm., or 1,050 to 920 millibars) is sufficient. The scale, however, must be subdivided above the upper limit to a distance dependent on the length of the vernier used in reading fractions of a scale division. If the barometer is to be used in a mine, the upper limit must be increased, following the increase of atmospheric pressure with the depth of the mine. The lower limit of the scale is governed by the maximum altitude at which the instrument is to be used. Fortin type barometers are rarely made to read lower than 20in. unless designed specifically for use in mountaineering or high-altitude surveying.

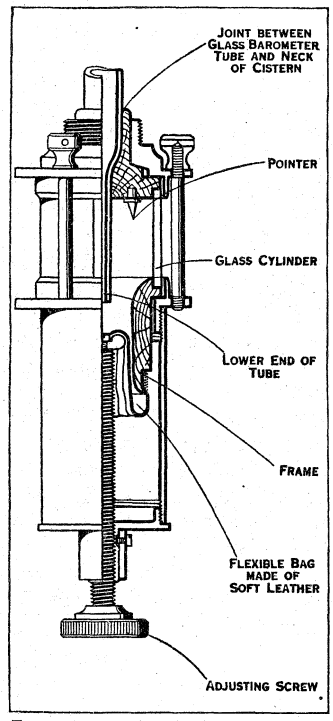


FIG. 5.—CISTERN OF MERCURY BAROMETER (FORTIN TYPE)

The Kew Pattern Barometer.—This type of barometer yields direct indications of the pressure by means of a single setting on the summit of the mercury column. No setting is made in the cistern. If the cistern (*see* fig. 6) and the glass tube of the barometer are cylindrical, the change in the level of the mercury in the cistern corresponding to a given pressure change is a definite fraction of the change in level of the summit of the mercury column, the value of this fraction depending on the dimensions of the instrument.

It will readily be seen that the movement in the tube is always smaller than that which would be obtained if the mercury in the cistern were brought to a fiducial point. Accordingly the scale of the Kew barometer is contracted, but the amount of this contraction is not large, and a nominal pressure-inch of scale rarely measures less than 0·95 true inch. The cistern is usually of cast iron, but stainless steel has recently been tried for this purpose. The lower end of the glass barometer tube is situated as nearly as possible at the centre of the cistern in order that it may be effectively sealed by the mercury in all positions of the instrument, whether erect, horizontal or inverted.

A Kew barometer, unless of exceptional size or design, is usually made portable by carefully tilting it until the mercury fills the tube completely. It may then be transported either horizontally, or cistern upward, the latter condition being preferred.

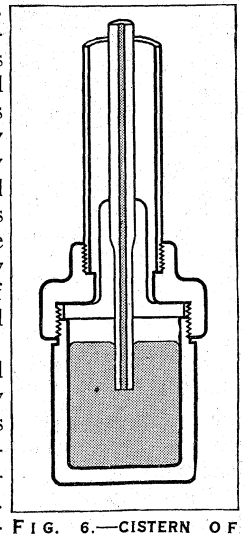


FIG. 6.—CISTERN OF MERCURY BAROMETER (KEW PATTERN)

Mercurial barometers have to be specially constructed for use on board ship. As the oscillation of the mercury is a serious obstacle to reading the barometer, the glass tube is constricted so as to oppose the flow of mercury through it. The amount of constriction is arranged to compromise between the error due to oscillation, or "pumping" as it is technically called, and the error due to the lag of the mercury column in following the variations of atmospheric pressure.

Mercurial marine barometers are usually of the Kew pattern. The glass barometer tube shown in fig. 7 may be regarded as illustrating both a Kew barometer and a marine barometer. In Kew barometers, there is usually a funnel-shaped air-trap A designed so as to collect at A any air that may rise into the barometer tube from the cistern, and to prevent it from reaching the vacuum space above the mercury column. The central portion S of the glass tube is usually of diminished bore in all Kew barometers, whether used on land or at sea. In marine barometers the bore is so diminished as to constitute a constriction. In land barometers this diminution is made in order to economize mercury, and should not be such as to impede the flow of the mercury considerably, or render the barometric column sluggish in taking up equilibrium with the atmospheric pressure.

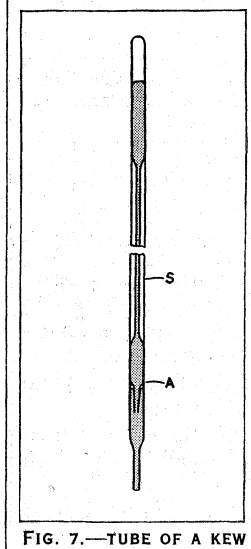


FIG. 7.—TUBE OF A KEW PATTERN BAROMETER

Reduction of Barometric Readings to Standard Conditions.—Since the indications of a mercury barometer are influenced by changes of temperature of the instrument, and of gravity acting on the mercury, corrections are normally made for these changes in order to obtain absolute values of the pressure.

Owing to the relatively high thermal expansibility of mercury the correction for temperature is important, being approximately $\frac{1}{10}$in., for a barometer reading 30 in. of mercury, corresponding to a change in temperature of 33°F. There is further a small difference between the temperature corrections to the Kew and Fortin types of barometer.

It is usual, in the case of inch and metric barometers, to correct the readings so as to refer to mercury at 32°F. (0°C.) and at standard gravity, the latter being regarded as the value of gravity at mean sea-level in latitude 45°. If the pressure and temperature are constant, the height of the barometric column varies inversely as the value of gravity at the station where the barometer is read. Full particulars and instructions for the correction of barometer readings to standard conditions will be found in the books of meteorological tables referred to in the bibliography.

A useful variation in the procedure of correction has been made in the case of mercury barometers with scales graduated in millibars. The gravity correction is expressed in terms of temperature in such a way that corresponding to any given station the temperature is found at which the instrument reads absolute pressures in true millibars. This temperature is called the fiducial temperature, and in practice it is only necessary to apply a correction for the departure of the temperature of the barometer at the time of reading from the fiducial temperature.

A mercurial barometer indicates the pressure of the air at the level of its cistern. In meteorological work, such as the mapping of isobars for weather forecasting, it is not the pressure at cistern level that is finally required, but the corresponding atmospheric pressure at mean sea-level at a point vertically below the barometer. Consequently a correction has to be made for the difference in atmospheric pressure between station-level and sea-level.

Accuracy of Mercurial Barometers.—It is not possible within the limits of this article to discuss in detail the different sources of error which may affect the accuracy of a mercury barometer. Much depends on the dimensions and type of barometer used. Increased accuracy is usually obtained by increasing the diameter of the glass barometer tube up to certain limits depending on the purpose for which the instrument is required. Barometers with a narrow tube (*e.g.*, less than $\frac{1}{5}$in. in internal diameter) can scarcely be called precision instruments, as the amount of capillary depression of the barometric column due to the forces of surface tension acting at the mercury meniscus varies considerably. Even in tubes of the size ordinarily used some variation in accuracy may be attributable to variation in capillary depression.

In general the Fortin type of barometer has a slight advantage over the Kew pattern in accuracy and permanence. This is especially the case with instruments having a tube of small internal diameter. With suitable precautions the Kew barometer can be made to yield an accuracy as great as that of a Fortin instrument of similar dimensions. In many classes of work it is preferable to use a Kew barometer and gain the advantage which this type offers in giving the barometric height by means of a single setting. If continuous accuracy over a period of several years is important, preference should be given to the Fortin type.

The following table indicates the general degree of consistency obtainable from a mercury barometer under good conditions of use:

Internal diameter of barometer tube.	Degree of consistency obtainable from the barometer in the measurement of pressure.		
inches.	inches.	millimetres.	millibars.
0·25	0·005	0·12	0·16
0·4	0·002	0·05	0·07
0·5—0·6	0·0015	0·03	0·04

Special accuracy may be obtained by taking particular precautions in methods of measurement and in the design of the barometer, particularly in the use of a tube of large diameter. A fundamental standard barometer has recently been constructed at the National Physical Laboratory, Teddington, Middlesex, to measure atmospheric pressures to within 0·01mm. of mercury.

Aneroid Barometers.—The aneroid barometer is often used as a substitute for a mercurial barometer under conditions in which the use of the latter is not admissible.

Fig. 8 shows the general arrangements of the mechanism of an aneroid. A corrugated chamber, formed by two thin metal diaphragms, is the fundamental element of an aneroid, and is technically called the vacuum box, since it is usually thoroughly exhausted of air. It is bolted to the base-plate of the instrument (*see* the sectional view in fig. 9), and connected to a steel spring which controls the stiffness of the combination. This spring is mounted so that it tends to open the box by pulling strongly upwards. A decrease in the atmospheric pressure causes the diaphragm box to expand. Consequently the point at which the box is anchored to the spring will move upwards (fig. 9), relatively to the base-plate of the instrument. The amount of this elastic movement caused by a change in air pressure is relatively small. It is of the order 0·005in. (linear) in an average diaphragm box,

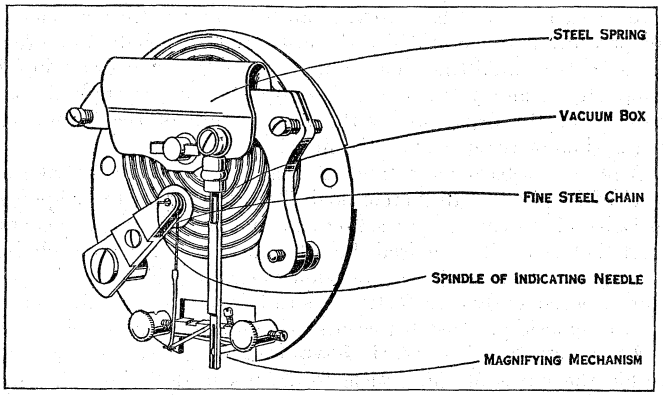


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FIG. 8.—GENERAL VIEW SHOWING THE MECHANISM OF AN ANEROID BAROMETER

corresponding to a change in pressure equal to 1in. of mercury. The instrument, however, gives a considerably magnified indication of this movement, which is linked up by a system of levers connected with a fine metallic chain which rotates the spindle on which the indicating needle is mounted. Nickel-silver alloy is most frequently employed for the diaphragms of vacuum boxes, but steel has also been used with considerable success.

Aneroid barometers are usually designed to read pressures with a precision which varies from 0·01in. to 0·05in. of mercury according to the size and range of the movement. A nominal inch of mercury, as shown on the average aneroid scale, usually measures at least a linear inch (sometimes more), and corresponds to a magnification of about 200 times the movement of the vacuum box. The aneroid form of barometer can readily be made self-registering, and fig. 10 illustrates one of the usual types of barograph. It is a general practice in making barographs to insert a suitable control spring inside each vacuum box, instead of using the external type of spring fitted to indicating aneroids. The main features of the mechanism of the indicating aneroid are retained, except that the metallic chain operating the indicating needle is replaced by a long pen lever, which traces out the record on a uniformly revolving drum driven by clockwork.

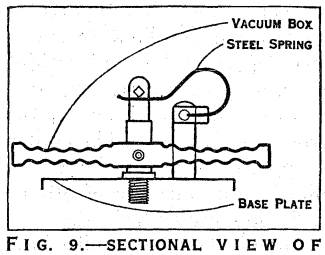

FIG. 9.—SECTIONAL VIEW OF VACUUM-BOX AND CONTROL SPRING OF AN ANEROID

The different effects of temperature changes on the reading of an aneroid barometer are sufficiently marked to necessitate compensation in aneroids generally. They are twofold in character, for in addition to the thermal expansion of the aneroid mechanism, particularly the diaphragms and main spring, there is a thermal change in the elasticity of the material of these parts.

Commercially, an aneroid is called "compensated" if it has some device in it which will make the reading independent of the temperature at such pressures as occur at sea-level (*i.e.*, at about 30in.).

Although an aneroid is sensitive to small changes of pressure, its reading cannot be relied upon to give the absolute value of the

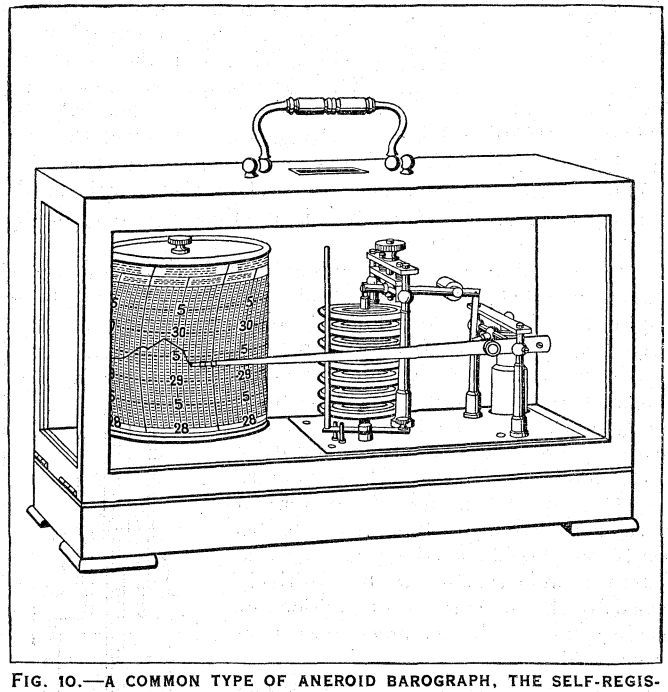

FIG. 10.—A COMMON TYPE OF ANEROID BAROGRAPH, THE SELF-REGISTERING ANEROID BAROMETER

pressure to a precision corresponding to one subdivision of the scale of the instrument (0·01in. for short ranges to 0·05in. for long ranges).

The utility of the aneroid as an absolute pressure indicator is limited by gradual and appreciable changes in the internal structure of the metal of the vacuum box, and for this reason it is highly advisable to compare the reading of an aneroid with that of a reliable mercury barometer at suitable intervals of time in order to avoid errors due to temporary or secular changes in the mechanism. Most important of all the defects to which an aneroid is susceptible is that generally known as "creep," which occurs when an aneroid, which has reached a steady condition at one pressure, is submitted to a different one. Although an aneroid

responds readily to a change in pressure, the diaphragms do not remain steady at the new pressure, but show a further small but gradual change in the same direction, in the course of time, while the same pressure is maintained.

Practical Uses of the Barometer.—A good mercurial barometer is an essential part of the equipment of most laboratories owing to the number of different scientific measurements which are dependent on a knowledge of the atmospheric pressure. Systematic use of barometers and other instruments is made on a wide scale by the Meteorological Office, which is responsible for the collection of information required for weather forecasting. Barometric readings are regularly taken on land and at sea over a wide area of the earth's surface in order to map the distribution of atmospheric pressure near the earth's surface.

A considerable amount of work has been done with aneroid barometers in the investigation of the meteorology of the upper atmosphere. Apart from the measurement of pressure, there is also a wide field for the use of a barometer in the determination of heights. Barometers are very sensitive to a change in height.

A change in altitude of 1,000ft., measured from sea-level corresponds approximately to a pressure change of one inch of mercury. The relation between height and pressure depends to a considerable extent on the temperature of the atmosphere, and although barometers are furnished with scales of altitude for the direct measurement of differences of height, such scales cannot be regarded as accurate under widely different atmospheric conditions. In general they represent some conventional relation between height and pressure, which needs further correction if accurate heights are to be obtained. There are a number of different conventional scales in use in England and other countries. Altimeter aneroids, adjustable so as to measure height above a convenient starting level, are in general use in aircraft.

The following table represents approximate average values of the atmospheric pressure at the respective heights above sea-level:—

Height (feet) above sea-level.	Corresponding pressure (inches of mercury reduced to standard conditions).	Height (feet).	Corresponding pressure (inches of mercury reduced to standard conditions).
−1,000*	31·02	14,000	17·58
0	29·92	15,000	16·89
1,000†	28·86	16,000	16·22
2,000	27·82	17,000	15·57
3,000	26·82	18,000	14·94
4,000	25·84	19,000	14·34
5,000	24·90	20,000	13·75
6,000	23·98	22,000	12·64
7,000	23·09	24,000	11·60
8,000	22·22	26,000	10·63
9,000	21·39	28,000	9·73
10,000	20·58	30,000	8·89
11,000	19·79	35,000	7·04
12,000	19·03	40,000	5·54
13,000	18·29	50,000	3·42

*Below sea-level. †Ascent.

Aneroid barometers are used quite extensively in certain branches of survey work. A justifiable use of the aneroid for this purpose lies in the measurement of heights intermediate between two given contours which have been accurately determined by other methods; *e.g.*, by means of a theodolite.

This requires relative measures of height only, and for such interpolation work the surveying aneroid is usually provided with a uniformly spaced scale of heights in addition to its pressure scale.

BIBLIOGRAPHY.—An article on this subject will be found in the *Dictionary of Applied Physics,* ed. by Sir Richard Glazebrook, vol. iii. (1922–23). Many detailed references are given in this article; also Kaye, *High Vacua;* and Dunoyer, *Vacuum Practice,* translated by Smith.

The following publications should be consulted. They also contain tables of numerical data for the reduction of barometer readings to standard conditions:—*The Observer's Handbook* (ed. by the London Meteorological Office); *Barometers and the Measurement of Atmospheric Pressure* (ed. by the United States Weather Bureau); *The Smithsonian Meteorological Tables;* and *Bul. Sm. Meteorological Soc.* for March, 1923. (F. A. G.)

BAROMETRIC LIGHT, the luminous glow which appears in the vacuous space above the mercury in a barometer tube when the tube is shaken. It is a special case of the general effect that, if a sealed tube containing mercury and a rarified gas be shaken, flashes of light are produced. With the gas neon bright flashes of red light can be excited by shaking it with mercury, even when the pressure of the gas is atmospheric.

The barometric light was first observed in 1675 by Jean Picard, a scholar of Gassendi's, who noticed flashes of light in the Torricellian vacuum when his barometer was moved about. It was made the subject of many experiments by Francis Hauksbee, who published an account of his work in 1709. He proved that the phenomenon was produced by the motion of mercury in either a glass or a varnished vessel, so that the glass was not a necessary factor, and that a very low pressure of the air was not necessary, as the light was strong when the air in contact with the mercury was at a pressure of an inch or two of mercury. He recognized that the rarefaction of the air was one of the conditions of the phenomenon, and he further stated that the light was electrical in origin, a conclusion suggested by the similarity in appearance of the light to that which he produced in exhausted vessels by the help of his electrical machine. The phenomenon roused much interest among his contemporaries. In 1745 Ludolf the younger clearly demonstrated that the agitation of the mercury produced an electrification of the barometer tube, by showing that the tube attracted, and then repelled, bits of paper in the familiar way. A little later Aepinus and Deluc brought the phenomenon again into notice, and further emphasized its electrical nature.

The barometric light is of interest as the first case of electrical discharge in gases at low pressure observed in the laboratory. The electrification is probably produced partly by the movement of the mercury over the glass surface, partly by the splashing of the mercury. The fact that a newly prepared surface of pure mercury acquires a positive charge in contact with glass has been recently (1920) demonstrated by Perucca, while the electrical effects accompanying splashing of mercury, or the bubbling of gas through mercury, have been investigated by Duhme, following the pioneer work of Lenard. Slight impurities in the mercury have a considerable influence on these effects, and the barometric light, as ordinarily produced, is a complicated phenomenon which has not been analyzed in detail.

For the first detailed experiments, *see* F. Hauksbee, *Physico-Mechanical Experiments* (1709). For the early investigations *see* J. Priestley, *History of Electricity* (5th ed., 1794); E. Gerland, *Geschichte der Physik* (1913). For the modern work on the potential differences at mercury surfaces, *see* A. Coehn, "Kontaktpotential" in *Ergebnisse der exacten Naturwissenschaften* (1922).

(E. N. DA C. A.)

BARON, MICHEL (1653–1729), French actor (whose family name originally was Boyron), was born in Paris. At the age of twelve he joined the company of children known as the *Petits Comédiens Dauphins.* He joined Molière's company, and then became a member of the company at the Hôtel de Bourgogne, and from this time until his retirement in 1691 was undisputed master of the French stage, creating many of the leading rôles in Racine's tragedies, besides those in two of his own comedies, *L'Homme à bonnes fortunes* (1686), and *La Coquette* (1687). In 1720 Baron reappeared at the Palais Royal. He died on Dec. 22 1729.

His son ÉTIENNE MICHEL BARON (1676–1711) was also a fine actor, and left a son and two daughters who all played at the Comédie Française.

See George Monval, *Un Comédien amateur d'art* (1893); also the Abbé d'Allamial's *Lettres à mylord XXX. sur Baron et la demoiselle Lecouvreur,* in F. G. J. S. Andrieux's *Collection des mémoires sur l'art dramatique* (1822).

BARON. This word, of uncertain origin, was introduced into England at the Conquest to denote "the man" (*i.e.,* one who had done him "homage") of a great lord, and more especially of the king. All who held "in chief" (*i.e.,* directly) of the king were alike *barones regis,* bound to perform a stipulated service, and mem-

bers, in theory at least, of his council. Great nobles, whether earls or not, also spoke of their tenants as "barons," where lesser magnates spoke of their "men" (*homines*). This was especially the case in earldoms of a palatine character, such as Chester, where the earl's barons were a well-recognized body, the Venables family, "barons of Kinderton," continuing in existence down to 1679. In the palatinate of Durham also, the bishop had his barons, among whom the Hiltons of Hilton Castle were usually styled "barons of Hilton" till extinct in 1746. Other families to whom the title was accorded, independently of peerage dignity and on somewhat uncertain grounds, were "the barons of Greystock," "the barons of Stafford," and the Cornwalls, "barons of Burford." Fantosme makes Henry II. speak of "mes baruns de Lundres"; John's charter granting permission to elect a mayor speaks of "our barons of our city of London," and a London document even speaks of "the greater barons of the city." The aldermen seem to have been loosely deemed equivalent to barons, and were actually assessed to the poll-tax as such under Richard II. In Ireland the palatine character of the great lordships made the title not uncommon (*e.g.*, the barons of Galtrim, the barons of Slane, the barons of the Naas).

As all those who held direct of the Crown by military service (for those who held "by serjeanty" appear to have been classed apart), from earls downwards, were alike "barons," the great difference in their position and importance must have led, from an early date, to their being roughly divided into "greater" and "lesser" baronies. Within a century of the Conquest, as we learn *Scaccario* already distinguishes their holdings as "greater" or "lesser" baronies. Within a century of the Conquest, as we learn from Becket's case (1164), there arose the practice of sending to the greater barons a special summons to the council, while the lesser barons, it is stipulated in Magna Carta (1215), were to be summoned only through the sheriffs. Thus was introduced a definite distinction, which eventually had the effect of restricting to the greater barons the rights and privileges of peerage.

Thus far the baron's position was connected with the tenure of land; in theory the barons were those who held their lands of the king; in practice, they were those who so held a large amount of land. The great change in their status was effected when their presence in that council of the realm which became the House of Lords was determined by the issue of a writ of summons, dependent not on the tenure of land, but only on the king's will. Camden's statement that this change was made by Henry III. after "the Baron's war" was long and widely accepted, but it is now assigned, as by Stubbs, to Edward I., and the earliest writs accepted as creating hereditary baronies are those issued in his reign. It must not, however, be supposed that those who received such summons were as yet distinguished from commoners by any style or title. The only possible prefix at that time was *Dominus* (lord), which was regularly used by simple knights, and writs of summons were still issued to the lowest order of peers as knights (*chevaliers*) only. The style of baron was first introduced by Richard II. in 1387, when he created John de Beauchamp, by patent, lord de Beauchamp and baron of Kidderminster, to make him "unum parium et baronum regni nostri." But it was not till 1433 that the next "baron" was created, Sir John Cornwall being then made baron of Fanhope. In spite, however, of these innovations, the former was only summoned to parliament by the style of "John Beauchamp of Kidderminster," and the latter by that of "John Cornwall, knight." Such creations became common under Henry VI., a transition period in peerage styles, but "Baron" could not evict "Sire," "Chevalier" and "Dominus." Patents of creation contained the formula "Lord A. (and) baron of B.," but the grantee still styled himself "lord" only, and it is an historically interesting fact that to this day a baron is addressed in correspondence not by that style, but as "the Lord A.," although other peers under the rank of duke are spoken of as "lords," while they are addressed in correspondence by their proper styles. To speak of "Baron A." or "Baron B." is an unhistorical and quite recent practice. When a barony, however, is vested in a lady it is now the recognized custom to speak of her as baroness, *e.g.*, Baroness Berkeley.

The solemn investiture of barons created by patent was performed by the king himself, by enrobing the peer in the scarlet "robe of estate" during the reading of the patent, and this form continued till 13 Jac. I., when the lawyers declared that the delivery of the letters patent without ceremony was sufficient. The letters patent express the limits of inheritance of the barony. The usual limit is to the grantee and heirs male of his body, occasionally, in default of male issue, to a collateral male relative (as in the case of Lord Brougham, 1860) or (as in the case of Lord Basset, 1797, and Lord Burton, 1897) to the heirs-male of a daughter, and occasionally (as in the case of Lord Nelson, 1801) to the heirs-male of a sister. Sometimes also (as in the case of the barony of Rayleigh, 1821) the dignity is bestowed upon a lady with remainder to the heirs-male of her body. The coronation robes of a baron are the same as those of an earl, except that he has only two rows of spots on each shoulder; and, in like manner, his parliamentary robes have but two guards of white fur, with rows of gold lace; but in other respects they are the same as those of other peers. King Charles II. granted to the barons a coronet, having six large pearls set at equal distances on the chaplet. A baron's cap is the same as a viscount's. His style is "Right Honourable"; and he is addressed by the king or queen, "Right Trusty and Well-beloved." His children are by courtesy entitled to the prefix "The Honourable."

Barons of the Exchequer were formerly six judges (a chief baron and five puisne barons) to whom the administration of justice was committed in causes betwixt the king and his subjects relative to matters of revenue. Selden, in his *Titles of Honour,* conjectures that they were originally chosen from among the barons of the kingdom, and hence their name; but it would probably be more exact to say that they were officers of a branch of the king's *Curia,* which was theoretically composed of his "barons." The title has become obsolete since 1875, when the court of exchequer was merged in the High Court of Judicature.

Barons of the Cinque Ports (originally Hastings, Dover, Hythe, Romney and Sandwich) were at first the whole body of their freemen, who were so spoken of in royal charters. But the style was afterwards restricted to their mayors, jurats, and (prior to 1831) members of the House of Commons elected by the Cinque Ports, two for each port. Their right to the title is recognized in many old statutes, but in 1606 the use of the term in a message from the Lower House drew forth a protest from the peers, that "they would never acknowledge any man that sitteth in the lower house to the right or title of a baron of parliament" (*Lords' Journals*). It was the ancient privilege of these "barons" to bear a canopy over the sovereign at his or her coronation and retain it as their perquisite. They petitioned as "barons of the Cinque Ports" to attend the coronation of George V., and a deputation was allowed to do so.

Baron and Feme, in English law, is a phrase used for husband and wife, in relation to each other, who are accounted as one person. Hence, by the old law of evidence, the one party was excluded from giving evidence for or against the other in civil questions, and a relic of this is still preserved in the criminal law. The foreign title of baron is occasionally borne by English subjects, but confers no precedence in the United Kingdom.

The Foreign Title.—On the continent of Europe the title baron, though the same in its origin, has come to imply a rank and status very different from its connotation in the United Kingdom, and again varies considerably in different countries. Originally *baro* meant no more than "man," and is so used in the Salic and other "barbarian" laws. In this way, too, it was long preserved in the sense of "husband." Gradually the word seems to have come to mean a "strong or powerful man," and thus "a magnate." Finally, in France in the 12th century the general expression *barones* was introduced in a restricted sense, as applied properly to all lords possessing an important fief, subject to the rule of primogeniture and thus not liable to be divided up and held of one overlord alone. Sometimes it included ecclesiastical lordships of the first rank. In the 13th century the Register of King Philip Augustus places the *barones regis Francie* next to the dukes and counts holding in chief, the title being limited to

vassals of the second rank. Towards the end of the century the title had come to mean that its bearer held his principal fief direct from the crown, and was therefore more important than that of count, since many counts were only mediate vassals. Thus the kings in granting a duchy or countship as an apanage to their brothers or sons used the phrase *in comitatum et baroniam*. From this period, however, the title tends to sink in importance. When, in the 14th century, the feudal hierarchy was completed and stereotyped, the barons are ranked not only below counts, but below viscounts, though in power and possessions many barons were superior to many counts. In any case, until the 17th century, the title of baron could only be borne by the holder of a territorial barony; and it was Louis XIV. who first cheapened the title in France by creating numerous barons by royal letters. This dissociation of the title from the idea of feudal rights and obligations was completed by Napoleon's decree of March 1, 1808, reviving the ancient titles. By this instrument the title of baron was to be borne *ex officio* by a number of high officials, *e.g.*, ministers, senators, councillors of state, archbishops and bishops. It was given to the 37 mayors who attended the coronation, and could be claimed by any mayor who had served to the emperor's satisfaction for ten years, and by any member of an electoral college who had attended three sessions. The title was made to descend in order of primogeniture to legitimate or adopted sons and to the nephews of bishops, the sole condition being that proof must be presented of an actual income of 15,000 fr., of which one-third should descend with the title. The creation of barons was continued by Louis XVIII., Charles X. and Louis Philippe, and, suspended at the revolution of 1848, was revived again on a generous scale by Napoleon III. The tolerant attitude of the Third Republic towards titles, which it does not officially recognize, has increased the confusion by facilitating the assumption of the title on very slender grounds of right. The result has been that in France the title of baron, unless borne by the recognized representative of a historic name, not only involves no political status, but confers also but very slight social distinction.

The same is true, *mutatis mutandis*, of most other European countries, and notably of Italy. In Austria and Germany the case is somewhat different. Though in Latin documents of the middle ages the term *barones* for *liberi domini* was used, it was not until the 17th century that the word *Baron*, perhaps under the influence of the court of Versailles, began to be used as the equivalent of the old German *Freiherr*, or free lord of the empire. The style *Freiherr* (*liber dominus*) implied originally a dynastic status, and many *Freiherren* held countships without taking the title of count. When the more important of them styled themselves counts, the *Freiherren* sank into an inferior class of nobility. The practice of conferring the title *Freiherr* by imperial letters was begun in the 16th century by Charles V., was assumed on the ground of special imperial concessions by many of the princes of the empire, and later exercised by all the German sovereigns. Though the practice of all the children taking the title of their father has tended to make that of baron comparatively very common, and has dissociated from it all idea of territorial possession, it still implies considerable social status and privilege in countries where a sharp line is drawn between the caste of "nobles" and the common herd, whom no wealth or intellectual eminence can place on the same social level with the poorest *Adeliger*. In Japan the title baron (*Dan*) is the lowest of the five titles of nobility introduced in 1885, on the European model. It was given to the least important class of territorial nobles, but is also bestowed as a title of honour without reference to territorial possession.

See John Selden, *Titles of Honor*, p. 353 (ed. 1672); du Cange, *Glossarium*, s. "Baro" (ed. Niort, 1883); Achille Luchaire, *Manuel des institutions françaises* (1892); Maurice Prou, art. "Baron" in *La Grande Encyclopédie*. (W. A. P.)

BARONET. Although the origin of this title has been the subject of speculation, it is not known why it was selected as that of "a new Dignitie between Barons and Knights" created by James I. The object of its institution was to raise money for the crown, as was also done by the sale of peerage dignities under this sovereign. But the money was professedly devoted to the support of troops in Ulster, that is, each grantee was to be liable for the pay of 30 men, at 8d. a day for three years. This amounted to £1,095, the sum paid for the honour. When it was instituted, in May 1611, the king covenanted that he would not create more than 200, and that only those who had £1,000 a year in landed estate and whose paternal grandfathers had borne arms should receive the honour. But these qualifications were soon abandoned. As an inducement to apply for it, it was made to confer the prefix of "Sir" and "Lady" (or "Dame"), and was assigned precedence above knights, though below the younger sons of barons. Eight years later (Sept. 30, 1619) the baronetage of Ireland was instituted, the king pledging himself not to create more than 100 baronets. Meanwhile, questions had arisen as to the precedence of the baronets, and James, by decree (May 28, 1612), had announced that it was his intention to rank them below the younger sons of barons. As this had the effect of stopping applications for the honour, James issued a fresh commission (Nov. 18, 1614) to encourage them, and finally, as "the King's wants might be much relieved out of the vanities and ambition of the gentrie" (in Chamberlain's words), he granted, in 1616, the further privilege that the heirs apparent of baronets should be knighted on coming of age.

The baronetage of Nova Scotia was devised in 1624 for promoting the "plantation" of that province, and James announced his intention of creating 100 baronets, each to support six colonists for two years (or pay 2,000 marks in lieu thereof), and also to pay 1,000 marks to Sir William Alexander (afterwards earl of Stirling), to whom the province had been granted in 1621. For this he was to receive a "free barony" of 16,000 acres in Nova Scotia, and to become a baronet of "his Hienes Kingdom of Scotland." Charles I. carried out the scheme, creating the first Scottish baronet on May 28, 1625, covenanting that the baronets "of Scotland or of Nova Scotia" should never exceed 150, that their heirs apparent should be knighted on coming of age, and that no one should receive the honour who had not fulfilled the conditions, viz., paid 3,000 marks (£166 13s. 4d.) towards the plantation of the colony. Four years later (Nov. 17, 1629) the king wrote to "the contractors for baronets," recognizing that they had advanced large sums to Sir William Alexander for the plantation on the security of the payments to be made by future baronets, and empowering them to offer a further inducement to applicants; and on the same day he granted to all Nova Scotia baronets the right to wear about their necks, suspended by an orange tawny ribbon, a badge bearing an azure saltire with a crowned inescutcheon of the arms of Scotland and the motto "Fax mentis honestae gloria." As the required number, however, could not be completed, Charles announced in 1633 that English and Irish gentlemen might receive the honour, and in 1634 they began to do so. Yet even so, he was only able to create a few more than 120 in all. In 1638 the creation ceased to carry with it the grant of lands in Nova Scotia, and on the union with England (1707) the Scottish creations ceased, English and Scotsmen alike receiving thenceforth baronetcies of Great Britain.

The history of the baronetage was uneventful till 1783, when in consequence of the wrongful assumption of baronetcies, an old and then increasing evil, a royal warrant (Dec. 6) directed that no one should be recognized as a baronet in official documents till he had proved his right, and also that those created in future must register their arms and pedigree at the Heralds' college. In consequence of the opposition of the baronets themselves, the first of these two regulations was rescinded and the evil remained unabated. Since the union with Ireland (1800) baronets have been created, not as of Great Britain or of Ireland, but as of the United Kingdom.

In 1834 a movement was initiated by Mr. Richard Broun (whose father had assumed a Nova Scotia baronetcy some years before), to obtain certain privileges for the order, but on the advice of the Heralds' college, the request was refused. A further petition, for permission to all baronets to wear a badge, as did those of Nova Scotia, met with the same fate in 1836. Meanwhile George IV. had revoked (Dec. 19, 1827), as to all future

creations the right of baronets' eldest sons to claim knighthood. Mr. Broun claimed it as an heir apparent in 1836, and on finally meeting with refusal, publicly assumed the honour in 1842, a foolish and futile act. In 1854 Sir J. Kingston James was knighted as a baronet's son, and Sir Ludlow Cotter similarly in 1874, on his coming of age; but when Sir Claude de Crespigny's son applied for the honour (May 17, 1895), his application was refused, on the ground that the lord chancellor did not consider the clause in the patent (1805) valid. The reason for this decision appears to be unknown.

A fresh agitation was aroused in 1897 by an order giving the sons of life peers precedence over baronets, some of whom formed themselves, in 1898, into "the Honourable Society of the Baronetage" for the maintenance of its privileges. But a royal warrant was issued on Aug. 15, 1898, confirming the precedence complained of. The above body, however, continued in existence as the "Standing Council of the Baronetage," and succeeded in obtaining invitations for some representatives of the order to the coronation of King Edward VII. It has been sought to purge the order of wrongful assumptions. A departmental committee at the Home Office was appointed in 1906 to consider the question of such assumptions and the best means of stopping them. Following this, an official roll of the baronetage was established by royal warrant of Feb. 11, 1910, a roll which was first gazetted on Feb. 23, 1914. Every person succeeding to a baronetcy must now exhibit to the Home Secretary his proofs of succession. In 1929 baronets, not of the Nova Scotia creation, were given leave to wear, hanging from the neck by an orange ribbon with a blue border, a badge of gold or silver gilt enamelled with the red hand of Ulster. All baronets are entitled to display in their coat of arms, either on a canton or on an inescutcheon, the red hand of Ulster, save those of Nova Scotia, who display, instead of it, the saltire of that province. The precedency of baronets of Nova Scotia and of Ireland in relation to those of England was left undetermined by the Acts of Union, and appears to be still a moot point with heralds. The premier baronet of England in 1945 was Sir Nicholas Henry Bacon whose ancestor was the first to receive the honour in 1611.

See Pixley's *History of the Baronetage;* Playfair's "Baronetage" (in *British Family Antiquity,* vols. vi.–ix.); Foster's *Baronetage;* G. E. Cokayne's *Complete Baronetage;* Nichols, "The Dignity of Baronet" (in *Herald and Genealogist,* vol. iii.). (J. H. R.)

BARONIUS, CAESAR (1538–1607), ecclesiastical historian, was born at Sora and educated at Veroli and Naples. At Rome he joined the Oratory in 1557 under St. Philip Neri (*q.v.*) and succeeded him as superior in 1593. Clement VIII., whose confessor he was, made him cardinal in 1596 and librarian of the Vatican. At two conclaves he was nearly elected pope, but at both was opposed by Spain on account of his work *On the Monarchy of Sicily,* in which he supported the papal claims against the Spanish. His *Annales Ecclesiastici* were undertaken in reply to the *Magdeburg Centuries;* after nearly 30 years of lecturing on the history of the Church at the Vallicella and being trained by St. Philip as a great man for a great work, he began to write, and produced the 12 folios (1588–1607) of the *Annales.* In spite of errors, especially in Greek history, in which he had to depend upon secondhand information, the work of Baronius is an honest attempt to write history. Sarpi, in urging Casaubon to write against Baronius, warns him never to suspect Baronius of bad faith, for no one who knew him could accuse him of disloyalty to truth. Baronius makes his own the words of St. Augustine: "I shall love with a special love the man who most rigidly and severely corrects my errors." He also undertook a new edition to the Roman martyrology (1586), which he purified of many inaccuracies.

His *Annales,* which end in 1198, were continued by Rinaldi (9 vols., 1676–77); by Laderchi (3 vols., 1728–37); and by Theiner (3 vols., 1856). The most useful edition is that of Mansi (38 vols., Lucca, 1738–59), giving Pagi's corrections at the foot of each page.

BARONS' WAR, the name given in English history to the civil war of 1263–1267. In 1261 Henry III. had been absolved by the pope from his oath to the Provisions of Oxford (1258), which King Louis of France by the Mise of Amiens (Jan. 23, 1264), further declared to be invalid. Led by Simon de Montfort, a section of the barons took up arms. Famous in the course of the war are the battles of Lewes (1264), where de Montfort defeated the king, and Evesham (1265), where the de Montfort party was routed and Simon himself slain; but the most important event of these years was de Montfort's parliamentary experiments of 1265. A settlement was finally reached by the Dictum of Kenilworth (1266) and the Statute of Marlborough (1267). (*See* ENGLISH HISTORY; MONTFORT, SIMON DE; OXFORD, PROVISIONS OF.)

BARONY, the domain of a baron (*q.v.*). In Ireland counties are divided into "baronies," which are equivalent to the "hundreds" (*q.v.*) in England, and seem to have been formed out of the territories of the Irish chiefs, as each submitted to English rule (General Report of the Census of England, iv. 181, 1873). In Scotland the term is applied to any large freehold estate even when held by a commoner. Barony also denotes the rank or dignity of a baron, and the feudal tenure "by barony."

BAROQUE, a term used to describe the tendencies prevailing in European art during part of the 16th, the 17th and the first half of the 18th centuries. It is of uncertain derivation, one explanation being that it springs from the Spanish word *barrueco,* a large irregularly-shaped pearl. The word denotes the greater freedom and irregularity which succeed, in European art, the equipoise and restraint of the Renaissance. At first marked by stateliness and amplitude of form, the Baroque style in the 18th century becomes more playful and piquant in character, this variety of it being known as the style of the Rococo (*q.v.*). Typical Baroque artists are: in architecture, Lorenzo Bernini (1598–1680) and Francesco Borromini (1599–1667); in sculpture, Lorenzo Bernini; and in painting, Pietro Berettini da Cortona (1596–1669) and Peter Paul Rubens (1577–1640).

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BAROQUE ARCHITECTURE. So many different factors both of technique and thought went to the making of Baroque art that, not so many years ago, when comparing it with the art of other periods, critics condemned it as false, over-emphasized and seeking only to astonish. "Its architecture," they asserted, "was debased and deformed; its painting, turbid and heavy; its sculpture, empty and confused." It was inevitable that the period of reaction having run its course, history and criticism should rectify the earlier conceptions, although not without a half century of conflict.

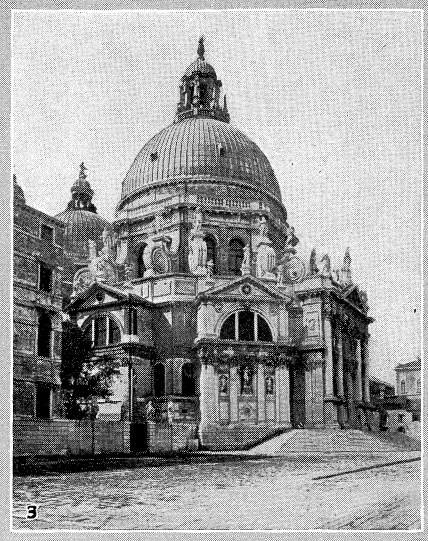
Baroque architecture was built up naturally on the basis of the final period of the Renaissance (*see* RENAISSANCE ARCHITECTURE). It arose in a world which had given itself over to an extreme self-indulgence, matching the extremes of religious asceticism indulged in by the clergy. There was, generally, a simultaneous increase in knowledge and in superstition, in benevolence and in crime, in splendour and in misery. In this worldly atmosphere art managed to extricate itself from a dominating concourse of aesthetic, religious and social elements. Under such conditions it could not have developed otherwise than it did.

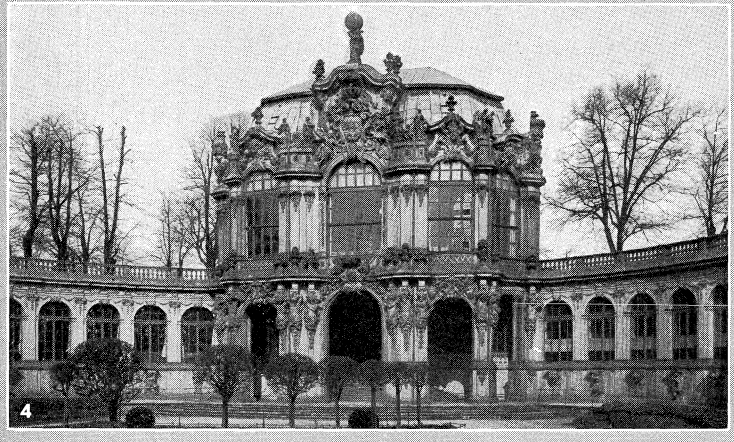
Characteristics.—Rome was the birthplace of Baroque art and there it developed in its own surroundings, in clear consciousness of its aims, with the support of a strong tradition. It repeated the very beginnings of the architecture of imperial Rome, just as Rome adorned herself with Byzantine, Romanesque and Renaissance buildings, because all their forms were akin to or derived from the Roman. The vaults, the cupolas, the arches, had their origin in the imperial art, even if enriched by the Byzantine, toned down by the Romanesque, softened by the Renaissance, amplified by the Baroque, subtilized by the neo-classical. On the other hand, Baroque architecture rejected resolutely the Gothic style, slender, mystical, dreamy, which substituted the tenuous aspiration of ascending lines for the practical solidity of horizontal planes and bindings. The altars, tombs, confessionals and pyxes, organs and choirs, altar-pieces and reliquaries, the palaces with their

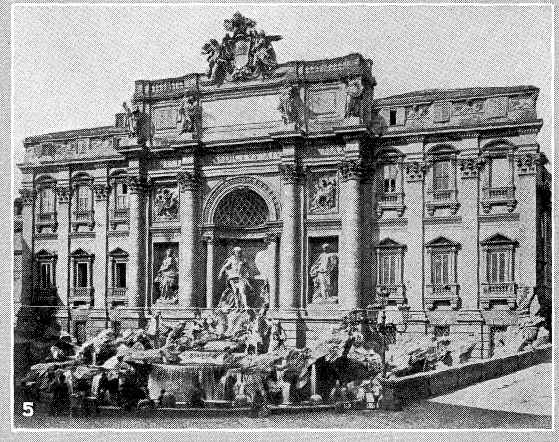
BAROQUE ARCHITECTURE

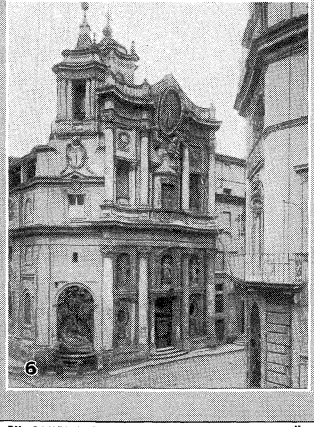
















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EXAMPLES OF THE BAROQUE STYLE IN EUROPE

1. Paris, church of the Invalides, designed by J.-H. Mansard, 1706, to complete the Hôtel des Invalides. The church, which contains the tomb of Napoleon I, is a square building symmetrically designed, surmounted by a dome raised on two high drums, and crowned by a light, spire-like lantern rising to a height of 350 feet
2. Bernini colonnades, St. Peter's, Rome. One of the two curving colonnades, built between 1655 and 1667, which adjoin St. Peter's Church and partly enclose the piazza before it. They are open on all sides, and are composed of four rows of columns of the Tuscan order
3. Venice, Church of Santa Maria della Salute, designed by Longhena and erected 1631–1682 by the state to commemorate the end of the great plague of 1630. The building is octagonal, with a central dome supported by great scrolls carrying statues, and a second dome above the choir
4. Dresden, wall-pavilion at a corner of the great court of the Zwinger Palace, built 1709–1718, M. Pöppelmann, architect. The design is marked by large window-spaces divided by slender piers with elaborate detail above
5. Rome, the Trevi Fountain, 18th century, probably from Bernini's design. It illustrates the perfection of proportion and unity of composition distinguishing the work of baroque architects, but with more elaboration of detail than earlier Italian examples
6. Rome, church of San Carlo alle Quattro Fontane, built 1640–46, designed by Borromini, who, with Bernini, brought the baroque style to its height in Italy
7. Rome, Barberini Palace, said to be the combined work of Bernini, Borromini and Maderna. The design recalls the earlier Renaissance style in its severe regularity. The false perspective in the windows of the third story is a detail characteristic of the baroque
8. Seville, church of San Jacinto, a Spanish version of the baroque form, less grandiose than the examples from other countries, but showing a similar trend

beds, mirrors, tables, divans and chairs—all had the same richness, the same importance. In the churches the splendour of the pictures was equalled by the polychromatic richness of the marble; in the palaces, the wealth of the brocades and tapestries, and everywhere the splendour of the metals. In the churches the cupola took a predominant place because it lent itself better than slender bell-towers to grandiose lines. For the most part the interiors consisted of spacious naves flanked by chapels or else by two narrow aisles, supported by pillars. In palaces importance was attached to the principal doorway, entrance and stairway, which in the Renaissance were relatively modest. Finally the Baroque architects passed on from the palaces and churches to the vast conception of entire open squares and the perspective of streets, with stairways, colonnades and fountains.

Bernini and Borromini.—The number of Italian architects during the Baroque period was very large and hailed from every province, more especially from Upper Italy. Without naming all of note it may be mentioned that the Baroque style culminated in two great artists, Bernini (1598–1680) and Francesco Borromini (1599–1667).

Development.—From Rome Baroque architecture spread over all Italy and into other European countries. Italian architects, generally speaking, belonged to the school of the innovating genius of Borromini rather than to the weighty and traditional school of Bernini. They were to be found then in Spain, France, the Netherlands, Germany, and above all, in Poland and Russia. But soon in these and other lands local architects came to the front who contrived to impart a special character of their own to Baroque—a character suited to the region, the climate, the building methods and material, and above all the tastes and temperament of the country. The fiery temperament of the Spaniards carried Baroque to an extreme, first with the work of the brothers Mora and Alonso Cano, then by the revival and aggravation of the stuccoesque style of José Churriguera (1650–1725) who created an architectural style which was bound to arrest attention by its fantasy and its undeniable beauties but which was so full of eccentricities, so overdone with ornamentations, so broken up and swamped by fantastic decoration, that the word *Churrigueresque* had to be coined to describe such an orgy of capricious ornamentation. France, which had become the preponderant power in Europe in the 17th century, not merely disregarded the Spanish movement but freed herself gradually from the influence of Italy, forming a style which was to win throughout the continent as many followers as the Italian Baroque, partly because it showed more regard for the practical necessities of life and paid more attention to the arrangement and adornment of the interiors. The periods of the Baroque were classified in France by a kind of court chronology; the Louis XIII. period, 1623–43, early Baroque; Louis XIV., 1643–1715, full Baroque; Regency, 1715–23, development into Rococo. The creations of French Baroque were countless—churches, palaces, castles and ornamental parks. Two great nuclei of buildings remain as outstanding examples of its quality, the Louvre and Versailles, upon which the greatest architects of the time were engaged: Lemercier (1590–1654), Nicolas François Mansart (1598–1666) (who gave the name of *mansardes* to the sloping roofs with upright windows used by him to interrupt the lines of his buildings and to make the top storeys more habitable), Louis Levau (1612–70), Claude Perrault (1613–88), Jules Hardouin Mansart (1646–1708) etc. In the Netherlands among the patrons of Baroque were Peter Paul Rubens, his friend Jacques Francquart (1577–1651), and his disciple, Faidherbe (1617–97). They developed a Baroque which showed signs of various influences, Italian and French as well as Spanish and German. At first fussy and "chopped up," it acquired repose when the forms of Palladio prevailed. While these declined and grew cold with Virigboon, in England they acquired vitality with Vanbrugh (1666–1726) who had been inspired by the sight of Versailles. Gradually in this period (1702–14) the simplicity of the so-called Queen Anne style, especially in private architecture, came into vogue—which was to be revived with a touch of genius in the nineteenth century. Great pomp and vigour were attained by Baroque in Germany where not only was a court-like character imparted to separate buildings but to districts and to entire towns, such as Karlsruhe, Mannheim, Saarbrücken, Ellangen, Potsdam, while a distinctive aspect was given also to old cities like Vienna, Dresden, Bayreuth, Würzburg, etc. In the Catholic south, especially Austria and Bavaria, Baroque took a warm grandiose form, full of movement in the Roman manner. Architects who became prominent were Fischer von Erlach, Hildebrandt, Prandauer, Neumann, Poppelmann and Andrea Schlüter. Baroque art existed for two centuries and then faded away naturally like all the literary, philosophical and religious forms and habits which had combined to create and support it.

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BAROSS, GABOR (1848–1892), Hungarian statesman, was born at Trencsén on July 6, 1848, and educated at Esztergom. He entered parliament in 1875, and attached himself to Kalmán Tisza. In 1883 he was appointed secretary to the ministry of ways and communications, and in 1886 he was appointed minister of ways and communications. The gigantic network of the Austro-Hungarian railway system and its unification was mainly his work. He regulated the Danube at the hitherto impassable Iron Gates Rapids by building canals to open up the eastern trade to Hungary. The amalgamation of the ministry of commerce with the ministry of ways in 1889 further enabled Baross to revise the tolls. This nationalist policy provoked protests both from Austria and

Germany at the Conference of Vienna in 1890, and Baross was obliged somewhat to modify his system. He died on May 8, 1892.

See Lászlo Petrovics, *Biography of Gabriel Baross* (Hung. Eperies, 1892).

BAROTAC NUEVO, a municipality of the province of Iloilo, Panay, Philippine Islands, near the Jalaur river, above its mouth on the southeast coast, and about 15 mi. N.E. of Iloilo, the capital. Pop. (1939), 20,572, of whom 10,318 were males and 1 white. The municipality is in a fertile district which produces palay (rice), sugar, coco-nuts, tobacco, corn and fruits. The school population in 1939 numbered 4,744, of whom 27.9% attended school. Of the 14,267 individuals 10 years old and over, 47.4% were able to read and write. The language is Panay-Bisaya. The municipality has an administrative centre and 21 barrios (wards).

(C. S. L.)

BAROTSE, BAROTSELAND, a people and country of South Central Africa. The greater part of the country is a British protectorate, forming part of northern Rhodesia. The Barotse are the paramount tribe in the region of the Upper Zambezi basin, but by popular usage the name is also applied to contiguous subject tribes, Barotseland being the country over which the Barotse paramount chief exercises authority. The present article treats of the people and of modern political developments.

The Barotse.—These people, originally known as Aälui, have occupied the extensive plain through which the Zambesi passes from 14° 35′ S. to 16° 25′ S. throughout the reigns of twenty-two successive paramount chiefs and therefore approximately since the commencement of the 17th century. Previously, for an indefinite period, they dwelt on the Kabompo river, 200 m. to the N.E. of their present country, and here the descendants of a section of the tribe which did not migrate still remain, under the name Balokwakwa (men of the ambuscade), formerly known as Aälukolui. The Makololo gave the Barotse their present name, an error for Marotse.

The Barotse proper are comparatively few in number; they are very black, tall in stature, deep in chest and comparatively speaking refined in feature. Being numerically small they form an oligarchy in which, with few exceptions, each man holds rank in a chieftainship of which there are three grades. As a reward of gallantry or ability the paramount chief occasionally conferred chief's rank on individuals not of Barotse birth, and these *ipso facto* assumed the name and privileges of the Barotse. In 1906 the paramount chief, by proclamation, abolished the state of slavery, an act which, however, left untouched the predominant position of the Barotse and their rights to chieftainship. The paramount chief shares with a queen (*Mokwai*) his authority and prerogatives. The Mokwai is not the wife but the eldest sister of the ruling chief. With his death her privileges lapse. Theoretically, these co-rulers are equal, neither may promulgate a national decree without the assent of the other, but each has a capital town, councillors and absolute authority in a province, the two having joint authority over all other provinces. The Barotse imagine the sun to be the embodiment of a great god whose sole care is for the amelioration of man. Him they worship, though more pains are taken to appease evil spirits. The spirits of ancestors—especially of deceased chiefs—are also objects of worship. Christianity of a Protestant Evangelical type was first introduced into the country in 1884 by François Coillard.

See RHODESIA.

The Establishment of British Suzerainty.—By the charter granted to the British South Africa Company in Oct. 1889, the company was allowed to establish its rule in the regions north of the Middle Zambezi not included in the Portuguese dominions, and by a treaty of June 11, 1891, between Great Britain and Portugal it was declared that the Barotse kingdom was within the British sphere of influence. The dispute between the contracting powers as to what were the western limits of Barotseland was eventually referred to the arbitration of the king of Italy, who by his award of May 30, 1905, fixed the frontier at the Kwando river as far north as 22° E., then that meridian up to 13° S., which parallel it follows as far east as 24° E., and then that meridian to the Belgian Congo frontier. In the meantime the British South Africa Company had entered into friendly relations with Lewanika, the paramount chief of the Barotse, and an administrator was appointed on behalf of the company to reside in the country. A native police force under the command of a British officer was raised and magistrates and district commissioners were appointed. In the internal affairs of the Barotse the company did not interfere, and the relations between the British and Barotse have been uniformly friendly. The pioneers of Western civilization were not, however, the agents of the Chartered Company, but missionaries. F. S. Arnot, an Englishman, spent two years in the country (1882–84) and in 1884 a mission, fruitful of good results, was established by the Société des Missions Evangéliques de Paris. Its first agent was François Coillard (1834–1904), who had previously been engaged in mission work in Basutoland and devoted the rest of his life to the Barotse. From the moment Great Britain assumed responsibility and the advance of European civilization became inevitable, all the influence acquired by Coillard's exceptional personal magnetism and singleness of purpose was used to prepare the way for the extension of British rule. Direct imperial control was substituted for that of the Company in 1924. (*See* RHODESIA.)

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BARQUISIMETO, a city of western Venezuela, capital of the State of Lara, on the Barquisimeto river, 101m. by rail S.W. of Tucacas, its port on the Caribbean coast. Population (1941) 54,176. It is built in a small, fertile valley of the Mérida Cordilleras, 1,985ft. above sea-level, has a temperate, healthy climate with a mean annual temperature of 78°, and is surrounded by a highly productive country from which are exported coffee, sugar, cacao and rum. Barquisimeto was founded in 1552 by Juan de Villegas, who was exploring the neighbourhood for gold, and it was first called Nueva Segovia after his native city. On March 26, 1812, it was totally destroyed by an earthquake, and with it 1,500 lives, including a part of the revolutionary forces occupying the town.

BARR, AMELIA EDITH (HUDDLESTON) (1831–1919), Anglo-American novelist, was born in Ulverston, England, on March 29, 1831. In 1850 she married Robert Barr and four years later went with him to the United States, where they settled in Austin, Tex., removing in 1867 to Galveston. There her husband and three sons died of yellow fever. Three daughters remained to her, and in 1869 she took them to New York city where she was a teacher for two years and then wrote for magazines and newspapers. Her first novel, *Romance and Reality* (1872), was followed by more than 60 others, the best known of which is *Jan Vedder's Wife* (1885). Her work is characterized by historical settings, generally English, Scotch or colonial American.

See *All the Days of My Life* (1913), an autobiography.

BARRA or **BARRAY** (Scand. *Baraey,* isle of the ocean), island, outer Hebrides, Inverness-shire, Scotland. Pop. (1931), 2,250. Area 34.7 sq.mi. It lies about 5 mi. S.W. of South Uist and is 8 mi. long and from 2 to 4 mi. wide, save at the sandy isthmus 2 mi. below Scurrival Point, where it is only a few hundred yards broad. The rock formation is gneiss. The highest hill is Heaval (1,260 ft.) and there are several small lochs. The chief village is Castlebay, with the castle of Kisamul, somewhat restored, on a rock in the bay, the stronghold of the M'Neills of Barra, one of the oldest Highland clans. There are remains of ancient chapels, Norse duns and stone circles on the island. The parish comprises a number of smaller islands and islets and contains 4,000 ac. of arable land and 18,000 ac. of meadow and hill pasture. Herring and other fisheries are important, and the coasts abound with cockles. On Barra Head, the highest point of Berneray, and also

the most southerly point of the outer Hebrides chain, is a lighthouse 580 ft. above high water.

BARRACKPORE, a town and subdivisional headquarters of British India, in the district of Twenty-four Parganas, Bengal. The town, situated on the left bank of the Hooghly, is divided between two municipalities, North Barrackpore (pop. [1941] 26,966) and South Barrackpore (pop. [1941] 32,751). It contains a cantonment and its name is said to be derived from the fact of troops having been stationed here since 1772. To the south of the cantonment is situated the park, within which is Government House, a noble building, which was the country house of the governors-general and viceroys from the beginning of the 19th century till 1912. Since the latter year it has been a suburban residence of the governors of Bengal.

BARRACKS, the buildings used for the quartering of unmarried enlisted personnel of the armed forces of a nation as distinguished from quarters assigned to officers, married noncommissioned officers and nurses. The term is usually applied to permanent structures used for the peace-time occupation of troops; but temporary portable buildings, fabricated from wood or metal and assembled in standard sectional lengths, are used in cantonments and training centres, and in these the recreational and messing accommodations and the utilities provided are somewhat less than in permanent barracks, and conditions more nearly approach those of a military encampment.

Barrack Construction History.—In the mediaeval armies of the eastern hemisphere when all military operations were conducted in the field, no permanent barracks were required. Until about 1800, troops in central and western Europe were billeted or quartered in the homes of citizens, but this system was a hardship on the people, was unpopular, subversive to satisfactory control and discipline, and exposed the troops to many temptations of both moral and political natures. The first barracks were erected in England for the foot guards in 1660, but these were built with little regard to the comfort and health of the troops. Among the earliest of those still existing are the Royal Barracks at Dublin, Ireland, dating from 1700. By 1800, barracks had been built in several parts of Ireland, but it was not until 1792 that George III obtained Parliamentary approval for the construction of permanent barracks in England. As the English barracks were used mainly in connection with the occupancy of fortifications, their construction was charged to the Royal Engineers, but, in 1796, this work was transferred to a civil department of the Government. In 1816, a civilian comptroller was appointed to supervise the construction and maintenance of military barracks, hospitals and storehouses on sites other than those occupied by fortifications. Bedsteads and hammocks were provided the men, but, in some instances, bunks extending from wall to wall and occupied by as many as 30 or more men were found. At one time during the 19th century, from four to six married women were permitted to reside in a barrack for the purpose of "promoting cleanliness, content and convenience to the soldiers." These women were subject to ejection by the commanding officer when it was found "that their presence resulted in discord or other undesirable aspects." Animals were not permitted within the barracks; and gradually kitchens were authorized, in which rooms all food was prepared either by the soldiers in person or by certain ones selected for this purpose. The civil department of the Government relinquished control of military barracks in 1818 and their supervision was again assumed by the Corps of Royal Engineers. In 1826, the School of Military Engineering, commanded by Colonel Charles Pasley, included in its curriculum a course in practical architecture. During that period, Wellington directed the replacement of the wooden bedsteads, berths and bunks by double-decked, two-man iron beds, provisions for kitchens known then as cook-houses, and certain sanitary facilities known as ablution houses. Following this, separate messes were established for noncommissioned officers and provisions were made for dining, athletic sports and other means of diversion for the soldiers. During the latter half of the 19th century, the British war office conducted an exhaustive inspection and study of quartering facilities, as a result of which many regulations were promulgated as to types of construction, quartering, cooking and sanitary rules, and provisions for the quartering of married men and their families. In 1904, a governmental civil department was again formed under a director, known as "director of barrack construction," but this agency functioned only until 1918, when it was abolished, and the control of quartering and hospitals again reverted to the Corps of Royal Engineers, where it has since rested.

The history of barrack construction in the United States has followed quite generally that of the British Army, usually in the following order by types: tents, huts, temporary buildings (commonly known as fabricated portable buildings), light frame structures, mill construction, hollow tile and concrete block buildings, brick or stone buildings and reinforced concrete buildings. Each type has had its era, although, since 1920, all of the types, with the exception of the hut, are found in various parts of the country, dependent generally on the climatic conditions and to the degree of permanency of the garrison or camp site. In the United States, great care is taken in the selection of sites for the location of army posts, camps, arsenals, depots, proving grounds and air fields. A site moderately close to a sizable town where recreational, religious, industrial and educational facilities are available is most desirable, with due consideration being given to the local and distant rail, highway and air transportation facilities at or in the vicinity of the installation. Military reservations, and especially those to be used for posts, camps or training areas, are selected after careful consideration is given to the climatic conditions, a good elevation, potable water supply, and a generally clean environment. Following the selection of the site, the erection of barracks which provide an abundant supply of fresh air is of prime importance.

Older Type Barracks.—Of the older type barrack garrisons still in existence in the United States are: Carlisle Barracks, Carlisle, Pa.; Plattsburg Barracks and Madison Barracks, N.Y.; Forts Ontario and Niagara, N.Y.; Jefferson Barracks, Mo.; McPherson Barracks (now Ft. McPherson), Ga.; Jackson Barracks, La.; Washington Barracks (now the Army War College) D.C.; Ft. Washington, Md.; Ft. Adams, R.I.; and Vancouver Barracks, Washington.

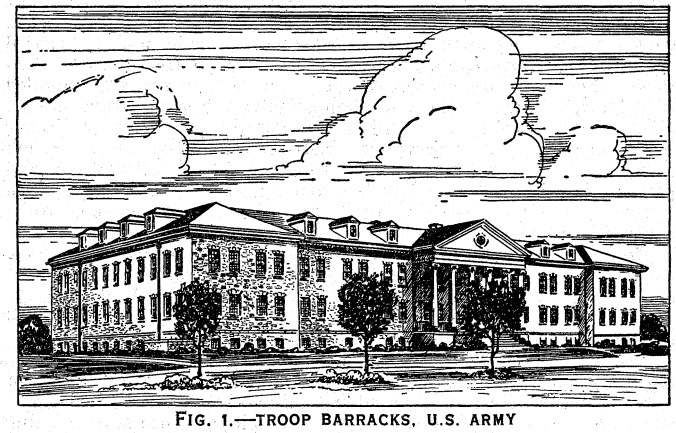

FIG. 1.—TROOP BARRACKS, U.S. ARMY

Real Estate.—Real estate on which barracks, quarters and storehouses of the United States Army are built is acquired by the War Department by purchase or condemnation, or is accepted by donation; but, in any event, only when authorized by the Congress. The Quartermaster General presents the project to the Secretary of War, who, after approving, refers it to the Assistant Secretary of War and the Judge Advocate General of the Army or the Attorney General of the United States. The funds from which final payment is made are withdrawn from annual or special appropriations made specifically for this purpose by the Congress. Real estate, the use of which is contemplated as temporary, is leased or rented. This includes camp sites for troops, office and storage space, garage space and recruiting stations. The real estate branch of the Quartermaster General's office is charged with actual procurement by purchase, lease or rental of all real estate for use in the military service.

Laws.—Laws passed by the Congress limit the cost of construction of quarters for an officer above the grade of captain to $14,500 and for an officer of and below the grade of captain to $12,500. Barracks, quarters, hospitals, storehouses and other military structures are erected either by contract or by the purchase and hire

method, the latter based on purchase of materials and employment of artisans and labour by the War Department representative. In either case, the work is closely supervised by a constructing quartermaster, who is appointed by the Secretary of War and under direct control of the Quartermaster General.

Utilities.—Electricity for power and lighting, gas for cooking, heating and shop use, and water for drinking, bathing and washing purposes, are produced on the military reservations in plants owned and operated by the Government or are purchased from the local municipality.

Maintenance.—Maintenance of utilities serving barracks, quarters, hospitals and administrative buildings, *viz.*, carpenter, electric, heating, plumbing, painting, blacksmithing and road work, is performed by the local quartermaster, who utilizes civilian and enlisted personnel for this purpose.

Modern Barracks.—Modern barracks provide five main facilities, *viz.*, dormitories, dining rooms and kitchens, sanitary provisions, administrative offices and organization property storage, and recreational rooms and equipment.

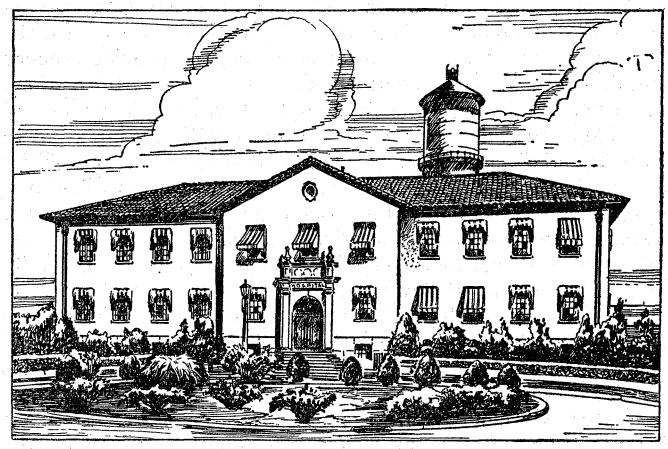

FIG. 2.—STATION HOSPITAL, U.S. ARMY

Dormitories.—Dormitories provide single iron beds for from 10 to 30 men each. The beds have a well-constructed fabric-type metal spring, a comfortable cotton-felt mattress and a feather pillow. Each soldier is provided with sheets, pillow cases and blankets in sufficient quantity to insure his comfort while resting and sleeping. Privates, corporals and sergeants, whether married or single, and unmarried enlisted men above the grade of sergeant are quartered in the barracks while married men above the grade of sergeant are provided with specially constructed non-commissioned officers' quarters having about five rooms, or are paid a commutation allowance to cover rental off the military reservation. Each man is issued a locker trunk and a clothing locker in which to store and protect his clothing and personal belongings; and his rifle and bayonet or pistol is secured in a locked arms rack, usually located along one wall of the squad room or in the hall just outside.

Heating and Ventilation.—Careful engineering studies have shown that the optimum indoor effective temperature in winter is 66°, and in summer about 71° F. To achieve this, heat must be supplied at certain periods in most climates and ventilation at all times and in all localities. Sources of artificial heat may be direct—stoves, radiators, fireplaces; indirect—hot air furnaces, steam coils, hot water pipes, radiators, or a combination of the two. Steam or hot water radiators are favoured in military construction, the direct, or direct-indirect systems seldom being employed since stove-heating is the least desirable method of warming barracks, both because of the fact that the heat is unevenly distributed (being intense close to the source and deficient at a distance) and the crowding together of soldiers in the warmer areas tending to facilitate transmission of respiratory diseases.

Under average conditions, and assuming no marked difference between indoor and outdoor temperatures, a squad room of average size and housing a normal complement of men, should provide for each of these 600–720 cu.ft. of air space. During the night (sleeping) hours, the air will require replenishment thrice hourly (1,800–2,200 cu.ft. per man per hour) though considerably less than this will suffice by day when most of the occupants are engaged elsewhere and the number in the room is thus materially reduced. But in offices and like quarters where those present are presumably active, as much as 3,000 cu.ft. per hour is required for adequate ventilation. Either natural ventilation (interchange of indoor and outdoor air via openings in the walls alone) or artificial ventilation (by the employment of mechanical devices), or both, may be found in barracks. In general, it has been determined that for natural ventilation, from 1.0 to 1.5 sq.ft. of inlet and outlet areas must be provided for the usual permanent barracks used as sleeping quarters when the outside temperature averages 50° F. and there is a mild prevailing breeze and no overcrowding or overheating within. Such areas may be supplied by simple double-sash windows—certain of these being open at the bottom to admit the (heavier) cold air from without, and others, across the room, opened at the top to permit egress of the (lighter) warm strata near the ceiling. This method may be supplemented by the use of roof ventilators for release of the heated air, or, in buildings of more than one story, of gravity exhaust ducts extending downward from the roof to the rooms below and pierced with openings located near the ceilings of these for the escape of their contained air as its temperature becomes elevated.

Bed Spacing.—Certain minimum amounts of bed and air space must be allotted each man quartered in a barrack, both to prevent actual overcrowding, and the transmission of infection from man to man (by coughing, etc.). Under usual conditions, 60 sq.ft. of floor space per bed is the least permitted, though in emergency this may temporarily be reduced to 50 sq.ft. provided ventilation be adequate. Too close a proximity of beds in a small area of a room, even though the total floor space enclosed by the containing walls meet the figure specified, is not countenanced. In other words, each bed must actually be centred in a rectangle measuring 6x10ft., with 6ft. from centre to centre of those adjoining. And further to lessen the dangers of infection, these are so arranged that the head of one sleeper lies opposite the feet of him on the adjacent bed. Likewise, since a single carrier of respiratory infection may readily contaminate all of his fellows who are susceptible, the most approved practice now limits the number of occupants of a squad room to 30.

Lighting.—Natural and artificial illumination are ordinarily employed conjointly in barrack buildings. The intensity of that received from either naturally varies with the intensity of the source and the brightness of the reflecting surfaces. Hence it is customary to employ light wall colourings, *i.e.* such as will reflect 40% to 60% of the light rays impinging upon them. Under such conditions, and with a uniform distribution of windows in the walls and no external obstructions of the visible sky area (source of natural illumination) such as shrubs, trees or nearby buildings, the minimum window glass area in terms of percentage of floor area, are recorded as follows by Lieut-Col. G. C. Dunham, U.S.A. (to whom we are indebted for the majority of the observations on sanitary precautions observed in barracks, as herein set forth).

	Minimum window glass area in % of floor area.
Squad rooms:	
Windows on one side only	20
Windows on both sides	12
Recreation rooms:	
Libraries, school rooms, drafting rooms, etc.	20
Kitchens and mess halls	15
Gymnasiums	12

In respect of artificial illumination, the minimum requirements in foot-candles (also taken from Dunham) are:

Squad room	5–7
Recreation room	
General	5–7
Reading tables or desks	7–10
Kitchen and mess halls	6–8
School rooms	
On desks	8–10
Typewriting	7–10
Gymnasium	5
Hallways	2–4
Storerooms	1–2
Laboratories	20
Operating rooms (hospital)	75

Messing Facilities.—Dining rooms have well-built and attractive mess tables, built with metal legs and wooden or non-staining composition tops, china dishes, glassware and silver-plated cutlery. The cuisine of the U.S. Army mess has improved since 1935 to such a marked degree that the American soldier enjoys a repast favourable with that set on the table of the average home in the land. Kitchen equipment is modern in that gas is generally used as fuel, sinks and work tables are built of monel metal and the pots, pans and cutlery for baking and cooking are of stainless steel or high grade aluminium. Meals are generally served from 6.30 to 7.30 in the morning, from 12 to 1 at noon, and from 5 to 6 in the evening. Cafeteria-style service predominates, although, in smaller units, the food is placed on the table in large serving dishes which are passed from one man to another. Specially detailed dining room orderlies, known as mess attendants, refill empty service dishes, set and clean the tables and perform general work about the mess. Cooks' helpers, in the ratio of one per cook and known as kitchen police, peel potatoes, wash pots and pans, scrub the floors, and perform other work as assigned by the mess sergeant or first cook, the former being charged with the general supervision of the mess, including the preparation of menus and the procurement of ration articles from the station quartermaster and from visiting hucksters of fresh fruits and vegetables.

Sanitary Provisions.—Sanitary provisions consist of shower baths, lavatories for personal ablution, toilets, foot baths and wash tubs. These rooms, commonly known as latrines, may be in the barracks proper or located in specially constructed buildings just in rear of the barracks.

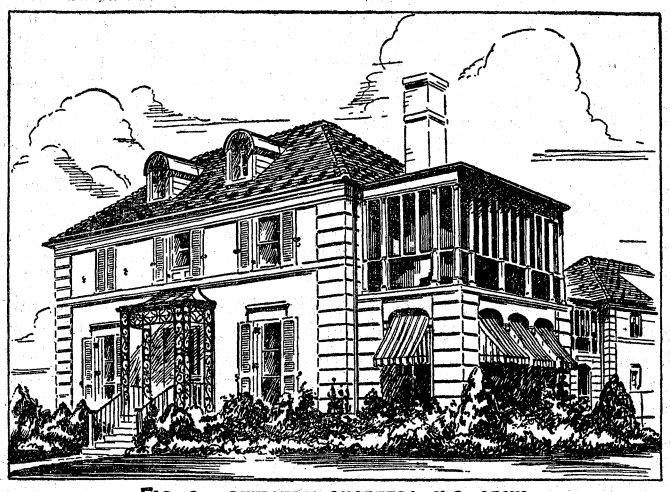

FIG. 3.—OFFICERS' QUARTERS, U.S. ARMY

Administrative Facilities.—An office, commonly known as the orderly room, for the troop, company or battery commander, the first sergeant, and the company clerk, provides the facilities required for the administration of the unit. Here the pay-rolls, morning reports, sick reports, duty rosters and other administrative records are prepared and the routine paper work conducted. Replacement clothing, bedding, miscellaneous messing and field equipment, spare weapons and ammunition are stored in the company supply room, the operation of which is charged to the supply sergeant who is assisted by the company mechanic or artificer. Normally, about a 5% reserve of clothing and equipment is carried in stock by each company.

Recreation.—Recreational facilities are usually found in the organization day room, although this term is a misnomer for its offerings are generally utilized only out-of-duty hours. Here are found a pool table, tables for cards, checkers, dominoes and other games, a radio or phonograph, writing desks, chairs and lamps for reading and studying and other miscellaneous provisions as may be desirable to promote the morale of the organization.

Welfare.—Post or garrison welfare facilities consist of a motion picture theatre where audible cinemas are presented at a lower charge to the soldier than at commercial theatres, a gymnasium, a swimming pool, bowling alleys and tennis courts. On some larger posts, a golf course is provided and horseback riding is available to men qualified to ride. The Post Exchange general store, barber shop, shoe shop, tailor shop, automobile service garage, gasoline and oil filling station and restaurant provide respective services at costs lower than are found off the reservation.

Religious Facilities.—A post chapel offers facilities for spiritual ministrations for the different religious groups of the command. Such ministrations include Catholic mass, Protestant morning and evening services, Friday services for those of Jewish faith, Sunday school and catechetical instructions.

Clubs.—A non-commissioned officers' club and an enlisted men's club provide facilities for dances, card parties, and other forms of recreation and amusement for the married soldiers and their families and for the unmarried men.

Library.—A post library and service club have provisions for other means of recreation and permit men to withdraw books to read in their barracks and magazines, newspapers and periodicals for reference in the library.

Hospital.—The station hospital provides medical and dental attention to the command and is operated at a high scale of efficiency. The post chaplain and the local representative of the American Red Cross call at the hospital daily to visit the sick and to further ensure that patients are provided with writing materials, reading matter, smokes, sweets and other desirable items, as well as to lend moral encouragement for the early recovery of the stricken soldier and, if necessary, to communicate with his relatives if he is unable to do so due to his physical condition.

Community Chest.—A post community chest offers temporary monetary assistance to those who are financially embarrassed; and, at Yuletide, a Christmas tree is erected, usually in the service club or theatre, where an afternoon or early evening local talent entertainment is held and each child of the garrison is presented with a gift suitable to its age.

Education.—Some garrisons conduct their own primary schools where children of officers and enlisted men attend at less inconvenience than riding a bus or tram car to town. Teachers are employed from the post commander's fund, which receives its income from a small share of the Post Exchange profits and from a small charge made for attendance at the school.

Burial.—A post cemetery, operated under control of the War Department, provides burial lots for soldiers with no next of kin and this last resting place is well laid out and maintained.

Bachelor Officers and Nurses.—Bachelor officers and nurses are each provided with apartment-style buildings. Each individual is allowed two rooms, a living room and a bedroom and bathroom. Usually a bachelors' mess and a nurses' mess are established in order that those quartered in the respective buildings can invite guests to meals. Some recreational facilities are usually found in these quarters, which permits the occupants to entertain themselves without leaving the building in inclement weather.

Officers' Quarters.—Officers' quarters are of two general classifications, *viz.*, field officers' (colonels, lieutenant-colonels and majors) quarters and company officers' (captains and lieutenants) quarters. The former generally have seven or eight rooms, two baths, a maid's room, laundry facilities, a garage and sometimes ground space in the rear for a garden. Quarters assigned to captains and lieutenants usually provide the same facilities as do those for field officers, differing only in the number of rooms, or perhaps their size; about six rooms and one or two baths are in these buildings.

Administrative Buildings.—Administrative buildings, other than those already mentioned, consist of post, regimental or battalion headquarters; the guard house; fire station; supply service warehouses, garage, repair shops, bakery and sales commissary; ammunition storehouses, rifle and pistol range houses; and classrooms for military instruction of the junior officers, non-commissioned officers and privates of the command. Stables are provided for the officers' mounts, the horses of the cavalry troops and the horse-drawn light field artillery, the draft mules of the wagon companies and the bell horses and pack mules of the light mountain artillery and supply pack troops.

Quartermaster, signal, medical, ordnance and chemical warehouses provide storage for staple and perishable subsistence, clothing, tools, dishes, stoves, stationery and office supplies, weapons, gas masks, radio, telephone and telegraph equipment, medicines, ammunition and powder, in addition to materials such as lumber, pipe, paints, metals and other supplies required to maintain the barracks, quarters, roads, walks and grounds. Granaries, hay and straw sheds, scale houses, sewage disposal plants, electricity generating plants, water pumping plants, and loading and unloading facilities for supplies, fuel and troops, add to the many responsibilities of the garrison commander and his staff in their administration, operation and maintenance of the barracks and other buildings necessary to shelter the troops stationed on the reservation.

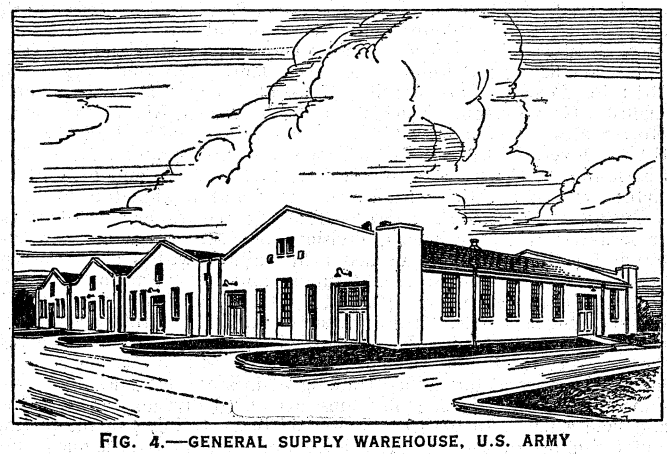

FIG. 4.—GENERAL SUPPLY WAREHOUSE, U.S. ARMY

Military Schools.—Special service schools of various classes are established at many Army posts. In the United States Army, these, in peace-time, are: Air Corps schools at Randolph and Kelly Fields, Tex.; Maxwell Field, Ala.; Chanute and Scott Fields, Ill.; Lowry Field, Colo.; and Wright Field, O.; Quartermaster Corps schools at Philadelphia, Pa.; and Holabird, Baltimore, Md.; Medical Corps, Dental Corps, and Veterinary Corps schools at Walter Reed General hospital, Washington, D. C.; Carlisle Barracks, Pa.; and Randolph Field, Texas; the Engineer Corps school at Ft. Belvoir, Va.; Ordnance Department school at Aberdeen Proving Ground, Md.; the Signal Corps school at Ft. Monmouth, N. J.; the Chemical Warfare school at Edgewood Arsenal, Md.; the Cavalry school at Ft. Riley, Kan.; the Coast Artillery school at Ft. Monroe, Va.; the Infantry school and Tank school at Ft. Benning, Ga.; the Field Artillery school at Ft. Sill, Okla.; the Army Finance school at Holabird Quartermaster Depot, Baltimore, Md.; plus 9 schools for bakers and cooks at divers posts.

Higher schools of military instruction, known as General Service schools, are located: the Command and General Staff school at Ft. Leavenworth, Kan.; and the Army Industrial college and the Army War college at Washington, D. C.

In addition to these, certain officers and enlisted men are designated annually to pursue special courses of instruction at various civilian institutions, such as Babson institute, Harvard School of Law, Harvard School of Business Education, Massachusetts Institute of Technology, Carnegie Institute of Technology, University of Michigan, Mayo hospital at Rochester (Minn.), the Coyne Electrical and Radio school at Chicago, the Dodge division of the Chrysler corporation at Detroit and with the motion picture industry at Hollywood, California.

Prisons.—United States Disciplinary Barracks for the confinement of major violators of the Articles of War are located at Governors Island, N. Y., and at Fort Leavenworth, Kansas.

Hospitals.—General hospitals are installed at Hot Springs National Park, Ark.; Fitzsimmons at Denver, Colo.; Letterman at the Presidio of San Francisco, Calif.; William Beaumont at El Paso, Tex.; Walter Reed at Washington, D. C.; Sternberg at Manila, P. I.; Tripler at Honolulu, Hawaii and Gorgas hospital in the Panama Canal Zone. Central dental laboratories are located at Washington, D. C.; Ft. McPherson at Atlanta, Ga.; Jefferson Barracks at St. Louis, Mo.; Ft. Sam Houston at San Antonio, Tex.; and at the Presidio of San Francisco, California.

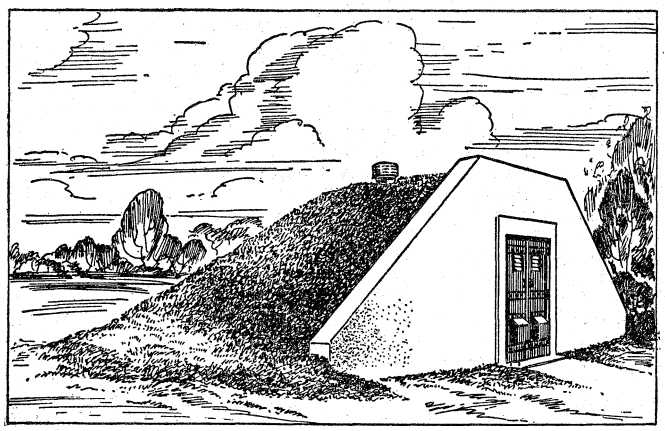

FIG. 5.—AMMUNITION AND POWDER MAGAZINE, U.S. ARMY

Supply Depots.—Supply depots, proving grounds, laboratories and arsenals are located at Columbus, Lacarne and Fairfield, O.; New Cumberland, Middletown and Philadelphia, Pa.; Brooklyn, New York city, Schenectady and Watervliet, N. Y.; San Antonio, Tex.; San Francisco, Benicia and Sacramento, Calif.; Chicago, Rock Island, Savanna and Belleville, Ill.; Baltimore, Aberdeen, Curtis Bay and Edgewood, Md.; Ft. Monroe, Portsmouth and Front Royal, Va.; Atlanta and Augusta, Ga.; Boston, Springfield and Watertown, Mass.; St. Louis, Mo.; Seattle, Wash.; New Orleans, La.; Jeffersonville, Ind.; Ogden, Utah; Dover, Metuchen, Pedricktown and Little Silver, N. J.; N. Charleston, S. C.; Ft. Wingate, N. M.; Ft. Robinson and Ft. Crook, Neb.; Ft. Wayne, Mich.; Ft. Reno, Okla.; and Washington, D.C.

Organizational Training.—Training centres are installations or localities where regiments, divisions or army corps are concentrated for the purpose of unified field training within and between the several combatant arms and supply and transportation services. These training centres are operated by the Field Artillery, Cavalry, Infantry, Signal Corps, Medical department, Coast Artillery, Quartermaster Corps, Ordnance department, Corps of Engineers, Chemical Warfare service, Tanks, Mechanized Cavalry, Military Police service, the Air Corps and for unified training of infantry brigades and divisions, cavalry brigades and divisions, armoured divisions, army corps and field armies. In the smaller organizations, training in the tactics and technique of the respective arms and services is scheduled and observed, while in the larger commands, such as divisions, corps and armies, strategical as well as tactical problems are given primary consideration. In all training, the principles of leadership, ingenuity, self-reliance, independent and quick, accurate decisions are stressed in order that no matter whether the commander or leader of the particular unit—be he the general commanding an army of several thousand men or the corporal leading a squad of but a few—should become a casualty, the second or next in command may at once assume leadership and responsibility for accomplishment of the mission assigned by higher authority.

Tent Camps.—Tent camps provide the majority of dormitory or barrack facilities during moderate and warm weather in the cooler sections of the country and throughout the year in the southern areas. Tentage is provided in various styles and sizes, dependent upon whether the command is "in the field" or "in garrison." In the field, each soldier and company, troop or battery officer is provided with one-half of a small tent, known as a shelter-half. Two of the halves are buttoned together, and, by the use of two collapsible jointed poles about 3 ft. long and several small aluminium or wooden pegs or pins, provide shelter for two junior officers or enlisted men. Men sleep on the ground and have two or more blankets, and sometimes a bed-sack, filled with straw, leaves or other readily available stuffing, to provide overnight rest and comfort. Battalion, squadron, regimental and higher commanders are allowed a tent about 9 ft. square, one or two to a tent, depending upon the rank and status of the occupants. Regimental and divisional headquarters tents, as well as supply tents, tents for shelter from the elements of mechanical repair personnel, field bakery units, bathing and delousing organizations, telephone, radio and message centre field offices, and medical and surgical operating tents are included. As both small and large troop units and commands may emerge from an open warfare or warfare of movement to a status of position or trench warfare, thence possibly into rest camps, semi-permanent garrison quarters, or even into a rather permanent bivouac status, the need for barracks and other "housekeeping" facilities may change, being influenced at the same time by the climatic conditions prevalent in the locality and by the seasons of the year.

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(M. V. B.)

BARRACUDA, a predatory, pike-shaped fish of the family Sphyraenidae. It has long, pointed jaws filled with teeth of razor-like sharpness and ranges in length from 3 ft. to 8 feet. Of about 20 species inhabiting the warmer seas, the Australian "giant pike" and the great picuda or becuna are thought to represent the largest and most vicious types, while the smaller, slender barracuda off the coast of southern California has the highest food value. Though a fish of different habits, the barracuda is thought by some to be more dangerous than a shark. Many swimming tragedies attributed in the past to sharks are now credited to the barracuda. Large barracudas, at least, are, for the most part, solitary, and lurk about tropical reefs as the pike does about the edges of pond or stream, stationary in the water, or gliding slowly about, alert and watchful. They approach fearlessly anything that moves in the water, as though from curiosity, are capable of high speed, at least for short distances, and seize smaller fishes which chance within range in a lightning rush. They are also said at times to swim on the outskirts of schools of small fishes in shallow water, herding them and preventing their escape until ready to feed. Fish is their normal food, and the risk to bathers from their attack, as from that by sharks, is doubtless exaggerated in the popular mind, but there unquestionably is a risk, though it may be slight. Because it is not easily exhausted and springs about in the most reckless fashion, the barracuda makes an excellent big-game fish. The very trait that makes it dangerous to bathers—that of pursuing any moving object—renders it easy to hook.

(J. T. N.)

BARRAGE, a term used by engineers for the construction of a dam across a river, checking the flow and so deepening the current or even creating a lake. In a military sense the term is used of the continuous line of artillery fire intended to hold up the advance of an enemy, or protect the advance of the combatant's own troops.

BARRANDE, JOACHIM (1799–1883), Austrian geologist and palaeontologist, was born at Saugues, Haute Loire, on Aug. 11, 1799, and educated in the École Polytechnique at Paris. He was tutor to the duc de Bordeaux (afterwards known as the comte de Chambord), grandson of Charles X, and when the king abdicated in 1830 Barrande accompanied the royal exiles to Prague. The first volume of his important work, *Système silurien du centre de la Bohême* (dealing with trilobites), appeared in 1852; and from that date until 1881 he issued 21 quarto volumes of text and plates. Two other volumes were issued after his death, in 1887 and 1894. He died at Frohsdorf on Oct. 5, 1883.

BARRANQUILLA, a city and port of Colombia, South America, capital of a province of the same name in the department of Atlantico, on the left bank of the Magdalena river about 7 mi. above its mouth. Population (1938) 150,395. Formerly transhipment was necessary at Puerto Colombia, but the deepening of the mouth of the river by the removal of dangerous bars, made Barranquilla a seaport as well as a river port. As the chief port of Colombia, Barranquilla is the clearing point for the Magdalena valley, handling half the foreign commerce of the country. The city does a large business in coffee, in handling the cotton grown in the surrounding region, and in exporting petroleum produced a few hundred miles up the Magdalena. Among the main industries of the city are thread and textile mills, flour mills, saw

mills, factories producing perfumes, soaps, beer, oils and greases, hats, shoes, and pharmaceutical products. Barranquilla is linked by roads and railroad with Puerto Colombia 17 mi. away, and by highway with Cartagena. The city of Barranquilla was founded in 1629, but attracted no attention as a commercial centre until about the middle of the 19th century, when efforts were initiated to secure the trade passing through Cartagena. The city is built on a low plain, is regularly laid out, and has many fine warehouses, public buildings and residences, but part consists of mud-walled cabins supported by bamboo (*guadua*) framework. The water supply is drawn from the Magdalena, and the city is provided with telephone, electric light and tram services. Suburban highways are well developed and the number of automobiles in use has increased rapidly. Daily airplane passenger service is maintained from Barranquilla to Bogotá.

BARRAS, PAUL FRANÇOIS JEAN NICOLAS, VICOMTE DE (1755–1829), member of French Directory, 1795–99, was descended from a noble family of Provence, and before the Revolution took part in French campaigns in India. In 1789 he adopted extreme democratic principles and was counted a Jacobin in the Convention, which he entered as deputy for the Var. Much of his time, however, was spent in missions to the districts of the south-east of France; and in this way he made the acquaintance of Bonaparte at the siege of Toulon. In 1794 his share in the anti-Robespierrist *coup d'état* of 9 Thermidor brought him almost to the front rank. In the next year, when the Convention was threatened by the royalist revolt of Vendémiaire it appointed Barras to command the troops engaged in its defence. His nomination of Bonaparte as one of his subalterns led to the famous "whiff of grapeshot" which shattered the royalist forces, and Barras became one of the five Directors who controlled the French republic. He was partially responsible for arranging the marriage between Bonaparte and one of his own many cast-off mistresses, Josephine de Beauharnais; and was probably also responsible for the appointment of Bonaparte to the command of the army of Italy in 1796. Barras, who made no secret either of his venality or of his prodigious sexual immorality, nevertheless acquired great prestige from Bonaparte's victories, but during the absence of the latter on his Egyptian campaign (1798) the popularity of the whole Directory rapidly declined. Barras indubitably assisted Bonaparte in his *coup d'état* of the 18th Brumaire, but the latter realized that Barras's unconcealed and indeed flaunted licentiousness made him useless to the new régime. Barras found his political career at an end, nor did he succeed after 1814 in inducing Louis XVIII. to take him seriously as a royalist supporter.

Barras left memoirs in a rough state to be drawn up by his literary executor, M. Rousselin de St. Albin. The amount of alteration which they underwent at his hands is not fully known; but M. George Duruy, who edited them on their publication in 1895, has given fairly satisfactory proofs of their genuineness. For other sources respecting Barras *see* the *Memoirs* of Gohier, Larevellière-Lépeaux and de Lescure; also Sciout, *Le Directoire* (1895–97), A. Sorel, *L'Europe et la Révolution française* (esp. vol. v. and vi., 1903–04), and A. Vandal, *L'Avènement de Bonaparte* (1902–04).

BARRATRY, in English and American law, is the indictable misdemeanour (more usually called *common barratry*) of habitually inciting and stirring up quarrels in disturbance of the peace, either in courts or elsewhere, and is punishable by fine and imprisonment. In 8 Co. Rep. 36 it is defined as "habitually to move, excite or maintain suits and quarrels." By a statute of 1726, if the person guilty of common barratry belonged to the profession of the law, he was disabled from practising in the future. For nearly two centuries there had been no record of an indictment having been preferred for this offence, but in 1889 a case occurred at the Guildford summer assizes, *R. v. Bellgrove* (*The Times,* July 8, 1889). As, however, the defendant was convicted of another offence, the charge was not proceeded upon.

In *marine insurance* barratry is any kind of fraud committed upon the owner or insurers of a ship by a master with the intention of benefiting himself at their expense. In bills of lading it is usual to except it from the shipowners' liability (*see* AFFREIGHTMENT).

BARRE, a city of Washington county, Vt., U.S.A., 7 mi. S.E. of Montpelier, on the Stephens branch of the Winooski river. It is served by the Central Vermont, the Barre and Chelsea and the Montpelier and Wells River railways. The population in 1920 was 10,008, 3,300 foreign-born; 1930, 11,307; 1940, 10,909. Barre is in the midst of large granite quarries, and its leading manufactures are monuments, tombstones, quarry machinery and pneumatic tools. The aggregate output of its 80 establishments in 1937 was valued at $6,556,061. There is a fine granite statue of Robert Burns, by J. Massey Rhind, presented in 1899 by the Scotsmen of the city. The town was organized in 1793, named after Isaac Barré (1726–1802), a defender of American rights in the British parliament, and the present city was chartered in 1894.

BARREL, a vessel of cylindrical shape, made of staves bound together by hoops, a cask; also a dry and liquid measure of capacity, varying with the commodity which it contains (*see* MEASURES AND WEIGHTS). It is a word of uncertain origin common to Romance languages. The term barrel is applied to many cylindrical objects, *e.g.,* to the drum round which the chain is wound in a crane, a capstan or a watch; to the cylinder studded with pins in a barrel-organ or music-box; to the hollow shaft in which the piston of a pump works; or to the tube of a gun. The "barrel" of a horse is that part of the body lying between the shoulders and the quarters. For the system of vaulting in architecture known as "barrel-vaulting," *see* VAULT.

BARREL-ORGAN, a small portable organ mechanically played by turning a handle. The barrel-organ owes its name to the cylinder on which the tunes are pricked out with pins and staples of various lengths, set at definite intervals according to the scheme required by the music. The function of these pins and staples is to raise balanced keys connected by simple mechanism with the valves of the pipes, which are thus mechanically opened, admitting the stream of air from the wind-chest.

Barrel-organs have been made with as many as three or four cylinders set in a circular revolving frame, but these more elaborate instruments were mainly used in churches and chapels, a purpose for which they were in great demand during the 18th and early 19th centuries. As long ago as the 15th century barrel-organs were known in Holland, where they are believed to have been invented.

BARREL VAULT, in architecture, a continuous or tunnel vault (*q.v.*), the cross section of which is the same throughout its length; a continuous arch (*q.v.*).

BARREN ISLAND, a volcanic island lying off the Andamans in the Bay of Bengal. It is irregularly circular and about 2m. in diameter, with an outer rim 700 to 1,000ft. in height and a central cone 1,015ft. high. This cone rises from a depth of 800 fathoms below the sea. It was active between 1789 and 1832.

BARRÈS, MAURICE (1862–1923), French writer and politician, was born at Charmes (Vosges) on Sept. 22, 1862. Maurice Barrès always considered himself a Lorrainer, charged with the interpretation and the vindication of his own people. His school days were spent at the Lycée of Nancy, and, immediately after, he made his literary *début* with some ironical pamphlets which successfully displayed his intellectual "dandysme." Renan paid him the compliment of being annoyed by his *Huit jours chez M. Renan* (1888).

He enhanced his reputation by the three volumes of the *Culte du moi,* which appeared from 1888 to 1891. They provoked much ridicule in the Press, but the humour, charm and "prétiosité" with which he developed his theme of the cultivation of the "ego," and thus a harmonious inner life, was hailed with delight by the younger generation. Many of the ideas which permeate his later works may be found in his second work *Un homme libre* (1889), which exercised a considerable influence on his generation. The section dealing with Lorraine was described by Ernest Lavisse as an admirable piece of historical psychology. His third book, *Le jardin de Bérénice* (1891), a novel, showed great delicacy of feeling and subtlety of style, and was inspired by the author's electoral campaign at Nancy as Boulangist candidate. He was only 26 when he was elected to the chamber, and from that time he led a life divided between literature and politics.

Intelligent, ardent, ambitious, modelling himself now on Benjamin Constant and now on Disraeli, Barrès, during the period between the end of Boulangism and the Dreyfus case, hesitated as to the wisest course to pursue. He stood for one of the Paris divisions as a Socialist patriot, and was defeated. In 1892, he wrote a short novel, *L'ennemi des lois,* the subject of which was anarchy. He travelled in Italy and in Spain. He edited for about six months a paper called *La Cocarde.* Maurras was his colleague in this venture, and together they roughly blocked out the future doctrines of the French Nationalist Party.

In 1897, he began the publication of his most important work, *Le roman de l'énergie nationale.* The generation and *milieu* described are his own. His characters are types rather than living beings, but as a delineation of a period it may be ranked with *Le Rouge et le Noir* and *L'Éducation sentimentale.* The second volume, *L'appel au soldat,* contains a vivid account of the Boulangist Movement, and the third, *Leurs figures,* a picture of parliamentary life at the time of the Panama affair, bears comparison with the pages of Saint-Simon.

The Dreyfus case, in which he took an active interest, made him a vehement Nationalist. He now assumed the position of spokesman for Lorraine, and undertook the series entitled *Bastions de l'Est. Au service de l'Allemagne* (1905) describes the year of military service under Germany of a young Alsatian, and *Colette Baudoche* (1909) tells the story of a young girl from Metz. The war brought these books a rather artificial success as propaganda. Meanwhile, Barrès was writing admirable descriptions of travel in France—*Les amitiés françaises* (1903), in Greece—*Le voyage de Sparte* (1906), in Spain—*Greco* (1912). They contain some of his best work, and some of the finest prose in the language.

The war was the apotheosis of his doctrines. He redoubled his activities. His work as a journalist had always been remarkable in quality, it now became remarkable in quantity also. He achieved the feat of writing an article for the *Echo de Paris* every day for four years. These, when they were re-issued in the long series, *L'âme française et la guerre* (1915–19), did not retain their original popularity.

After the war, Barrès carried on his rôle as defender of the French Eastern front by a mediocre work, *Le génie du Rhin* (1921). He returned to pure literature with his novel *Un jardin sur l'Oronte* (1922), which derives its inspiration from his earlier travels in the East. These he described in *Une enquête aux pays au Levant,* which appeared in 1923 on the very day, Dec. 5, of the author's sudden death in Paris from heart failure. He left much unpublished work, the materials for the autobiography, *Mémoires,* on which he was engaged, and a large correspondence, which will probably prove to be one of the most interesting of his generation.

He was, when he died, even more than Anatole France, the most significant figure among contemporary French men of letters. The influence of his political thought had worn itself out, but his literary authority still swayed the younger generation. He had the power to charm. The prejudices, the narrowness and the egotism, with which he had been reproached, gradually disappeared. The qualities of sympathy and reverence always commanded his esteem, and his epic of the countryside, *La colline inspirée* (1913), reveals the springs of his religious life. His old age would have been fruitful, and his death deprived us of recollections which might have rivalled *Les Mémoires d'outre-tombe.* Of all French writers he may best be compared with Chateaubriand. Like Chateaubriand he created but one living figure, himself, but into that figure he breathed the soul of contemporary France, and thereby captured the heart of his generation.

(A. T.)

BARRETT, LAWRENCE (1838–1891), American actor, was born of Irish parents in Paterson (N.J.), April 4, 1838. His family name was Brannigan. He made his first stage appearance at Detroit as Murad in *The French Spy* in 1853. In Dec. 1856 he made his first New York appearance at the Chambers Street Theatre as Sir Thomas Clifford in *The Hunchback.* He served with distinction in the Civil War as captain in the 28th Massachusetts infantry regiment. From 1867 to 1870, with John McCullough, he managed the California Theatre, San Francisco.

Among his many parts may be mentioned Hamlet, Lear, Macbeth, Shylock, Richard III., Wolsey, Benedick, Richelieu, David Garrick, Hernani, Alfred Evelyn, Lanciotto in George Henry Boker's (1823–90) *Francesca da Rimini,* and James Harebell in *The Man o' Airlie.* He played Othello to Booth's Iago and Cassius to his Brutus. He acted in London in 1867, 1881, 1883 and 1884. His Richelieu in Bulwer Lytton's drama was considered his best part. He wrote a life of Edwin Forrest in the *American Actors Series* (Boston, 1881), and an admirable sketch of Edwin Booth in *Edwin Booth and his Contemporaries* (Boston, 1886). He died March 20, 1891.

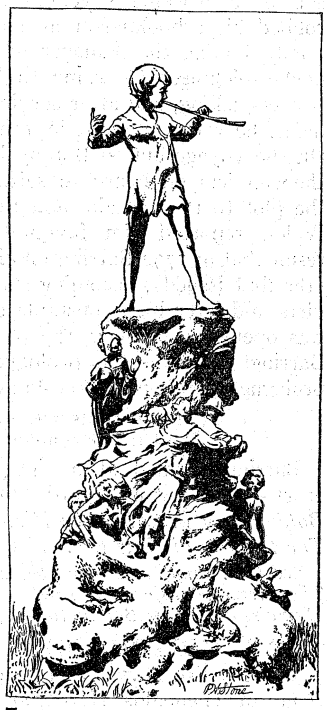
BARRETT, WILSON (1846–1904), English actor, manager, and playwright, was born in Essex on Feb. 18 1846, the son of a farmer. After experience in acting and management in the provinces, in 1879 he took the old Court theatre, where he introduced Madame Modjeska to London, in adaptations of *Maria Stuart, Adrienne Lecouvreur, La Dame aux Camélias* and other plays. In 1881, he took the Princess's theatre, and became famous in melodrama—*The Lights of London,* by G. R. Sims, *The Silver King,* by Henry Arthur Jones (1882), and *Claudian,* by W. G. Wills. Later he acted chiefly in the provinces. In 1886 he made his first visit to America, and in 1898 visited Australia. During these years the London stage was coming under new influences, and Wilson Barrett's vogue in melodrama had waned. But in 1895 his drama of religious emotion, *The Sign of the Cross,* attracted audiences outside the ordinary circle of playgoers. He died on July 22 1904.

BARRHEAD, small burgh, Renfrewshire, Scotland, on the Levern, 7½ mi. S.W. of Glasgow by the L.M.S.R. Pop. (est. 1938) 12,265. Area 1.1 sq.mi. Founded in 1773, it absorbed Arthurlie, Dovecothall and Grahamston. It does bleaching, calico-printing, cotton-spinning, weaving, iron and brass founding, engineering and the manufacture of sanitary appliances. Neilston (pop. of parish, 15,305), 2 mi. S.W., has bleachfields and print-works, and 2 mi. N.E. lie Hurlet, making alum and other chemicals, and Nitshill with chemical works, quarries and collieries.

BARRICADE or **BARRICADO,** an improvised fortification of earth, paving-stones, trees or any materials ready to hand, thrown up, especially across a street, to hinder the advance of an enemy; in the old wooden warships a fence or wooden rail, supported by stanchions and strengthened by various materials, extending across the quarter-deck as a protection during action. The word is derived from Spanish *barrica,* "a cask," casks filled with earth having been early used to form barricades.

BARRIE, SIR JAMES MATTHEW, O.M. (1860–1937), British novelist and dramatist, was born at Kirriemuir, in Forfarshire, Scotland, May 9, 1860. He began to write even before he went to school and, while he was a student at Edinburgh University, almost finished a three-volume novel. In 1883 he became leader-writer on the *Nottingham Journal,* and his career as a man of letters may be said to have begun in the following year with the appearance of an article, entitled "An Auld Licht Community," in a London paper, the *St. James's Gazette.* Frederick Greenwood, editor of the paper, gave the young writer such encouragement that he moved to London in 1885; and in 1887 appeared his first book, *Better Dead,* a jeu d'esprit based on his contributions to journalism. In 1888 *Auld Licht Idylls,* a volume of sketches of life in his native village, revealed to the world the genius of a new master of humour and pathos, and the same year saw the publication of *When a Man's Single,* a novel of journalistic life, and *An Edinburgh Eleven,* sketches of famous Edinburgh men. *A Window in Thrums,* published in 1889, set the seal on his fame as a master of what has been called Kailyard fiction (*q.v.*). Two further books appeared in 1891—*My Lady Nicotine,* which contains some of the most amusing literature ever written about smoking, and *The Little Minister,* in which he interwove the humours of Thrums with a romantic love-story. It was about this time that Barrie began to write for the theatre, and his first play, *Walker, London* (1893), won immediate success, with J. L. Toole in the chief part. There was more of the

idyllic and sentimental genius of the author in his next successful comedy, *The Professor's Love-Story* (1895). Meanwhile, in 1894, Barrie had published his beautiful autobiographical study of his early life with his mother, *Margaret Ogilvy,* and we suspect the presence of an autobiographical element again in *Sentimental Tommy,* a novel at once sympathetic and mocking, about a young Scot with an "artistic temperament," which was published in 1895. This and its sequel, *Tommy and Grizel* (1900), were Barrie's last essays in prose fiction, and with all their merits they showed that he was aiming at something outside the range of his genius. He was more happily inspired in *The Little White Bird* (1902) in which we get our first introduction to the fantastic world of Peter Pan.



THE "PETER PAN" STATUE IN KENSINGTON GARDENS, LONDON

It was on the stage, however, that Barrie was to pour out his genius in the greatest abundance and variety. His early plays, including the stage version of *The Little Minister* (1897), contain only faint hints of the dramatist who in the year 1903 was to hold the stage with no fewer than three plays (*Quality Street, The Admirable Crichton* and *Little Mary*), and who in 1904 was to endear himself to the nursery with *Peter Pan,* which has been described as "a kind of poetical pantomime." This was followed by *Alice-Sit-by-the-Fire* (1905), and by *What Every Woman Knows* (1908). *Peter and Wendy,* which was published in 1911, was only a kind of pendant to *Peter Pan.* As for the plays written since that time, Barrie became more expert, as he grew older, in preserving the balance between comedy and pathos, and more daring in preaching from the stage the very simple gospel that is to be found in his rectorial address, delivered at St. Andrews University, on Courage. In that address (1922) he described his business in life as "playing hide and seek with angels," and in most of his later work will be found an underlying appeal to make life, as far as is possible, a game with angels, to become as little children, and to prefer a heavenly failure to a too-worldly success. This is the dominant theme in *The Will,* a short and sentimental play produced in 1913, where we see the folly of success expounded in terms of commonplace life without the author's usual fantastic elaborations. *The Twelve Pound Look,* which belongs to about the same period, is a more comic treatment of the same theme.

Barrie is, in the general opinion, more infallibly an artist in his comedy than in his pathos, and *The Twelve Pound Look* is, perhaps, the most successful of all his one-act plays. *Pantaloon* and *Rosalind* are two other one-act pieces which are published in the same volume with *The Twelve Pound Look* in the collected edition. They are both plays of mixed comedy and pathos. Another and longer play written during this period was *The Adored One,* which was censured by a number of critics on the ground that it was a joke about a murder. Barrie's war plays are of no permanent importance. *A Kiss for Cinderella* (1916), though in some respects a comedy of the World War, does not depend on the War for its chief appeal, but is the fullest expression of the genius of Barrie that playgoers had had since those marvellous years, 1903 and 1904. In *A Kiss for Cinderella* we realize how near is the author's genius to that of Hans Andersen, on the one hand, and of Dickens, on the other. Like Hans Andersen he mixes the everyday world with fairyland, and like Dickens he entices us to that borderland of laughter where we suddenly find ourselves in tears. There surely never was a play in which the dramatist played "hide and seek with angels" to better purpose. In 1917, he produced *Dear Brutus,* a comedy with tragic implications, which takes us into still remoter regions of dreamland than we visit in *A Kiss for Cinderella.* In *Mary Rose* (1920), as in *A Kiss for Cinderella,* and *Dear Brutus,* we travel from reality into dreamland or into ghostland, and his comedy more than ever seems to be tinged with a deep sense of human tragedy. His only play since *Mary Rose* has been his one-act enigma, *Shall We Join the Ladies?* (1922). Barrie received a baronetcy in 1913, and the Order of Merit in 1922. He died June 19, 1937.

See J. A. Hammerton, *Barrie: The Story of a Genius* (1929).

BARRIE, capital of Simcoe county, Ontario, Canada, 56 mi. N. of Toronto, on Lake Simcoe, an important centre on the Canadian National Ry. and connection for Camp Borden nearby. It has several manufactories and is a summer resort. Pop. (1941) 9,725.

BARRIER ACT, an act passed by the General Assembly of the Church of Scotland in 1697 guarding against hasty legislation by the provision that acts involving a change in the Church law must be approved by the presbyteries and by the General Assembly.

BARRIÈRE, THÉODORE (1823–1877), French dramatist, signed, alone or in collaboration, over 100 plays; among the most successful were: *La Vie de bohème* (1849), adapted from Henri Murger's book with the novelist's help; *Manon Lescaut* (1851); *Les Filles de marbre* (1853); *L'Héritage de Monsieur Plumet* (1858); *Les Faux Bonshommes* (1856) with Ernest Capendu; *Malheureux vaincus* (1865), which was forbidden by the censor; *Le Gascon* (1878). Barrière died in Paris on Oct. 16, 1877.

See *Revue des deux mondes* (March 1859).

BARRIER REEF. The Great Barrier Reef, the largest continuous mass of coral in the world, lies off the north-east coast of Australia and extends virtually from New Guinea south of the Fly River delta (Bramble cay: 9° 15′ S., 153° 20′ E.) to about Sandy cape (24° 30′ S., 150° 20′ E.), a distance of 1,100 nautical (1,260 statute) miles. On the north its termination is probably due to the fresh muddy waters of the Fly river, on the south to the increasing coolness of the waters (68° F). It follows fairly closely the edge of the continental shelf—which here apparently represents a submerged (Pleistocene?) coastline—at about 50 fathoms. Beyond it steep submarine slopes lead down to depths of over 100 fathoms: behind it are depths of 10–25 fathoms, and towards the south of 40–60 fathoms, for the most part over a sandy bottom. In the north (Cape York peninsula) the reef keeps within 20 m. of the coast and here it is composed of sections each a few miles long separated by gaps a mile wide. Farther south it draws away to distances of 120–150 m. from the coast and also gradually breaks up into small scattered clusters. Throughout its length it varies greatly in width. Between the reef and the mainland are numerous islands, those adjoining the coast being often lofty, rugged and densely wooded fragments of the hill ranges behind. Here the muddiness or freshness of the water (Burdekin, Fitzroy, etc. rivers) operates against coral growth, and the small flat coralline islets (atolls) are in clearer waters farther out. Much discussion has centered around the formation and precise significance of the Barrier Reef. Of the two main hypotheses—the "glacial-control" hypothesis which postulates a rise in the sea-level due to melting ice, and the subsidence theory—the latter has gained most support. Trial borings (Funafuti, Ellice islands in 1903; Oyster cay, 22 m. N.E. of Cairns, 1926) have proved inconclusive, but the numerous evidences of submergence and "drowning" of coastal features in this region (*cf.* the recent and perhaps still continuing subsidence of the sea-floor north of Sandy cape) support other indications that the coral has grown upon or near the sinking rim of the continent. The outer (eastern) face of the coral is the most active and vigorously growing part, rearing nearly perpendicular walls from depths of 20–25 fathoms to a little below low-tide level. Above this the coral is dead and is smashed by storms into blocks which are piled up (*cf.* the "negro-heads," isolated blocks standing up above high-water level), ground into sand, re-compacted and ultimately form steep-sided banks and low flat-topped islets. Behind the permanently

submerged growing "front," with its well-known, but almost unbelievable, riot of colour and animal life, and its tidally submerged or above-water bank, is a zone of feebler and more irregular growth studded with numerous basins and holes. This zone sinks gradually westwards and from it rise mushroom-topped pinnacles of growing coral. Each segment of reef had its "plan" determined mainly by prevailing wind and wave direction, being usually curved in at either end and tending to form a closed oval, which then often fills up and becomes a "cay." The coral islets are colonized fairly rapidly by a select assemblage of salt-tolerant plants whose seeds are borne by birds, winds or waves—mangroves, casuarinas, pandanus palms and other creeping and flowering types. (Coconut palms are never "self-sown" here.) The rich and varied animal life includes many gaily-coloured fish, sea-urchins with poisonous spines, giant clams, star-fish, etc. Pearl oysters, once very plentiful, are still systematically fished, and these, with the trochus shell (resembling a large periwinkle) yield considerable quantities of the mother-of-pearl of trade. Another important economic product is the bêche-de-mer (trepang) or sea-cucumber, which is boiled, dried and exported in great bulk to China. Dugong, turtles and sponges (the "hard" variety) occur but are not as yet much exploited. The interior passage-way (the "Grand Canal") offers a fairway for vessels trading up this coast—sheltered and calm, while outside the breakers form a long line of surf. But the numerous rocks and reefs, the hurricanes which occur as far south as lat. 16° S., the tides which, pent in the narrows, rise in places 30 ft., and in the north the narrowness and complexity of the passageways make this also one of the most dangerous coasts of Australia. Numerous Barrier Reef problems have been systematically studied in Australia and a scientific expedition organised by the British Association went out in 1928 to undertake further investigations.

BARRIER TREATY, the name given first to the treaty signed on Oct. 29, 1709, between Great Britain and the states general of the United Netherlands, by which the latter engaged to guarantee the Protestant succession in England in favour of the house of Hanover; while Great Britain undertook to procure for the Dutch an adequate *barrier* on the side of the Netherlands, consisting of a number of fortified towns, together with the citadel of Ghent. (*Cf.* the Treaty of Ryswick, 1697, *q.v.*) A second Barrier treaty was signed between Great Britain and Holland on Jan. 29, 1713, the terms of which were included in the Treaty of Rastatt, between the emperor and France, signed on March 7, 1714. A third Barrier treaty was signed in Nov. 1715.

BARRILI, ANTONIO GIULIO (1836–1908), Italian novelist, was born at Savona, and was educated for the legal profession, which he abandoned for journalism in Genoa. He was a volunteer in the campaign of 1859 and served with Garibaldi in 1866 and 1867. From 1865 (*Capitan Dodero*) onwards he published many popular novels. Some of the best of the later ones are *Santa Cecilia* (1886), *Come un Sogno* (1875), and *L'Olmo e l'Edera* (1877). His *Raggio di Dio* appeared in 1899. Barrili also wrote two plays and various volumes of criticism, including *Il rinnovamento letterario italiano* (1890). He was elected to the Italian chamber of deputies in 1876; and in 1889 became professor of Italian literature at Genoa.

BARRING-OUT. The most typical example of this practice was at Bromfield school, Cumberland, where "it was the custom, time out of mind, for the scholars, at Fasting's Even (the beginning of Lent), to depose and exclude the master from the school for three days." During this period the school doors were barricaded and the boys armed with mock weapons. If the master's attempts to re-enter were successful, extra tasks were inflicted as a penalty, and willingly performed by the boys. On the third day terms of capitulation, usually in Latin verse, were signed, and these always conceded the immediate right to indulge in football and a cockfight. The custom was long retained at Eton and figures in many school stories.

BARRINGTON, DAINES (1727–1800), English lawyer, antiquary, and naturalist, fourth son of the first Viscount Barrington, was appointed a Welsh judge in 1757 and afterwards second justice of Chester. Though an indifferent judge, his *Observations on the Statutes, chiefly the more ancient, from Magna Charta to 21st James I., cap. 27, with an appendix, being a proposal for new-modelling the Statutes* (1766), had a high reputation among historians and constitutional antiquaries. Many of his other works are included in a volume of *Miscellanies on Various Subjects* (1781).

BARRINGTON, GEORGE (b. 1755), an Irishman with a curious history, was born at Maynooth on May 14, 1755, the son of a working silversmith named Waldron. In 1771 he robbed his schoolmaster at Dublin and ran away from school, finally joining the manager of a touring theatrical company in pocket-picking. He came to London, where he continued his pocket-picking, and after serving several long terms of imprisonment, he was sentenced in 1790 to seven years' transportation. On the voyage out to Botany bay a conspiracy was hatched by the convicts on board to seize the ship. Barrington disclosed the plot to the captain, and the latter, on reaching New South Wales, reported him favourably to the authorities, with the result that in 1792 Barrington obtained a warrant of emancipation (the first issued), becoming subsequently superintendent of convicts and later high constable of Paramatta. In 1796 a theatre was opened at Sydney, the principal actors being convicts, and Barrington wrote the prologue to the first production. The prologue contains the well-known lines:

> True patriots we, for, be it understood
> We left our country for the country's good.

Barrington died at a ripe old age at Paramatta, but the exact date is not on record. He was the author of *A Voyage to Botany Bay* (1801); *The History of New South Wales* (1802); *The History of New Holland* (1808).

See *Life, Times and Adventures of George Barrington* (1820?), and *The Genuine Life and Trial of George Barrington* (1790); *The Memoirs of George Barrington* (1790).

BARRINGTON, JOHN SHUTE, 1ST VISCOUNT (1678–1734), English lawyer and theologian, was the son of Benjamin Shute of Theobalds, Herts., and took the name of Barrington on succeeding to an estate. He was created an Irish peer as Viscount Barrington of Ardglass in 1720. Employed by Lord Somers to induce the Scottish Presbyterians to accept the union with England, he was rewarded by a place in the customs, which he lost on the change of administration in 1711. He became M.P. for Berwick in 1714, but was expelled from the House of Commons in 1723 for having taken part in the Harburg lottery. Shute was a champion of the civil rights of Protestant dissenters, and wrote some theological works. He died on Dec. 14, 1734.

BARRINGTON, SAMUEL (1729–1800), British admiral, son of the 1st Viscount Barrington. He entered the navy, and in 1747 had worked his way to a post-captaincy. On the outbreak of the Seven Years' War he served with Hawke in the Basque roads in command of the "Achilles." In 1759 the "Achilles" captured a powerful French privateer, in the Havre-de-Grace expedition of the same year carried the flag of Rear-Admiral Rodney, and in 1760 sailed with John Byron to destroy the Louisburg fortifications. Barrington was next appointed in 1768 to the frigate "Venus" as governor to the duke of Cumberland. In 1778 he became rear-admiral and went to the West Indies, where he took the island of Santa Lucia from the French, and repulsed the attempt of the Comte d'Estaing to retake it. Superseded in 1779 by Byron, he refused the command of the Channel fleet offered him on his return home. He took part in the relief of Gibraltar in October 1782, and as admiral he flew his flag for a short time in 1790, but was not employed in the French revolutionary wars. He died in 1800.

See Ralfe, *Naval Biographies,* i. 120; Charnock, *Biographia Navalis,* vi. 10.

BARRINGTON, SHUTE (1734–1826), youngest son of the 1st Viscount Barrington (*q.v.*), educated at Eton and Oxford, became successively bishop of Llandaff in 1769, Salisbury in 1782, Durham in 1791. He was a Protestant who was willing to grant Catholics "every degree of toleration short of political power," but he was most generous and kind to the emigrant French bishops and clergy. He was the last but one of the so-called Prince Bishops

of Durham, and as such was Count Palatine and *custos rotulorum*, with almost royal jurisdiction and precedence, and he well supported the dignity of his station. He died on March 25, 1826.

BARRINGTON, WILLIAM WILDMAN SHUTE, 2ND VISCOUNT (1717–1793), eldest son of the 1st Viscount Barrington, was born on Jan. 15, 1717, and died at Becket on Feb. 1, 1793. He was returned to Parliament in March 1740 as member for Berwick-upon-Tweed. In 1755 he was made a privy councillor and secretary at war, and in 1761 was appointed chancellor of the exchequer. In 1762 he became treasurer of the navy and in 1765 returned to his former position of secretary at war until Dec. 1778; during four months in 1782 he was joint postmaster-general.

See Shute Barrington, *Political Life of William Wildman, Viscount Barrington* (1814).

BARRISTER, in England and Ireland the term applied to the highest class of lawyers who have exclusive audience in all the superior courts. Every barrister in England must be a member of one of the four ancient societies called Inns of Court, viz., Lincoln's Inn, the Inner and Middle Temples, and Gray's Inn, and in Ireland, of the King's Inns. The existence of the English law schools can be traced back to the 13th century. Associations of lawyers acquired houses of their own in which students were educated in the common law, and the degrees of barrister (corresponding to apprentice or bachelor) and serjeant (corresponding to doctor) were conferred. These schools of law are now represented by the Inns of Court (*q.v.*).

Both sexes are admitted as members of the Inns of Court, on paying certain fees and on passing a general (elementary) examination or (alternatively) producing evidence of having passed a public examination at a university; their subsequent call to the bar depends on their keeping 12 terms (of which there are four in each year), and passing certain further examinations (*see* ENGLISH LAW *ad fin.*). A term is "kept" by dining six times (three for a student whose name is on the books of a university) in hall. The profession of barrister is open to almost every one; but no person connected with the law in any inferior capacity or who is a chartered or professional accountant, can enter an Inn of Court as a student until he has entirely and bona fide ceased to act or practise in such capacity. Some of the Inns also make a restriction that their members shall not be engaged in trade. A form of admission has to be filled up, containing a declaration to this effect, and mentioning *inter alia* the age, nationality, condition in life and occupation of the applicant. Previous to the student's call this declaration must be repeated, and he must further declare that he is not in holy orders, has not held any clerical preferment and has not performed any clerical functions during the year preceding. Subject to the above, practising solicitors of not less than five years' standing may be called to the bar without keeping any terms, upon passing the necessary examinations, and, *per contra*, a barrister of the same standing may, without any period of apprenticeship, become a solicitor upon passing the final examination for solicitors. Irish barristers of three years' standing may be called to the English bar without passing any examination upon keeping three terms, and so also may barristers of those colonies where the professions of barrister and solicitor are still kept distinct. No one can become a barrister till he is 21 years old.

The benchers of each Inn of Court may reject any applicant for membership with or without cause assigned; and for sufficient reasons, subject to an appeal to the judges as visitors of the Inns, they may refuse to call a student to the bar, or may expel from their society or from the profession ("dis-bar" or "dis-bench") barristers or benchers.

The peculiar business of barristers is the advocacy of causes in open court, but in England a great deal of other business falls into their hands. They are the equity draftsmen and special pleaders. The higher rank among barristers is that of king's or queen's counsel. They lead in court, and give opinions on cases submitted to them, but they cease to practise as equity draftsmen or special pleaders and to take pupils. Precedence among king's counsel, as well as among outer barristers, is determined by seniority. A king's counsel is appointed by letters patent to be "one of His Majesty's counsel learned in the law." The appointment rests with the lord chancellor, to whom the barrister desiring a silk gown makes application. There is no definite time required to elapse between "call" and application for a seat within the bar, but it is generally understood that a barrister must be of at least 10 years' standing before he is appointed a king's counsel. The first king's counsel was Sir Francis Bacon, who was appointed by James I., and received a payment of a fee of £40 a year. Succeeding king's counsel received a similar payment, until its abolition in 1831. There was not another appointment of a king's counsel until 1668, when Francis North was so honoured. From 1775 king's counsel may be said to have become a regular order. Their number was very small so late as the middle of the 19th century (20 in 1789; 30 in 1810; 28 in 1850), but at the beginning of the 20th century there were over 250. A king's counsel may not, unless by special licence, take a brief against the crown, but such a licence is never refused unless the crown desires his services in the case. The old order of serjeants-at-law (*q.v.*) is now extinct. Although every barrister has a right to practise in any court in England, each special class of business has its own practitioners, so that the bar may almost be said to be divided into several professions. The most marked distinction is that between barristers practising in chancery and barristers practising in the courts of common law. The fusion of law and equity brought about by the Judicature Acts 1873 and 1875 was expected in course of time to break down this distinction; but to a large extent the separation remains. Common law counsel usually attach themselves to a circuit and to one or more quarter sessions. Business before the court of probate, divorce and admiralty, the privy council and parliamentary committees, also exhibits this tendency to specialization. In some of the provincial cities there are also local bars. The bar of Ireland presents generally the same features as the bar of England. For the Scottish bar, *see* under ADVOCATES, FACULTY OF. There is no connection whatever between the Scottish and English bars.

Counsel is not answerable for anything spoken by him relative to the cause in hand and suggested in the client's instructions, even though it should reflect on the character of another and prove absolutely groundless, but if he mention an untruth of his own invention, or even upon instructions if it be impertinent to the matter in hand, he is then liable to an action by the party injured. Counsel may also be punished by the summary power of the court or judge as for a contempt, and by the benchers of the inn to which he may belong on cause shewn.

The rank of barrister is a necessary qualification for nearly all offices of a judicial character, and a very usual qualification for other important appointments. Not only the judgeships in the superior courts of law and equity in England and in her colonies, but nearly all the magistracies of minor rank—recorderships, county court judgeships, etc.—are restricted to the bar. The result is a unique feature in the English system of justice, viz. the perfect harmony of opinion and interest between the bar as a profession and all degrees of the judicial bench. Barristers have the rank of esquires, and are privileged from arrest whilst in attendance on the superior courts and on circuit, and also from serving on juries whilst in active practice.

Barristers cannot maintain an action for their fees, which are regarded as gratuities, nor can they, by the usage of the profession, undertake a case without the intervention of a solicitor, except in criminal cases, where a barrister may be engaged directly, by having a fee given him in open court, nor is it competent for them to enter into any contract for payment by their clients with respect to litigation.

See J. R. V. Marchant, *Barrister-at-law: an Essay on the legal position of Counsel in England* (1905); Holdsworth, *History of English Law* vol. vi.

BARROIS, CHARLES (1851–), French geologist, was born at Lille, on April 21, 1851, and studied geology there under Prof. Jules Gosselet. To this master he dedicated his first comprehensive work, *Recherches sur le terrain crétacé supérieur de l'Angleterre et de l'Irlande,* published in the *Mémoires de la société géologique du Nord* in 1876. In this essay the palaeontological zones in the Chalk and Upper Greensand of Britain were

for the first time marked out in full detail. In the year 1876 Dr. Barrois was appointed a collaborateur to the French Geological Survey, and in 1877 professor of geology in the University of Lille.

BARROS, JOÃO DE (1496–1570), called the Portuguese Livy, born at Vizeu, may be said to have been the first great historian of his country. Educated in the palace of King Manoel, he composed, at the age of 20, a romance of chivalry, the *Chronicle of the Emperor Clarimundo,* in which he is said to have had the assistance of Prince John, afterwards King John III., who gave him various important posts. In 1532 the king appointed Barros factor of the India and Mina House—positions of great responsibility and importance at a time when Lisbon was the European emporium for the trade of the East. Barros proved a good administrator, displaying great industry and disinterestedness. He made but little money where his predecessors had amassed fortunes.

At this time, John III., wishful to attract settlers to Brazil, divided it up into captaincies and gave that of Maranhão to Barros, who, associating two partners in the enterprise with himself, prepared an armada of ten vessels, carrying 900 men, which set sail in 1539. Owing to the ignorance of the pilots, the whole fleet suffered shipwreck, which entailed serious financial loss on Barros; yet not content with meeting his own obligations, he paid the debts of those who had perished in the expedition. During all these busy years he had continued his studies in his leisure hours, and shortly after the Brazilian disaster he offered to write a history of the Portuguese in India, which the king accepted. The first of the Decades of his *Asia* appeared in 1552, the Second Decade came out in 1553 and the Third in 1563, but the Fourth and final one was not published until 1615, long after the author's death (Oct. 20, 1570).

As an historian and a stylist Barros deserves the high fame he has always enjoyed. His Decades contain the early history of the Portuguese exploration and government in Asia, and is still consulted by students. Though, on the whole, impartial, Barros is the narrator and apologist of the great deeds of his countrymen, and lacks the critical spirit and intellectual acumen of Damião de Goes. Diogo do Couto continued the Decades, adding nine more. A modern *Da Asia de João de Barros, dos feitos que os Portuguezes fizeram no descubrimento e conquista dos mares e terras do Oriente* (Lisbon 1778–88) includes a life of Barros by the historian, Manoel Severim de Faria, and a copious index of all the Decades. The Decades were translated both into Italian and German.

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BARROSA, BATTLE OF, 1811. In Feb. 1811 the garrison of Cadiz made a sortie in the hope of raising the siege (*see* PENINSULAR WAR). 10,000 Spaniards and 4,000 British under the Spaniard Lapeña sailed to Tarifa and thence marched back towards Cadiz, intending to take the besiegers in rear. Victor, the French commander, sent Villatte to block the road to Cadiz where it ran over the Bermeja peninsula. This peninsula was a strip of land three miles wide, formed by the sea on one side and the Almansa creek on the other. Across its southern or mainland end stretched the Chiclana forest and beyond this rose a low ridge, known as the Heights of Barrosa, which commanded the entrance to the peninsula. Lapeña encountered Villatte after passing through the Chiclana forest and, after a sharp fight, drove him over the Almansa creek. Sir Thomas Graham, commanding the British contingent, wished to occupy the heights of Barrosa, but Lapeña, whose one desire now was to re-enter Cadiz, peremptorily ordered him to continue his march. Graham reluctantly obeyed, but as he was passing through the forest he heard that Victor with 7,000 men was advancing from the east. Realizing the importance of the heights of Barrosa, Victor ordered Ruffin to occupy their southern extremity and Leval their northern. Graham, though he had only 4,000 men, immediately decided to recover the heights. He therefore sent Dilkes' brigade against Ruffin and Wheatley's against Leval. In spite of a murderous fire of musketry and artillery, Dilkes' men steadily advanced on to the ridge in line, halted to pour a volley into the French masses on its crest, and charging, drove them headlong off the heights. Wheatley met with even greater success; his line, emerging from the forest, took Leval's columns by surprise and inflicted terrible losses upon them. Leval's supports fled without firing a shot and joined Ruffin's retreating division. The losses on both sides were extremely heavy, the British, out of 4,000 men, losing 1,200, and the French 2,000 out of 7,000. On a small scale it was one of the finest achievements of British arms in the war. (H. L. A.-F.)

BARROT, CAMILLE HYACINTHE ODILON (1791–1873), French politician, was born at Villefort (Lozère) on Sept. 19, 1791. He was called to the Parisian bar in 1811 and came into prominence in the revolution of July 1830, when he joined the National Guard and took an active part. As secretary of the municipal commission, which sat at the Hôtel de Ville and formed itself into a provisional government, he was charged to convey to the Chamber of Deputies a protest embodying the terms which the advanced Liberals wished to impose on the king to be elected. Louis Philippe's Government was far from satisfying his desires for reform and he persistently urged the "broadening of the bases of the monarchy," while he protested his loyalty to the dynasty. He was returned to the Chamber of Deputies for the department of Eure in 1831. In 1846 Barrot made a tour in the Near East, returning in time to take part in the preliminaries of revolution. He organized banquets of the disaffected in the various cities of France and demanded electoral reform to avoid revolution. He tried to support the regency of the duchess of Orleans in the chamber on Feb. 24, only to find it too late for half-measures. He acquiesced in the republic, and gave his adhesion to Gen. Cavaignac. He became the chief of Louis Napoleon's first ministry, in the hope of extracting Liberal measures, but was dismissed in 1849 as soon as he had served the president's purpose of avoiding open conflict. After the *coup d'état* of Dec. 1851 he was one of those who sought to accuse Napoleon of high treason, and suffered imprisonment. On the fall of the empire he was nominated by Thiers president of the Council of State. But his powers were then failing, and he had only filled his new office for about a year when he died at Bougival on Aug. 6 1873. Barrot was described by Thureau-Dangin as "le plus solennel des indécis, le plus méditatif des irréfléchis, le plus heureux des ambitioux, le plus austère des courtisans de la foule."

See his *Mémoires,* edited by Duvergier de Hauranne in 1875–76.

BARROW, ISAAC (1630–1677), English mathematician and divine, was educated at Charterhouse, Felsted, and St. Peter's college, Cambridge, where he studied literature, science, and philosophy. He travelled in France, Italy, and the Near East.

On his return, in 1659, to England he received ordination from Bishop Brownrig, and in 1660 he was appointed to the Greek professorship at Cambridge. In July 1662 he was elected professor of geometry in Gresham college, on the recommendation of Dr. John Wilkins, master of Trinity college and afterwards bishop of Chester; and in May 1663 he was chosen a fellow of the Royal Society, at the first election made by the council after obtaining their charter. In 1664 he became first Lucasian professor of mathematics at Cambridge, resigning in 1669 in favour of his pupil, Isaac Newton. His uncle gave him a small sinecure in Wales, and Dr. Seth Ward, bishop of Salisbury, conferred upon him a prebend in that church. In the year 1670 he was created doctor in divinity by mandate; and, upon the promotion of Dr. Pearson to the see of Chester, he was appointed to succeed him as master of Trinity college by the king's patent, Feb. 13, 1672. In 1675 Dr. Barrow was chosen vice-chancellor of the university.

By his English contemporaries Barrow was considered a mathematician second only to Newton. He was undoubtedly a clear-sighted and able mathematician, who handled admirably the severe geometrical method, and who in his *Method of Tangents* approximated to the course of reasoning by which Newton was afterwards led to the doctrine of ultimate ratios; he introduced the differential triangle, and was the first to observe explicitly the reciprocal

relation between differentiation and integration.

His *Sermons* have long enjoyed a high reputation; they are weighty pieces of reasoning, elaborate in construction and ponderous in style.

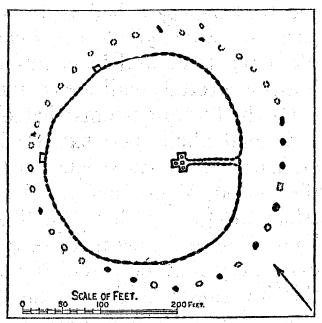
His scientific works are very numerous. The most important are:—*Euclid's Elements; Euclid's Data; Optical Lectures,* read in the public school of Cambridge; *Thirteen Geometrical Lectures; The Works of Archimedes, the Four Books of Apollonius's Conic Sections, and Theodosius's Spherics, explained in a New Method; A Lecture,* in which Archimedes' Theorems of the Sphere and Cylinder are investigated and briefly demonstrated; *Mathematical Lectures,* read in the public schools of the University of Cambridge. The above were all written in Latin. His English works have been collected and published in four volumes folio.

See Ward, *Lives of the Gresham Professors,* and Whewell's biography prefixed to the 9th vol. of Napier's edition of Barrow's *Sermons.*

BARROW, a river of south-eastern Ireland. It rises in the Slieve Bloom mountains, and flows eastward and then almost due south, to form the estuary known as Waterford harbour. Including the 12m. of the estuary, the length of its valley is rather more than 100 miles. The total area of drainage to Waterford harbour (including the basin of the Suir) is 3,500sq.m., and covers the whole of the county of Kilkenny, with parts of Waterford, Cork and Limerick, Tipperary, Carlow, King's and Queen's counties.

BARROW. The origin of barrow-making is unknown. The earliest deliberate burials occurred in the Mousterian period, in caves; and although connecting links are not numerous, the natural cave must have been the ancestor of the megalithic passage-grave. In all essentials the cave and the passage-grave are the same; the "points," so to speak, of a habitation cave are (1) the ground in front of the mouth, (2) the mouth, and (3) the dark, little used interior. Of these the mouth was the most important, and was often walled off; and it is natural to suppose that the darker recesses were used for sleeping in at night. These three features correspond fairly well with the typical arrangement of a passage-grave; and if the houses of the dead were modelled upon those of the living, as is usually supposed, there may be some truth in this suggested evolution. Megalithic burial-places were very often covered with mounds of earth or, in stony country, cairns of stone; they were in fact the first barrows, so they must be considered here.

Megalithic Barrows.—There are two types of megalithic barrow—round and long. In some regions both occur side by side, and it is supposed that they represent the circular and rectangular type of hut respectively. The three classic examples of megalithic round barrows are Gavr Inis, Britanny; New Grange, Ireland (fig. 1); and Maes Howe in Orkney. The mound of Houge Bie in Jersey belongs to the same class. In essential plan these are all identical—a huge mound covering a long flagged passage, leading to a central, or nearly central cruciform chamber; the whole mound being sometimes surrounded by a circle of stones or a ditch. There are no examples of this type in England, except possibly, in a degenerate form, in Cornwall and (more doubtfully) in Derbyshire.

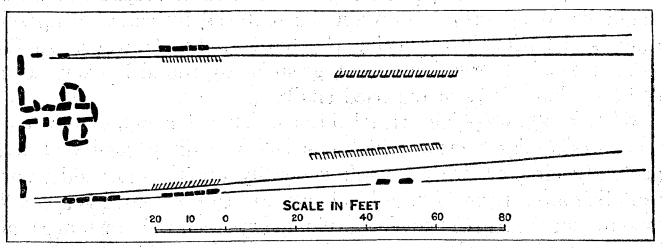


FROM COFFEY, "NEW GRANGE" (ROYAL IRISH ACADEMY)

FIG. 1.—PLAN OF CHAMBERED ROUND BARROW AT NEW GRANGE, NEAR DROGHEDA, IRELAND

Long Barrows.—The long type is called a long barrow or long cairn. Its varieties are numerous. It may be a simple mound of earth, as in Wessex, or a cairn covering stone burial-chambers, as in Oxfordshire and the Cotswolds. It has different names in foreign lands; but the navetas of Minorca, the Giants' tombs of Sardinia, and the long, rock-cut tombs so common in Mediterranean lands are all varieties of the same species. Like the round ones these long tombs were intended for collective burial. At Belas Knap, a long barrow near Cheltenham, there is a strong hint of human sacrifice; and the remains of purificatory fires were found within the cairn. Tribute was paid to Weland, the invisible smith of the Berkshire downs, nearly two thousand years after the burial-place was built; and the custom of leaving twopence there for a horse to be shod survived down to within living memory.

Long barrows are of earth and stone. Those of earth probably had wooden chambers. At Worbarrow, excavated in 1893 by Gen. Pitt-Rivers, remains of wooden posts were found inside the barrow. The substitution of earth and wood was due to the absence



FROM OVERY, "SURVEY OF WAYLAND'S SMITHY" (SOCIETY OF ANTIQUARIES, LONDON)

FIG. 2.—WAYLAND'S SMITHY, BERKS.

of suitable stone for building chambers. Wherever such stone was present it was used. In some cases it was even transported several miles. In the celebrated West Kennet long barrow near Avebury, the chambers are of sarsens or grey wethers, but the interstices between them were filled up by flat oolitic slates brought there from near Calne—that is the nearest outcrop, at any rate—seven miles away, and oolitic chips can be picked up on the surface of an unexcavated long barrow on Horton down, two miles to the south-west. In Wiltshire there are about a hundred altogether; elsewhere they are less abundant, but there are many in Hampshire and Dorset, a few in Cornwall, Somerset, Yorkshire, Kent and Sussex, and at least three in Lincolnshire.

Three types of chambered long barrows may be distinguished. At first the entrance was made in the east end, and through a portal consisting of two upright stones and a lintel. Through this one went along a narrow passage between uprights, and on either side of the passage were the burial chambers. The whole was covered in by a mound of earth and stones. To this type belong Wayland's smithy in Berks (fig. 2), several of the Somerset long barrows, and in Gloucestershire Hetty Pegler's Tump at Uley and the Nympsfield barrow close by. Later the burial chambers were entered by a passage opening in the side of the barrow; but a dummy portal was still placed at the east end, leading nowhere. Most of the Cotswold long barrows are of this later "false passage-grave" type exemplified in fig. 3. Finally, as in the St. Nicholas long barrow, the side chambers degenerated into mere cists without entrances. The long barrows of Brecknockshire belong, for the most part, to this late stage.

The makers of long barrows belonged to the Mediterranean race. The evidence of long barrow skulls is quite consistent. This burial custom continued until the invasion of the beaker-folk, but one must not imagine that the Mediterranean natives stopped making long barrows the moment the beaker-folk landed.

Bell Barrows.—The beaker-folk specialized in round barrows, of which there are many kinds. One form, the bell barrow, consists of a large mound with a ditch round it. Between the foot of the mound and the ditch there is left a narrow shelf or berm of natural ground, and round the outside of the ditch a small bank is cast up. The whole has the appearance of a bell—hence the name, invented by Colt Hoare.

All bell barrows belong to the early part of the bronze age. They are very common in Wiltshire, and some of them have yielded rich burial goods of gold and bronze. A pit, roughly circular, was first dug in the chalk; the corpse was then placed in it with the grave-goods. A mound of earth was piled on the top, and last of all a shallow ditch was dug round and the contents thrown up over the skirt of the mound. The digging of the ditch was probably a ritual performance, for in the case of certain barrows (which seem to belong to an earlier date) the ditch was much deeper and very irregularly dug, having originally served a practical purpose—that of a quarry for obtaining the material of the mound. The material of which earthen long barrows were made was certainly derived from the side ditches which flank it.

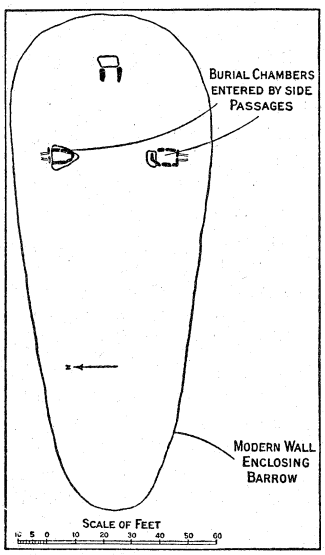
This question of the method of construction, though impor-

tant, has been little studied. A shallow ritual ditch may easily survive, but it is less easy to see why any change at all should have taken place. In a late bell barrow, at Roundwood in Hampshire, the material of the mound consisted entirely of scraped-up soil, dark in colour, such as would be obtained from the surface of a ploughed field. If during the long-barrow period there were few cultivated fields, and if later they became very common, it might be found easier to obtain the material by scraping up soil than by laboriously quarrying the hard chalk. However, so far as superficial observation goes, a great many round barrows seem to be made entirely of quarried chalk.

Disk Barrows.—The ritual ditch reached its highest development in the disk barrow, which consists of a ditch, nearly always perfectly circular, with a bank generally on its outer side, surrounding a platform of bare level ground. In the centre is a small, low mound of earth, covering (in every recorded instance) an interment of burnt bones. In no instance has a primary inhumation been found in a disk barrow. The diameter of disk barrows varies, but normally it is about 150 feet. There are two types of disk barrows, both more or less contemporary. Sometimes, in the commonest type of disk barrow, there is more than one central mound.

The disk barrows belong exclusively to the early part of the bronze age. They are thus roughly contemporary with bell barrows; but in bell barrows there have been found both beakers and copper knives. These objects are characteristic of the very earliest phase, and as they have never been found in a disk barrow it is reasonable to infer that disk barrows did not come into fashion until later. The fact, too, that the burials in them are invariably cremated points in the same direction.

In at least 25 cases certain ribbed beads of glass or faience have been found associated with early bronze age burials. The age and provenance of these beads is disputed. Sir Flinders Petrie, Professor Sayce, and Dr. Hall regarded them as Egyptian, but Sir Arthur Evans has suggested that they may have come from Crete. Opinions differ also with regard to their age. The dates mentioned by Sir Arthur Evans all fall between 1600 and 1100 B.C., and this covers the dates suggested by others and 1400 to 1200 B.C. would appear to be a central date, and one in agreement with the opinions of Egyptologists. The matter is of prime importance for British prehistoric chronology; and since out of the 25 separate instances where the beads have been found no less than five were in disk barrows, it may be concluded firstly, that all normal disk barrows are contemporary, and secondly that their date falls round about 1400–1200 B.C.



FROM THURNAM, "CRANIA BRITANNICA"

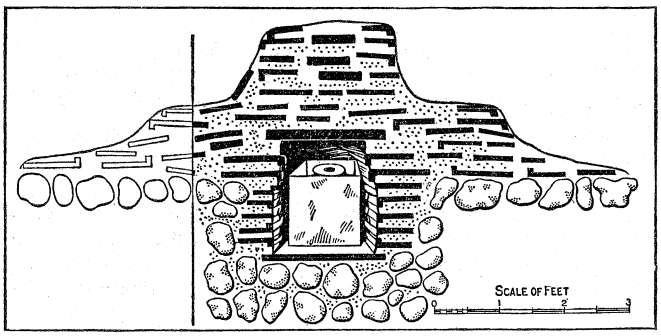
FIG. 3.—WINDMILL TUMP, RODMARTON, A COTSWOLD LONG BARROW

The beads in question are sometimes referred to as the "Stonehenge beads." But the only reason for associating them with Stonehenge is that they have been found in two separate barrows near Stonehenge. That, of course, proves nothing. It is quite usual to find regimental buttons and empty cartridge-cases in the same barrows, but this does not prove that Stonehenge was built by the British army.

The burials in disk barrows are supposed, from the nature of the grave-goods—the supposition is not necessarily correct—to have been the burial-places of women. We may, if we like, associate this fact with the supposed matriarchy of the Picts. The disk barrow was certainly an elaborate kind of burial-place, likely to have been used only for important people.

Twin Barrows.—Contemporary with disk barrows are twin barrows, which consist of two mounds with but a single ditch. It has been suggested that these are the burial-places of a man and his wife. There is no evidence to disprove this and it seems not unlikely. Sometimes, however, *three* mounds are included within the ditch. Triple barrows are less common—and do not necessarily disprove the husband and wife hypothesis.

Elsewhere in stony countries, instead of digging a pit, they made a cist of four slabs of stone; and instead of a ditch they



FROM THE "TRANSACTIONS" (ESSEX ARCHAEOLOGICAL SOCIETY)

FIG. 4.—SECTION OF TOMB IN ROMAN BARROW ON MERSEA ISLAND

surrounded the mound with a ring of upright stones. Sometimes the ring of stones was there without the mound. That stone circles were invariably burial-places would be hard to prove; exhaustive excavation of all or nearly all such circles could alone achieve it. But in all cases where such excavation has been undertaken, some remains of a burial have been found in the centre; and one may conclude that, even if they served some additional object, their primary purpose was sepulchral.

As in countries where stone is available it was used for the tomb itself and the surrounding enclosure, so the disk barrow was perhaps merely an attempt to reproduce the stone circle in a stoneless country. A burial-pit is certainly a substitute—the only possible one—for a stone cist; for even in Wiltshire, in the regions where sarsen stones occur, stone cists were actually made. Thus near Avebury several sarsen-cists have been found, some of them containing beakers. Moreover, the usual ring of stones surrounds the barrow too. Stony countries are the rule, and stoneless ones, like most of Wessex, the exception, in western Europe; and England was almost the first stoneless country that the beaker-people had met with in their wanderings. In those parts of England where stone occurs they would follow their usual practice; and in others they would conform as closely to it as the altered conditions permitted.

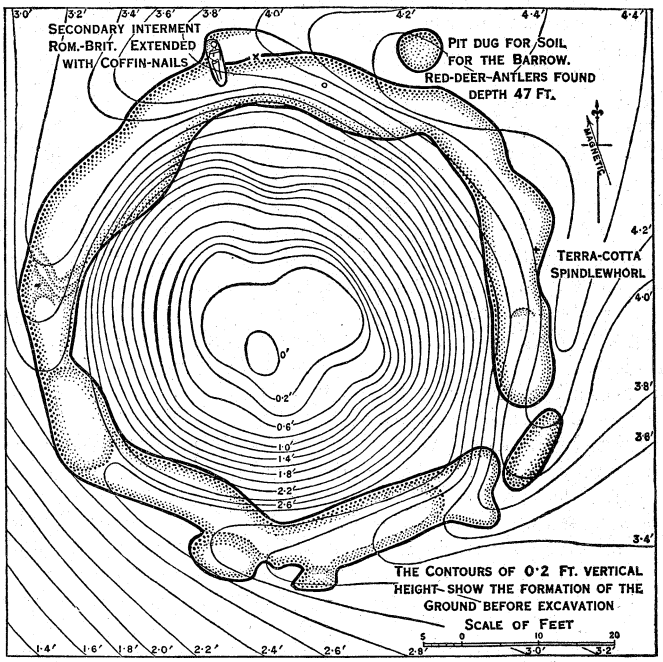
Of the burial customs that obtained in England between about 1200 and about 600 B.C. we know very little. Probably many cremation barrows belong to this period. Towards the close of the period, if not before, began those invasions of Continental tribes bringing with them, like their "beaker" predecessors, the knowledge of a new metal—iron. At least four different varieties of pottery may be associated with the tribes which took part in this invasion; though not all these varieties are necessarily contemporary. Barrows were not invariably thrown up over the cremations; it was a common practice to dig a hole in an existing barrow and put the cinerary urn with the bones in it. Several barrows, made at an earlier date perhaps, have been found thus "potted." One found in 1925 on Woodminton down in south Wilts contained 28 burials in urns, all more or less fragmentary, only eight being capable of complete restoration.

Urn-fields.—Urn-fields were an alternative method of disposing of the dead. Sometimes they were near barrows—Gen. Pitt-Rivers found a small one on Handley hill, Dorset, near his Barrow 24. It consisted of 52 pits, each containing burnt bones, and in 47 cases there was an urn as well. The pottery used for this purpose, here and elsewhere, is generally of the finger-tip type, which is coarse and contains a large admixture of pounded flint grit. It is very friable and is the despair of pot-menders. Urn-fields also occur in the Lower Thames basin; the urns from one at Ashford in Middlesex are in the British Museum.

The finger-tip people invaded Yorkshire, for their pottery has recently been found at Scarborough on the site where later the

Romans built a signal station. A still later wave of invaders built barrows—the only iron age barrows known in this country. They are called the Danes' graves and some, still to be seen in a small copse near Driffield in the East Riding, contained remains characteristic of the first La Tène period (500–300 B.C.). The barrows are quite small and are placed close together.

The later iron age people, whom Caesar found here, buried in urn-fields, the most celebrated being those at Aylesford and



FROM "EXCAVATIONS IN CRANBORNE CHASE," BY PERMISSION OF CAPT. PITT-RIVERS

FIG. 5.—BARROW IN CRANBORNE CHASE, DORSET, WITH IRREGULAR DITCH

Swarling in Kent. It is possible that mounds covered these interments and were ploughed away, but there is no such evidence.

Roman Barrows.—The Romans occasionally buried in barrows, particularly in the east of England. Roman barrows are peculiar on account of their steep, conical outline. Six—called the Six Hills—occur at Stevenage in Hertfordshire, and there is another at Youngbury in the same county. The Bartlow hills in Essex are similar, and yielded beautiful enamelled casquets and other objects. There is another on Mersea island, Essex. Sometimes these barrows contain a brick chamber, and the burnt remains are generally in a beautiful jar of green glass. A fine Roman interment, once possibly covered by a barrow, was found at Radnage, near Bledisloe in the Chilterns. The contents are in the British Museum.

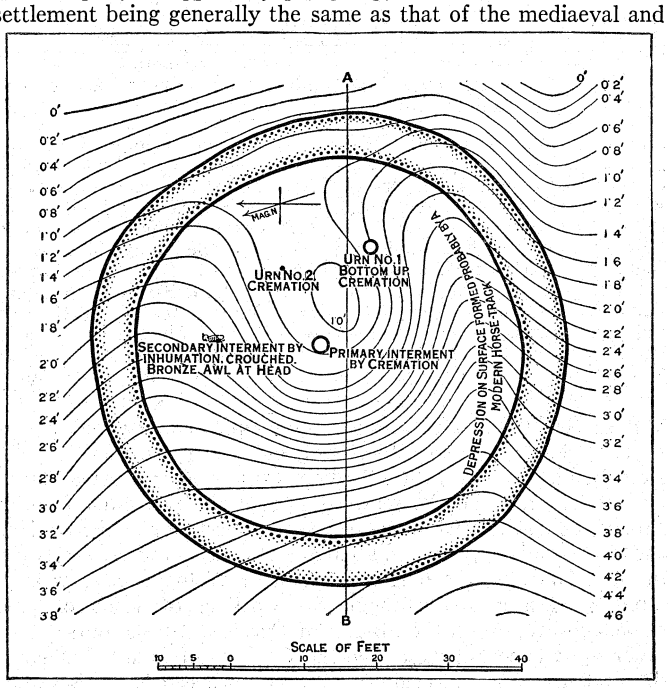
One class of mound sometimes called a barrow, seldom, if ever, yields an interment. It consists of a low, flat rectangular mound rather like a pillow; there is often a longitudinal crease down the middle, and sometimes grooves or creases at right angles to and on either side of the central one. These mounds often occur near and within hill-top camps, but may be of more recent date. One of the best groups is that on Steeple Langford Cowdown, near Yarnbury in Wiltshire. No satisfactory explanation of the purpose of these mounds has ever been put forward. It has been suggested that they are artificial rabbit warrens, but such temptations to burrow seem rather superfluous. One such in Hollybush camp on the Malvern hills has been twice excavated without providing a solution of the problem.

Saxon Barrows.—The Saxons certainly made barrows, and the best example near Oxford is the Asthall barrow. It is a very big mound and the interment was by cremation, so that the valuable grave-goods were much damaged. No doubt such burial was reserved for important people, then as in earlier times, for the usual method of burial during the period was either in flat cemeteries or as secondary interments in prehistoric barrows. It is quite common to find these secondary interments in all the prehistoric barrows described; they are generally at no great depth in the body of the mound. Such remains have been found in Wiltshire in disk barrows as well as in more bulky mounds, and in that county they are much more common than flat cemeteries. In the Cotswolds secondary interments of the Anglo-Saxon period have been found in the long barrows at Swell, Crawley and Lyneham.

On the Berkshire downs is a gigantic mound called now Scutchamer Knob, which is the modern form of *Cwichelmes-hlew*. It is two miles from West Ilsley, but is best approached from West Hendred and Ginge on the north. This mound is mentioned in the Anglo-Saxon Chronicle under the year 1086, where it is said that the Danes went along Ashdown, that is to say along the Ridgeway, to Cwichelmes-hlew. It was probably the burial-mound of Cwichelm, the first king of Wessex. A similar mound may have existed at Challow, near Wantage—the hill of Ceawa.

A celebrated find of gold jewellery was made in a barrow in Taplow churchyard. It is probable that this barrow was of Anglo-Saxon construction, for the name of Taplow originally signified the hill of Taepa; and by analogy we may conclude that by his "hill" was meant his barrow. (The difference in connotation between *beorh*, barrow, and *hlaew*, hill, is unknown, but *hlaew* may have meant a *big* hill, both natural and artificial.)

In Kent are a number of Saxon barrows. Like the Danes' graves, they occur in large numbers, set close together, and are small. There is a group in Greenwich park and another on Barham downs. Both groups contained burials of the pre-Christian period (A.D. 450–600). Mounds might have been visible over the graves in some of the other so-called "flat" cemeteries, did not these nearly always occur on ploughed land. These small mounds would rapidly disappear by ploughing; and the site of the Saxon settlement being generally the same as that of the mediaeval and



FROM "EXCAVATIONS IN CRANBORNE CHASE," BY PERMISSION OF CAPT. PITT-RIVERS

FIG. 6.—PLAN OF BARROW NO. 23, HANDLEY HILL, DORSET. EXCAVATED IN AUGUST, 1893

modern village, the site of the earlier cemetery was nearly always included within the common fields of the township.

Castle Mounds.—Castle mounds, which are often mistaken for barrows, usually have a courtyard or bailey attached, the pair resembling a loaf of bread in plan. In one instance, in Wales, a mound served both purposes, being used as a castle mound and containing in its centre a stone cist with a prehistoric burial. The tops of castle mounds were fortified by a wooden keep or castle, or by a stone wall, whose hard foundations may sometimes be detected round the rim. The centre is sometimes hollow, and there is generally a deep, wide moat, with a causeway for the entrance. If the mound is a barrow, the surrounding ditch is not, as a rule, so big.

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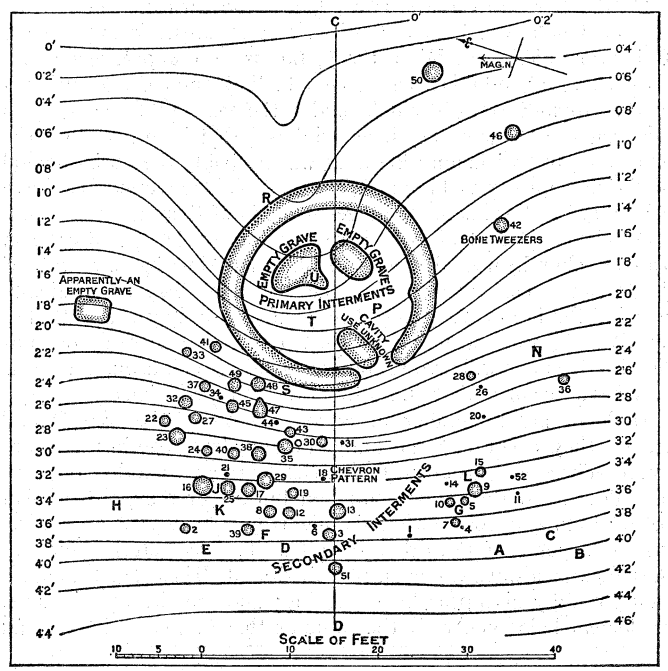

FROM "EXCAVATIONS IN CRANBORNE CHASE," BY PERMISSION OF CAPT. PITT-RIVERS

FIG. 7.—PLAN OF BARROW NO. 24, HANDLEY HILL, DORSET. EXCAVATED IN 1893 BY GENERAL PITT RIVERS

Naenia Cornubiae (1872); W. Greenwell and George Rolleston, *British Barrows* (1878); O. Montelius, *Der Orient und Europa* (Stockholm, 1899); T. H. Bryce, "Explorations among the Cairns of Bute and Arran," Proc. Soc. Ant. Scot., vols. xxxvi.–xxxviii. (1901–3); *Place-names of Berkshire,* p. 31 (1911); George Coffey, *New Graves* (1912); Mrs. M. E. Cunnington, "List of the Long Barrows of Wiltshire" (with first-hand description of each), *Wilts. Arch. Mag.,* xxxviii. pp. 379–414 (Devizes, June, 1914); O. G. S. Crawford, *Long Barrows and Stone Circles of the Cotswolds and the Welsh Marches* (1925); *Buckinghamshire Place-names,* English Place-name Society, vol. ii. p. 14 (Cambridge, 1925); O. G. S. Crawford and Alex. Keiller, "Wessex from the Air" (1928); Ordnance Survey Professional Papers Nos. 6 and 8. (O. G. S. C.)

BARROW-IN-FURNESS, municipal, county and parliamentary borough, Lancashire, England, 264½ mi. N.W. by N. from London, on the L.M.S.R. Pop. (1938) 66,850. Area (land) 17.2 sq.mi. It is on the seaward side of the peninsula forming part of the district of Furness, between the estuary of the Duddon and Morecambe bay, where a narrow channel intervenes between the mainland and the long low island of Walney. Barrow is of rapid modern growth through the working of veins of pure haematite iron ore in the district of Furness. At the outset Barrow merely exported the ore to the furnaces of South Wales and the midlands. At the beginning of the 19th century this export amounted to a few thousand tons, and though it had reached some 50,000 in 1847 the population of Barrow was only 325. In 1846 the first section of the Furness railway was opened, connecting Barrow with the mines near Dalton; in the ensuing years a great increase in trade justified the opening of further communications, and in 1859 the ironworks of Messrs. Schneider & Hannay were instituted. The Barrow Haematite Steel company (1866) absorbed this company, and a great output of steel produced by the Bessemer process was begun. Other industries followed. Of these the shipbuilding works came to surpass the steel works in importance, but were founded on them. The first vessel was launched in 1873. The greater part of this industry is carried on by the firm of Vickers-Armstrongs, whose yards occupy over 100 ac. Both naval and merchant vessels were built here, but the specialty of these yards, for which no geographical reason can be given, is the construction of submarines. Most British submarines, other than those built at naval dockyards, have come from Barrow. The town shares with Belfast and the Clyde the pick of the new liner tonnage. In 1932 Barrow launched the only large vessel of the year, "Queen of Bermuda," and in 1934 six liners of similar size were launched. Other industries include a petroleum storage establishment, a paper-pulp factory, and engineering and wagon works with tool and boiler-making a specialty.

The docks in the strait between Barrow Island and the mainland were constructed in 1867. The Ramsden docks are a subsequent extension. There is also a graving dock. Passenger steamers run to Belfast. The Cavendish dock adjoining the Ramsden dock on the east is leased to the firm of Vickers-Armstrongs for the construction of aircraft. The former firm of Vickers, Sons and Maxim (originally Vickers, Sons and Co.) changed its name in 1911 to Vickers, Ltd. (*q.v.*). Vickerstown, on Walney Island, is a residential suburb of Barrow. The James Dunn park is on the east, and the Biggar Bank, a public recreation ground facing the Irish sea, on the west side of the island. Barrow was incorporated in 1867, became a county borough in 1888, and has returned one member to parliament since 1885.

BARROWE or BARROW, **HENRY** (1550?–1593), English Puritan, was born about 1550, at Shipdam, Norfolk. He graduated from Clare hall, Cambridge, in 1569–70. About 1580 or 1581 he retired to the country, and was led by study to the strictest form of Puritanism. He came into intimate relations with John Greenwood, the Separatist leader, whose views (probably due in part at least to Browne's influence) he adopted without reserve. He was associate with "the brethren of the Separation" in London at this time. Greenwood having been imprisoned in the Clink, Barrowe came from the country to visit him, and on Nov. 19, 1586, was detained by the goaler at the instigation of Archbishop Whitgift. After nearly six months' irregular detention he and Greenwood were formally indicted (May 1587) for recusancy. They were ordered to find heavy bail for conformity, and they remained in prison for the rest of their lives. During his imprisonments he was engaged in written controversy with Robert Browne (down to 1588). He also wrote treatises in defence of separatism and congregational independency, the most important being:—*A True Description of the Visible Congregation of the Saints, etc.* (1589); *A Plain Refutation of Mr. Gifford's Booke, intituled A Short Treatise Gainst the Donatistes of England* (1590–91), and *A Brief Discovery of the False Church* (1590). In 1590 it was resolved to proceed on a capital charge of "devising and circulating seditious books." They were tried and sentenced to death on March 23, 1593. They were hanged early on the morning of April 6.

The opinions of Browne and Barrowe had much in common, but were not identical. Both advocated congregational independency. But the ideal of Browne was a spiritual democracy, towards which separation was only a means. Barrowe, on the other hand, regarded the whole established church order as polluted by the relics of Roman Catholicism, and insisted on separation as essential to pure worship and discipline (*see* further CONGREGATIONALISM).

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BARRY, SIR CHARLES (1795–1860), English architect, was born in London on May 23 1795, the son of a stationer. He was articled to a firm of architects till 1817, when he set out on a three years' tour in Greece and Italy, Egypt and Palestine to study architecture. In 1820 he settled in London. One of his first works was the church of St. Peter at Brighton, in 1826. In 1831 he completed the Travellers' club in Pall Mall, a splendid work in the Italian style and the first of its kind built in London. In the same style and on a grander scale he built in 1837 the Reform club. He was also engaged on numerous private mansions in London, the finest being Bridgewater house (1847). Birmingham possesses one of his best works in King Edward's school which he built in the Tudor style between 1833 and

1836. For Manchester he designed the Royal Institution of Fine Arts (1824) and the Athenaeum (1836), and for Halifax the town hall. He was engaged for some years in reconstructing the Treasury buildings, Whitehall. But his masterpiece, notwithstanding all unfavourable criticism, is the houses of parliament at Westminster (1840–60). Barry was elected A.R.A. in 1840 and R.A. in the following year, and received many foreign honours. He was knighted in 1852. He died suddenly at Clapham, London, on May 12, 1860, and was buried in Westminster abbey. In 1867 appeared a life of him by his son Bishop Alfred Barry (1826–1910). *See* H. H. Statham, *The Architectural Genius of Sir C. Barry* (1901).

His son, EDWARD MIDDLETON BARRY (1830–1880), was also an architect, and was professor of architecture at the Royal academy from 1873 until his death. He completed his father's work on the houses of parliament at Westminster, and Halifax town hall. Other buildings designed by him were Covent Garden theatre, Charing Cross and Cannon Street hotels, the Birmingham and Midland institute, new galleries for the National gallery and new chambers for the Inner Temple.

The youngest son, SIR JOHN WOLFE WOLFE-BARRY (1836–1918), civil engineer, who assumed the additional name of Wolfe in 1898, was educated at Glenalmond, and articled as engineering pupil to Sir John Hawkshaw, with whom he built the railway bridges across the Thames at Charing Cross and Cannon street. In 1867 he worked on his own account. Among the works on which he was engaged were extensions of the Metropolitan District railway, the St. Paul's station and bridge of the London, Chatham and Dover railway, the Barry docks of the Barry Railway company near Cardiff, the lock entrance, dock and graving dock at Immingham, Grimsby, the extensions of the Surrey Commercial docks on the Thames, the Tower and new Kew bridges over the Thames. On the completion of the Tower bridge, in 1894, he was made a C.B., becoming K.C.B. three years later. Wolfe-Barry served on a number of important royal commissions, notably on that on London Traffic (1903–05), and 1892–1906 was one of the two British representatives on the International Suez commission. He led in promoting (1901–02) the Engineering Standards committee for the standardization of certain engineering products. He died at Chelsea on Jan. 29, 1918.

BARRY, ELIZABETH (1658–1713), English actress. At first she was unsuccessful on the stage; but she was coached by her lover the earl of Rochester. Her performance as Isabella, queen of Hungary, in the earl of Orrery's *Mustapha,* was said to have caused Charles II and the duke and duchess of York so much delight that the duchess took lessons in English from her, and when she became queen she gave Mrs. Barry her coronation robes in which to appear as Elizabeth. Mrs. Barry is said to have created over 100 parts. In 1709 she retired from the stage and died on Nov. 7, 1713.

BARRY, JAMES (1741–1806), British painter, was born at Cork on Oct. 11, 1741. His picture of the "Conversion by St. Patrick of the King at Cashel" (1763) brought him the acquaintance and friendship of Edmund Burke, who, with other friends, sent him abroad to study art. In 1773 he was elected R.A., and he exhibited pictures on classical and historical subjects in the Academy year by year until 1776. Of these the most famous is the "Death of General Wolfe," familiar through numerous engravings. The reason why he ceased to exhibit at the Academy seems to have been annoyance at the reception of this picture. He was expelled from the Academy in 1799 on account of his *Letter to the Dilettanti Society,* which expressed a good deal of contempt for his contemporaries. In 1773 he published *An Inquiry into the Real and Imaginary Obstructions to the Acquisition of the Arts in England,* vindicating the capacity of the English for the fine arts and indicating some of the circumstances which had prevented their progress. In 1777 he agreed to decorate the interior of the hall of the Society of Arts in the Adelphi, a task which occupied him for seven years. Barry died on Feb. 22, 1806.

BARRY, JOHN (*c.* 1745–1803), U.S. naval officer, was born in County Wexford, Ireland, and bred to the sea. At the age of 21 he was a merchant shipmaster out of Philadelphia, and, at the outbreak of the American Revolution, he outfitted the first Continental fleet in the fall of 1775. Commissioned captain of the Continental brig "Lexington," on March 14, 1776, he early distinguished himself by capturing, after a sharp engagement, the British tender "Edward," the first prize brought into the port of Philadelphia. When Howe's army advanced across New Jersey, threatening Philadelphia in Dec., 1776, Barry volunteered as aide-de-camp to General John Cadwalader, commanding a Philadelphia brigade, and saw action at the second battle of Trenton, or Assunpink Creek, and at Princeton. Meanwhile, congress had ranked him as seventh captain on the seniority list, and commissioned him to the frigate "Effingham." Before she was ready for sea, in Sept. 1777, Howe's advance from Brandywine forced Barry to take the unfinished frigate up the Delaware, where he scuttled and sank her by orders of General George Washington. In the winter of 1777–78, Barry commanded a spectacular boat foray, which ran the British batteries at Philadelphia, and raided enemy shipping in Delaware river and bay. Ordered to Boston to command the frigate "Raleigh," he was unfortunate in being sighted by a superior enemy force shortly after he put to sea in Sept. 1778. Chased for 48 hours, he was finally cornered off Wooden Ball Island, near the mouth of the Penobscot, where he fought a gallant but futile action against a British 64-gun ship and a frigate, and actually managed to get about one-third of his crew ashore in safety. In the fall of 1780, Barry was placed in command of the frigate "Alliance," his first assignment being to convey Col. John Laurens on a diplomatic mission to France. This he accomplished, taking several prizes on the way, and, on his return, had a spectacular engagement with two British sloops of war, which attacked him, by means of sweeps, while the "Alliance" lay becalmed off Newfoundland. Barry was wounded and the "Alliance" badly mauled when a slight breeze arose, and he turned the tables on his opponents by bringing his guns to bear and quickly subduing both of them. His second voyage to France was to take the Marquis de Lafayette home after Yorktown. On the final cruise of the "Alliance," beginning in Aug. 1782, Barry ranged the shipping lanes from Bermuda to Cape Sable, was caught in the fringe of a hurricane which had wrecked the British fleet homeward bound from Jamaica, and took four of them, as well as a half-dozen other prizes. He put into Lorient to refit, and was delayed by a mutiny among his officers. Sailing just in advance of the completion of the peace negotiations, Barry touched at Martinique and Havana on his homeward voyage, picked up a bullion shipment at the latter port, and, in the Gulf of Florida fought the last engagement of the Revolutionary War, on March 10, 1783. Three British frigates sought to intercept him and he beat them off, badly damaging the frigate "Sybil." After a voyage to Canton in the China trade, Barry retired from the sea, but was recalled to active service as senior captain of the new U.S. navy, on June 4, 1794, and superintended the construction of the frigate "United States," which he commanded thereafter. In the quasi-war with France he twice was in command of all U.S. ships in the West Indies, and took a number of French privateers. In 1799–1800, he carried two of the U.S. commissioners sent by John Adams to try to arrange a peaceful settlement of the differences with France. He landed them at Corunna after a stormy passage. Retained on the list of captains after President Jefferson's naval reduction of 1801, Barry was too ill to respond to a request that he command a squadron intended for the Mediterranean in 1802 to deal with the Barbary powers. However, his success in training young officers—Decatur, Somers, Stewart, Jacob Jones, Trippe, etc., who later became celebrated in U.S. naval history—had already gained him the courtesy title, "Father of our Navy." The entire nation mourned his death in Philadelphia, on Sept. 13, 1803.

See "A Biographical Sketch of Commodore John Barry" in the *Port Folio* (July 1813); M. J. Griffin, *The History of Commodore John Barry* (Philadelphia, 1897); and William Bell Clark, *Gallant John Barry* (New York, 1938). (W. B. CK.)

BARRY, SPRANGER (1719–1777), British actor, was born in Dublin, on Nov. 23, 1719, the son of a silversmith. His first London appearance was made in 1746 as Othello at Drury Lane theatre. In *Hamlet* and *Macbeth* he alternated with Garrick, arousing the latter's jealousy by his success as Romeo. This resulted in his leaving Drury Lane for Covent Garden theatre in 1750, accompanied by Mrs. Cibber, his Juliet. Both houses now at once put on *Romeo and Juliet* and Barry's impersonation was preferred by the critics to Garrick's. In 1758 Barry built the Crow Street theatre, Dublin, and later a new theatre in Cork.

His second wife, ANN STREET BARRY, was born in Bath in 1734. Early in life she married an actor of the name of Dancer, and it was as Mrs. Dancer that she made her first recorded appearance in 1758 as Cordelia to Spranger Barry's Lear at the Crow Street theatre. It was not until she came to Drury Lane with Barry that her reputation advanced to the high point at which it afterwards stood. She died on Nov. 29, 1801, and was buried in Westminster abbey.

BARRY, a municipal borough, Glamorganshire, Wales, 8 mi. S.W. from Cardiff on the Bristol channel. Pop. (est. 1938) 35,810. Area, 6.7 sq.mi. A small brook named Barri runs here into the sea, whence the place was formerly known in Welsh as Aber-Barri; but the name of both the river and the island is supposed to be derived from Baruch, a Welsh saint of the 7th century, who had a cell on the island. His chapel, which still existed in Leland's time, was a place of pilgrimage in the middle ages. One of the followers of Fitzhamon, about the end of the 11th century, built a castle at Barry, of which only a gateway remains.

Barry comprises the ecclesiastical parishes of Barry, Cadoxton, Merthyr-Dovan, and a portion of Sully in which is included Barry Island (194 ac.), now, however, artificially joined to the mainland. The total population of this area in 1881 was 478, that of Barry village alone being only 85. The enormous increase in the population of more than 35,000 in 60 years was entirely brought about by coal exporting during the last quarter of the 19th century. The great demand for steam coal at that time gave opportunities for a number of colliery owners to secure an alternative port to Cardiff, with an independent railway to it from the coalfields. After failing in 1883, they obtained parliamentary powers for this purpose in 1884, and the first sod of the new dock at Barry was cut in November of that year. The docks are 114 ac. in extent, and have accommodation for the largest vessels afloat. Further docks were built in 1889 and 1898.

As a great coal-exporting town it had railway connections with the Rhondda valley by the Barry railway, with Aberdare and Merthyr by the junction of the Barry and Taff Vale at Treforest, and with the G.W.R. main line at St. Fagans. There are also connections with the Rhymney, Brecon and Merthyr, and Vale of Glamorgan railways and the L.M.S.R. All the smaller lines are now incorporated with the G.W.R. After 1918, in particular, Barry, together with "Barry Island," became a favourite resort for the mining valleys—a development which increased with modern motor transport and was encouraged by the municipal authorities. There is a women's training college which draws most of its students from the industrial valleys. Barry, which is in the Llandaff and Barry parliamentary division of Glamorganshire, was incorporated in 1939.

BARRY, a term in heraldry for a transverse division of the shield into equal partitions; this is termed "barry of six (eight or ten) pieces," according to the number of the divisions. The term *barry-bendy* is used when the transverse lines (barways) are crossed by vertical lines (bendways).

BARRYMORE, ETHEL (1879–), American actress, was born on Aug. 15, 1879 in Philadelphia (Pa.), and was educated at the convent of Notre Dame in that city. She made her début in 1896 in the company of her uncle, John Drew. In 1897 she first appeared in England in *Secret Service,* and in 1898 with Sir Henry Irving's company in *The Bells* and *Peter the Great.* She was first starred by Charles Frohman in *Captain Jinks* in 1900, and became one of the leading actresses in the United States, appearing in, among other plays, *A Doll's House* (1905), *Alice-Sit-by-the-Fire* (1906), *Captain Jinks* (1907), *Mid-Channel* (1910), *Declassé* (1922), *The Second Mrs. Tanqueray* (1924), *Hamlet* and *The Merchant of Venice* (1925–26), *The Constant Wife* (1926), and *Rasputin and the Empress* (1933).

Her brother JOHN BARRYMORE (1882–1942) first appeared on the stage in *Magda* in 1903. He appeared in *The Jest* (1919), *Richard III* (1920) and *Hamlet* (1923). He repeated *Hamlet* at the Haymarket Theatre, London (1925). He also achieved success as a film actor. He died May 29, 1942.

Another brother, LIONEL BARRYMORE (1878–), made his first appearance in 1893 in *The Rivals,* his grandmother, Mrs. John Drew, taking the part of Mrs. Malaprop, and he has had a successful career on both stage and screen.

BAR-ṢALĪBĪ, JACOB or **DIONYSIUS,** the best-known and most voluminous writer in the Syrian Jacobite church of the 12th century. (Jacob was his baptismal name; Dionysius he assumed when consecrated to the bishopric.) Like Bar-Hebraeus, he was a native of Malatia on the Upper Euphrates. In 1154 he was created bishop of Mar'ash by the patriarch Athanasius VIII.; a year later the diocese of Mabbōg was added to his charge. In 1166 Michael I., the successor of Athanasius, transferred him to the metropolitan see of Amid in Mesopotamia, and there he remained till his death in 1171. A long account of his writings, with copious extracts from some of them, has been given by Assemani (*Bibl. Orient.* ii. pp. 156–211); *see* also W. Wright (*Syriac Literature,* pp. 246–50). His commentaries on the Gospels were used by Dudley Loftus in the 17th century.

BARSI, a town of British India, in the Sholapur district of Bombay, lying within a tract entirely surrounded by the Nizam's dominions. Pop. (1941) 34,839. Barsi is a flourishing centre of trade, exporting to Bombay large quantities of cotton and oilseeds. There are oil and cotton mills. It is connected with the main line of the Great Indian Peninsula railway by a light railway.

BAR SINISTER, a phrase used for a charge in heraldry denoting bastardy; ignorantly used, for heraldry knows nothing of a bar sinister. It is one of the words of Sir Walter Scott, who had many imitators. More cautious writers speak of a bend sinister, a charge as strange to mediaeval English heraldry, which has, indeed, no piece set apart to signify bastard descent, although the later heralds have been wont to mark the bastard's arms with a *bâton sinister couped.* This charge seems now out of fashion, a wavy border having taken its place.

BAR-SUR-AUBE, a town of France, capital of an arrondissement, department of Aube, 34 mi. E. by S. of Troyes on the railway between that town and Belfort. Pop. (1936) 3,939. Bar-sur-Aube lies at the foot of hills on the right bank of the Aube at its confluence with the Bresse. Traces of a Roman settlement have been found to the south of the town. Under the counts of Champagne it had important fairs which did not cease till 1648. During the Napoleonic wars several actions took place here. Boulevards occupy the site of the old ramparts. The churches of St. Pierre and St. Maclou both date mainly from the end of the 12th century—St. Pierre has wooden exterior galleries and two fine Gothic porches. The wine of the district is of some repute, and there is an annual wool fair. The town is the seat of a sub-prefect and has a tribunal of first instance.

BAR-SUR-SEINE, a town of France, department of Aube, on the left bank of the Seine, 20 mi. S.E. of Troyes by the Eastern railway. Pop. (1936) 2,394. The town lies under a hill crowned by ruins of the castle of the counts of Bar, and consists chiefly of one long street. Devastated in 1359 by the English, when, according to Froissart, no fewer than 900 mansions were burnt, it also suffered greatly in the religious wars of the 16th century. The church of St. Étienne of the 16th and 17th centuries contains some fine stained glass. Bar-sur-Seine has a tribunal of first instance. Wood-sawing is carried on, and there is trade in wine and wood, and in the products of paper-mills and tanneries. The Canal de la Haute-Seine begins here.

BART, JEAN (1651–1702), French admiral, the son of a fisherman, saw his first service with the Dutch Navy, but on the outbreak of the war with France, entered the French naval service. Louis XIV., hearing of his exploits against the pirates of the North Sea, made him captain of a frigate in 1686. He had resource, wit, and a navigating skill which made him a terror to English commerce during the wars between Louis XIV. and William III. In 1689 he forced his way through the Anglo-Dutch cruisers carrying a cargo of ammunition from Calais to Brest; in the same year he was imprisoned at Plymouth, from whence he escaped with four others, crossing to St. Malo in a yawl. In 1692 he made a daring descent on the coast of England, burning several merchant ships on the way. He is one of the heroes of the French Navy, and his native town of Dunkirk has a square named after him.

See A. Richer, *Vie de Jean Bart,* (Epinal, 1837); H. Malo, *Les Corsaires,* (1912).

BARTELS, HANS VON (1856–1913), German painter, was born in Hamburg, the son of Dr. N. F. F. von Bartels, a Russian government official. He studied under the marine painter R. Hardorff in Hamburg, under C. Schweitzer in Düsseldorf and C. Oesterley in Hamburg, and at the Berlin School of Art. After some time spent in travel he settled in Munich in 1885 and was

appointed professor of painting in 1891. An oil painter of great power, Bartels was one of the leading German water-colour painters, his work consisting mainly of seascapes and scenes of fishing life. He excels in storm scenes and in depicting the strong, healthy fishing-folk of the northern coasts. Among his principal works are: "Sturmflut" (Berlin Gallery); "Lonely Beach" (Hungarian National Gallery); "Potato Harvest-Rügen" (Prague); "Storm—Bornholm" (German emperor's collection); and "Moonlight on the Zuyder Zee" (New Pinakothek, Munich). He died at Munich on Oct. 5, 1913.

BARTENSTEIN, a town in the Königsberg district of East Prussia, at the junction of the Königsberg–Lyck railway with branches from north-east and south-west. Pop. (1939) 13,010. It is an agricultural centre with some wool-spinning.

BARTER, the term used to describe the direct exchange of commodities without the use of a medium of exchange. Barter still exists in the interior of Africa and of South America. Barter from Fr. *barater,* to exchange, to truck, reminds us that, however the processes of exchange may be disguised by the immediate translation of goods into money or money into goods, all trade essentially remains barter. Moreover, if direct barter has its obvious imperfections, the indirect barter which consists in buying or selling for money has also its imperfections. (*See* MONEY; BANKING AND CREDIT; TRADE, PRIMITIVE.)

BARTET (REGNAULT), **JEANNE JULIA** (1854–1941), French actress, was born in Paris and trained at the Conservatoire. In 1872 she began a successful career at the Vaudeville, and in 1879 was engaged at the Comédie Française, of which she became a *sociétaire* in 1880. For many years she played the chief parts both in tragedy and comedy, her grand style and exquisite finesse making her supreme among the younger actresses on the French stage. She had a season in London in 1908. She made her farewell to the stage in 1919 and died in Paris in Nov. 1941.

BARTH, HEINRICH (1821–1865), German explorer, was born at Hamburg on Feb. 16 1821, and educated at Berlin university, where he graduated in 1844. He had already visited Italy and Sicily and had formed a plan to journey through the Mediterranean countries. After studying Arabic in London he set out on his travels in 1845. From Tangier he made his way overland throughout the length of north Africa, visiting the sites of the ancient cities of Barbary and Cyrenaica. He also travelled through Egypt, ascending the Nile to Wadi Halfa and crossing the desert to Berenice. While in Egypt he was attacked and wounded by robbers. Crossing the Sinai peninsula he traversed Palestine, Syria, Asia Minor, Turkey and Greece, everywhere examining the remains of antiquity; and returned to Berlin in 1847. For a time he was engaged there as *Privatdozent,* and in preparing for publication the narrative of his *Wanderungen durch die Küstenländer des Mittelmeeres,* which appeared in 1849.

At the instance of Bunsen and other scientists, Barth and Adolf Overweg, a Prussian astronomer, were appointed colleagues of James Richardson, an explorer of the Sahara who had been selected by the British government to open up commercial relations with the states of the central and western Sudan. The party left Tripoli early in 1850, but the deaths of Richardson (March, 1851) and Overweg (Sept., 1852) left Barth to carry on the mission alone. He returned to Europe in Sept. 1855, after one of the most fruitful expeditions ever undertaken in inner Africa. In addition to journeys across the Sahara, Barth traversed the country from Lake Chad and Bagirmi on the east to Timbuktu on the west and Cameroon on the south, making prolonged sojourns in the ancient sultanates or emirates of Bornu, Kano, Nupe, Sokoto and Gando and at Timbuktu. He studied minutely the topography, history, civilization and resources of the countries he visited. The story of his travels was published simultaneously in English and German, under the title *Travels and Discoveries in North and Central Africa* (1857–58). For accuracy, interest, variety and extent of information Barth's *Travels* have few rivals among works of the kind. It is a book that will always rank as a standard authority on the regions in question, of which a great part, under the name of Nigeria, has since come under British rule. Barth returned to Germany, where he prepared a collection of Central African vocabularies (Gotha, 1862–66). In 1858 he undertook another journey in Asia Minor, and in 1862 visited Turkey in Europe. In the following year he was appointed professor of geography at Berlin university and president of the Geographical Society. He died at Berlin on Nov. 25 1865.

See Schubert's *Heinrich Barth, der Bahnbrecher der deutschen Afrikaforschung* (Berlin, 1897). An edition of the *Travels* in two volumes was published in London in 1890 (Minerva Library of Famous Books).

BARTH, KASPAR VON (1587–1658), German philologist, was born at Küstrin, in Brandenburg. Of his writings the most important are: *Adversaria* (1624), a storehouse of miscellaneous learning, dealing not only with classical but also with mediaeval and modern writers; and commentaries on Claudian (1612, 1650) and Statius (1664).

BARTH, a town on the Grabow inlet of the Baltic sea, west of Stralsund, in the Prussian province of Pomerania. Pop. (1939) 12,042. Industries include shipbuilding and cabinet-making.

BARTHÉLEMY, AUGUSTE MARSEILLE (1796–1867), French satirical poet, was born at Marseille. His name can hardly be separated from that of his friend and compatriot, J. P. A. Méry (1798–1866), with whom he carried on in Paris so intimate a collaboration that it is not possible to distinguish their personalities in their joint works. In 1825 appeared a clever political satire on the Government of Charles X., *Les. Sidiennes,* followed by *La Villéliade où la prise du chatêau de Rivoli* (1827), *La Corbiéréide* (1827), *La Peyronnéide* (1827), the joint productions of Barthélemy and Méry. The success was immediate and pronounced; 15 editions of the *Villéliade* were called for during the year. A rapid succession of political squibs and satires was now poured forth by the authors, among the most remarkable being *Biographie des quarante de l'académie française* (1826), and *Napoléon en Égypte* (1828), which passed through nearly a dozen editions in a year. In 1829 Barthélemy was imprisoned and fined 1,000 francs for the publication of their *Fils de l'homme,* a poem on the duke of Reichstadt, Napoleon's son. The revolution in 1830 liberated him and he and Méry celebrated the triumph of the people in one of their most brilliant efforts, *L'Insurrection.* From March 1831 to April 1832 they produced a series of verse satires issued weekly, the *Némésis,* attacking the Government and ministers of Louis Philippe. For the next few years he enjoyed a handsome pension from the Government and refrained from all satirical writing. He again resumed his old style in 1844 but without the former success.

See J. Garson, *Barthélemy et Méry étudiés spécialement dans leurs rapports avec la légende napoléonienne,* in vol. lviii. of the *Mémoires* of the Académie Royale . . . de Belgique, and the *Oeuvres* of Barthélemy and Méry, collected, with a notice by L. Reybaud, in 1831.

BARTHÉLEMY, FRANÇOIS, MARQUIS DE (1747 or 1750–1830), French politician, was elected a member of the Directory in May 1797, through royalist influence, but was arrested at the *coup d'état* of the 18 Fructidor (1797) and deported to French Guiana, but escaped. He returned to France after the 18 Brumaire, entered the senate in Feb. 1800 and contributed to the establishment of the empire. In 1814 he abandoned Napoleon, and was named peer of France, after the second Restoration receiving the title marquis.

His *Papiers* were published by J. Kaulek (Paris, 4 vols., 1886–88).

BARTHÉLEMY, JEAN JACQUES (1716–1795), French writer and numismatist, was born in Cassis, Provence. In 1744 he became assistant to M. Gros de Boze, keeper of the royal collection of medals, and in 1753 succeeded him. In 1755 he accompanied the French ambassador, M. de Stainville, afterwards duc de Choiseul, to Italy, where he spent three years in archaeological research. Choiseul had a great regard for Barthélemy, and on his return to France, Barthélemy became an inmate of his house, and received valuable preferments from his patron.

Barthélemy was the author of a number of learned works on antiquarian subjects, but the great work on which his fame rests is *Voyage du jeune Anacharsis en Grèce, vers le milieu du quatrième siècle avant l'ère chrétienne* (1787). He began it in 1757 and worked on it for 30 years. The hero, a young Scythian,

descended from the famous philosopher Anacharsis, is supposed to repair to Greece for instruction in his early youth, and after making the tour of her republics, colonies and islands, to return to his native country and write this book in his old age, after the Macedonian hero had overturned the Persian empire. In the manner of modern travellers, he gives an account of the customs, government and antiquities of the country he is supposed to have visited; a copious introduction supplies whatever may be wanting in respect to historical details; while various dissertations on the music of the Greeks, on the literature of the Athenians and on the economy, pursuits, ruling passions, manners and customs of the surrounding states supply ample information on the subjects of which they treat.

BIBLIOGRAPHY.—Barthélemy's correspondence with Paolo Paciaudi was edited by Ch. Nisard with the *Correspondance inédite du comte de Caylus* (1877); his letters to the comte de Caylus were published by Antoine Serieys as *Voyage en Italie* (1801); and his letters to Mme. du Deffand in the *Correspondance complète de Mme. du Deffand avec la duchesse de Choiseul, l'abbé Barthélemy et M. Craufurt* (1866), edited by the marquis de Sainte-Aulaire. *See* also *Mémoires sur la vie de l'abbé Barthélemy, écrits par lui-même* (1824), with a notice by Lalande. His *Oeuvres complètes* (1821) contain a notice by Villenave.

BARTHÉLEMY SAINT-HILAIRE, JULES (1805–1895), French philosopher and statesman, was born in Paris on Aug. 19, 1805, and died on Nov. 24, 1895. In his early years he was a journalist, and from 1826 to 1830 opposed the reactionary policy of the king in *Le Globe*. At the revolution of 1830 he signed the protestation of the journalists on July 28, 1830. After 1830 he contributed to *Le Constitutionnel, Le National* and the *Courrier français* until 1833, when he turned to ancient philosophy, undertaking a translation of Aristotle, which occupied him from 1837 to 1892. He obtained the chair of ancient philosophy at the Collège de France (1838) and a seat at the Academy of Moral and Political Science (1839). After the revolution of 1848 he was elected as a republican deputy; but withdrew after the *coup d'état* of Louis Napoleon. Elected deputy again in 1869, he joined the opposition to the empire, and in 1871 supported Thiers for the presidency. Appointed senator for life in 1875, he was minister of foreign affairs in the cabinet of Jules Ferry, and promoted the establishment of a French protectorate over Tunis. His principal works, besides the translation of Aristotle (35 vols.) are: *De la logique d'Aristote* (1838); *Pensées de Marc-Aurèle* (1876); *M. V. Cousin, Sa vie et sa correspondance* (1895); *Des Védas* (1854); *Le Bouddha et sa Religion* (1860); *Du Bouddhisme* (1855); *Mahomet et le Coran* (1865).

See G. Picot, *B. Saint-Hilaire, Notice historique* (1899).

BARTHEZ, or BARTHÈS, **PAUL JOSEPH** (1734–1806), French physician, was born on Dec. 11, 1734, at Montpellier. He began the study of medicine at Montpellier in 1750, taking his doctor's degree in 1753. In 1759 he obtained a medical professorship at Montpellier, and in 1774 he was created joint chancellor of the university. In 1778 he published his most famous work, *Nouveaux élémens de la science de l'homme,* in which he employs the expression "vital principle" as a convenient term for the cause of the phenomena of life.

On the outbreak of the French Revolution he was settled in Paris, being consulting physician to Louis XVI. He lost much of his fortune and retired to Carcassonne, where he devoted himself to the study of theoretical medicine and wrote his *Nouvelle mécanique des mouvements de l'homme et des animaux* (1798). In 1802 he published his *Traitement des maladies goutteuses.* He died in Paris on Oct. 15, 1806. He bequeathed his books and manuscripts to J. Lordat, who published two volumes of his *Consultations de médecine* in 1810.

BARTHOLINUS, GASPARD (CASPAR BERTHELSEN) (1585–1629), physician, was born in 1585 at Malmö, in Sweden. His precocity was extraordinary; at three years of age he was able to read, and in his 13th year he composed Greek and Latin orations and delivered them in public. He studied at Copenhagen and afterwards at Rostock and Wittenberg. He then travelled through Germany, the Netherlands, England, France and Italy. In 1613 he became professor of medicine in the university of Copenhagen, and filled that office for 11 years, when, falling into a dangerous illness, he made a vow that if he should recover he would apply himself solely to the study of divinity. He fulfilled his vow by becoming professor of divinity at Copenhagen and canon of Roskilde. He died on July 13, 1629, at Sorö in Zeeland.

Of his sons, THOMAS (1616–1680) was born at Copenhagen, where, after a long course of study in various universities of Europe, he was appointed successively professor of mathematics (1647) and anatomy (1648). During his tenure of the latter chair he distinguished himself by observations on the lymphatics. In 1661 he retired to Hagestaed. He died at Hagestaed in 1680. Another son, ERASMUS (1625–1698), born at Roskilde, spent 10 years in visiting England, Holland, Germany and Italy, and filled the chairs of mathematics and medicine at Copenhagen. He discovered double refraction in Iceland spar (*Experimenta crystalli islandici disdiaclastici,* Copenhagen, 1669). He died at Copenhagen in 1698. In the third generation CASPAR THOMESON (1655–1738), son of Thomas, also taught anatomy at Copenhagen, his name being associated with the description of one of the ducts of the sublingual gland and of the *glandulae Bartholini,* while his younger brother, THOMAS (1659–1690), was a student of northern antiquities who published *Antiquitatum Danicarum libri tres* in 1689.

BARTHOLOMAEUS ANGLICUS (DE GLANVILLA), English Franciscan, who joined the Order in France. After studying at Oxford, he became a lector at Paris (*c.* 1220) and later at Magdeburg (*c.* 1230), whither he was invited by the general of the province of Saxony. About 1250—not 1350, as often stated—he wrote his famous *De Proprietatibus Rerum,* an encyclopaedia giving a good idea of the general culture of his day. In seeking to summarize the theories of the saints and philosophers concerning things which bear on the Scriptures, Bartholomew treats of everything from God to the lowest element, earth. Of special interest are his views on everyday life, geography, psychology, physiology, anatomy and disease, plant and animal life, cosmology and meteorology. The trend of his scientific tendencies and his metaphysical views suggest that he may have been a pupil of Grosseteste at Oxford.

The popularity of his book is attested by the early translations into many European vernaculars and by the numerous *incunabula.* It was translated into English by Trevisa in 1398 and was well known to Elizabethan writers. Selections from Trevisa are incorporated in R. Steele's *Mediaeval Lore from Bartholomew Anglicus* (1905) and in G. C. Coulton's *Social Life in Britain from the Conquest to the Reformation* (1919).

See also A. Schneider, "Metaphys. Begriffe d. B. Anglicus" in *Festgabe f. C. Baeumker* (Münster, 1913); T. Plasmann, "B. Anglicus" in *Arch. Fran. Hist.*, p. 68 sq. (biographical article) (1919); L. Thorndike, *Hist. of Magic and Experimental Science,* vol. ii. (1923).

BARTHOLOMEW, ST., the Apostle: *see* APOSTLE. For Massacre *see* ST. BARTHOLOMEW, MASSACRE OF.

BARTHOLOMEW, JOHN (1831–1893), Scottish cartographer, was born in Edinburgh, the son of a map publisher. He was for some time assistant to the German geographer, August Petermann, until in 1856 he took up the management of his father's firm. Among his numerous publications mention may be specially made of the series of maps of Great Britain reduced from the Ordnance Survey to scales of $\frac{1}{2}$ in. and $\frac{1}{4}$ in. to 1 m., with relief shown by contours and a systematic scale of colours. The $\frac{1}{2}$ in. series was extended by his son, J. G. Bartholomew.

BARTHOLOMEW FAIR, a fair held in West Smithfield, London, on St. Bartholomew's Day from 1133 to 1855. The charter was granted by Henry I. to his former minstrel, Rahere, who had founded the priory of St. Bartholomew. For centuries the fair lasted a fortnight, but in 1691 it was shortened to four days. In 1641 it involved no less than four parishes: Christ Church, Great and Little St. Bartholomew's, and St. Sepulchre's. It was customary for the lord mayor of London to open the fair formally on St. Bartholomew's Eve. The fair grew to be a vast national market and the chief cloth sale in the kingdom. Down to 1854 it was usual for the representative of the Merchant Taylors' Guild to proceed to the cloth fair which formed part of Bartholomew Fair, and test the measures used for selling cloth

there by the company's silver yard. The fair was finally closed in 1855.

For a full account *see* Prof. H. Morley, *Memoirs of Bartholomew Fair* (1859).

BARTHOU, JEAN LOUIS (1862–1934), French politician, was born at Oloron-Sainte-Marie Aug. 25, 1862. He practised as a lawyer in Pau and in 1889 was elected deputy. He became Minister of Public Works in the Cabinet of Charles Dupuy, 1894, in which Poincaré also made his début as Finance Minister. Minister of the Interior in the Méline Cabinet of 1896, he returned to the office of Minister of Public Works in 1906, under Sarrien. Successively Keeper of the Seals and Minister of Justice, he combined in 1913 the duties of Premier and Minister of Public Instruction. He was minister without portfolio in Painlevé's cabinet during World War I, Minister of War in that of Briand in 1921 and represented France at the Genoa Conference, 1922. Barthou was elected senator in July 1922 and was president of the Reparations Commission in October of the same year. In July 1926 he was appointed Vice-President and Minister of Justice in Poincaré's cabinet. As foreign minister in 1934, he visited Prague, Warsaw, and Belgrade, to discuss plans for an "Eastern Pact." On Oct. 9, 1934, he was assassinated at Marseilles with King Alexander of Yugoslavia.

BARTIN, a town in the vilayet of Zonguldak in Turkey, retaining the name of the ancient village Parthenia and situated near the mouth of the Bartan-su (anc. Parthenius), which formed part of the boundary between Bithynia and Paphlagonia. The town, which is the residence of a *kaimmakam,* is built on two low limestone hills and its streets are paved with limestone blocks. It is noted for the fine box-wood grown in the vicinity, is a port of call for Black sea coasting steamers and carries on a considerable trade with Istanbul which might be increased were it not for the obstruction of the harbour by a bar. Population 64,227.

BARTIZAN, a small battlemented turret, corbelled out at the angle of a wall or tower to protect a warder and enable him to see around him. Bartizans generally are furnished with ovlets or arrow-slits.

BARTLESVILLE, a city in the midst of the oil and gas fields of north-east Oklahoma, U.S.A., on the Caney river, 18m. from the Kansas line; the county seat of Washington county. It is on federal highways 60 and 75, is served by the Santa Fe and the Missouri-Kansas-Texas railways and has a commercial airport. The city was incorporated in 1897. In 1900 the population was 698; in 1920, 14,417, of whom 92% were native white; and in 1940 it was 16,267.

About 25 oil and gas companies have offices in the city, where the first oil well, drilled in 1897, is still producing. There is a large zinc and lead smelter. An experiment station of the U.S. bureau of mines is there, with a staff of 40 technicians occupied exclusively with problems in oil and gas. The city is well laid out, with streets 100 ft. wide as the rule. It has four parks, a number of substantial and handsome public and business buildings, including a fine high school and junior college, and a civic centre with a large auditorium.

BARTLETT, JOHN (1820–1905), American publisher and compiler, was born in Plymouth (Mass.), on June 14, 1820. He became a bookseller and publisher in Cambridge (Mass.), was a volunteer paymaster for a short time on the South Atlantic Squadron, and from 1865 to 1889, when he retired, was a member of the publishing house of Little, Brown and Company in Boston. In 1855 he published the first edition of his *Familiar Quotations,* subsequently greatly expanded, and in 1894, after many years' labour, he published his *New and Complete Concordance . . . of Shakespeare,* surpassing any of its predecessors in the number and fullness of its citations from the poet's writings. In all of his work he was greatly assisted by his wife, a granddaughter of President Joseph Willard of Harvard and a daughter of Sidney Willard, professor of Hebrew there. Bartlett died at Cambridge (Mass.), on Dec. 3, 1905.

See the sketches by M. H. Morgan in Amer. Acad. of Arts and Sciences, *Proceedings* (vol. 41, 1908) and by T. W. Higginson in *Carlyle's Laugh and Other Surprises* (1909).

BARTLETT, JOHN RUSSELL (1805–1886), American historical and linguistic student, was born at Providence (R.I.), Oct. 23, 1805. After a varied mercantile career he was in 1850–53 commissioner for the survey of the boundary between the United States and Mexico. As a result of this work he published *A Personal Narrative of Explorations and Incidents in Texas, New Mexico, California, Sonora and Chihuahua* (2 vols., 1854). From 1855 to 1872 he was secretary of State of Rhode Island, and in this capacity thoroughly rearranged and classified the State records, and prepared various bibliographies and compilations, relating in the main to the history of the State. He is chiefly remembered, however, for his *Dictionary of Americanisms* (1848), a pioneer work. He died in Providence, May 28, 1886.

BARTLETT, PAUL WAYLAND (1865–1925), American sculptor, was born in New Haven (Conn.), the son of Truman H. Bartlett, an art critic and sculptor. When 15, he began to study at Paris under Frémiet, modelling from animals in the Jardin des Plantes. He won a medal at the Paris Salon of 1887. Among his early works are: "The Bear Tamer," in the Metropolitan Museum of Art, New York; the equestrian statue of Lafayette, in the Place du Carrousel, Paris, the powerful and virile Columbus and Michelangelo, in the congressional library, Washington, D.C.; the "Ghost Dancer," in the Pennsylvania academy, Philadelphia; the "Dying Lion"; the equestrian statue of McClellan in Philadelphia; and a statue of Joseph Warren in Boston, Massachusetts. Of his later works the most notable are the group in the pediment over the House wing of the Capitol, Washington, D.C.; the six statues in front of the New York public library; a statue of Benjamin Franklin at Waterbury (Conn.); and "Patriotism" in red granite at Duluth, Minnesota. He was made a commander of the Legion of Honour shortly before his death in Paris on Sept. 20, 1925.



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

THE BEAR TAMER, ONE OF BARTLETT'S BEST KNOWN EARLY STUDIES

BARTÓK, BÉLA (1881–1945), Hungarian composer and pianist. Born March 25, 1881, at Nagyszentmiklós, Transylvania, he began composition at the age of nine and studied first under László Erkel and later at the musical academy, Budapest, under Stephen Thoman and John Koessler. In 1903 his symphonic poem "Kossuth" was performed in Manchester under Hans Richter. The strong national movement in Hungary influenced his work and resulted in his researches, in collaboration with Zoltán Kodály, into folk music and traditional melodies. In 1907 he became professor of the piano at the musical academy, Budapest, retiring five years later to devote himself to composition and research. By the close of World War I he was recognized as one of Hungary's foremost composers. Among his notable works are "Bluebeard's Castle" (1911) and the pantomime "The Miraculous Mandarin" (1919). He also wrote chamber music and numerous works for the piano. In 1940 he went to New York city where he died on Sept. 26, 1945.

BARTOLI, DANIELLO (1608–1685), Italian Jesuit priest, was born at Ferrara and entered the Society of Jesus in 1623. He became rector of the Jesuit college in Rome in 1685, and wrote the *Istoria della compagnia di Gesu* (1650–73); it is of value in regard to the early work of the Society in Asia. He died at Rome.

A collected edition of his works was published in 12 vols. by Marietti at Turin (1825–56); another in 50 vols. at Florence (1826).

BARTOLINI, LORENZO (1777–1850), Italian sculptor, was born in Vernio in Tuscany. After acquiring reputation as a modeller in alabaster, he went in 1797 to Paris, where he studied painting under Desmarets, and afterwards sculpture under F. F. Lemot. For Napoleon he executed a colossal bust, and was sent by him to Carrara to found a school of sculpture. The rest of his life was spent there and in Florence. His works are varied and include an immense number of busts. The group of "Charity," the "Hercules and Lichas" and the "Faith in God," are among the best examples of his work.

BARTOLOMMEI, MARQUIS FERDINANDO (1821–1869), Italian revolutionary, belonged to an old and noble Florentine family. In 1847–48 his house was a centre of revolutionary committees, and during the brief constitutional *régime* he was very prominent. After the return of the grand duke Leopold II. he became a conspirator on behalf of Italian freedom and unity, allying himself with the popular party and quitting the semi-Liberal nobles. On the outbreak of war between Piedmont and Austria he worked hard for the overthrow of the grand duke, and on April 27, 1859, Florence rose as one man, the troops refused to fire on the people, and the grand duke departed, never to return. A provisional government was formed and Bartolommei elected *gonfaloniere*. In the summer elections were held, and on the meeting of parliament Bartolommei's unitarian views prevailed, the assembly voting the resolution that the house of Lorraine had forfeited its rights and that Tuscany must be united to Italy under King Victor Emmanuel. Bartolommei was made senator of the Italian kingdom and received various other honours. His last years were spent in educational and philanthropic work.

The best biography of Bartolommei is contained in *Il Rivolgimento Toscano e l'azione popolare,* by his daughter Matilde Gioli (Florence, 1905).

BARTOLOMMEO DI PAGHOLO, FRA (1475–1517), the Italian historical and portrait painter—known also as BACCIO (short for Bartolommeo) DELLA PORTA (because he lived near the Porta Romana), was born in Soffignano, near Florence, and died in Florence on Oct. 31, 1517. He was a pupil of Cosimo Roselli, and was a close student of the works of Leonardo da Vinci. Of his early productions, the most important is the fresco of the Last Judgment, in which he was assisted by his friend Mariotto Albertinelli. He came under the influence of Savonarola, and was so affected by his death that he soon after entered the Dominican convent and for some years gave up his art. He had not long resumed it, in obedience to his superior, when Raphael came to Florence and formed a close friendship with him. Bartolommeo learned from the younger artist the rules of perspective, while Raphael owes to the *frate* the improvement in his colouring and handling of drapery. Some years afterwards he visited Rome, and was struck with a feeling of his own inferiority when he contemplated the masterpieces of Michelangelo and Raphael. On his return he painted the magnificent figure of St. Mark (his masterpiece, at Florence) and the undraped figure of St. Sebastian. He painted a profile portrait of his friend Savonarola in the character of St. Peter Martyr. The majority of Bartolommeo's compositions are altar-pieces. The best collection of his works is in the Pitti Palace, Florence. The Louvre possesses an "Annunciation" and a "Virgin in Glory," and there are examples in the National Gallery, at Panshanger, and in Berlin and elsewhere.

See F. Knapp, *Fra Bartolommeo und die Schule von San Marco* (Halle, 1903); H. von der Gabelentz, *Fra Bartolommeo und die Florentiner Renaissance* (Leipzig, 1922).

BARTOLOMMEO VENETO (*c.* 1480–1555), Italian painter, a pupil of Gentile Bellini at Venice, influenced later by the Milanese school. He lived for some time at Cremona and also worked at Ferrara. Very little is known of this painter, whose fine portraits are much sought after and highly prized. He was until recently almost unknown and it is mainly due to the researches of Giovanni Morelli and Adolfo Venturi that he was identified as the author of a few striking paintings. His colour is brilliant and harmonious, his drawing hard, precise and powerful. His earliest work extant is the "Madonna" from the Casa Martinengo in Val Sansibio, now with Conte Donà delle Rose at Venice. It is dated 1502, and bears the curious signature *Bartolamio mezo Venizian e mezo Cremonese*. In his later signatures he calls himself simply Venetian. Other early works are the "Madonna and Child" (1505) with a remarkable landscape background, at the Bergamo museum, and the "Circumcision" signed and dated 1506, now in the possession of the Hon. Mrs. Trollope of Crowcombe Court, Taunton. These works are Bellinesque; and from a "Madonna" once in the Ercolani Collection at Bologna, which bore the mutilated inscription, *1509. a di 7. Aprile, Bartolamio Scholario de Ze . . . . Be . . . .* it must be concluded that he was the pupil of Gentile Bellini, "Ze" standing for "Ge" in the Venetian dialect. Later in his career Bartolommeo took to portrait painting, and a number of portraits from his hand show the influence of the Milanese school. One of the finest portraits is that of Lodovico Martinengo (1530) in the National Gallery, London. The striking portrait of Massimiliano Sforza (1512), of the Holford Collection, is now in America.

The Fitzwilliam Museum, Cambridge, England, the Ambrosiana at Milan and the Budapest gallery also possess male portraits by him. His female portraits are distinguished for their somewhat fantastic and original arrangement. The Staedel Institut of Frankfurt has a so-called "Lucrezia Borgia" whose golden locks of almost metallic texture are carefully arranged in rows of long corkscrews like ringlets. A similar coiffure is to be seen in the "Salome" at Dresden and in the "Woman breaking a ring" in the collection of Duca Melzi at Milan. The Conte Cesare de Mayno, Milan, has a "Lady playing a Lute" dated 1520, the "Ceres" of the Hertz Collection, now in the Palazzo Venezia, Rome, has recently been ascribed to the artist. The Albertina at Vienna has a drawing of a head, of clear and masterly execution.

See S. Lermolieff, *Gal. Borghese und Doria Pamf.* (1890), and *Gal. München und Dresden* (1891); A. Venturi, *La Galleria Crespi* (1900) and an important paper, "Orig. d. pitt. venez." in *L'Arte* II. (1907); Crowe and Cavalcaselle, *History of Painting in North Italy* (ed. Borenius, 1912); J. P. Richter, *La Collezione Hertz* (1928).

BARTOLOZZI, FRANCESCO (1727–1815), Italian engraver, was born at Florence, on Sept. 21, 1727, and died on March 7, 1815. He was originally destined to follow the profession of his father, who was a gold-and-silver-smith, but he manifested so much skill and taste in designing that he was placed under the superintendence of two Florentine artists, who instructed him in painting. After devoting three years to that art, he went to Venice and studied engraving, being apprenticed to Joseph Wagner. He then removed to Rome, where he engraved works by Domenichino and other Italian masters, and completed a set of engravings representing events from the life of St. Nilus, and, after returning to Venice, he set out for London in 1764 at the invitation of Mr. Dalton, librarian to George III. He became engraver to the king. For nearly 40 years he resided in London with his friend Cipriani, in Warwick street, Golden square, London, and executed a large number of engravings for George III. which are still in the royal collections, including the engravings after Holbein's drawings at Windsor. Among others are those of "Clytie" and "Silence," after Annibale Caracci; of the "Virgin and Child," after Carlo Dolce, and of the "Madonna del Sacco," after Andrea del Sarto. He engraved many works of Cipriani and Angelica Kauffmann. Bartolozzi also contributed a number of plates to Boydell's *Shakespeare Gallery*. In 1802 he was invited to Lisbon as director of the National academy. He remained in Portugal till his death.

In his later years in London Bartolozzi had a studio where many works, signed with his name, but to which he only put the finishing touches, were produced. He was not the inventor of the red chalk manner of engraving, which was already practised in France by Demortenu, but, encouraged by Angelica Kauffmann, Bartolozzi made it the fashion. His son, Gaetano Stephano (1757–1821), also an engraver, was the father of Madame Vestris (*q.v.*).

See A. Tuer, *Bartolozzi and his Works* (1882); C. H. S. John, *Bartolozzi, Zoffany, Kauffmann with other Foreign Members of the R.A., 1768–92* (vol. xvi. of *British Artists,* 1924).

BARTOLUS (1314–1357), Italian jurist, the most famous master of the dialectical school, was born at Sassoferrato, whence his usual style of Bartolus de Saxoferrato. He studied law under Cinus at Perugia and under Oldradus and Jacobus de Belvisio at Bologna. He held the chair of law at Perugia from 1343 onwards, and made the law school of Perugia as famous as that of Bologna. A magnificent monument was raised to his memory in the church of San Francisco at Perugia.

Many writers have sought to account for the fame of Bartolus by attributing to him the introduction of the dialectical method; but this had been employed by Odofredus, a pupil of Accursius, in the 13th century, and the successors of Odofredus had abused it by burying the subject-matter of their writings under dialectical forms. Bartolus reformed this abuse and avoided excess; but his

great reputation was probably due to his revival of the exegetical system of teaching law. He imparted to his lectures a practical interest by making use of the experience he had gained as an assessor to the courts at Todi and Pisa. His treatises *On Evidence* and *On Procedure* are his best-known works; his *Commentary on the Code of Justinian* has sometimes been exalted almost to an equal authority with the code itself.

BARTON, BENJAMIN SMITH (1766–1815), American naturalist, was born at Lancaster, Pa., in 1766. When only 24 years old he was appointed to a professorship of natural history and botany at the College of Philadelphia, now the University of Pennsylvania—probably the first position of its kind in any American college. Later he became professor of *materia medica* (1795) and successor to Dr. Benjamin Rush in the chair of practical medicine (1813).

Having an ardent thirst for literary fame as well as wide scientific knowledge, he wrote books on such diverse subjects as the natural history of Pennsylvania, the disease of goitre, the *Fascinating Faculty Which Has Been Ascribed to the Rattlesnake and Other North American Serpents,* the honey-bee, the stimulant effects of camphor on vegetables, and numerous other subjects in natural history, botany and *materia medica,* the best known being his *Elements of Botany* (1803). In 1802 he was chosen president of the American Philosophical Society and was a member of honorary scientific societies in Moscow, London, Scotland and Denmark. He died in Philadelphia, Dec. 19, 1815.

See *Pioneers of Science in America,* edited by W. J. Youmans (1896).

BARTON, BERNARD (1784–1849), English poet, was born at Carlisle on Jan. 31, 1784. His parents were Quakers, and he was commonly known as the Quaker poet. He was a bank clerk at Woodbridge, Suffolk. Barton published several volumes of verse, but is chiefly remembered for his friendship with Charles Lamb, which arose out of a remonstrance addressed by him to Lamb on the freedom with which the Quakers had been handled in the *Essays of Elia.* When Barton contemplated resigning his bank clerkship and supporting himself entirely by literature, Lamb dissuaded him. "Keep to your bank," he wrote, "and the bank will keep you." Barton died at Woodbridge on Feb. 19, 1849. His daughter Lucy married Edward FitzGerald.

See *Poems and Letters of Bernard Barton, selected by Lucy Barton, with a biographical notice by Edward FitzGerald* (1849).

BARTON, CLARA (1821–1912), American philanthropist, was born in Oxford (Mass.), in 1821. During the Civil War she distributed supplies for the relief of wounded soldiers; and at its close she organized at Washington a bureau of records to aid in the search for missing men. In connection with this work she identified and marked the graves of more than 12,000 soldiers in the National Cemetery at Andersonville, Georgia. During the Franco-Prussian War, Miss Barton assisted in organizing military hospitals. In 1871 she superintended the distribution of relief to the poor in Strasbourg and in 1872 performed a like service in Paris. For her services she was decorated with the Iron Cross by the German emperor. In 1873 she returned to the United States, where she at once began her efforts to effect the organization of the United States branch of the Red Cross and to bring her country into the Treaty of Geneva. Her efforts were successful in 1881–82. She was the first president of the American Red Cross, holding the position until 1904. She represented the United States at the international conference held at Geneva, 1884; Karlsruhe, 1887; Rome, 1892; Vienna, 1897; and St. Petersburg (Leningrad), 1903. She was the author of the American amendment to the constitution of the Red Cross which provides that the society shall distribute relief not only in war but in times of such other calamities as famines, floods, earthquakes, cyclones and pestilence. She conducted the society's relief for sufferers from the yellow fever in Florida (1887), the flood at Johnstown, Pa. (1889), the famine in Russia (1891), the hurricane along the coast of South Carolina (1893), the massacre in Armenia (1896), the Spanish-American War in Cuba (1898), the hurricane at Galveston, Texas (1900), and several other calamities. She wrote *An Official History of the Red Cross* (1882); *The Red Cross in Peace and War* (1898); *A Story of the Red Cross* (1904), and *Story of my Childhood* (1907). She died at Glen Echo (Md.), on April 12, 1912.

See Corra Bacon-Foster, *Clara Barton, Humanitarian* (1918).

BARTON, SIR EDMUND (1849–1920), Australian lawyer and statesman, was born in Sydney Jan. 18 1849. Educated at the grammar school and university there, he was called to the bar in 1871, becoming a Q.C. in 1889. He was elected to the New South Wales legislature by the University of Sydney in 1879. From 1883 to 1887 he was speaker of the house of assembly; and in 1889 he became attorney-general. In 1896 he had succeeded Sir Henry Parkes as leader of the Federation movement; and in 1900 he led the delegation which presented the Commonwealth Constitution bill to the Parliament in London. The following year he became Australia's first Federal prime minister. He held office for two years, when he was made senior puisne judge of the high court of Australia, being succeeded in the premiership by Alfred Deakin. Sir Edmund was throughout his career an ardent supporter of imperial preference and an advocate of protection. He died suddenly at Medlow Bath, near Sydney, Jan. 6 1920. Known affectionately as the Father of Australia, he inspired throughout his long career as a politician a deep personal devotion.

See H. G. Turner, *The First Decade of the Australian Commonwealth* (1911).

BARTON, ELIZABETH (*c.* 1506–1534), "the maid of Kent," was, according to her own statement, born in 1506 at Aldington, Kent. In 1525, when she was a servant in the house of Thomas Cobb, steward of an estate near Aldington owned by William Warham, archbishop of Canterbury, she had an illness, after which she passed into trances and uttered prophecies. Cobb reported the matter to the parish priest, who in turn acquainted Archbishop Warham. After her recovery the girl continued to feign trances, and as her fame steadily grew, the archbishop in 1526 instructed the prior of Christ church, Canterbury, to send two of his monks to hold an enquiry into the case. One of these latter, Edward Bocking, obtained her admission as a nun to St. Sepulchre's convent, Canterbury. Under Bocking's instruction Barton's prophecies became still more remarkable, and attracted many pilgrims, who believed her to be in direct communication with the Virgin Mary. Her utterances were directed towards political matters, and she declared that should Henry persist in his intention of divorcing Catherine he "should no longer be king of this realm . . . and should die a villain's death." Even such men as Fisher, bishop of Rochester, and Sir Thomas More, corresponded with Barton. In 1532 Henry passed through Canterbury and is said to have seen the nun who tried to terrify him into abandoning his marriage. After its solemnization in May 1533, her utterances becoming still more treasonable, she was examined before Cranmer, and confessed. In Jan. 1534, by a bill of attainder the maid and her chief accomplices were condemned to death, and they were executed at Tyburn on April 20.

See F. A. Gasquet, *Henry VIII. and the English Monasteries* (ch. iii. 1899 ed.); T. E. Bridgett, *Life of Blessed John Fisher* (1888); vols. vi. and vii. of *Letters and Papers of Henry VIII.;* James Gairdner, *The English Church in the 16th Century* (1899); Strype, *Memorials,* I. i. 271, and *Cranmer;* A. D. Cheyney, "The Holy Maid of Kent," in *Transactions of the Royal Historical Society,* N.S. xviii. A detailed account of the case is contained in the published Act of Attainder 25 Henry VIII. c. 12.

BARTON-UPON-HUMBER, urban district of Lindsey, Lincolnshire, England, terminus of L.N.E. branch railway, 44 mi. N.E. of Lincoln. Pop. (1938) 6,182. Area 11.2 sq.mi. It lies near low hills, on flat ground bordering the Humber, though its centre is a mile from the river. Barton appears in Domesday, with its ferry over the Humber. It rose into importance as a seaport, for it supplied eight ships and men to Edward III's expedition to Brittany. The church of St. Peter has a pre-Conquest west tower, with early Norman top story. The two lower stories are arcaded, the lower having round arches and the upper triangular. There is a round-headed south doorway and a triangular-headed north doorway. The rest of the church is Decorated and Perpendicular. A low pre-Conquest building 15 ft. by 12 ft., with deeply splayed windows, stands against the west face. The church of St. Mary is fine Early English with Perpendicular clerestory. The chief trade

is cycle manufacturing; others are the making of bricks and tiles and chemical manures.

BARTOW, a city in the lake region of Florida, U.S.A., 45 mi. east of Tampa, on the ridge running through the state from north to south; the county seat of Polk county. It is served by the Atlantic Coast Line and the Seaboard Air Line railways. The population in 1930 was 5,269; in 1940 it was 6,158 by federal census. Bartow is surrounded by extensive orange, grapefruit and banana groves, immense phosphate mines, and irrigated farms, and has a variety of manufacturing industries. There are two large and beautiful lakes (Hancock and Polk) near by.

BARTSCH, PAUL (1871–), American biologist, was born in Tuntschendorf, Germany, on Aug. 14, 1871. Following his graduation at the State University of Iowa in 1896 he joined the staff of the U.S. National museum, Washington, in which he served as aid in the division of mollusks from 1896 to 1905 and as assistant curator of marine invertebrates from 1905 until 1914 when he was made curator. In 1899 he became professor of zoology in George Washington university, and in 1901 lecturer on medical zoology in Howard university. The U. S. bureau of fisheries in 1907 placed him in charge of the inquiry into the pearl-mussel industry of the Mississippi valley. Subsequently he was the representative of the Smithsonian institution on various scientific expeditions to the waters of the Philippines, Cuba, Haiti and the Bahamas. In 1912 he took charge of the experimental breeding of Cerions on the Florida Keys for the Carnegie and Smithsonian institutions. He made war gas experiments for the U.S. bureau of mines, and in 1918 produced a poison gas detector for the Chemical Warfare Service. His published writings include more than 250 technical papers, chiefly on biological subjects.

BARUCH, the name (meaning "blessed" in Hebrew) of a character in the Old Testament (Jer. xxxvi., xxxvii., xliii.), associated with the prophet Jeremiah, and described as his secretary and spokesman.

BOOK OF BARUCH

This deutero-canonical book of the Old Testament is placed by the LXX. between *Jeremiah* and *Lamentations,* and in the Vulgate after *Lamentations.* It consists of several parts, which cohere so badly that we are obliged to assume plurality of authorship.

The book consists of the following parts:—

i. 1–14. The historical preface with a description of the origin and purpose of the book.

i. 15–ii. 5. A confession of sin used by the Palestinian Remnant. This confession was according to i. 14 sent from Babylon (i. 4, 7) to Jerusalem to be read "on the day of the feast and on the days of the solemn assembly." The confession is restricted to the use of the remnant at home (*see* next paragraph). In this confession there is a national acknowledgment of sin and a recognition of the exile as a righteous judgment.

ii. 6–iii. 8. A confession of the captives in Babylon and a prayer for restoration. This confession opens as the former (in i. 15) with the words found also in Daniel ix. 7, "To the Lord our God belongeth righteousness, etc." The confession is of the Exiles and not of the remnant in Palestine, as Marshall has pointed out. Thus it is the Exiles clearly who are speaking in ii. 13, "We are but a few left among the heathen where thou hast scattered *us";* ii. 14, "Give us favour in the sight of them which have led us away captive"; iii. 7, "We will praise thee in our captivity"; iii. 8, "We are yet this day in our captivity where thou hast scattered us." On the other hand, the speakers in the confession in i. 15–ii. 5 are clearly the remnant in Jerusalem, i. 15, "To the Lord our God belongeth righteousness but unto us confusion of face . . . to the men of Judah and the inhabitants of Jerusalem." The Exiles are mentioned by way of contrast to the speakers; ii. 4, 5, "He hath given *them* to be in subjection to all the kingdom that are round about *us* to be a reproach among all the people round about where the Lord hath scattered *them.* Thus were they cast down . . . because *we* sinned against the Lord our God."

iii. 9–iv. 4. The glorification of wisdom, that is, of the law, Israel is bidden to walk in the light of it; it is the glory of Israel and is not to be given to another.

iv. 5–v. 9. Consolation of Israel with the promise of deliverance and lasting happiness and blessing to Jerusalem.

From the foregoing description it seems clear that the book is derived from a plurality of authors. The evidence for a fourfold authorship is strong though not convincing. In any case i.–iii. 8 and iii. 9–v. 9 must be ascribed to different authors.

It is generally agreed that i.–iii. 8 was originally written in Hebrew; the rest in Greek. As regards the date, the fifth year after the destruction of Jerusalem, mentioned in i. 2, will give the date for the first part of the book as A.D. 74 or 75, but it is evident that the writer made use of earlier material. Thus i. 15–iii. 8 is strongly liturgical in character; it has all the leading notes found in the Jewish liturgy, which in its essential elements goes back to pre-Christian times (for details *see* Oesterley, *The Books of the Apocrypha,* pp. 500 *seq.*). The section iii. 8–iv. 4 is a little later, but not later than the middle of the 2nd century A.D., as it is quoted by Athenagoras and Irenaeus. The last section iv. 5–v. 9 is probably a little earlier, the beginning of this century.

APOCALYPSE OF BARUCH

The discovery of this long lost apocalypse was due to Ceriani. This apocalypse has survived only in the Syriac version of which Ceriani discovered a 6th century ms. in the Milan library. The Syriac is translated from the Greek; for Greek words are occasionally transliterated, and passages can be explained only on the hypothesis that the wrong alternative meanings of certain Greek words were followed by the translator. The Greek in turn is derived from the Hebrew, for unintelligible expressions in the Syriac can be explained and the text restored by retranslation into Hebrew.

As there are undoubtedly conflicting elements in the book, it is possible to assume either a diversity of authorship or a diversity of sources. A short summary may here be given of the grounds on which a diversity of authorship has been postulated. If the letter to the tribes in captivity (lxxviii.–lxxxvi.) be disregarded, the book falls into seven sections separated by fasts, save in one case (after xxxv.) where the text is probably defective. These sections, which are of unequal length, are—(1) i.–v. 6; (2) v. 7–viii.; (3) ix.–xii. 4; (4) xii. 5–xx.; (5) xxi.–xxxv.; (6) xxxvi.–xlvi.; (7) xlvii.–lxxvii. These treat of the Messiah and the Messianic kingdom, the woes of Israel in the past and the destruction of Jerusalem in the present, as well as of theological questions relating to original sin, free will, works, the number of the saved, the nature of the resurrection body, etc. The views expressed on several of the above subjects are often conflicting. In one class of passages there is everywhere manifest a vigorous optimism as to Israel's ultimate well-being on earth, and the blessedness of the chosen people in the Messianic kingdom is sketched in glowing and sensuous colours (xxix., xxxix.–xl., lxiii.–lxxiv.). Over against these passages stand others of a hopelessly pessimistic character, wherein, alike as to Israel's present and future destiny on earth, there is written nothing save "lamentation, and mourning, and woe." The world is a scene of corruption, its evils are irremediable, its end is nigh, and the advent of the new and spiritual world is at hand.

The affinities of this book and IV. Ezra are so numerous that Ewald and Ryle assumed identity of authorship. But their points of divergence are so weighty that this view cannot be sustained. Three courses still remain open. If we assume that both works are composite, we shall perforce admit that some of the constituents of IV. Ezra are older than the latest of Baruch, and that other constituents of Baruch are decidedly older than the remaining ones of IV. Ezra. On the other hand, if we assume unity of authorship, it seems impossible to arrive at finality on the chronological relations of these two works. Langen, Hilgenfeld, Wieseler, Stähelin, Renan, Hausrath, Drummond, Dillmann, Rosenthal and Gunkel have maintained on various grounds the priority of IV. Ezra; and Schürer, Bissell, Thomson, Deane, Kabisch, De Faye, Wellhausen and Ryssel the priority of Baruch on grounds no less convincing.

A very close relation subsists between this book and rabbinical literature; in some instances they are almost word for word.

In lxxvii, 19, it is said that Baruch wrote two epistles, one to the nine-and-a-half tribes and the other to the two-and-a-half at Babylon. The former is found in lxxviii–lxxxvi; the latter is lost, but is probably preserved either wholly or in part in the Book of Baruch, iii, 9–iv, 29. On the other hand, it is not necessary to infer from lxxv that an account of Baruch's assumption was to be looked for in the book. The literature is cited in R. H. Charles, *Apocalypse of Baruch*, pp. xxx–xliii.

A book undoubtedly written originally by a Jew but subsequently revised by a Christian, as has been shown by Kohler in the *Jewish Quarterly Review* (1893), pp. 407–409, passed under a double name in the Abyssinian Church, where it was known both as "the Rest of the Words of Baruch" and "the Rest of the Words of Jeremiah." It has been preserved in Greek, Ethiopic, Armenian and Slavonic. The Greek was first printed at Venice in 1609, next by Ceriani in 1868 in his *Mon. Sacra*, v, 11–18; by Harris, *The Rest of the Words of Baruch*, in 1889; and Bassiliev, *Anec. Graeco-Byzantina*, i, 308 *seq.* (1893). The books begin like the Syriac Apocalypse of Baruch with an account of the removal of the sacred vessels of the temple before its capture by the Chaldees. Baruch remains in Jerusalem and Jeremiah accompanies the exiles to Babylon. After 66 years' exile Jeremiah brings back the Jews to Jerusalem, but refuses to admit such as had brought with them heathen wives. Then follows a vision of Jeremiah which is Christian.

Harris regards the book in its present form as an eirenicon addressed to the Jews by a Christian after the rebellion of Bar Cochba (Barcochebas) and written about 136. Though the original work was dependent on the Apocalypse of Baruch it cannot have been written much before the close of the 1st century A.D. Its *terminus ad quem* is at present indeterminable.

See further the additions and commentaries in Charles, *Apocrypha and Pseudepigrapha*. (R. H. Ch.; W. O. E. O.)

BARUCH, BERNARD MANNES (1870–), American statesman, was born in Camden (S.C.), Aug. 19, 1870. For many years he was a member of the New York Stock Exchange. In 1916 he was appointed a member of the advisory committee of the Council of National Defense, and subsequently became chairman of the committee on raw materials, minerals and metals, and of the war industries board. In 1919 he became a member of the Supreme Economic Council of the Peace Conference in Paris, and in the same year was appointed by President Wilson a member of the industrial conference in Washington. After Wilson's term expired, in 1921, Baruch continued to be the unofficial adviser of presidents, devoting himself also to harmonizing agricultural economy with that of industry and industrial labour, and to putting the nation in a state of adequate defense. After 1939 he was summoned repeatedly by President Roosevelt on the latter problem, and out of this service grew the rubber defense program, the manpower shortage relief plan (first applied to the aircraft and shipbuilding industries of the Pacific coast) and the postwar reconversion chart. Though his counsels were often disregarded when first proffered, nearly all of them were eventually adopted by President Roosevelt. He wrote *American Industry in the War* (1917–18) and *The Making of the Reparation and Economic Sections of the Treaty* (1920). (A. Kr.)

BARUGO, a municipality on the north coast of the province and island of Leyte, Philippine Islands, on Carigara bay. Pop. (1939), 19,564, of whom 9,574 were males; no whites. Principal products are abacá (Manila hemp), copra, sugar, palay (rice), corn and tobacco. The school-age population in 1939 numbered 7,140, of whom 30.1% attended school. Of the 13,175 individuals 10 years old and over, 47.3% were able to read and write. The vernacular is a dialect of Bisaya. The municipality has an administrative centre and 16 barrios (wards). The number of parcels of land declared for taxation in 1938 was 9,349. (C. S. L.)

BARWANI, an Indian state in the Malwa agency of Central India, in the Satpura mountains, south of the Narbada. Area, 1,189 sq.mi.; population (1941) 176,666. Many of the inhabitants are Bhils. The chief or rana, who has a salute of nine guns, is a rajput of the Sisodia clan, connected with the Udaipur family. Though the family lost most of its possessions during the Mahratta invasion in the 18th century, it never became tributary to any Malwa chief. The small town of Barwani is near the left bank of the Narbada.

BARYATINSKY, ALEXANDER IVANOVICH, Prince (1814–1879), Russian soldier and governor of the Caucasus, entered the army in 1833. In 1835 he served with great gallantry in the Caucasus. In 1845 he was again ordered to the Caucasus, and distinguished himself, especially in the attack on Shamyl's stronghold. In 1846 he assisted Field Marshal Paskievich to suppress the Cracow rising. From 1848 to 1856 he took a leading part in all the chief military events in the Caucasus, his most notable exploits being his victory at Mezeninsk in 1850 and his operations against Shamyl at Chechen. His energetic and at the same time systematic tactics inaugurated a new era of mountain warfare. In 1853 he became chief of staff. In 1854 he took part in the brilliant Kürük Dere campaign. On Jan. 1, 1856, he became commander in chief of the Caucasian army, and, subsequently, governor of the Caucasus. Within three years of his appointment, the whole of the eastern Caucasus was subdued, and the elusive Shamyl was captured. He was created a field marshal, but on Dec. 6, 1862, he was, at his own request, relieved of his post, and spent the last years of his life abroad.

BARYCENTRIC CALCULUS, a system of geometric analysis developed by August Ferdinand Möbius (*q.v.*) and founded on a generalization of the notion of centre of mass (or centre of gravity) of a system of mass particles. This explains the significance of the term "barycentric," from Gr. *βαρύς*, barys', heavy, and *κέντρον*, ken'tron, centre. Möbius was in possession of his method in 1823, and he published a general development of it in 1827.

If two particles of weights α and β are attached to the ends A and B, respectively, of a weightless rod AB, then there is a point P on AB such that the rod may be balanced, under the force of gravity, on a support at P. It will then exert on the support at P a pressure equal to that produced by a weight of $\alpha+\beta$. It may be shown that the point P is situated so that its distances from A and B, respectively, are in the ratio of β to α; that is, so that $AP:PB=\beta:\alpha$. This point P is called the centre of gravity (or centre of mass) of the particles at A and B. Similarly, there is a centre of gravity or balancing point P for particles of weights α, β, γ, placed at the respective vertices A, B, C of a triangle ABC; and the notion is extensible to any number of masses situated either in a plane or in space. The point P may be called the *barycentre* for the given masses with the given positions; and we may attach to it a weight equal to the sum of the weights of the given masses, since the system, when supported at the barycentre, or balancing point P, exerts at P a pressure equal to that due to the sum of the weights of the particles.

In the generalization of the foregoing notions, according to the method of Möbius, there may be associated with a given point A *any* real (positive, negative or zero) numerical quantity α, called its *weight*, the weighted point being denoted by αA. The sum of two weighted points αA and βB is defined to be the weighted point $(\alpha+\beta)$G, where G is a point on the directed line AB such that $AG:GB=\beta:\alpha$; we then write $\alpha A+\beta B=(\alpha+\beta)G$. By means of geometry it is proved that $(\alpha A+\beta B)+\gamma C=\alpha A+(\beta B+\gamma C)=(\alpha+\beta+\gamma)P$, where P is the (generalized) centre of mass of particles of weights α, β, γ placed at A, B, C, respectively. More generally, we have $\alpha A+\beta B+\gamma C+\cdots+\lambda L=(\alpha+\beta+\gamma+\cdots+\lambda)X$, where in general X is a determinate point; this point is called the *barycentre* of the weighted points αA, βB, ... λL. If $\alpha+\beta+\gamma+\cdots+\lambda$ is zero, the point X lies at infinity in a determinate direction except when $-\alpha$A is the barycentre of βB, γC, $\cdots$, λL, in which case $\alpha A+\beta B+\cdots+\lambda L$ vanishes and X itself is indeterminate.

If ABCD is a given tetrahedron of reference and if P is any given point in space, then weights α, β, γ, δ may be assigned to A, B, C, D, respectively, so that $\alpha A+\beta B+\gamma C+\delta D=(\alpha+\beta+\gamma+\delta)P$. It is evident that the quantities α, β, γ, δ may be replaced by $k\alpha$, $k\beta$, $k\gamma$, $k\delta$, without affecting the validity of this equation, if k is any real numerical quantity different from zero. Hence the numbers $\alpha,\beta,\gamma,\delta$ may serve as a set of homo-

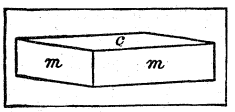
geneous co-ordinates of P. Thus the barycentric calculus affords a remarkable system of co-ordinates for representing the points of space. In the case of a plane, three fixed points of reference in the plane are sufficient; and in the case of a line, only two points on the line are needed. Since it furnishes such a set of co-ordinates, the barycentric calculus has been one of the important means leading to the development of the powerful methods of modern projective geometry. In another aspect it has also been the forerunner of important work in modern algebra.

See A. F. Möbius, *Der barycentrische Calcul* (Leipzig, 1827), reprinted in his *Gesammelte Werke,* vol. i., pp. 1–388; and *Encyklopädie der mathematischen Wissenschaften* (Leipzig), vol. iii., pp. 1289–1300. The former contains the original development of the barycentric calculus by Möbius; the latter gives a brief summary and a history, with adequate references to the literature. (R. D. Ca.)

BARYE, ANTOINE LOUIS (1796–1875), French sculptor, was born in Paris on Sept. 24, 1796. Like many of the sculptors of the Renaissance he began life as a goldsmith. After studying under Bosio, the sculptor, and Gros, the painter, he was in 1818 admitted to the École des Beaux Arts. In 1823, when he was working for Fauconnier, the goldsmith, he discovered his real bent from watching the wild beasts in the Jardin des Plantes, making vigorous studies of them in pencil drawings and then modelling them in sculpture on a large or small scale. In 1831 he exhibited his "Tiger devouring a Crocodile," and in 1832 had mastered a style of his own in the "Lion and Snake." Thenceforward Barye, though engaged in a perpetual struggle with want, exhibited year after year these studies of animals—admirable groups which reveal him as inspired by a spirit of true romance and a feeling for the beauty of the antique, as in "Theseus and the Minotaur" (1847), "Lapitha and Centaur" (1848), and numerous minor works. As examples of his larger work we may mention the Lion of the Column of July, of which the plaster model was cast in 1839, various lions and tigers in the gardens of the Tuileries, and the four groups—War, Peace, Strength and Order (1854). In 1852 he cast his bronze "Jaguar devouring a Hare." He was made professor at the museum in 1854, and was elected to the Academy of Fine Arts in 1868. He died on June 25 1875.

See Arsène Alexandre, "A. L. Barye," *Les Artistes célèbres,* ed. E. Muntz (1889) (with a bibliog.); Charles DeKay, *Life and Works of A. L. Barye* (1889), published by the Barye Monument Assoc. of New York; Roger Ballu, *L'Oeuvre de Barye* (1890).

BARYTES, a widely distributed mineral composed of barium sulphate ($BaSO_4$). Its most striking feature and the one from which it derives its name barytes, barite (from the Greek βαρύς, heavy) or heavy spar, is its weight. Its specific gravity of 4·5 is about twice as great as that of salt and of many other colourless, transparent and glassy minerals not unlike barytes in general appearance. The mineral is usually found in a state of considerable chemical purity, though small amounts of strontium and calcium sulphates may isomorphously replace the barium sulphate.



A CRYSTAL OF BARYTES
Showing the simplest form of crystal and also the cleavage form. However complex the crystals, they break up along cleavages into this characteristic shape

Crystals of barytes are orthorhombic; they are usually very perfectly developed and present great variety of form. The simplest crystals are rhomb-shaped tables bounded by the two faces of the basal pinacoid (*c*) and the four faces of the prism (*m*); the angle between the prism-faces (*mm*) is 78° 23′, while that between *c* and *m* is 90°. The mineral has a very perfect cleavage parallel to the faces *c* and *m,* and the cleavage surfaces are perfectly smooth and bright. The crystals may be transparent and colourless, or white and opaque, or of a yellow, brown, bluish or greenish colour. The mineral occurs also in a granular, earthy or stalactitic condition. It is known as "cawk" in the Derbyshire lead mines. Barytes is of common occurrence in metalliferous veins, especially those which yield ores of lead and silver.

Commercially, barytes is used in the preparation of barium compounds, as a body for certain kinds of paper and cloth and in gramophone records, as a white pigment ("permanent white"), and as an inert body in coloured paints. (L. J. S.)

BARYTOCALCITE, a rare mineral found only in the neighbourhood of Alston, in Cumberland, where it occurs as diverging groups of white transparent crystals in veins of lead ore. The crystals belong to the monoclinic system and are usually prismatic or blade-shaped in habit. The hardness is 4, and the sp. gr. 3·65. Chemically, barytocalcite is a double salt of barium and calcium carbonates, $BaCa(CO_3)_2$, thus differing from the orthorhombic alstonite (*q.v.*), which is an isomorphous mixture of the two carbonates.

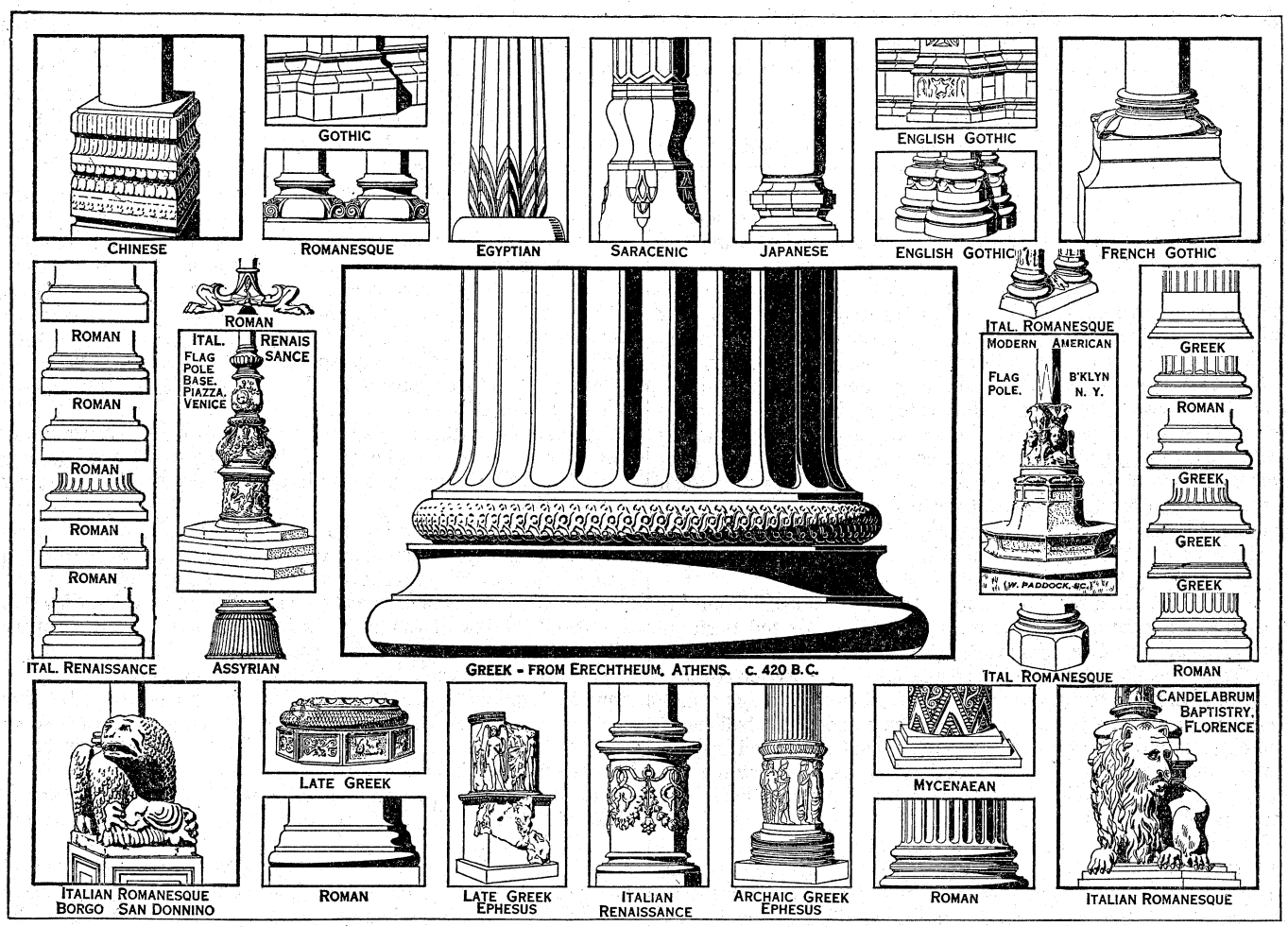
BASALT, in petrology, one of the oldest rock names, supposed to be derived from an Ethiopian word *basal,* signifying a stone which yields iron; according to Pliny, the first basalts were obtained in Ethiopia. In current usage the term includes a large variety of types of igneous rock belonging to the basic subdivision, dark in colour, weathering to brown, and comparatively rich in magnesia and iron. Some basalts are in large measure glassy (tachylytes), and many are very fine grained and compact; but it is more usual for them to exhibit porphyritic structure, showing larger crystals of olivine, augite, or felspar in a finely crystalline groundmass. Olivine and augite are the commonest porphyritic minerals in basalts, the former green or yellowish (and weathering to green or brown serpentine), the latter pitch-black. Porphyritic plagioclase felspars, however, are also very common, and may be one or two inches in length, though usually not exceeding a quarter of an inch. Basaltic lavas are frequently spongy or pumiceous, especially near their surfaces; and the steam cavities become filled with secondary minerals such as calcite, chlorite, and zeolites.

Till recent years it was widely believed by continental geologists that the pre-Tertiary basalts differed so fundamentally from their Tertiary and recent representatives that they were entitled to be regarded as a distinct class. For the older rocks the names anamesite, diabase porphyrite, *diabasmandelstein,* or melaphyre were used, and are still favoured by many writers, to indicate varieties and states of more or less altered basalts and dolerites, though no longer held to differ in any essential respects from the better preserved basalts. Still older is the term *trap,* which is derived from a Swedish word meaning "a stair," for in many places superposed sheets of basalt weather with well-marked step-like or terraced features.

In the early years of the 19th century a great controversy convulsed the geological world as to the origin of the older basalts or "floetz-traps." Werner, the Saxon mineralogist, and his school held them to be of aqueous origin, the chemical precipitates deposited in primeval seas, but Hutton and a number of French geologists maintained that they were volcanic rocks emitted by extinct craters (*see* Geology: *History of the Science*).

Minerals of the felspathoid group occur in a large number of basaltic rocks belonging to the alkaline group; nepheline, analcite, and leucite are the most common, but haüyne is occasionally present. If nepheline entirely replaces felspar, the rock is known as nepheline-basalt; if the replacement is only partial the term nepheline-basanite is used. Similarly there are analcite and leucite-basalts and leucite-basanites. The nepheline is in small six-sided prisms, and usually cannot be detected with the unaided eye. Even with the help of the microscope nepheline-basalts are not always easy to determine, as the crystals may be exceedingly small and imperfect, and they readily decompose into analcite and zeolites. Most nepheline-basalts are fine grained, very dark coloured rocks, and belong to the Tertiary period. They are fairly common in some parts of Germany and occur also in Tripoli, Asia Minor, Montana, Cape Verde Islands, etc. Leucite-basalts contain small rounded crystals of leucite in place of plagioclase felspar. Rocks of this group are well known in the Eifel, and other volcanic districts in Germany, also in Bohemia, Italy, Montana, Java, Celebes, etc.

The distribution of basalts is world-wide; and in some places they occur in immense masses, and cover great areas. In Washington, Oregon, and Idaho many thousands of square miles are occupied by basaltic lava-flows. In the Sandwich Islands and Iceland they are the prevalent lavas; and the well-known columnar jointed basalts of Skye, Staffa, and Antrim (Giant's



GOTHIC, SARACENIC, JAPANESE, ENGLISH GOTHIC, ARCHAIC GREEK, BY PERMISSION FROM SIR BANISTER FLETCHER'S "HISTORY OF ARCHITECTURE ON THE COMPARATIVE METHOD," EIGHTH EDITION, 1928 (BATSFORD); ENGLISH GOTHIC, FROM GARDNER, "GUIDE TO ENGLISH GOTHIC ARCHITECTURE." (CAMBRIDGE UNIVERSITY PRESS); ROMAN (TUSCAN), ROMAN (TEMPLE OF SUN), ROMAN (TUSCAN), ROMAN (FROM A ROMAN TEMPLE AT PAESTUM), ROMAN (DORIC), ITALIAN RENAISSANCE, FROM BUHLMANN, "CLASSIC AND RENAISSANCE ARCHITECTURE" (NEFF AND HELBURN); GREEK (ERECHTHEUM), FROM D'ESPOUY, "FRAGMENTS D'ARCHITECTURE ANTIQUE" (MASSIN); AMERICAN (FLAG-POLE), BY COURTESY OF "ARCHITECTURE"; GREEK (CORINTHIAN), ROMAN (TEMPLE OF VESTA), GREEK (INNER PROPYLAEA), GREEK (TEMPLE OF APOLLO, PHIGALEIA), GREEK (TEMPLE OF DIANA, PROPYLAEA), ROMAN (STOA OF HADRIAN, ATHENS), ITALIAN RENAISSANCE, FROM BUHLMANN, "CLASSIC AND RENAISSANCE ARCHITECTURE" (NEFF AND HELBURN); ROMAN (PORTICO OF OCTAVIA) FROM D'ESPOUY, "FRAGMENTS D'ARCHITECTURE ANTIQUE" (MASSIN)

Causeway) form a southward extension of the Icelandic volcanic province, with which they are connected by the similar rocks of the Faeroe Islands. In the Deccan in India and in western Victoria great basaltic lava fields are known; and Etna and Vesuvius emit basaltic rocks. Liquid of essentially basaltic composition is now commonly regarded as the parent magma from which the greater number of igneous rock types is derived. (*See* PETROLOGY.)

(C. E. T.)

BASANAVICIUS, JONAS (1851–1927), Lithuanian statesman, was born in the province of Suwalki in 1851 and educated at Mariampol. He then proceeded to Moscow university, where he studied philology, history and medicine. His name was particularly associated with the famous journal *Ausra* (Dawn), which he issued in East Prussia and smuggled into Lithuania during the last decades of the 19th century. In 1885, however, he was obliged to leave Germany and for many years practised as a doctor in Bulgaria. In 1905, after the Russian Revolution, he was unanimously elected president of the famous Diet of Vilna. He was equally famous as a scholar, and was especially interested in Lithuanian folk-lore. He has been styled the "Patriarch of the Lithuanian Renaissance."

BASAWI: *see* CASTE.

BASCOM, JOHN (1827–1911), American educator and philosophical writer, was born at Genoa (N.Y.), on May 1, 1827. A graduate of Williams College and the Andover Theological seminary, he taught at Williams, and at the University of Wisconsin, of which he was president from 1874 until 1887, thereafter returning to Williams. He retired in 1903 and died on Oct. 3, 1911, at Williamstown (Mass.). Among his publications are: *Aesthetics* (1862); *Philosophy of English Literature* (1874); *Problems in Philosophy* (1885); *The New Theology* (1891); *Social Theory* (1895); *Growth of Nationality in the United States* (1899); and *God and His Goodness* (1901).

BASE. (1) An adjective meaning low or deep, and, so, mean, worthless, or wicked (Fr. *bas,* Late Lat. *bassus,* low). (2) A term for a foundation or starting point, used in various senses; (Gr. βάσις "stepping," and so a foundation or pedestal); in sports, as in baseball; in geometry (*q.v.*), the line or face on which a figure or solid stands; in crystallography (*q.v.*), as in "basal plane"; in surveying (*q.v.*), in the "base line," an accurately measured distance between the points from which the survey is conducted; in heraldry (*q.v.*), in the phrase "in base," applied to any figure or emblem placed in the lowest part of a shield. In chemistry (*q.v.*), the term denotes a substance which combines with an acid to form a salt (*see* ALKALI).

Base, in architecture, the lowest visible member of a column or pier. On it the shaft rests. Originally, when wooden posts were commonly used, the base served the function of keeping the wood away from the floor or ground and distributing its weight over a large foundation, thus increasing the stability of the whole. In masonry columns it similarly spreads the load. Although the base is rigidly simple in Egyptian work, and is missing in the Greek doric order normally, it is, elsewhere, universally moulded or otherwise decorated. A base course or ground table is a similar projecting feature, running around the bottom of a wall.

In military language, it is the locality where main depots of supplies, ammunition, war material and reinforcements of personnel are established, and where a line of communication with the field army originates. An "advanced base" is the locality in

which are situated the advanced depots of ammunition, supplies and other stores which form a link between the base and the fighting troops, and from which issues are made direct to formations, field depots and dumps.

BASEBALL (originally written "base ball") is the national game of the United States of America. A game of baseball is a contest between two teams of nine players each, involving the throwing, batting and catching of a ball on a field on which are placed four "bases," fixed points at the angles of a 90-ft. square. The players run from base to base in the scoring of "runs" by which victory is decided.

In the United States, baseball's most skilled players are professionals, receiving salaries and making the playing of baseball their full-time vocation from early March until the close of the season in September or early October. The professional teams represent cities. Their outstanding players become public figures, notables not only in their "home" city but often nationally. The teams representing cities are organized in leagues, usually of eight teams each, representing eight different cities. Each league's teams play among themselves a schedule of games from spring to fall. Each team plays every other team an equal number of games in the course of a championship season, half in its own park, and half in the park of its opponent, taking its rank in the championship rating according to its percentage of games won.

In the larger cities the operation of the city baseball "team" is a commercial enterprise, conducted by an incorporated business company, and involving extensive investment in real estate and structural accommodations for spectators. In addition to the players, it employs maintenance and refreshment-purveying personnel in proportion to the size of the city and of its ball park, and administrative staffs which include "scouts," trained experts whose mission is to travel about the land in quest of new players to be brought to the cities as replacements and strengtheners of the playing personnel.

Though nine players constitute a team at any point in a baseball game, in the professional leagues, its executive officer, the "manager," usually has available more than twice that number in uniform during the course of a contest. Similarly, though only one ball and one bat can be in play at any given moment, about three dozen balls are used in the course of an average game and each team is equipped with an arsenal of two or three dozen bats. In the major leagues, the National league and the American league, whose cities represent New York, Chicago and other great cities of the eastern half of the United States, each team at times during the season may have as many as 40 players in uniform and eligible for play, though 25 is the limit in force through most of the season.

The constant influx of new players to the professional leagues comes from the playing fields of schools and colleges, the independent teams representing factories, business houses, wards and sections of cities, rural districts, etc. In the United States nearly every boy plays baseball in the course of his elementary schooling. Those with superior skill go on with it into adolescence and sometimes adulthood.

Outside the United States, baseball is played widely in Canada, Mexico, Cuba, Venezuela, Australia, and, before the outbreak of war in 1941, in Japan. Nowhere outside the United States has the game assumed a professional aspect to any considerable degree, although leagues of teams contesting in fixed schedules of round-robin play for the annual championships have been in operation in all the foregoing localities, as well as Panama and Tunisia.

How Baseball Is Played.—Baseball belongs to the extensive genus of civilized athletic competitions stemming from the primitive play-urge to whack a fragment of rock about the place with a club.

Two boys with one stick of wood and one ball portray baseball in its essence when they mark two fixed points on their playground with a couple of flat stones as "bases" and take turns whacking the ball with the "bat." One, armed with the bat, stands at one of the bases. The other stands an agreed distance away and tosses the ball to the "batter," who drives it as far as he can, then runs as many times back and forth between the bases as is possible before his rival gets hold of the ball and rushes back to one base or the other. Each keeps count of his "runs" and, after each has had the same number of turns at batting, the one who has "scored" the most runs is the winner.

Baseball in all the leagues, in the big city stadia with attendances of 50,000 and more spectators for important games, in the annual world series at the close of the season with its often "million-dollar gate," is exactly this same competition. One ball and one bat are in play at any given moment of the game. There are nine-man teams opposing each other instead of just two individuals. There are four bases instead of two. In scoring a run a batter must go to each of the other three bases before returning to his starting point to complete his "run," but he may perch temporarily on a base on his way round until opportunity offers to continue his course, usually in the form of the batting of the ball by a teammate.

Just as each batter has eight teammates to help him, there are nine players to pursue the batted ball instead of just the one boy who in the playground miniature had to be both thrower and retriever.

The official baseball rules, universally and uniformly in force, unchanged in any conspicuous feature after 1920, prescribe the dimensions and markings of the playing field, the conditions under which the teams function when "at bat" and when "in the field," the law of the game as it has evolved to cover every conceivable eventuality of the sport.

The rules give each team collectively nine turns at bat, or "innings," and at the end of nine innings for each side, the one with the most runs is the winner. If both teams have an equal number, the game continues until one side or the other, in equal innings played, can show a plurality of runs.

The bases are fixed points at the angles of a 90-ft. square. Most of the play of the game takes place within or near the outlines of this square ("the diamond").

Positions.—The bases are called "first," "second," "third" and "home plate." All batting is done at home plate. The base-running proceeds from home plate counterclockwise along the boundaries of the square. A run is scored when a player, having successively touched first, second and third, reaches home plate.

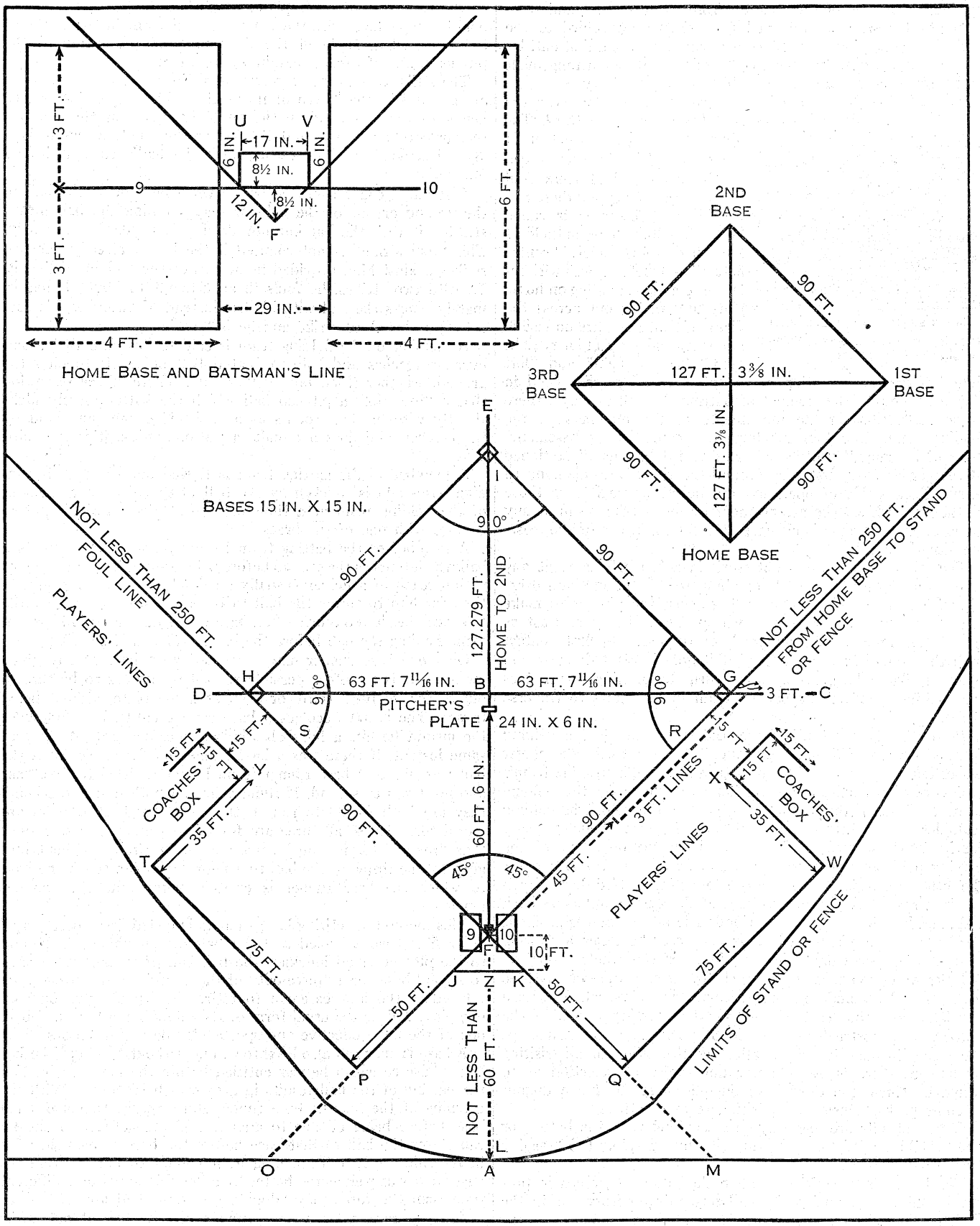
Seven of the nine players on the fielding team take stations on the playing field, prepared to capture ("field") the ball as soon as possible after it is hit by the batter. The other two, the "pitcher" and the "catcher," form the "battery." The catcher stands outside the diamond at the home plate angle, within stepping distance of home plate, but not close enough to impede the batter's activities.

The pitcher stands near the centre of the diamond. He puts the ball in play by throwing it to the catcher. The batter stands on one side of the home plate, within a prescribed area marked on the ground, "the batter's box." He gets his chance to hit the ball as it passes him on its way to the catcher. He therefore stands facing the plate, swinging the bat with both hands, and in such a position as to be able to put the full force of his shoulders and arms into his swing at the ball as it is passing above home plate.

Players are termed "right-handed batters" or "left-handed batters" according to whether they stand on the side of the plate nearer third base or the side nearer first. A right-handed batter looks at the pitcher over his left shoulder as the pitcher begins his "delivery," the pitching of the ball to the catcher. A left-handed hitter's chin is near his right shoulder as the pitcher starts to throw.

The bat used is made of hardwood, all one piece, maximum length allowed 42 in., thickness $2\frac{3}{4}$ in., smaller in diameter at its handle end. There is no restriction of the bat's weight, except that no metal or any other reinforcement may be used in its construction. It is allowable to apply to the gripping surface a covering of tape or other abrasive agent to give a firm hold for the batter's hands.

The legal professional ball is restricted to a weight of between 5 and $5\frac{1}{4}$ oz. and a circumference of from 9 to $9\frac{1}{4}$ in. It has a



COURTESY OF "SPORTING NEWS"

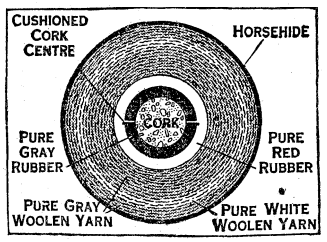
Official measurements for laying out baseball field

rubber core, is wound tightly with woollen yarn, and covered with two bi-spatular pieces of white leather, so shaped as to fit together tightly as a single-thickness cover over the entire surface, the two pieces sewn together with a silk-thread seam.

When the batter hits the ball inside "fair territory," he is entitled to start his course around the bases. Fair territory includes the diamond itself and the area of the playing field between the "foul lines." These are straight white lines along the ground

marking two sides of the square (from home to first and from home to third), and prolonged beyond first and third to the limits of the playing field. Since it is only a fair ball that entitles the batter to run, the fielding team's defensive arrangement places its seven movable men within the fair territory.

Four of them (the "infielders") patrol the ground near the base lines from first to second and from second to third. The other three (the "outfielders") are stationed in the wide sweep of the playing field from foul line to foul line beyond these two base lines. This area is called "the outfield." The outfielders are called "right fielder," "centre fielder" and "left fielder" with relation to a man standing on home plate and facing out across the diamond, but there are no visible boundaries separating "right field," "centre field" and "left field." With the exception of the pitcher and catcher (and in their case only at the moment of putting the ball in play), there is no restriction on the movements of the members of the fielding team. The four infielders are named "first baseman," "second baseman," "shortstop" and "third baseman," stationed in that order from first base around the rim of the diamond to third. Their fields of operation are nearly as flexible as those of the outfielders. The arrangement of the fielding team at any given point in a game is changed to meet the needs of the existing situation.



CROSS SECTION OF A BASEBALL
Nine inches in circumference, the ball weighs about five ounces

The main offensive force at work in a baseball game at any given point is the batting team's ability to hit the ball and drive it far, fast, and straight enough back past the pitcher to make it a "fair ball," *i.e.*, to remain within fair territory at least as far as the limits of the diamond, or to make its first contact with the ground in fair territory if it goes beyond the diamond before striking the ground. Along with this batting power goes the running speed of the batting team in its efforts to traverse the bases.

Put-outs.—To meet this force, the rules provide the fielding team with ways of making "put-outs." A put-out puts the player out of offensive play until his next turn at bat. The batting team's inning continues until three put-outs are made by the fielding team. At "3-out," the batting team goes to the field. The fielding team leaves the field and assembles at its own "bench," ready for its inning of attack. One bench is at the boundary of the playing field between home plate and first base. The bench for the other team is between home plate and third base. Each bench is roofed over, uses the front of the grandstand as its back wall, and has side walls at either end. The bench itself is at about the level of the ground, which is excavated to allow a flooring of concrete. The name "dugout" includes the whole structure, with its water-fountain and its rack for holding the two or three dozen bats that compose a major league club's arsenal. A passage usually leads from each dugout to the dressing rooms in the grandstand's substructure. In each ball park the home team keeps the same dugout all season, allotting the other to all visiting teams, but there is no rule nor uniformity of selection as to which is which, the third base dugout being the home dugout in some parks, housing the visiting team in others.

Most put-outs are made by (1) "striking out" the batter, or (2) "catching a fly," or (3) "throwing him out," or (4) "tagging out" a base runner.

The batter is "struck out" when the pitcher succeeds in preventing him from hitting the ball into fair territory within the limit of three "strikes." A strike is counted on the batter whenever he swings at a pitched ball and misses it. A strike is counted on him when he does not swing at a pitched ball which passes him inside the "strike zone," which is an imaginary rectangular plane suspended in front of the batter. Its top and bottom are invisible lines level with his shoulders and knees respectively. Its long sides are perpendiculars extending upward from both ends of the front rim of home plate, which is a rubber slab, pentagonal in shape, level with the ground, two sides fitting exactly into the home plate angle of the diamond, and presenting to the pitcher a straight front margin 17 in. wide.

The strike zone is thus a rectangle 17 in. wide, facing squarely at the pitcher, the length of its vertical sides depending on the height of the batter. When the pitched ball passes through this rectangle at any point and the batter does not swing, it is a "called strike," counting exactly as if he had swung at it and missed.

A strike is counted on the batter when he "fouls" the ball to the ground or out of the field of play. Fouling the ball means striking it with the bat but not driving it inside fair territory. This "foul strike" is not counted if the batter already has two strikes against him, provided he swings at the ball in fouling it. If, with two strikes, he fouls in an attempt to "bunt," that is, merely blocks the ball with his bat instead of swinging, his foul counts as his third strike and he is "out."

A member of the fielding team is said to "catch a fly" whenever he reaches and holds a batted ball before it touches the ground, whether it be fair ball or foul. There is the exception that a "foul tip," a pitched ball which the batter merely flicks slightly with his bat, counts as a strike if caught and held by the catcher, and does not make a put-out unless it is the third strike.

A member of the batting team is tagged out when he is running bases and is touched by the ball in the hand of a member of the fielding team at a time when the base runner is not in contact with one of the bases.

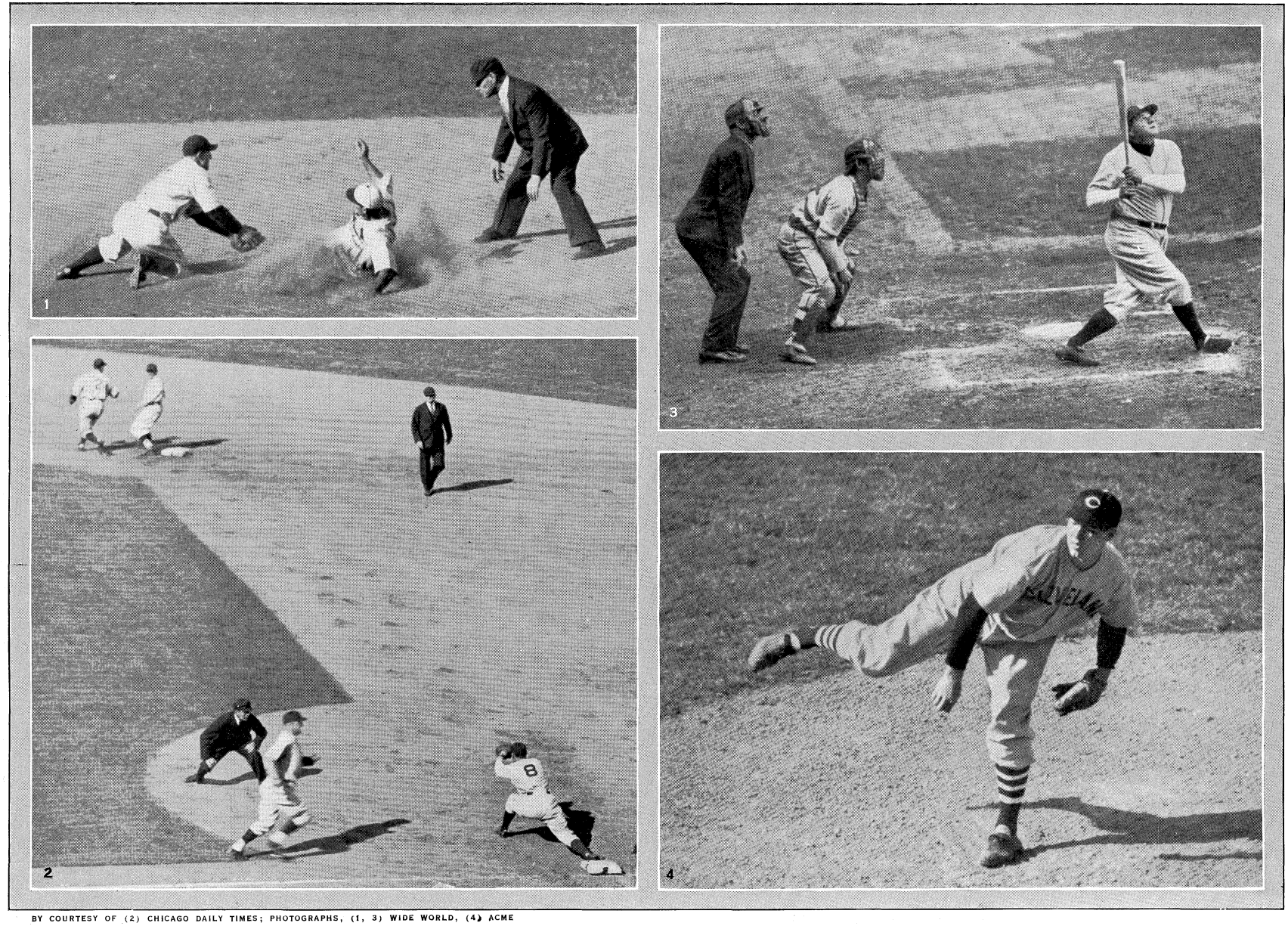
A member of the batting team is thrown out when he bats a ball which touches the ground before being caught but which comes within reach of a fielder (usually an infielder or the pitcher), in time for him to throw the ball to the first baseman so that the latter catches it and touches first base with some part of his person while holding the ball before the batter can reach first base.

Only one base runner may have title to a base at any given moment. It is therefore possible for a base runner to be thrown out at second base, third, or even at home plate without being tagged. The batter becomes a base runner entitled to first base the instant he hits a fair ball which strikes the ground. At that same instant, if there was a base runner on first base when the ball was hit, that base runner is no longer entitled to first base and must run to second. If runners are on both first and second, they are both forced to run to the base ahead. If runners are on all three bases, all three are forced to run. Any base runner thus "forced" to run can be put out, or "retired," without tagging, by the throw of the ball to a fielder who can touch the base to which the base runner is entitled before the base runner reaches it.

This method of retiring base runners is called "the force play." With first base occupied and the ball driven along the ground to the pitcher or an infielder, the ball can often be first thrown to second base for a "force-out" of the man from first base, then relayed to the first baseman to retire the batter—two outs on one play. This is the usual form of the "double play" in baseball, one of the most effective and spectacular defensive tactics.

A base runner can also be thrown out without tagging if he has left a base to which he was entitled before the ball was hit and the batting of the ball results in a fly which is caught. With the catching of the fly, the base runner must return to his original base before being eligible to advance. If the catcher of the fly can throw the ball to that base before the base runner succeeds in returning to it and touching it, it counts an out, retiring the base runner as well as the batter by a "double play" of a different type than the force play "double up" described above.

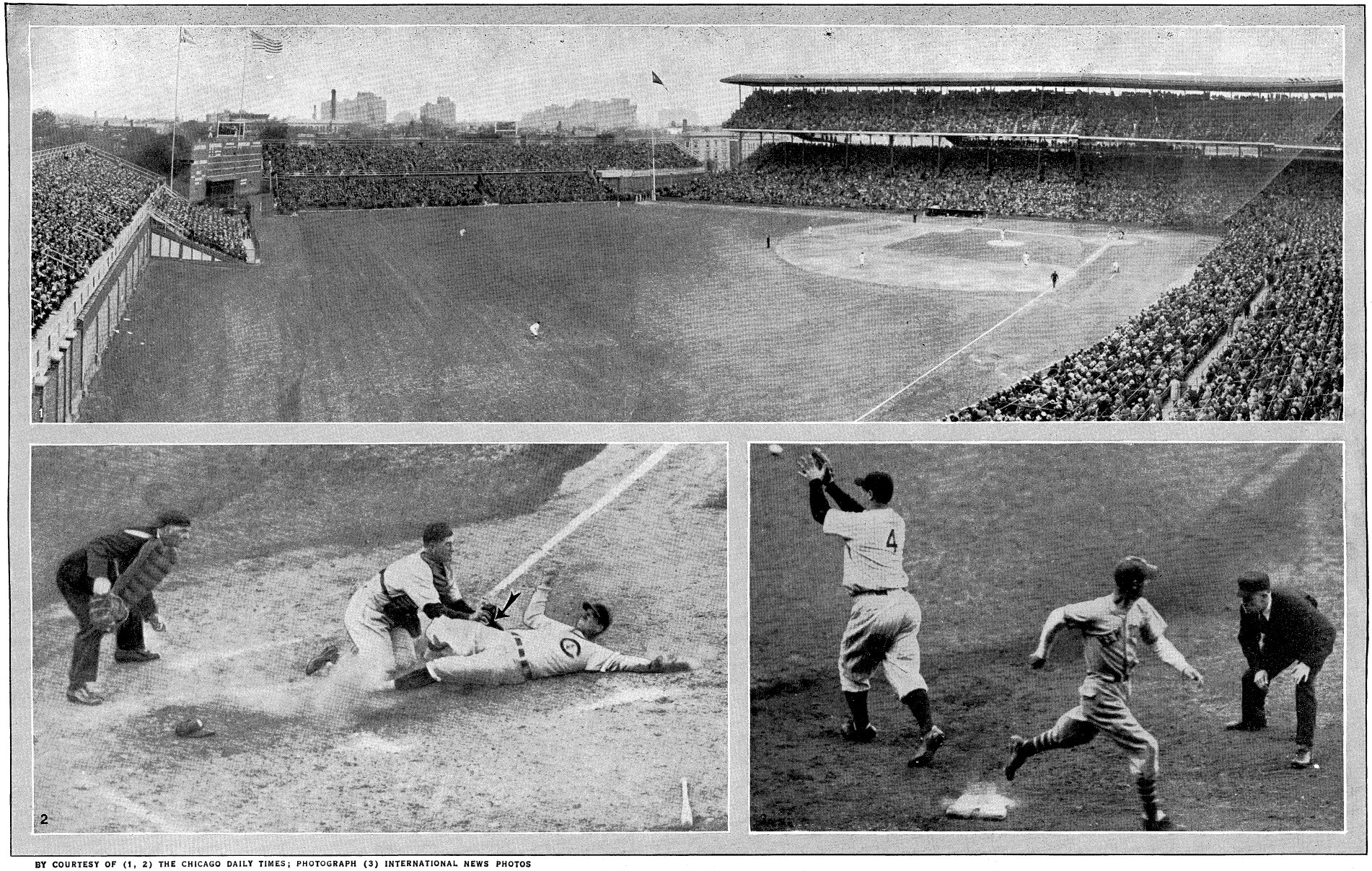
In very rare cases a base runner can be tagged out while standing on a base if, through confusion of mind or misjudgment of the play in progress, he remains standing on a base to which he is no longer entitled. In almost all situations of baseball, however, the bases form anchoring posts (isles of safety) for the players of the side at bat in their progress towards scoring runs.



BY COURTESY OF (2) CHICAGO DAILY TIMES; PHOTOGRAPHS, (1, 3) WIDE WORLD, (4) ACME

BASEBALL IN THE UNITED STATES

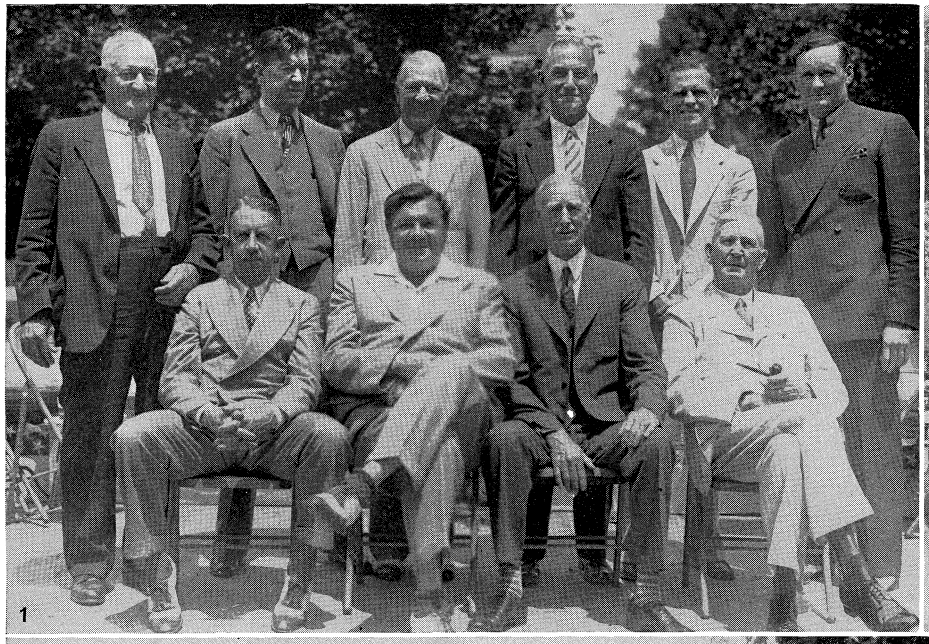
1. Sliding into second. Pepper Martin of St. Louis stretches a single to a double in the World Series game, Detroit, 1934. The game was won by the Cardinals, 11 to 0.
2. A fast double play in the World Series between Detroit and the Chicago Nationals at Wrigley Field, Chicago, 1935
3. Babe Ruth hits a home run
4. Bob Feller of the Cleveland Indians as he pitched a no-hit, no-run game in 1940

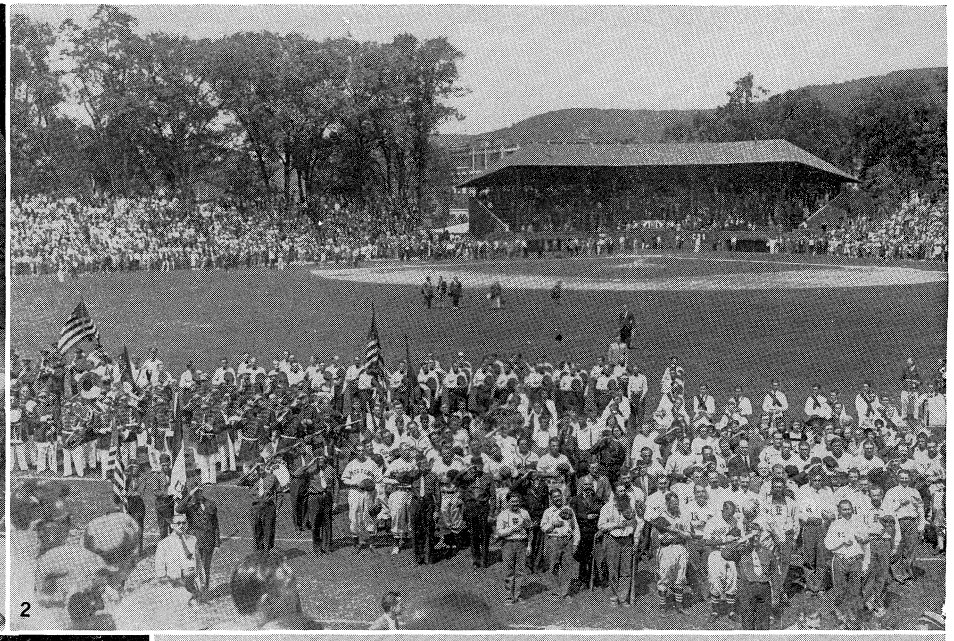


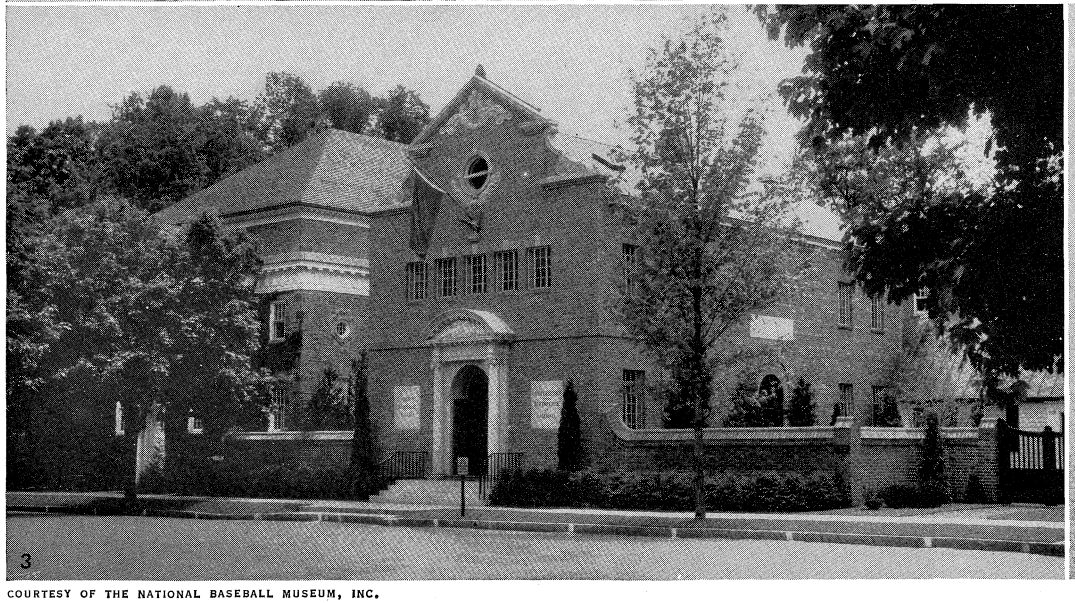
BY COURTESY OF (1, 2) THE CHICAGO DAILY TIMES; PHOTOGRAPH (3) INTERNATIONAL NEWS PHOTOS

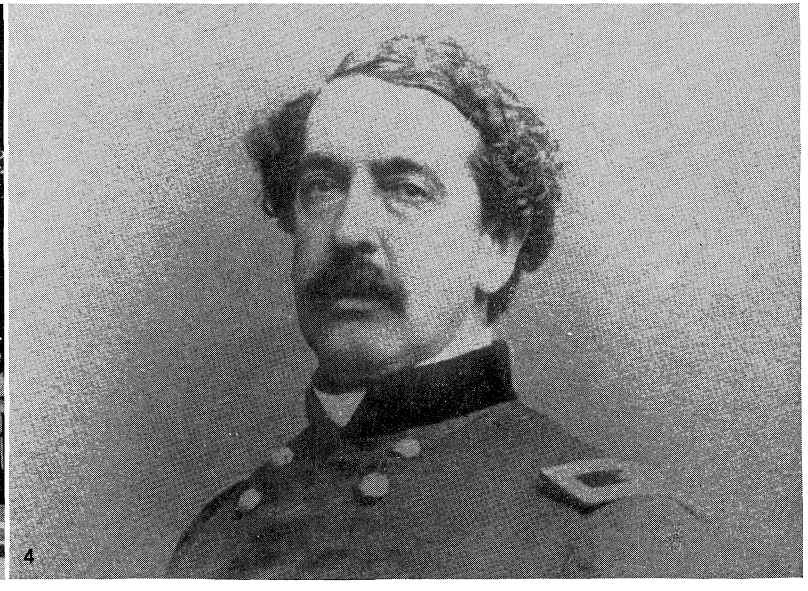
"WORLD SERIES" BASEBALL GAMES IN THE UNITED STATES

1. A panoramic view of the third game of the World Series in 1935 between the Chicago Nationals and the Detroit Americans at Wrigley Field, Chicago. 2. Jurges of the Chicago Cubs out at home. Manager Mickey Cochrane of Detroit with the ball. The throw was made from Fox to Cochrane. 3. Travis Jackson of the Giants is safe on first base after his bunt down third base line in the fourth World Series game between the New York American and the New York National League champions at the Yankee Stadium, New York, 1936.









COURTESY OF THE NATIONAL BASEBALL MUSEUM, INC.

NATIONAL BASEBALL MUSEUM AND HALL OF FAME

1. Ten of the "Baseball Immortals" present at the Cooperstown ceremonies. Seated, left to right: Eddie Collins, Babe Ruth, Connie Mack, Cy Young. Standing, left to right: Hans Wagner, Grover Alexander, Tris Speaker, Napoleon Lajoie, George Sisler, Walter Johnson
2. Dedication of Doubleday field, Cooperstown, June 12, 1939. Site of the first game of baseball in 1839
3. National Baseball Museum and Hall of Fame at Cooperstown, N.Y. Dedicated June 12, 1939
4. Portrait of Abner Doubleday, father of baseball, in the Baseball Hall of Fame

The Umpires.—The play of a ball game is under supervision and control of one or more umpires, acting as the impartial judges and announcing decisions on whether the pitched balls pass over the plate within or outside of the "strike zone," whether batted balls are fair or foul, whether a base runner has been put out by a throw or by tagging, or is "safe" *i.e.,* entitled to hold the base he has reached by running.

Three umpires are usually on duty in professional games, one stationed behind the catcher, the other two covering the plays that occur on base runners at first, second and third bases. The home plate umpire starts the game by calling play for the first inning of the game. The ball goes into play when the pitcher pitches it to the catcher. It remains in play except when an umpire calls "time," which is done on all foul balls except flies that are caught before touching the ground, also upon the request of either team at a time when the ball is being held by a player of the fielding team and no base runner is attempting to advance. Time is called on the rare occasions when a batted ball strikes a base runner, and in other circumstances when the umpire's discretion so dictates.

The Attack.—When the plate umpire orders the game to start, he has in his possession the "batting order" of each team, a list of nine names delivered by each manager as the order in which his players will come to bat, regardless of their defensive positions. This list is in force throughout the game in its original order of precedence. A substitute entering the game takes the batting order place of the player for whom he is substituted. A player leaving the game is not permitted to come back into it.

Each team in its innings strives to advance its members around the bases to score as many runs as possible before the third out ends its inning. Each inning is a new game, in the sense that it starts with the bases empty. The first man in the batting order is the first batter in his team's first inning. In subsequent innings, the first batter up is the man whose name in the batting order follows that of the last batter in the previous inning whose completed turn at bat resulted in the third out. In cases where the third out is made on a fielding play which did not involve any hit or strike-out or base on balls, or any other completion of the batter's turn at bat, the man at bat when the third out was made becomes the first batter of the next inning.

The rules permit base runners to advance on the bases at their own risk of being tagged out at any time the ball is in play. The basis of advance, however, is the batted ball when it is batted into fair territory outside the immediate control of the fielding team. The acme of successful batting is to drive a pitched ball beyond the confines of the playing field inside fair territory, *i.e.,* between the foul lines.

A ball so driven is called a "home run." It has passed beyond the reach of any fielder's capacity to regain control of it and entitles the batter to run as he pleases around the bases to score a run at home plate. This ball usually goes over the fence. Any and all base runners who are on base when the home run is hit likewise make their way to the plate and register a run each.

Failing a home run, the batter aims to drive the ball in such a way that it cannot be caught before touching the ground in fair territory nor caught after touching ground soon enough to be thrown to first base before the batter gets there. If he succeeds in this, he has "made a hit." If he drives it far enough so that he can reach second base safely, it is a "two-base hit," "two-bagger" or "double." A hit long enough for the batter to reach third base is a "three-base hit," "three-bagger" or "triple."

With the ball thus hit by the batter into fair territory, any members of his team who are already occupying bases advance around the bases as far as is possible before the ball is returned to the infield. They must reach their objectives without being tagged out; thus their judgment of how far they can go when the ball is hit safely is a major element in successful attack.

A batter hitting the ball inside fair ground and reaching first base safely because of a fielding lapse, *i.e.,* failure to catch the ball, or inaccurate throwing, is not credited with a hit. The failure of the fielder appears in the record of the game as an "error" committed by him. Failure to tag a base runner with the ball when a chance offers to make a put-out by this method also counts as an error.

The "Base on Balls."—A batter may reach first base without having hit the ball. This is nearly always the result of inaccuracy by the pitcher in his efforts to make the batter hit a "bad" ball, *i.e.,* a ball passing the batter at a point where the batter cannot hit the ball with his full power. Whenever the batter does not swing at a pitched ball, and the pitched ball does *not* cross the plate inside the "strike zone," *i.e.,* over the plate at a level between the batter's shoulders and knees, the umpire standing behind the catcher announces "one ball." If four "balls" are thus declared on the batter in a single turn at bat, he is entitled to go to first base without a play being made on him, the recipient of "a base on balls."

Frequently (sometimes as many as four or five times in the same game) there is a base on balls not due to the pitcher's inaccuracy, but performed by him for tactical reasons. The team at bat, for instance, has a base runner in "scoring position," *i.e.,* on second or third base or both, but none on first. If, in the collective judgment of the pitcher, his catcher and his manager, the man at bat is more likely to make a safe hit than the man who will follow the man at bat in the opposing team's batting order, it is considered sound tactics to give the batter an intentional "pass" to first base. The catcher moves from behind the plate to one side, the side away from the batter, and the pitcher delivers four pitches which the batter cannot reach while standing in the batter's box. The batter thus receives a base on balls and must go to first base, bringing to bat the weaker hitter.

The intentional pass has the additional merit of setting up a possible force play at second base which can materialize if the weaker hitter drives the ball along the ground within reach of an infielder or the pitcher or catcher. With a base runner on second base a force play is also set up at third base, and if both second and third are occupied when the intentional pass is given, there is made possible also a force play at home plate. The defensive side's advantage is in being enabled to make a put-out without tagging the base runner trying for the base. Contact need merely be made with the base by a defensive player with the ball in his possession and control before the base runner reaches the base. This advantage is of greater potency when there are fewer than two out, in which situation the batter's "grounder" can be converted into a double play, rescuing the pitcher and the defensive team's cause from a scoring threat.

So valuable is this double play opportunity that often, when there is no disparity between the batting abilities of the two batters under consideration, the intentional pass will be ordered by the manager, solely to create the double play opportunity.

As countertactic when an intentional pass is given, the team at bat frequently replies by "sending in a pinch hitter," that is, taking the weaker hitter out of the line-up and substituting another player whose likelihood for driving the ball for a safe hit or a fly to the deep outfield is greater than that of the player brought to bat by the intentional base on balls. Such a pinch hitter must be a player not already in the line-up, nor in the batting order at any previous time in the game. Pinch hitters are sent into action in other situations than as a rebuttal to an intentional pass. In fact, in nearly every baseball game, the late innings are marked by one or more substitutions of this type, made by whichever team is behind in the score of the game.

"Hit by Pitched Ball."—The batter reaches first base without hitting the ball if a pitched ball at which he does not swing strikes any part of his person. The umpire then awards him the right to go to first base, "hit by pitched ball."

"Missed Third Strike."—If with two out, or with first base unoccupied regardless of how many are out, the batter swings and misses the ball for his third strike, and the catcher does not catch the pitched ball before it touches the ground, the batter is entitled to run for first base just as if he had hit the ball along the ground in fair territory. The catcher must then get the ball and throw to first base ahead of the batter in order to put him out. In instances when such a pitched ball rebounds off the catcher out into the diamond, the pitcher or any in-

fielder may make the pickup and throw to first just as if it were an infield grounder. This right to try for first base does not exist when first base is occupied and there are fewer than two out, because, if it did, the catcher might drop the ball directly in front of him and thereby create the opportunity for a double play, throwing to second to force out the man on first, the double play then to be completed by a throw from second to first before the batter arrived at first base.

The "Infield Fly" Rule.—Similar protection is afforded the batting side by the "infield fly" rule, in instances where, with both first base and second base occupied, or with first, second and third base occupied, and fewer than two out, the batter hits a high fly which in the judgment of the umpire can readily be caught by an infielder or the pitcher or catcher, inside fair ground. When such a fly is hit in such circumstances, the umpire immediately declares the batter "out," whether or not any member of the fielding team subsequently catches or misses catching the ball. This law was enacted in 1895 because clever infield players would pretend to catch the fly, but at the last moment would let it strike the ground, thus setting up a force play at both third base and second base, which could be made a double play by quick and accurate throwing. An attempt to bunt, however, under the conditions noted above, which results in a fair fly shall not be regarded as an infield fly.

Very rarely the batter is awarded first base by the umpire because of "interference by the catcher," meaning that the catcher has touched the batter's arm or other part of his person, or the bat itself, while the pitched ball is on its way from the pitcher to home plate.

A game without a base on balls for any batter of either side is unusual. In an average game there are from four to a dozen bases on balls. A team may go for days, or even weeks, on the other hand, without any of its batters reaching first by being hit by a pitched ball. Missed third strikes are even more uncommon in the professional leagues. In the course of a major league season, playing more than 600 games, there are usually fewer than a dozen instances of interference with the batter by the catcher.

"Stolen Bases."—The batter, because he has eight other batters on his team, can perch on a base to wait until a teammate-batter drives the ball out of reach of fielders, enabling him to travel further on his road to home plate to score a run for his side. The rules do not compel him, however, to wait for the ball to be batted. His only restraint is the threat of being tagged out, of being touched with the ball in the hand of a member of the fielding team at a time when he is not on a base.

Obviously, a dash for the next base when the ball is being held by the pitcher, the catcher, or an infielder, makes the runner a certain "out." When the pitcher delivers the ball to the batter, however, he can match his speed with the strength and accuracy of the catcher's arm. If the runner makes such an attempt and succeeds in reaching the next base without being tagged out, he is said to have "stolen a base."

In 19th-century baseball and the first 20 years of the 20th century, the stolen base was a prominent and spectacular feature of baseball play. In the years immediately following World War I, better materials and improved machinery in the making of baseballs brought on the era of the "lively ball." It became more advantageous to wait for the batter to hit the ball than to risk the matching of speed against perfect play by the catcher and the infielder guarding the base to be "stolen."

Except in cases of speedy players with a flair for "getting the jump" on the pitcher and talent in avoiding the tagging stab of an infielder's hands, "stolen bases" as individual exploits ceased to be a usual procedure.

The "Hit-and-Run."—Attempts at stealing bases in modern baseball usually take the form of the "hit-and-run" play, in which the batter co-operates with the base runner. It requires a fast base runner and a coolheaded, keen-eyed and quick-thinking batter, and is rated as a "risk" play, a "gamble," not highly favoured by most major league managers except in emergencies.

When it is used, the setup almost always calls for a base runner on first, but on no other base. The runner starts for second base as the pitcher begins his pitch. If the second baseman shifts to be in position to receive a throw to second base from the catcher, the batter tries to drive the ball along the ground through the area ordinarily guarded by the second baseman. If it is the shortstop who has thus "covered" second, the batter tries to drive the ball through the shortstop's just-vacated sector.

When the batter succeeds in his effort, the ball goes to the outfield as a safe hit and the runner usually reaches third base easily. There are lesser degrees of success. The batter may hit the ball along the ground but not through the open sector. This results usually in an out at first base on the batter, with the runner reaching second safely, moderately advantageous, since it has placed the runner on second base, in position to score on an ordinary one-base hit to the outfield by a subsequent batter and has removed the double play menace that always exists when a base runner is on first base with fewer than two out.

If the batter hits a fly, the base runner must quickly retrace his path and regain first base, which is usually done easily. If the batter misses the ball entirely, the most he has accomplished is to offer a visual hazard to the catcher's throw to second base. The play in this instance takes the pattern of a plain attempt to steal second base. In every major league season a large percentage of the stolen bases credited to players are the result of hit-and-run plays in which the batter fails to hit the ball.

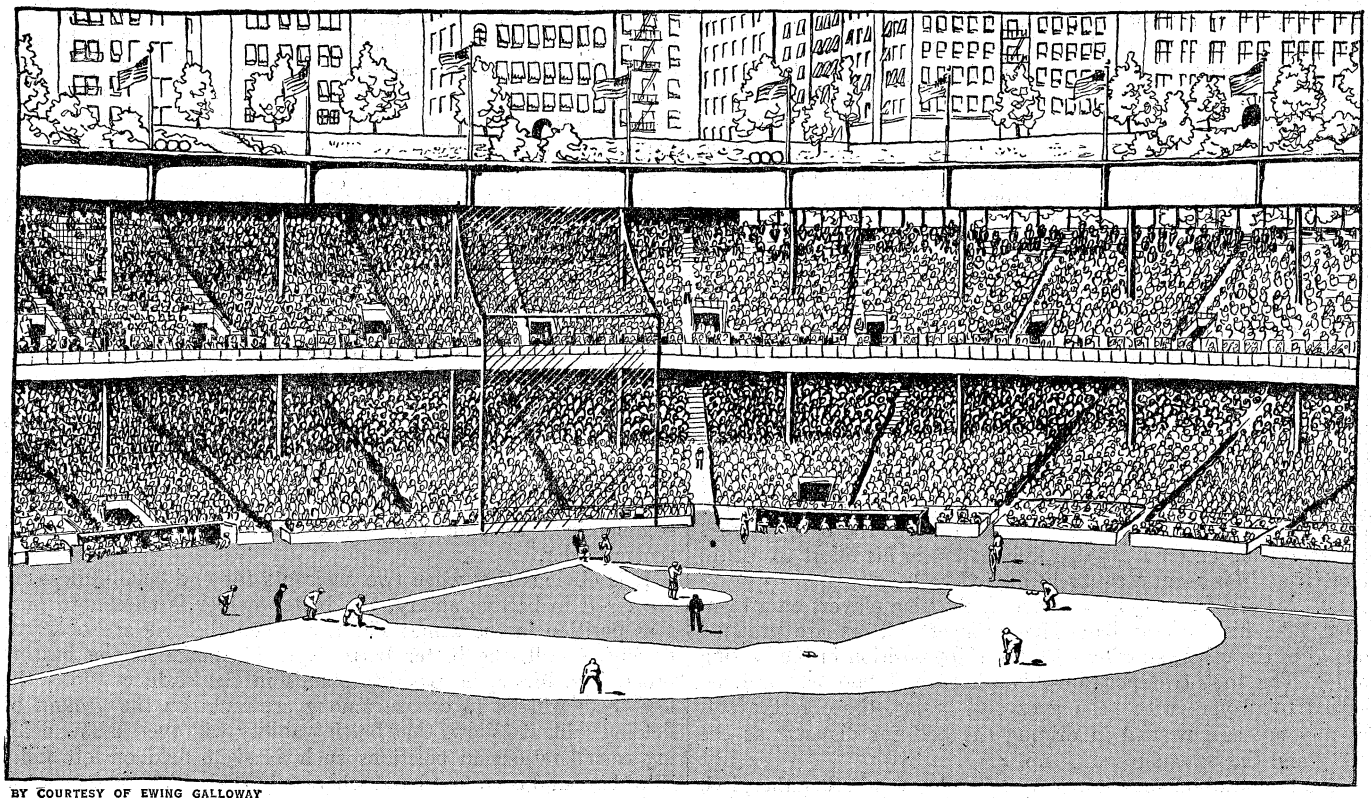
Since the hit-and-run play involves two players, there is usually the exchange of a secret signal between them, or a signal to both of them by the manager or one of the "coachers."

The coachers, two in number, are stationed outside the diamond, one near first base and the other near third. They are advisers to the base runners and liaison operatives between the manager on the bench and the batter and the base runners. They take their stations as soon as their team begins its inning at bat, yielding to the opposing team's coachers when the inning ends and the opposing team comes to bat. Coachers are usually experienced men whose days of active service as players have ended. Besides their duties in the course of the game, they act as lieutenants and all-around assistants to the team's manager and are listed in the personnel of the ball club as "coaches." In the major leagues the team manager has at least two, often three, of these assistants. Often the manager himself elects to serve as a coacher in the play of the game, usually choosing the position at third base, since it is there that the most vital decisions of base-running must be made, namely, whether to stop at third base or to keep on running and try for home plate.

When the manager is directing play from the coacher's box, the hit-and-run signal travels directly from him to the batter and base runner. If he is a "bench manager," he signals to one coach or the other. If the defensive team detects the signal, or suspects from some action or attitude of either player that the hit-and-run play is about to be used, their defense calls for a "pitch-out." As the runner starts his dash, the pitcher pitches the ball to the catcher at a point outside the reach of the batter's bat, thus putting the catcher in position to make a clear throw to second base.

The most disadvantageous outcome of the hit-and-run play occurs when the batter hits a "line drive" that is caught by the pitcher or an infielder. Such a drive, travelling low and fast and caught within a fraction of a second of its leaving the bat, retires the batter instantly and makes a double play virtually inevitable, since the ball is caught within easy throwing distance of first base and the base runner, at the moment of the catch, has gone more than half way to second. The fly catch rule requires him to return to his base under penalty of being put out if the ball is held on that base by a defensive player.

The Bunt.—Nearly every time a batter tries to hit a ball in a baseball game he takes a full swing, aiming to drive it with his bat as fast and as far as he can. He puts every ounce of muscle into his swing, stepping "into" the ball as it approaches him and lashing at it with the bat held in both hands and powered by wrists, arms, shoulders, back and hips. There are times, however, when he "bunts" the ball, tries to tap it lightly with



BY COURTESY OF EWING GALLOWAY

A BASEBALL GAME AT THE POLO GROUNDS, HOME OF THE NEW YORK "GIANTS"

Looking toward home plate from right field with a player on first base and a man up to bat. If the batter hits the ball the pitcher is preparing to throw, he will run to first base and the player already there will attempt to reach second base. Notice the "dugouts" where players await turn to bat, and substitute players watch for a call to enter the game

the bat to make it spill along the ground 12 or 15 ft. into a zone about halfway between pitcher and catcher and off to one side or the other of a straight line from catcher to pitcher. In "bunting," the batter usually relaxes his grip on the bat and, instead of swinging, merely holds out his bat so that the ball strikes it and plops to the ground with only enough force to send it out into the diamond the required distance. The bunt is always a strategic action. The batter therefore tries to conceal his intent as long as possible so that neither the batterymen nor the infielders can "get the jump" on the play. The bunt is usually intended to be a "sacrifice," that is, the batter expects to be thrown out at first base. His purpose is to enable one or more base runners to proceed to their next base while the play is being made on his bunt, retiring him at first base. He thus "sacrifices" himself in the interests of advancing a potential run or two an important stage of the journey around the bases.

In a close game, the sacrifice is routine procedure when a batter reaches first base with none out in the late innings, especially if his team is one run behind, or the score is tied. If the first batter of the inning reaches second base on either a two-base hit or by the help of a fielding error, the sacrifice bunt is considered mandatory. At any stage of any game, most managers will order a bunt whenever both first and second bases are occupied with none out. So faithfully is this done that sometimes the defensive team shifts its infield arrangement so that the first baseman and third baseman are stationed 10 or 20 ft. closer to home plate than ordinarily. This invites the batter to "cross them up" by swinging at the ball instead of bunting, but the sacrifice bunt is rated so sound a procedure that only rarely does the attacking team discard it, no matter how close the infielders play on the defense.

When a bunt is the expected tactic, the defensive team exerts every effort to defeat it. The pitcher resorts to high fast pitches because (a) it is harder for the batter to dump the ball along the ground if he has to reach high to block a ball with his bat and (b) the greater the speed of the pitch the less likely the batter will be to hit the ball at all, or, hitting it, to control its course. A bunted ball going foul counts a strike even after two strikes. A pitcher having succeeded in getting two strikes on a bunting batter can usually count on the batter not risking a third strike on a foul bunt. The bunt strategy can thus be eliminated by the pitcher when his control and speed are working smoothly.

When the ball is successfully bunted into fair territory, the defensive team is quick to seize any chance there may be to defeat it by fielding the ball to second base or to third for a force play. Exact judgment is required for this play, for the base runner, expecting the bunt, is off at top speed the moment the ball and bat are in contact. Catcher, pitcher and either the third baseman or the first baseman are usually rushing towards the ball. The one who reaches it usually gets shouted advice from the others as to where to throw the ball, whether to try for the force play or merely to throw to first base to retire the batter.

When the ball is bunted towards first base, bringing the first baseman from his base towards home plate, it is the task of the second baseman to run over to first base to receive the throw for the putout of the batter. In this formation the shortstop takes care of second base and the third baseman covers his own base.

When the ball is bunted on the third-base side of the diamond with first base the only base occupied by a base runner, the third baseman joins the pitcher and catcher in trying for the ball, the first baseman takes charge of his base, the second baseman covers second, and the shortstop moves over to defend third.

If there are runners on first and second when the ball is bunted towards third, it is the pitcher's play to field the ball, unless the bunt is so short that the catcher can overtake the ball as it rolls across the grass. The catcher is the man with the entire picture of the play in front of him. On any bunt, unless he can field the ball himself, it is usually the catcher who calls out instructions as to where the ball is to be thrown.

Because the territory in which a bunt is fielded is so close to home plate, it is never used to sacrifice a runner from third to home except after a prearranged signal, on receiving which the runner on third starts running as soon as the pitcher starts delivering his pitch. This is an "all-or-nothing" play. If the batter misses the ball entirely, the catcher, by catching the ball, has the base runner trapped between third and home, a certain out,

unless the runner resorts to dodging back and forth and some error of throwing or catching allows him to escape.

The bunt with a runner rushing home from third base is called the "squeeze play." If the batter can bunt the ball into fair territory, it means a certain run scoring for his side, because of the runner's flying start. The best the defensive side can do is to throw out the batter at first base. The squeeze play is the most spectacular and most dangerous sacrifice bunt.

An expert batter, gifted with exceptional running ability, will sometimes bunt the ball when there are no teammates on any of the bases. The unexpectedness of his action and his speed sometimes enable him to reach first base before the ball can be thrown there. This is known as "beating out a bunt," and counts as a one-base hit, just as if he had swung and driven the ball far enough to reach first safely. A batter assigned to sacrifice sometimes beats out his bunt, but only rarely, because when the sacrifice is in order, he takes particular care to be sure to meet the ball fairly. The batter who aims solely to beat out a bunt for the purpose of getting on base himself takes a quick stab at the ball. In fact, such a batter is in the act of running for first base an instant before his bat touches the ball, whereas the sacrificing batter loses this flying start in his effort to assure himself and his team a squarely bunted ball.

Special Skills.—*Offense.*—Each of the nine players on a team must take his turn at bat. The strongest hitters are grouped one after the other, starting with the third position in the batting order. The first two positions, "leadoff" and "no. 2," are assigned to players with keen eyes and brains, those fast afoot, usually not as powerful in driving the ball for distance as the no. 3 and the "cleanup man," no. 4.

The best lead-off man is one who can know whether the pitch will be a strike or a ball if he lets it pass him without swinging. Such a player is called a "waiter." By "waiting out" the pitcher, letting the bad ones pass, he draws many a base on balls which a less accurately judging batter would not receive. In his strategic position, first batter up in the first inning, and following the weak-hitting pitcher in the other innings in which he bats, a base on balls for him is usually just as advantageous to his team as making a one-base hit. "Getting on base" is the lead-off man's main offensive function, since over a stretch of games his run-driving opportunities are relatively few.

For no. 2 the manager selects his best "hit-and-run man," the batter who is most skilled in driving the ball towards the right-field side of the playing field. When there is a runner on first, the first baseman is "tied to the bag," that is, he takes his position on or close to first base, thus opening a wider sector through which the ball may safely be driven along the ground into right field. The ability to hit the ball in this direction is important, whether on a routine hit-and-run play with the base runner rushing for second base as the pitcher pitches or not. The ball driven safe to right field with a runner on first usually enables the runner to advance as far as third base without great likelihood of being put out. The no. 2 man must also be a capable bunter.

No. 3 is usually the best all-around offensive player on the team, with speed afoot combined with batting power and skill. The greatest hitters of all time have been in the main no. 3 in their team's batting order—Ty Cobb, Babe Ruth, Rogers Hornsby, Eddie Collins, George Sisler, for example. No. 4 and no. 5 are the long-distance hitters, not likely to hit the ball safely as large a percentage of times as no. 3, but often with greater distance. The remaining positions in the batting order scale downward and it is here one finds the high-skilled defensive stars, players whose value to the team is their mastery of their fielding positions. No. 9 is invariably the pitcher, the most specialized of all the ballplayers, whose hitting ability is usually negligible. There are, rarely, pitchers with batting ability, but because a pitcher is called on for duty only about once in five days, even pitchers so gifted do not have the chance to continue "tuned up." On the whole, pitchers are poor hitters. Their batting ability is never considered; whereas in the other positions a man's worth always represents his combined batting and fielding skills.

Defense.—There is no baseball rule relating a man's position in the batting order with his position on defense. The batting order, as handed to the umpire at the start of the game, is a list of nine names, with no indication of their fielding positions, which may be rearranged at any point in the play. Lead-off man is as likely to be a second baseman as an outfielder. No. 3 may be a shortstop or a catcher.

No. 3 is more likely to be a right fielder or left fielder, however, because batting looms so large in his coefficient of worth. In the scale of defensive skills, pitcher is no. 1, shortstop is no. 2, second baseman is no. 3, then catcher, centre fielder, first baseman, third baseman, then the two flanking outfielders, whose degree of fielding importance relative to each other depends on the comparative areas and other physical hazards of their respective "fields," determined usually by the contour of their home playing field's outfield boundaries.

This scale of skills is the basis of the baseball expert's argument in rating one team superior to the other defensively because it is stronger "down the middle." A great team must have a star player at each "middle position," catcher, "the keystone combination," meaning the second baseman and shortstop, and centre fielder.

It is obvious that when two aspirants for one fielding position are equal in batting ability, the better fielder is chosen to play that position in the game; likewise, when the two are of equal defensive skill, the better batter gets his name in the batting order. The lower the position stands in the scale of skills the less there will be to choose among aspirants on the ground of fielding skill. It follows that batting ability will overshadow fielding considerations in positions such as right field or left field, third base and even first base, whereas in the middle positions the manager will weigh very carefully the fielding merits in making his selections. He must have for his shortstop the best possible fielder of the position he can find, regardless of batting, and whatever such a star fielder can furnish in hitting power is sheer profit. But his right fielder and his left fielder must be hitters, and whether they can run faster, judge a fly ball more accurately, throw a ball straighter, or not is a secondary consideration.

Fielding.—*Outfielders.*—Of the three outfielders collectively, less is required in the way of special skill than in any of the other six positions. All the catching of thrown balls, all tagging of base runners, all plays on ground balls to retire runners at bases, take place in the diamond and the immediately adjacent terrain. The outfielders are stationed in order to be able to catch batted balls driven reasonably high in the air beyond the diamond. They must be able to judge the trajectory of such flies and have speed of foot to run to the point where the ball will come down. They must have the ability to catch and hold the ball for the put-out.

Batted or thrown balls which pass beyond the infielders along the ground must be run to earth and "picked up" by the outfielders. Strong throwing arms are essential, and the more accurately an outfielder can throw the ball to the right point in the infield, the more valuable his defensive services to his team. An alert and ambitious outfielder can also add to his value by moving in as a "backer-up" of the infield when the ball has been batted to some point other than his own area and is being thrown about by his teammates in an effort to retire base runners.

The centre fielder rates high in the fielding scale because of his central position in the outfield. He must be a "ball-hawk," possessing great speed and expert judgment of a batted ball's trajectory. The accomplished centre fielder makes a study of all the important batters of rival teams. He keeps a mental chart of each batter's "power," *i.e.,* towards which point in the rim of the outfield the batter's longest drives will be directed. The centre fielder will not only station himself at a strategic point to meet each threat but will direct the playing positions of his outfield teammates on either side. The difference between a three-base hit and a put-out is often such a strategic shift of position by an outfielder.

Almost invariably the great defensive outfielders of baseball history have been centre fielders, Tris Speaker, Max Carey, Terry Moore, Joe DiMaggio, to name a few. Not as much skill

is demanded in right field or left field as in centre, but a right fielder or left fielder can employ all the talent he has in the way of speed, judgment, throwing, etc., to enhance his own value and further his team's defensive solidarity.

Infielders.—The outfielders form the outer ring of defense against the batting of the opposing team; the infielders form an inner ring, four strong, their function to field the ball at close range. They capture on the fly line drives from the bats of their opponents when such drives come within reach, but mainly their work on batted balls is the "picking up" of "grounders," when the ball is batted so that it skips along the ground towards the outfield or shoots swiftly across the grass making one or two contacts with the turf.

The fielding of a grounder is baseball's most characteristic play, setting it apart from all other sports. When a batted ball strikes the ground, the game becomes a race between the batter's speed in running from home plate to first base and an infielder's agility and adroitness in gaining control of the ball and throwing it.

The four infielders shift positions to guard against each batter's individual power, as do the outfielders. They have the additional responsibility of guarding the bases when any or all of them are occupied. When a ball is batted along the ground, only one of them is called on for the effort to gain control of it, but at least one of the others is almost always involved in covering a base to take the throw; sometimes two bases must be covered for a possible throw, sometimes all three.

In the many situations arising in the course of one game, the infielders must adjust themselves with flawless judgment, lightning speed and sound co-operation in order to be efficient. The fielding of grounders—pickup and throw—is the common skill of all four infielders. Each position has its special modifications of grounder-fielding requirements.

At shortstop the throw is the longest and/or most difficult, whether or not the batted ball is a swift one shooting towards the outfield to the shortstop's right or left or straight at him, or is a tantalizing slow skipper which he must rush in towards the plate to field fast in order to have a chance to retire the batter at first base.

The second baseman's function on grounders is the same, except that his throw has a shorter distance to travel to reach first base, therefore giving him an extra instant of time. Offsetting this advantage somewhat is the fact that the shortstop faces first base in all instances except when a ball is off to his right, while the second baseman, on most of his grounders, must throw "around the corner." It is a baseball saying that a good shortstop can always move over and become a good second baseman, but even a very good second baseman cannot often become an even adequate shortstop, mainly because of the extra throwing skill and power demanded by the shortstop's location in the fielding strategy.

On a force play at second base, whether part of a double play or not, either the second baseman or the shortstop must cover second to catch the throw with his foot on the base, just as the first baseman does on an "out at first." The force play is always a potential double play. The second baseman, coming to the base to take the throw, has first base over his left shoulder, so that he must throw around the corner to complete the double play. Skill in thus "pivoting" is an important part of a second baseman's category of talent.

The third baseman, playing nearer the batter than the shortstop or second baseman, must be agile and nimble but is not called on to scurry over as wide a zone as they. The grounder aimed his way reaches him or is past him into the outfield sooner than is the case at second or short. On his most difficult play, the fielding of a bunt or a dribbling roller half-way between home plate and his position, the third baseman finds himself with a throw to first which is shorter than any the second baseman or shortstop is ordinarily called on to make and with more time in which to make it.

The first baseman's fielding of grounders is made easier because of his proximity to the goal for which the batter is striving. Often he is able to touch first base with his foot, with ample time to spare, after picking up the batted grounder. When there is not time for that, his throw is a mere underhand toss to the pitcher as the pitcher moves over to cover first base.

The first baseman's hardest play develops when there are base runners on one or more of the bases and the fielding of a grounder involves a throw to second, third or home. Such plays are rare by comparison with the number of throws made by the other infielders. Because they are often important, it is considered an advantage for the first baseman to be a left-handed thrower, making it a more natural movement for him than for a right-handed thrower. Second basemen, shortstops and third basemen in modern baseball are invariably right-handed throwers. First basemen are sometimes right-handed, sometimes left-handed. Catchers are always right-handed. Pitchers and outfielders may throw with either hand.

The Battery.—The pitcher functions as an emergency first baseman when a grounder is driven towards the first baseman at a point so far from first base that the first baseman has not time to run to the base before the batter will reach it. This is not a difficult fielding play for the pitcher, provided he starts running promptly. The distance from the pitcher's box to first base is roughly two-thirds as long as the distance the batter must run. The pitcher can easily get there ahead of the batter. All that remains is to catch the ball as tossed to him by the first baseman and touch first base with his foot. It is a fairly common play, though sometimes throughout an entire game the pitcher may not be called on to make it.

Otherwise the pitcher's fielding functions consist of trying to field any ball batted in his direction, to catch it and hold it for the out if it is a line drive or a fly that does not go high enough into the air for the catcher or one of the infielders to reach it before it will strike the ground, to pick it up and field it to some base if it has struck the ground. On bunts the pitcher functions as an infielder, covering his share of the zone between the foul lines and between the pitcher's box and home plate. Fielding skill is an important asset to a pitcher. It can save him many a game and make up for a moderate degree of deficiency in pitching skill. Without fielding talent a pitcher can be successful only by the possession of exceptional pitching ability.

The catcher, as a fielder, is mainly a catcher of high flies, a thrower, and a guard at home plate. The flies he is called on to catch are "skyscrapers," batted balls that soar almost straight upward from the bat and come down somewhere between the base lines and the grandstand or else directly in front of home plate. Keenness of vision to perceive the angle at which the ball leaves the bat is the indispensable attribute necessary to get a quick start in the right direction from home plate. Unerring catching of these "straight-up" flies develops a special sense in catchers not required in any other position. The ball is high in the air directly overhead and coming down at him almost perpendicularly.

The "good hands" essential to every baseball player are especially important for the catcher. Throughout the game he must catch the pitched balls not batted by the batter, sometimes pitches which strike the ground near the plate. Sometimes he must jump for high ones or wide ones. The bat swinging directly in his visual line as he reaches for the pitch is no hazard to him. From long use he has become accustomed to it. It is when the bat flicks the ball slightly in passing that the catcher's good-handedness "pays off." If the batter has two strikes, the ability of the catcher to catch the ball and hold it makes the difference between a strike-out, ending the batter's term at bat with a put-out, and potential trouble. Such a "foul tip," eluding the catcher's grasp, becomes a mere foul ball, counting nothing against the batter and, in fact, granting him one more chance to hit the ball safely.

The catcher sometimes fields a bunt or a half-hit batted ball spilling just in front of the plate. Agility in pouncing upon the ball and accuracy in throwing to the proper base are then required. The catcher's throwing arm is a valuable item in his team's defense. Base runners will be chary of straying too far from

their bases when the catcher has a quick and strong arm ready to shoot the ball to the baseman for a tag-out before the runner can scramble to safety. When a runner attempts to steal a base, the attempt usually begins as the pitcher starts pitching the ball to home plate. Unless the batter hits the ball, the play then becomes a match between the catcher's throwing arm and the base runner's speed.

Pitching.—Important as is his fielding, the catcher functions even more importantly as the counsellor of the pitcher. He is, besides, the only player in the defensive lineup who has the whole game in front of him at all times. He is the player best placed for directing advice to teammates when necessary in the rapid action of the contest.

When a batter comes to bat, the defensive pitcher and catcher operate against him as a unit, "the battery." Up to the moment the batter hits the ball, the whole game is this duel between batter and battery. The pitcher is equipped with a strong throwing arm, able to fire the ball across home plate so rapidly as to offer the batter only a flicker of time to decide whether or not to swing at it.

Besides sheer "speed," the pitcher has other resources in the way of "curves," "change of pace," "screw-balls," "sliders," etc. These represent ways of throwing the ball so that its course through the air diverts from the usual line of a "fast ball," causing the batter to go "off his stride," swing too early or too late at the ball, strike it merely a glancing blow, or miss it entirely.

Before each pitch, the catcher, squatting behind the plate, with his hands together between his knees, "gives signs" to the pitcher. With the fingers of his bare hand he transmits to the pitcher instructions for the next pitched ball. The catcher's knowledge of the batter's abilities and peculiarities guide him in his choice of pitches. His knowledge of his pitcher's abilities shapes his decisions on each pitch.

Most batters get their greatest power into a drive when the ball comes to them a little above waist level. A minority are "low-ball" hitters, preferring a pitch between the belt-line and the knees. With most batters it makes a difference whether the pitched ball is "inside" or "outside," that is, across the plate near the edge that is closer to the batter or the rim of the plate further from him. Most batters can more readily hit a "fast ball," that is, a straight one, than a curve or any of the "breaking balls." Some gifted batters have more success when the ball "breaks," a factor in this phenomenon being that the breaking ball is always less swift in its course than the "fast one." Nearly all batters have a "blind spot," or "hole," of greater or less extent, somewhere in the strike zone. If the pitcher has good control, he can pitch the ball across the plate through the hole, and the batter is virtually helpless, either missing the ball or striking it an ineffectual glancing blow.

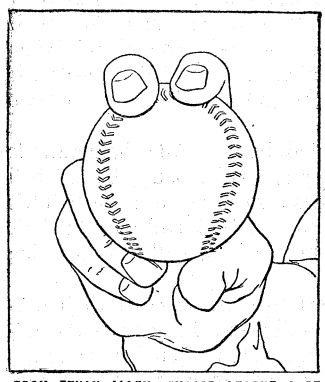
The mental capacities and experience of each pitcher determine how much of the battery's collective thinking is done by the catcher. In general, the catcher is the boss. Veteran pitchers, "smart" men to start with, learned in the ways of batters in general, and with their own special systems of pitching to each, need little assistance from the catcher. But for most pitchers, particularly young ones or new ones, it is the physical skills that occupy the pitcher's attention, while the catcher does the "thinking," makes the decisions what to pitch and where.

Even in the case of a veteran pitcher, the catcher keeps his partner under constant study, alert to detect signs of "weakening." In the major leagues for most clubs in the course of a season, only about half of their games, usually less than half, are transacted with a single pitcher playing the entire game. Sometimes three or four pitchers divide the work. It is the catcher's verdict, upon consultation with the manager, which brings about the removal of one pitcher from the line-up and the substitution of another.

In 19th-century baseball, up until about 1870, the pitcher was merely a player assigned to put the ball in play by pitching it to the batter to hit. One man usually did nearly all the pitching for a ball club all season, with a "change pitcher" to relieve him of some of the load at times. This change pitcher was usually an outfielder. The two would often merely exchange fielding positions without leaving the game.

With the start of league baseball in the 1870s, the pitcher became a stronger factor in defensive play, his use of speed and curves became a deciding element in championship contests.

A major league club has 25 players on its roster normally. Usually 9 or 10 of these are pitchers. A team's infield and outfield line-up may remain intact for weeks on end, barring injuries and illnesses. Its "regular catcher" occupies that position in about two-thirds of the season's games. Each "regular pitcher," however, requires about three or four days' rest between appearances in actual games, spending his time during his rest days at light exercise, running about the outfield during practice, seeing to it that his pitching arm is moderately exerted each day but in general merely "keeping in shape" until his next turn to pitch in a game.



FROM ETHAN ALLEN, "MAJOR LEAGUE BASEBALL," THE MACMILLAN COMPANY

How the pitcher "grips" the ball in the act of delivering it to the batter

In a "staff" of ten pitchers, the manager earmarks his best five at any given time as "starting pitchers." These are "the regulars." They take their turns every four or five days, resting in-between. The remainder of the staff constitutes the "bull pen squad." Two or three of them each day are assigned to be ready for the call to substitute for the starting pitcher. They occupy a bench near the boundary of the playing field, usually in foul territory.

When the catcher detects signs of weakening on the part of the pitcher in the game, these bull pen pitchers begin "warming up." Near their bench regulation-size home plates are embedded in the turf. At a proper distance from each of these plates is a replica of the pitcher's box used in the game. They warm up by throwing practice pitches to substitute catchers, using the practice plates as markers and the practice boxes to give them the same footing they will have if called to enter the line-up. The bench, together with the practice ground, is known as "the bull pen."

Control.—The catcher is quick to perceive signs of tiring on the part of the pitcher, a slowing up of his fast pitches, a dulling of the break in his curve. From other points of vantage, the pitcher's tiring becomes evident in "loss of control."

Pitching demands more of a man in the way of exact co-ordination of mental and muscular faculties than any other activity in the game. He is aiming at an invisible rectangular plane 17 in. wide, about 3½ ft. high (the strike zone), outlined by the front rim of home plate as to width, by the batter's shoulders and knees as to height.

This plane is suspended above home plate at a point almost 60 ft. from the "box" against which the pitcher's pivoting foot must push in the act of pitching the ball. This box is a plate of composition, 24 in. long, 6 in. wide, placed with its long sides facing home plate and second base, at a distance of 60 ft. 6 in. from the "point" of home plate where it fits into the home angle of the diamond. It is about 14½ in. from the home plate's point to the 17-in. front rim which marks the width of the strike zone.

The term "pitcher's box" is a holdover from 19th-century baseball when an oblong area was marked out by white lines on the ground for the pitcher to occupy in the act of delivering the ball. In 1893 the actual drawing of a "box" on the ground was discarded in favour of a slab of rubber, 12 in. by 4 in., for the pitcher to step on when delivering the ball. The term "box" has continued in use, however, referring loosely to both the pitching plate and the immediate area surrounding it for about 15 ft. in every direction.

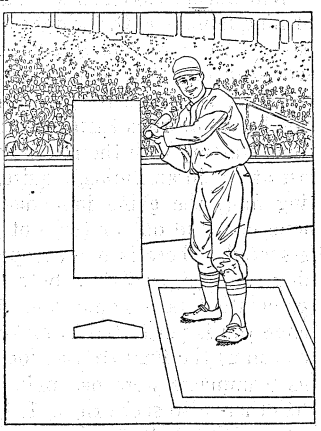
This circular area is kept free of grass and rises in a gentle slope to the point where the pitching plate is imbedded. The plate is level with the ground at the summit of the slope. The rules specify that the summit shall be not more than 15 in. above

the level of the base lines. This is enough of an elevation, however, to put into baseball language the term "pitching mound" as an alternative to "pitcher's box."

Lapses of control apparent to spectators take the form of bases on balls, representing failure of the pitcher to deliver his pitches inside the strike zone. Less often such failure results in hit batsmen. Each base on balls puts a potential run on first base, as does each hitting of a batsman with a pitched ball. Sometimes a weakening pitcher's flustered nerves take the form of a "balk."

A balk is a departure from the restrictions imposed upon the pitcher by the rules. In pitching the ball he must have his pivoting foot in contact with the pitching plate. If he does not, even a good pitch should be called a ball, if no runners are on base and if the batter does not strike at it; if a runner is on base, it becomes a balk. The pitcher must hold the ball in both hands in front of him at chest level before starting his delivery. Once started, he must continue his pitch so that the ball is delivered to home plate. If he starts to make a throw to first base when a base runner is occupying that base he may not stop, but must "go through with" the throw. If the pitcher fails to observe these limitations, a balk is declared.

The balk rule is for the protection of base runners primarily. No balk is ever announced by the umpire unless there is at least one base runner on the bases. The penalty for committing a balk is that every base runner is awarded the advance to the next base ahead. With a base runner on third, a balk thus results in the gift of a run to the team at bat.



FROM ETHAN ALLEN. "MAJOR LEAGUE BASEBALL." THE MACMILLAN COMPANY

Diagram showing the "strike zone" above home plate, the target of the pitcher in his delivery of the ball to the batter

The Pitching Repertoire.—A pitcher's speed is usually the index of his general ability. A diminution in the speed of successive pitches is the symptom the catcher sees oftenest as forecast of disaster. Originally, speed was the pitcher's sole reliance in his effort to thwart the batter. The curve was developed in the late 1860s. Other variations from the straight line of fast ball pitching have developed in succeeding epochs, but fundamentally the fast ball continues to be the basis of pitching science.

The fundamental curve is a swerving pitch which breaks away from the straight line downward and across home plate in the direction of the catcher's right knee if the pitcher is right-handed; towards the catcher's left knee if the pitcher throws left-handed.

Many pitchers employ a curving ball whose "break" slants the opposite way from the regulation curve, a pitch known variously as the "fadeaway" (Christy Mathewson), the "screw-ball" (Carl Hubbell), or some pet name applied by the pitcher himself who has mastered its secrets (Dazzy Vance's "dazzy ball"). The effect is to endow the pitcher with a "reverse curve"; thus Mathewson, a right-handed pitcher, used the conventional curve to break the ball away from right-handed batters, and his fadeaway to break it away from left-handed hitters. Hubbell, a left-hander, used his screw-ball to slant the pitched ball out and beyond the reach of right-hand hitters, using the regulation curve when facing a left-handed hitter. In the case both of curves and reverse curves, the ball reaches the batter at a slower rate of speed than the pitcher's "fast ball," and the deception is almost as much due to the slower ball's falling away from the bat as to its swerving from the straight trajectory from the pitcher's hand to catcher's glove. A comparatively few pitchers use the "knuckle-ball," whose power lies in its almost entire lack of axial rotation as it sails towards home plate. This absence of spin makes it the plaything of air-currents, so that, when the knuckles are expertly employed, the ball is "wobbly" as it approaches the batter, making it harder to hit solidly than a spinning ball sailing along "on the beam."

Other variations from the fast ball are grouped as "change of pace" balls, in which the difference in speed is relied upon to throw the batter off his stride. The most spectacular of these has been the "rainbow" ball (also "ephus," "blooper," "balloon"), made most effective by Truett Sewell, co-leader in victories in the National league in 1943, and the "butterfly ball" of Jim Tobin, no-hit-game pitcher of 1944.

Uniforms and Equipment.—The baseball uniform consists of a cap, a blouse, pants, stockings and shoes. In league baseball the home team always wears white blouses and pants. Gray is the prevailing solid colour of the blouses and pants of the visiting team. Baseball law requires the uniforms to be "uniform," that is, all the players of the same team must wear uniforms of exactly the same design and trimming when playing a championship game. Caps, blouses, pants and stockings are different for different players only in size and in the identification number worn on the back of the blouse. Each player has his own number, so that by referring to the printed scorecard the spectator can identify the players by name by observing the numeral he wears along his spine.

The cap has a visor as a shield from the overhead rays of the sun. "Sun-fielders," outfielders whose location makes it necessary for them frequently to stare into the sun when judging the flight of the ball, have the peaks of their caps equipped with sunglasses, spectacles of tinted glass. These are usually fastened on the underside of the cap's visor, snugly out of the way most of the time, but with a device which enables the outfielder to snap them down into working position when the ball is batted his way high in the air.

The baseball blouse is collarless, with abbreviated sleeves usually ending halfway from shoulder to elbow. Under the blouse the player wears a "sweat shirt," a flannel undershirt with long sleeves that come halfway from elbow to wrist. With most clubs these shirts also are of uniform colour and design.

The pants cover the player's knees, the elastic at the bottom pinching in just below the knee joint, with ample material to allow freedom of knee motion in running and to afford a degree of protection from abrasion by sudden, forceful contact with the ground. Most players wear, along the outside of each thigh, under the pants, "sliding pads," two slabs of padded felt reinforced with leather and suspended from the waist. These pads protect the sides of the player's legs when he flings himself feet-first along the ground ("sliding to a base"), as well as from abrasions that might be suffered in unintentional tumbles.

Players wear white cotton stockings underneath woollen coloured stockings. The woollen stocking usually is footless, its bottom consisting of an elastic band which passes beneath the player's instep.

The shoes are oxford style, very light in weight, with flexible soles and heels. Each shoe has two spike plates, one for the sole, the other for the heel. These plates are triangular in shape, with a short prong at each angle giving the player a good grip on the ground, whether it be turf or the grassless dirt surface of the base lines.

The pitcher also wears on his pitching foot (right foot for a right-hand pitcher; left foot for a "southpaw") an additional "pitcher's plate," a metal reinforcement at the inside of the toe, to give him a better foothold in the act of pivoting to deliver the ball. Umpires wear spiked shoes similar to those of the players.

It is in the lettering and the trimming of their caps, blouses and pants and in the colour and design of the stockings that the teams are distinguished from each other beyond the mere identification as home team and visiting team by the solid white or gray of the bodies of their uniforms. A team's travelling uniform usually is lettered with the name of its city.

Gloves.—In pre-league baseball of the 19th century, baseball was played bare-handed. One by one, starting with the catcher and first baseman, the players began wearing gloves to protect whichever hand bore the brunt of the ball's impact. In modern times every player wears a glove when in the field.

The gloves are leather, with some degree of reinforcement (padding) in all cases. The catcher's glove is the largest and heaviest, thickly padded at all points except the middle of the palm, in which the pitched ball imbeds itself. It is all one piece, except for the cleft between the thumb and the index finger. The first baseman's glove, thinner and much more flexible than the catching "mitt," is a solid expanse of leather for the four fingers. The thumb, however, is separate, with a webbing connecting it with the index-finger edge of the rest of the glove.

The gloves worn by pitchers, infielders and outfielders are "finger-gloves," with a separate compartment for each finger and for the thumb. A leather strap (usually two or more) connects the thumb with the index finger and forms a grasping "net" which enables the player to get a tighter hold on a swiftly moving ball.

Protective Equipment.—Except for the catcher, the baseball player in the field is considered adequately armoured when he wears his regulation uniform and glove. The catcher wears a mask, chest protector and shin guards in addition. The mask fits the front half of his head, a padded metal frame, with solid bars across its open front, so that the catcher has full visibility, but is protected from being hit in the face or about the head, ears and throat by the ball. The chest protector is a solid padded framework extending up over both shoulders and down between the legs, folding at about the waist line to allow stooping. The catcher's shin guards are of light metal over the shins, with padded leather extensions that fit over the knees, and at the bottom are shaped to the shoes so that a catcher "blocking" home plate has reasonable protection from the spikes of a player sliding feet-first.

The umpire, whose uniform is a navy blue serge "business suit," with a cap of the same shade, likewise wears mask, chest protector and shin guards when on duty behind home plate. The mask is similar to the catcher's. Most umpires wear a special "umpire's" body protector under the outer clothing. The umpire's shin guards are worn under his trousers, which extend full-length to the insteps, so that from the stands the umpire's only visible protection is his mask.

At bat, the only protection worn by a player in addition to his regulation uniform is a "helmet." The most popular skull protector is a shell of composition or light metal fitting inside the batter's cap on the side of his head which is presented towards the pitcher (the left side for a right-hand batter's head, the right side of his head if he bats left-handed).

Playing the Game.—As is made apparent by the rules of play, the pitcher is the central figure in the playing of a baseball game. The game is a succession of "plays." Each play begins when the pitcher delivers the ball to the batter. Each play lasts until the pitcher holds the ball again, standing with his foot against the pitcher's box, in position to deliver the next pitch.

If the pitched ball travels past the batter to the catcher and is then tossed directly back to the pitcher, it is a complete play in itself. If the ball is batted, the play goes on until the ball has been fielded, all base-running has stopped and the ball returned to the pitcher again for the next pitch.

Each team's manager is its supreme authority on the field. It is the manager who selects his line-up from his available players, drafts the batting order of his nine players starting the game and during the game orders shifts of positions by men in his line-up and makes substitutions.

A substitution may be made at any point in the game when "time" has been called by the umpire. A player taken out of the line-up can not return in the same game. When the manager makes two or more substitutions at one time, he must specify them one at a time to the umpire, so that each substitute's place in the batting order is immediately established. Such substitutions may be made regardless of the positions played by the players involved. For instance, he may take out of his line-up his pitcher and second baseman, substituting a second baseman to bat in the pitcher's place in the batting order, the new pitcher batting where the second baseman formerly batted. He may send in as many substitutions at one time as he wishes, up to the limit of his nine names, but each substitute takes a fixed position in the batting order at the moment the change is made. Without making any substitution, the manager may at any time in the game shift his players from one fielding position to another. He may shift all nine positions in fielding, but can never change a man from one place to another in his batting order.

The visiting team always has the first inning at bat in modern baseball, the home team's inning, by choice, coming second. In common parlance "inning" includes an inning at bat for each team. Originally a game was described as consisting of "nine innings for each side." Usage has erased the last three words. A game, in modern baseball language, consists of nine innings. A team's 6th inning is now its "half of the 6th." In written accounts of ball games this is followed out further, so that a play is said to have occurred "in the first half of the 6th," or simply "in the top of the 6th," which conveys to the reader the information that the visiting team was at bat at the time in its 6th inning. If the home team was batting, the writer would place the play "in the last half of the 6th," or more likely, "in the last of the 6th."

Whichever team has scored the most runs at the completion of nine innings is the winner of the game. If the side last at bat has scored more runs in eight innings than the opposing side has scored in nine, the game ends after the first half of the 9th. If the score is even after nine full innings, play continues until one side has more runs than the other in even innings played. At any time, starting with the latter half of the 9th inning, that the team last at bat in an inning acquires one run more than the team batting first, the game immediately terminates, whether there be none out, one out or two out at the moment the "winning run" is scored. There is one exception to this, coming when the winning run is scored by a base-runner who was "on base" when a teammate hits a home run. In such a case, the hitter of the home run is permitted to make the circuit of the bases and score his run as the final transaction of the game. If more than one of his teammates were occupying bases when the "homer" was hit, the others also score runs. It is thus possible for the team last at bat to win an "extra-inning game" by as great a margin as 4 runs, although the almost invariable score of a home team's extra-inning victory is by a one-run plurality. A game may be terminated by the umpire because of rain, darkness or other cause which in his judgment interferes with further play. If at least five equal innings have been played, the umpire may declare the game a tie or a decided game, depending on the score.

Season.—The "championship season" of a baseball league extends from mid-spring until early fall. The major league season starts about mid-April and ends on the Sunday nearest to Oct. 1 each year. The annual "world series" between the pennant-winners of the two major leagues begins on the Tuesday or Wednesday following the "closing day" of the league seasons. The world series continues until one of the pennant-winning clubs has won four victories over the other, thus establishing it as the "world champion" team of the year.

Preceding the opening of the championship season, each club has a period of spring training, a month or more during which its players are conditioned for playing a game almost every day over a period of months ($5\frac{1}{2}$ in the majors). It is during this training trip that new candidates for active service with the club are tried out. The manager and his assistants exert their efforts to select and train the strongest line-up possible from their squad of players. Practice games are played between teams picked from the squad; also exhibition games against teams representing other organized baseball cities, preferably cities in other leagues, whose training camps are located within ready reach.

Except when war or other considerations play a part, each club does its spring training in a locale where the temperature is likely to approximate the level of the summer temperature in its home city. Major league clubs ordinarily choose locations in Florida, Texas and California, though in general, "somewhere south" describes the training location of every club of every league, major and minor.

Some multiple of 14 is chosen as the number of games to be

played by each team of an eight-club league, thus booking an equal number of games "home and away" for each team against each of the other seven clubs. In a six-club league the number for each club is a multiple of 12. The major leagues in 1904 fixed on 154 games as a permanent figure.

Almost never, however, does every club in both major leagues play exactly 154 games in a season. When games end in tie scores, a fresh game must be played between the two clubs at a subsequent date in order to play off the tie. The tie is a legal game and counts in the official records. Postponements of games late in the season because of weather sometimes result in a reduction from the allotted 154 for the clubs involved because the schedule of travel fails to provide an opportunity for a subsequent play-off.

In common practice, the play-off of ties and postponed games takes the form of the "double-header," in which two games are played on the same date, with a short rest period intervening. The popularity of the "bargain bill" with the public has resulted in scheduled double-headers placed in the schedule in its original draft before the season's start, always on holidays and often on Sundays throughout the summer.

The 154 games are arranged to take in 24 week ends and the three holidays nationally celebrated, Memorial day (May 30), Independence day (July 4) and Labour day (first Monday in September). These are the "big days" in the schedule. The ordinary weekday games, from an attendance standpoint, are merely "fillers-in," looming important in the schedule only when the pennant race is close with the home team having a chance for first place or one of the first division positions.

Starting in the 1930s, additional "big days" appeared in league schedules in the form of night games. Experiments in playing ball games under artificial lighting were reported in 1883 (Ft. Wayne, Ind.), but because of the large area necessary to be illuminated to as near daylight level as possible, it was never tried in league games until 1930.

On May 2, 1930 (Wichita at Des Moines, Western league) was played the first night game that counted toward a league pennant. Since to most patrons of professional baseball weekdays are workdays, the opportunity to see a ball game on a weekday evening instead of waiting until Saturday or Sunday came as a boon. Night baseball became popular.

By 1935, engineers had solved the problem of lighting the extensive areas of major league stadia and in May of that year the first major league championship night game was played in Cincinnati. By the outbreak of war in 1941, the majority of major league ball parks had lighting systems, and major league schedule-makers each spring planned and spotted the night games with as much care as they devoted to weekend and holiday dates.

The Championships.—Arranged in the order of their percentages, from the highest to the lowest, the list of eight clubs in a league on any given day is called the "club standing." The first four clubs are in the first division, the rest in the second division. The no. 1 club is the league-leader and the lowest in percentage is the tailender.

After all games are finished on the last day of the season, the club standing at that point becomes the championship record for the year. The no. 1 team is the pennant-winner, winning the right to fly from a flagpole in its home field a banner or pennant, combining the red, white and blue of the United States flag in a design of its own selection, with lettering and numerals proclaiming it the champion of its league for that year. This pennant is customarily raised near the start of the ensuing season and flown from the masthead throughout that season, the championship theoretically belonging to the club which won it the year before until the closing of the current season crowns a new king of the league's clubs.

For seven of the clubs in each major league closing day means the disbandment of the players for the winter. The two pennant-winners, however, meet in the world series, a postseason competition in which about half of the total cash receipts of the first four games forms a players' pool, to be divided among the four first division teams of each league. The players of the pennant-winning teams, as world series opponents, fittingly receive the lion's share, 70%.

For instance, in 1943, when the players' pool recorded a new all-time-high record of $448,005.74, the amount divided between the playing personnel of the two clubs which played the series was $341,604.02. Of this amount, 60% was the share for the 25 players of the winning New York Yankees, 1943 world champions. The 40% remaining was the share of the 25 players of the defeated St. Louis Cardinals, National league pennant-winners but losers to the American league champions in the world series.

The Washington and Cincinnati clubs, second-placers in the two leagues, each had $36,600.43 to divide up among their players, as compared with the $204,962.41 divided by the Yankee players and the $136,641.61 cut up by the Cardinals. Third place in each league brought a total of $24,400 to each club's players, while fourth-place clubs in each league received $12,200 each, to be divided among their 25 players.

The minor league counterparts of the world series are the junior world series, between the champion teams of the International league and the American association, and the Dixie series, between the champions of the two A-1 circuits, the Southern association and the Texas league.

Most of the minor leagues conduct, each within its own membership, a postseason series known as the "Shaughnessy play-offs," taking the name from Frank J. Shaughnessy, president of the International league, who was primarily responsible for its introduction into baseball. The International league, in 1933, was the first league to institute it as an annual feature. Played usually for a special trophy, the Governor's cup, etc., these series are participated in by the first four teams in the final standing of the regular pennant race. The team winning the Shaughnessy play-off is usually considered the league's champion team of the year. Often the winner of the pennant race is defeated in the play-offs.

Since these Shaughnessy play-off games are counted in the league records as part of the season, the total number of games played by the first division teams goes above the multiple-of-14 or multiple-of-12 number originally assigned to each club in the league in the pennant-race schedule. The extra games are variable in number, since the play-off series is an eliminative process. Each series ends when one team has secured a prescribed number of wins, which may eventuate in as few as four games if four is the prescribed number, or extend to seven, sometimes more than seven, if one or more tie games occur.

Organized Baseball.—As the national game, baseball is played informally by schoolboys on their playgrounds, by teams representing community groups—schools and colleges, factories, department stores, employed personnel of hotels, shipyards, mines, railroads, etc., and in time of war by teams representing service units of the army, navy and marines. While in the cases of business firms some of the players receive financial compensation for their baseball playing, the term "professional baseball player" applies exclusively to men employed as players by teams which are members of leagues subscribing to the authority and regulations governing what is known as "organized baseball."

This system consists of a mutual agreement among the operators of baseball teams representing cities and towns in baseball leagues throughout the United States and in parts of Canada to recognize one central supreme authority, the commissioner, and to subscribe to the body of rules administered by this authority. Most important, these rules regulate the transfer of players from one league to another and among teams in the same league. The provisions aim at protecting the individual player from exploitation, while at the same time imposing restraint on his freedom of choice to the extent that at no time after signing up with any club in organized baseball can he, without the consent of his employer, obtain employment from any other club in organized baseball until he has received an unconditional release from the baseball contract under which he is employed in any given year.

The two major leagues and each of their eight member clubs are signatories to an agreement, called the Major League agreement, the first article of which creates the office of commissioner

and sets forth its functions. The two major leagues, acting as one party, and the National association, as the other, are signatories to the Major-Minor League agreement, the first clause of which recognizes the office of commissioner as created by the Major League agreement.

The commissioner's office in 1921 took the place of the National commission, a three-man board of arbitration established in 1903, made up of the presidents of the two major leagues and an elected chairman. The framework of the National commission continued under the commissioner's office in the form of the advisory council, the two league presidents with the commissioner as chairman. Nearly all the authority formerly vested in the National commission was transferred to the commissioner. Kenesaw Mountain Landis, former federal judge in the Chicago district, was chosen commissioner, beginning a term of service which continued until his death, Nov. 25, 1944, a period of about 24 years.

The minor leagues, whose number is variable from year to year, are classified according to the populations of their member cities as AA, A-1, A, B, C and D. The three "double-A" leagues have solidarity and historic continuity comparable to that of the majors, though their line-ups of cities have undergone changes more frequently. (The National league's list of cities did not change after 1900; the American's after 1903.) The International league, senior of the AAs, included in 1945 Baltimore, Buffalo, Jersey City, Newark, Rochester and Syracuse, of eastern United States, and Montreal and Toronto in Canada. The American association, not identical except in name with the American association of the 19th century, comprised cities in the midwest—Columbus, Indianapolis, Kansas City, Louisville, Milwaukee, Minneapolis, St. Paul and Toledo. The Pacific Coast league's line-up of cities had been more subject to change than the other two double-As, but constants were San Francisco, Los Angeles, Portland and Seattle.

A-1 includes the Southern association and the Texas league. The lower groups usually locate themselves with their titles—Eastern league, Indiana-Illinois-Iowa (Three-I) league, Kentucky-Tennessee (Kitty) league, South Atlantic (Sally) league, Eastern league, Florida East Coast league, Quebec Provincial league, West Texas-Arizona league, etc.

The grading of leagues from top to bottom is part of the mechanism in the rules of organized baseball for assuring a player's opportunity for advancement. The grading represents different levels of salary limit. By an annual draft empowering higher classification leagues to select players at fixed prices from leagues lower in the rating, the advance of a player, when merited, is made inevitable. Transfers of players' contracts are on a buy-and-sell basis, not only among teams in the same league, but in inter-league transactions. There are fixed prices applying at the various levels for the drafting process.

Each year before the arrival of the draft deadline in September, players of unusual ability are transferred to higher leagues by the sale of their contracts at prices higher than the fixed draft price that would be obtained if his club chose to keep his contract beyond the date of the draft deadline on the chance that he would be overlooked by scouts seeking reinforcements for teams in higher-rated leagues.

This trading in players' contracts evolved out of the baseball wars of the 19th century. In the years before baseball teams were organized into leagues, rival clubs commonly raided each other's ranks and hired away each other's stars in free competition on an open market. In 1879, Arthur H. Soden, of the Boston club, effected the adoption of a resolution by the National league by which five players of each club might be named who could not be approached for hire by any other club in the league. This was the beginning of the Reserve rule, amplified in 1883, when Col. A. G. Mills, National league president, brought about a national agreement between the National league and the American association, the two major leagues operating at the time, and the minor leagues then in existence.

The Reserve rule, requiring the observance of each team's rights to the services of the players on its reserve list, is the cornerstone of the organized baseball structure. The original list of five reserved players was increased to 11 as part of the 1883 agreement. The number of players permitted to be held on each club's reserve list was increased in all gradations of leagues in the intervening years. The modern maximum is 40, the limit for the reserve lists of clubs in the two major leagues.

The Playing Rules.—"The Official Playing Rules of Professional Base Ball Clubs," as adopted at the meeting of the Joint Playing Rules committee of the National league and the American league, held at National league headquarters, New York city, March 2, 1904, and as amended in subsequent years by official major league committees, govern the playing of baseball not only in the professional leagues but universally.

The Averages.—Each league maintains a statistical bureau in which are filed the scores of all its championship games. After each game, the official scorer, appointed by the league, drafts a record of the game, with its detailed columns showing each player's hits, runs, errors, etc. At the end of each season the records of all the games played are combined into the official averages for that year.

Origin of Baseball.—On June 12, 1939, the Hall of Fame and National Museum of Baseball was dedicated at Cooperstown, N.Y. This was the central ceremony of a countrywide, summer-long celebration of the national game's 100th anniversary. It was in Cooperstown, a village in Otsego county, north-central New York state, in the summer of 1839, that Abner Doubleday (later a general in the U.S. army) laid out the first baseball field and conducted the first game of baseball ever played. The players were cadets of the military preparatory school at which he was stationed as instructor. In 1919 the Cooperstown village fathers leased the site of the original playing field used by the cadets, dedicating it as a permanent memorial under the title Doubleday field, Sept. 6, 1920. Sept. 29, 1923, permanent title to Doubleday field was transferred to the village of Cooperstown by a New York supreme court order.

In the late 19th century, when baseball had grown to national stature as a professional sport, the question of its origin was a topic of wide discussion, because of its resemblance to "rounders," a boy's game originating in Great Britain, and to boys' games flourishing in different sections of the United States, called "town ball," "one old cat," "two old cat," "three old cat" and "four old cat," all of which contained rudiments of baseball.

In 1907, A. G. Spalding, one of the most famous of the 19th-century players and founder of the sporting goods manufacturing company, A. G. Spalding & Bros., appointed a commission of research to establish the exact date when the evolutionary transition of village green sports crystallized to a form from which 20th-century baseball could trace its direct descent.

The members of the commission were: Morgan G. Bulkeley, first president of the National league and subsequently a United States senator from Connecticut; A. G. Mills, third president of the National league; Nicholas E. Young, president of the National league from 1885 to 1902; Alfred J. Reach, big league player of the '70s, president of the Philadelphia National league club for 20 years and senior member of the sporting goods firm of A. J. Reach & Co.; George Wright, the greatest player of baseball's earliest days of league organization and head of the Wright and Ditson sporting goods company; Arthur Pue Gorman, U.S. senator from Maryland; and James E. Sullivan, president of the Amateur Athletic union.

This commission published its report in the *Baseball Guide* of 1908. Its chief findings were two in number: first, that baseball is a distinctly American sport and had no connection with "rounders" or any other foreign game; secondly, that the first rules for playing baseball, according to all evidence obtainable to date, were devised by Abner Doubleday, in Cooperstown, N.Y., in 1839.

The playing field devised by Doubleday placed the bases at the corners of a 90-foot square, called "the diamond." His fixture of base locations and distances between bases has never been changed. In the games of "cat," which were played prior to baseball, it was necessary to bat, run and touch a base, or bases. The number of bases to be touched depended upon whether it was

"one old cat," "two old cat" or "three old cat." A run was scored when the batter touched an outlying base, retraced his steps and regained the batsman's base, or "home-plate," as it later became known in baseball. "One old cat" could be played with three players, but more enjoyably with four or more. In "two old cat," in "three old cat" and in "four old cat" the number of players could be increased to 10, 12, 14 or more. No organized teams played, nor were sides formally chosen. The object of the game was to "stay in" as batsman as long as possible, runs being considered merely an accessory to "staying in."

From this primitive method of "bat the ball, run and tally" developed the game of town ball, in which the selection of teams upon the field, or competition of sides previously agreed upon or chosen, engendered the method of team competing against team. Thus when baseball was devised by Doubleday, the fact of team competition had been determined in town ball. The Olympic Town Ball club was organized in Philadelphia in 1833. This appears to be the first team of that character assembled in the United States. Town ball was played with a field diagram laid out as a perfect square with four corners, or goals, each of them about 60 ft. apart. The batsman's position was halfway between the 1st and 4th goal. The catcher was back of the batsman and outside the square. There were no batted foul balls, and it was considered to be expertness on the part of the batsman to deflect the ball back of him.

Because town ball, also known as round ball, was thought by some to be the newly invented game of baseball, two entirely different games became identified with the name of baseball. In 1845 the Knickerbocker Baseball club of New York drew up the first code of rules for baseball. The first match game of record was played under these rules between the Knickerbocker club and a picked team which, for this game, called itself the New York club. The game was played at Hoboken, N.J., in 1846. Games were played by the Knickerbockers in matches with the Gotham, Eagle and Empire clubs of New York city, and with the Excelsior, Atlantic, Putnam and Eckford clubs of Brooklyn, then a separate city from New York. There were other clubs than these.

(W. E. Bt.)

The Controversy over Baseball's Origin.—In the early days of modern American baseball, no one who wrote of it seemed to doubt that it was an evolution from the English children's game known then and thereafter as "rounders." A simple change in the rules, according to these authorities, transformed it into a man's game. In rounders, as then played, the fielder put out a runner making for a base, or caught off base, by throwing the ball at him and hitting him with it. This precluded the use of a hard ball and, since a soft ball cannot be batted very far, limited both the size of the field and the activity of the players. Then, presumably about 1840, some American had the idea of putting out the runner by "tagging" him—touching him with the ball or the hand holding it. It became immediately possible to use a hard ball—at first, a kind of miniature cricket ball.[1] And the game suddenly grew up. The rules of the pioneer Knickerbocker Baseball club of New York, drawn up in 1845, constitute the earliest known documentary record of this change.

However, many of the old-time players refused to entertain the thought that a foreign nation had anything to do with inventing a great American institution like baseball, and especially A. G. Spalding, who had made a fortune out of sporting goods. Hence the "Spalding commission," composed not of skilled investigators but of baseball men assisted by a United States senator, appointed ostensibly to investigate the origins of the game but really to "prove" its exclusively American origin. And in 1908, this commission reported in the official baseball guide that the game, including the essentials of the modern rules, the dimensions of the field and even the name, were invented in 1839 at Cooperstown, New York, by Abner Doubleday—afterward General Doubleday, a hero of the battle of Gettysburg—and that the foundation of this invention was an American children's game called "one-old-cat." As most of the pioneer players were dead before 1908, this report caused so little controversy at the time that gradually even the standard reference books accepted its conclusions as seasoned history. Effective attempts to refute its data did not begin until 1939, the centenary of the alleged invention, when Robert W. Henderson, of the New York Public Library, issued a pamphlet embracing some scholarly researches of his own, all casting doubt on the Doubleday theory and strengthening the case for an English origin. Others have since added a few corroborative details.

The main points in support of this contention are as follows:

The name "baseball" to designate some popular English game has been traced back to the first half of the 18th century. In the *Letters* of Mary Lepell, Lady Hervey, occurs a passage under date of Nov. 8, 1748 satirizing Frederick Prince of Wales and his moronic habits: "The Prince's family is an example of cheerful and innocent amusements . . . they divert themselves at baseball, a play all who have, or have been, schoolboys, are well acquainted with." In *Northanger Abbey* (written about 1798) Jane Austen remarks of her heroine, "It was not very wonderful that Catherine, who had by nature nothing heroic about her, should prefer cricket, baseball, riding on horseback, and running round the country at the age of fourteen, to books."

But before this the name, and most probably the game, were already known in America. In 1744 *A Little Pretty Pocket-Book* was published in England. Illustrated with crude wood-cuts, it pictures and describes in doggerel quatrains 26 childrens' sports—one for each letter of the alphabet. And "B" is represented by "Baseball." The text records that the batter hits the ball and runs from base to base. The illustration, which comprises only part of the field, shows a player at the plate, holding a bat with a curious flat, fanlike end, a catcher behind him, a pitcher preparing to throw a small ball underhand, two bases—marked by posts instead of bags—with a baseman beside each of them. This book, furiously popular in England, was reprinted twice in America—New York 1762 and Worcester, Mass., 1787.

There followed other references, some less definite, some good documentary evidence, to an American game of this kind. The journal of George Ewing, a soldier, written at Valley Forge in 1778, tells of "playing at base." Some boys "playing at ball" in the Wall street region of New York abandoned their game to join one of the riots which preceded the Revolution. In 1787 the faculty of Princeton college forbade the students to "play with balls and sticks in the back common of the college." Thurlow Weed, editor and politician of Rochester, New York, mentioned in his memoirs "a baseball club organized about 1825." Corroborating this, Samuel Hopkins Adams turned up in a copy of Weed's newspaper dated in the 1820s an item stating that the Rochester Baseball club, with about 50 members, was in practice for its season's activities. The elder Oliver Wendell Holmes, Harvard 1829, mentioned to an interviewer that he had played a good deal of baseball while in college at Cambridge. These are only a few selected references from a number discovered incidentally and accidentally. Systematic search of books, documents and records before 1830 would most probably turn up many others.

Then came the unpretentious document which ties up English rounders to American baseball in their primitive forms. *The Boy's Own Book,* published in London in 1828 and so popular that it ran through many editions, was as the name suggests a treatise on boys' sports, with rules. The second edition includes a chapter entitled "Rounders," with a note that the game is called "feeder" in London. As there described, it bears a far closer family resemblance to modern American baseball than does Rugby football to its acknowledged offspring, American intercollegiate football. It was played on a diamond with a base at each corner, the "goal" or fourth base identical with the plate beside which the batter stood. The batter might run whenever he hit the ball across or over the diamond. A ball hit in any other direction constituted a foul; he might not run on it. If he struck

[1] Mr. Irwin says: "Then, presumably about 1840, some American had the idea of putting out the runner by 'tagging' him—. . . It became immediately possible to use a hard ball . . ." I would say that if the American was Doubleday, as seems certainly possible, and the date was "about 1840" then baseball *was* originated by him at Cooperstown, because the hard ball is certainly the thing that differentiates baseball from other similar sports, modern softball, for instance, and it is absolutely incorrect to assert that anything existing prior to the use of a hard ball or the practice of tagging out base-runners could be called "baseball," even if the words base and ball were connected together to describe something else. (W. E. Bt.)

at it and missed it three times he was out. A batted ball caught on the fly constituted an out. When a runner made the circuit of the bases it counted one point or tally for his side. Then came the one vital difference which distinguished this game from modern baseball. When a grounder was fielded, the fielder put the runner out by throwing the ball at him and hitting him with it. The same rule applied to a runner caught off base. The woodcut accompanying the article bears a strong resemblance to that illustrating the rhyme on "baseball" in the *Little Pretty Pocket-Book*. Even the bat is the same strange-looking implement. However, objects which look like flat stones now serve as bases, and there seem to be two catchers—the second one, probably, to range for fly fouls.

That book was pirated in both Boston and Providence. The Providence version made a few minor changes in the rules, presumably to conform with the American practice in a familiar game; and the editor changed the heading of the chapter to "Base or Goal Ball." This cheaply printed booklet bears the date 1835—when General Doubleday was 16 years old.

Most English immigrants to America in Colonial times were from those south counties of which Mary Lepell and Jane Austen were residents. That the old game was called "baseball" in that region, as it was called "feeder" in London and "rounders" in western England, and that south-county immigrants took both the name and the game to America, seems a tenable hypothesis.

These are some of the main positive points in contradiction of the Doubleday thesis, but there are also a few negative ones. Abner Doubleday entered West Point in 1838 and was graduated and commissioned in regular order in 1842. In that period, as later, a West Point cadet had no leave during his second year. That he was at Cooperstown at all in 1839 is therefore improbable, that he was an instructor in a military school unlikely, and that he held the rank of colonel virtually impossible. The notes, statements and affidavits gathered by the Spalding commission were afterward lost in a fire and we have only the finished report. In this, an old resident named Abner Graves figured as the chief witness. And he testified that in the game taught to Cooperstown by Abner Doubleday the fielder put out the runner by *hitting him with the ball*. This means, of course, the old English game, not the modern one, and renders unlikely the statement that Doubleday laid out a diamond with the exact dimensions of the one used today—for a ball light and soft enough to be thrown full force against a player's head without danger of inflicting serious bodily injury could scarcely have been batted out of an infield so large.

As for "one-two-and-three old cat," the critics of the Spalding report hold that in the 18th century those games were what they are today—substitutes for baseball when the boys have not enough players for two full teams. "Town ball" seems to have been only another American name for "rounders" or "feeder" or old-time baseball. Reminiscences in the sporting periodicals of the 1850s and 1860s go to prove that it was played in New England even before 1833, when Philadelphia had a town ball club and drew up written rules. However, New England, unlike Philadelphia, distinguished between fair and foul balls. On the other hand, in parts of New England, "home" base and the batter's plate were not identical, but stood a few feet apart from each other, so that the lineup included a fourth baseman.

At about the time when the Knickerbocker club made the new variety of the game popular in New York city and the surrounding communities, the old "soft ball" variety had a sudden vogue in Boston. Until the Civil War they were called respectively "Boston baseball" and "New York baseball." New York and New Jersey regiments taught their own game to other Union soldiers; and when the war ended, the more rugged and adult New York game held the field as a sport for grown men. (W. I.)

Later History.—From 1845 until 1854 baseball was played by the code of rules first written for the game. In 1854 there was a revision which provided specifications for the size and weight of the ball. On March 10, 1858, the first attempt was made at organization of clubs, their number having greatly increased and the game having expanded throughout the territory about New York city, extending to Philadelphia. Massachusetts still played town ball. In 1859 Washington, D.C., organized a baseball club followed in 1860 by Lowell, Mass. Allegheny, Pa., and Hartford, Conn., also organized clubs that year. From that time the game became more widespread, going to Maine, Kentucky, and in 1866 to Portland, Ore. Baseball was played in towns and hamlets other than the cities mentioned during this period, but the clubs were considered to be town or minor clubs as against organized clubs, a distinction which has followed the progress of professional baseball since.

The National Association of Baseball Players, organized in 1858, embraced 16 clubs in New York city. W. H. VanCott was its president. The Knickerbocker playing rules were amplified, and the ball and bat were made to conform to measurements approximating those of the present day. In 1863 the rules were further amplified. From 1861 to 1865 baseball languished except in the armies of the Civil War. In 1865 a convention was held in New York at which 91 clubs were represented, including the cities of St. Louis, Chattanooga, Louisville, Washington, Boston and Philadelphia. It was strictly an amateur organization without schedules for games, and its purpose was to preserve the stability of the rules and the amateur status of the sport.

In 1865 and 1866 professionalism began to make its appearance. Players did not derive their livelihood from baseball, but the more expert accepted sums of money as members of any club that would engage them for occasional games. This was a new development, somewhat unexpected, and it seriously perturbed the equanimity of the amateur players. Gentlemen players of baseball openly avowed their objection to what they expressed in caustic language as deterioration. In addition to the disposition of some players to accept hire for their services, open pool-selling and bribery by gamblers, some of which was successful, outraged the better element among players and organizers of clubs. This conflict between amateur and professionalism eventually led to a professional organization, the first of its kind, and a puny affair compared with the later great associations of clubs in leagues.

In 1867 the Nationals of Washington, under the lead of Arthur Pue Gorman, afterward U.S. senator from Maryland, made the first trans-Allegheny tour. The team went as far west as St. Louis. In that year the Rockford, Ill., club began the practice of paying salaries to some of its players. In 1868 the Cincinnati team was organized on what were known as semiprofessional lines, a characterization of athletes peculiar to the United States. A semiprofessional does not play baseball for a living, but is hired in occasional games. In 1869 the Cincinnati team was hired as an outright professional organization, and made a successful tour of the United States from New York to San Francisco. The Cincinnati team did not lose a game that year and was undefeated until June 14, 1870. During the successful career of the Cincinnati team rival clubs became imbued with an eager desire to win from it, throwing aside all restraint of policy relative to being amateurs in order to engage the best players available. Every attempt was abandoned by most of the important clubs to preserve an amateur standing, despite the fact that they were members of the National association, which was an amateur body. Once professionalism had entered the game it was impossible to keep the professional and amateur exponents of the sport reconciled. The organization of the professional Cincinnati team was followed by that of another professional team at Chicago, and in 1870 the National Association of Baseball Players was disrupted, the pure amateurs withdrawing from the annual meeting. A new amateur organization was effected in 1872 but died in 1874, the last of the concerted attempts to keep the control of the game within amateur influence. In 1871 the National Association of Professional Baseball Players was organized in New York. This embraced the Athletics of Philadelphia; Bostons; White Stockings of Chicago; Eckfords of Brooklyn; Forest Citys of Cleveland; Forest Citys of Rockford, Ill.; Haymakers of Troy, N.Y.; Kekiongas of Fort Wayne, Ind.; and Mutuals of New York. The affairs of the organization were loosely conducted. The circuit was not preserved intact. Many scheduled games never were played.

Gambling and contract breaking became so repulsive to players of higher principle and to certain owners that they withdrew. The association dissolved in 1876 when the National League of Professional Base Ball Clubs came into existence with the seceders from the association back of it. It was organized in New York city, Feb. 2, 1876, with a membership made up of the Athletics of Philadelphia; Hartford, Conn.; Boston; Chicago; Cincinnati; Louisville, Ky.; St. Louis; and the Mutuals of New York city.

The first president of the league was Morgan G. Bulkeley, afterward governor of Connecticut and also U.S. senator from that state. He served one year and was succeeded by William A. Hulbert, commended by all baseball folk when in 1877 he expelled from baseball for life four ball players found guilty of dishonesty. From this time confidence was established in the professional branch, and amateur baseball grew with the revived interest in professional baseball. Hulbert remained president of the league until his death in 1882. During his administration baseball had sufficiently developed to be regarded as an institution. Col. A. G. Mills, one of the most notable athletic authorities in the U.S., afterward prominent in the Olympic games, was elected president of the league in 1883. He resigned in 1885. Nicholas E. Young was elected to succeed him in 1885 and held office until 1903. Presidents in succession since then have been Harry Clay Pulliam, Thomas J. Lynch, John K. Tener, former governor of Pennsylvania, John A. Heydler and Ford C. Frick.

In 1882 the American association was formed in cities not members of the National league circuit. National league owners attempted to equalize salaries of players, regardless of cities and local conditions, by a uniform scale of hire. The players opposed it, and in 1890, after forming a league known as the Players' league, took the field against the National league. In one year the player organization was wrecked. The American association engaged in open rivalry with the National league in 1891, a venture hopelessly destined to failure, and in the winter of 1891 was merged with the National league into a 12-club organization having a monopoly of major league baseball.

As "the" major league, the National league operated with 12 clubs from 1892 to 1899, inclusive. Falling off of patronage in Baltimore and Cleveland, due mainly to the weakening of the two teams' line-ups by trades, resulted in the return to the eight-club membership, starting with the 1900 season. Baltimore, Washington, Cleveland and Louisville were dropped as National league cities, leaving as members Boston, Brooklyn, Chicago, Cincinnati, New York, Philadelphia, Pittsburgh and St. Louis, the National league roll-call from that time on down through the 20th-century decades.

This resumption of an eight-club setup by the one and only major league in existence led to the rise of a rival circuit, the Western league, organized as a minor league in 1893, its membership midwest cities covering about the same territory as the present-day American association.

In 1900 Charles A. Comiskey, owner of the St. Paul, Minn., club of the Western league, moved his team to Chicago, and renamed it the Chicago White Sox, although Chicago was a member of the National league, with continuous membership from the league's inception in 1876, when its team was known as the Chicago White Stockings. In the same year the Western league shifted its Grand Rapids, Mich., team to Cleveland, one of the cities abandoned by the National league after 1899.

The move to Chicago by Comiskey received the assent of the National league, but when permission was sought to place teams for the 1901 season in Baltimore and Washington, the National league refused.

Two years of baseball war followed. Having changed its name to the American league, the militant former Western leaguers, headed by their president, Byron Bancroft Johnson, moved their Indianapolis, Kansas City, Minneapolis and Buffalo clubs to Baltimore, Washington, Philadelphia and Boston for the start of the 1901 season.

The American league withdrew from the national agreement, the body of rules governing relations between all professional leagues, major and minor, their transfers of players from one league to another, and their territorial restrictions in the operation of clubs. Its 1901 line-up of eight cities listed, besides the newly invaded four eastern cities, Chicago, Detroit, Cleveland and Milwaukee in the west. For 1902 the Milwaukee club was moved to St. Louis, invading National league territory there, and for 1903 the Baltimore franchise was shifted to New York, establishing the American league's roster of cities as it continued to stand down through the decades after the "baseball war."

In the "war" years, the American league made inroads on the National league's galaxies of star players to such a degree that it became firmly established as a major league. When peace was made between the two leagues in midseason, 1903, the new agreement entered into by both gave each of the two leagues equal importance. The agreement forbade the consolidation of two clubs occupying one city into one ownership, prohibited shifting of teams from one city to another by either league without the consent of the other, set rules for transfers of players from one major league to another, as well as re-establishing the rules dealing with securing minor league players.

The "war" brought into prominence two men whose names became baseball tradition, Connie Mack (Cornelius McGillicuddy) and John J. McGraw. In 1901 Mack, a former National league catcher and manager of the Pittsburgh Pirates in 1894–95–96, was manager of Milwaukee when the Western league changed its name and went to war. In 1901 he was placed at the head of the American league's new Philadelphia team, the Athletics. In 1902 he won the first of a long line of championships with his Athletics. The success of the American league's rise to major league status was largely attributed to his leadership and inspiration.

McGraw, a star third baseman of the Baltimore Orioles, National league pennant-winners three straight years in the middle 1890s, was manager of Baltimore's American league club starting the 1902 season. In June, a National league countermove to the raids on their ranks by the American league induced McGraw to jump back to the National as manager of the New York Giants. For the next quarter of a century McGraw and his Giants were headliners in the baseball world comparable in prominence to Mack and his Athletics in the American league. They met in world series rivalry as champions of their respective leagues in 1905, 1911 and 1913.

"Ban" Johnson, first president of the American league, continued as president until 1927. He was succeeded by Ernest Sargent Barnard, who held office until his death in March 1931. William Harridge, secretary of the league from 1927 on, succeeded Barnard as president and was re-elected in 1938 for a 10-year term.

The World Series.—The leagues co-operated in arranging their season schedules so that in cities represented in both leagues there would be a dovetailing of the home games, one team being away from home on all dates on which the other had a home game scheduled. The supreme authority of organized baseball was established as the National commission, a three-man board of arbitration, consisting of the presidents of the two leagues and an elected chairman.

In the fall of 1903 the pennant-winners of the two leagues met in a postseason series of games, won by the Boston Red Sox of the American league from the Pittsburgh Pirates, National league champions, 5 games to 3. This postseason series was no new idea. In seven successive years, starting with 1884, postseason games had been played between the pennant-winners of the National league and the American association.

In the world series of the '80s, the teams arranged matters between themselves, scheduling games when and where agreed upon, dividing the proceeds by the same dual method of procedure. The 1903 world series was likewise arranged between the two clubs concerned.

In 1904, the Boston Red Sox, which had won the 1903 world championship, won the American league pennant, and issued a challenge to the National league pennant-winners, the New York Giants. The Giants refused, on the ground that there should be formal rules and central supervision of a contest in which the

prestige of the rival leagues was involved as well as that of the individual clubs. Boston claimed the 1904 world championship by default. The New York president, John T. Brush, offered a code of rules to the two leagues for the governance of postseason championship games, which were adopted for permanent use, starting with the 1905 world series.

Details in the Brush rules were changed through the decades following, but the main features were unchanged. For three years (1919–20–21) the number of victories required to win the series was raised to five, but was returned to the original four in 1922 and continued at that figure.

The scheduling of games originally involved choosing by lot (it was done by tossing a coin). The major leagues now alternate in opening the series. In the even-numbered years the series opens in the park of the National league pennant winner. In the odd-numbered years the American league champion plays its first world series games at home.

Instead of 3–3–1, the distribution of the games is 2–3–N. After the first two games in the series-opening park, the teams shift to the park of the rival league's champions for three games. If neither has won four games after five games have been played, the scene shifts back to the field on which its first game was played and remains there for as many more games as are necessary to decide the winner.

In the years of World War II, starting with 1943, transportation emergencies changed this order. Again the system became three games in the series-opening park, then the shift to the other team's field, with the difference from the original Brush plan that regardless of how many games should become necessary, there would be no return trip to the first city.

The All-Star Game.—Starting with 1933, the major leagues have played an annual All-Star game in July, one game between teams of players chosen from all the teams of both leagues. They oppose each other as league against league. No championship, flag or trophy is involved. The players do not receive any part of the gate receipts, which are donated to charitable purposes. Nevertheless, public interest in the All-Star game is second only to the attention given the world series.

This is expressed in the fact that radio rights for broadcasting the All-Star game commanded a price on the advertising market comparable with the $100,000 usually paid by an advertiser for the world series radio "exclusive." During World War II, play-by-play of the All-Star game and the world series was sent overseas for the benefit of the men in the armed forces on all the fronts, as well as to the civilian population of Cuba (14 stations), and to South America, north of the Amazon from Atlantic to Pacific.

The first All-Star game was held in conjunction with the Century of Progress World's Fair in Chicago. In 1933 the game was played in Comiskey park, home field of Chicago's American league club, the White Sox. In 1934 the game was played at the Polo Grounds, New York city, home of the National league's New York Giants. In subsequent years the leagues have alternated as "home" teams.

The Federal League.—During the period when organized baseball was governed by the National commission (1903–21) there was one attempt by outside interests to conduct championship baseball on a major league level independent of "O.B." This outlaw organization was the Federal league, which conducted pennant races in 1914 and 1915.

Baltimore, Brooklyn, Buffalo, Chicago, Indianapolis, Kansas City, Pittsburgh and St. Louis were represented in the 1914 season, with Indianapolis winning the pennant. In 1915 the Indianapolis team was transferred to Newark, N.J. Chicago won the 1915 pennant.

The Federal league not only placed teams in organized baseball territory, but offered contracts to the outstanding players and managers of the two major leagues. Its "raids" were not as successful as those of the American league had been in securing stars. After the 1915 season came another "peace treaty," the Federal league passing out of existence. Two of the men who had backed the outlaw league heavily joined the major leagues as owners of the Chicago National league and the St. Louis American league clubs respectively. Players developed by Federal league clubs and not previously the "property" of organized baseball found places in organized baseball. Those who had left O.B. to join up with the "Feds" returned to the clubs from which they had "jumped."

The Hall of Fame.—The National Museum of Baseball is at Cooperstown, N.Y., the officially-designated birthplace of the game. It contains relics, pictures and documents, and its central chamber is Baseball's Hall of Fame in which are memorialized players and personalities who have made major contributions to baseball. The museum is a substantial fireproof building 34 ft. wide by 60 ft. deep, three stories high, designed especially to house the collections and bronze tablets of the "Immortals." It is of Colonial design. The walls are of James River Colonial brick similar in colour to that of the old buildings in Williamsburg, Va., with harmonizing slate roof. The entrance is flanked by Ionic columns. The Colonial effect is preserved within the building. As the visitor enters, his attention is arrested by a walnut screen on whose panels are lettered in gold the names of the members of the hall of fame.

The first five players selected for membership in the hall of fame were Ty Cobb, Babe Ruth, Walter Johnson, Honus Wagner and Christy Mathewson. Additions to the roll of Immortals are made from time to time by election in polls conducted by the Baseball Writers' Association of America and by the Hall of Fame committee appointed by the commissioner of baseball.

Glossary.—Terms not defined or explained in foregoing text which are used in printed accounts of baseball games; also some vernacular expressions in common usage among players.

Ace.—The best pitcher on the team, the one who is most dependable, the manager's first choice for that position in his line-up whenever the pitcher has had enough rest and is otherwise physically fit.

Alibi.—A player's description of how he came to make an error in fielding or a mistake of judgment. An habitual explainer of his own bad playing is called "Alibi Ike."

Apple.—A baseball.

Arbiter.—An umpire.

Aspirin tablets.—A pitcher whose speed is dazzling in any given game is said to be throwing aspirin tablets.

Average player.—One who is more concerned with his personal feats than with the success of his team. He'd rather make a hit in a losing game than go hitless in a game won by his team. In the field he'd rather not get his hands in contact with a batted ball difficult to field, than risk the danger of being charged with a fielding error if he fails to make the play.

Backing up.—A player on the fielding team, who anticipates a throw about to be made to a teammate and who runs to a point where he can field the ball if his teammate fails to stop its course, is said to "back up" his teammate. The term is also used when the ball is a batted ball and a fielder shifts to a position behind the man actually fielding the ball. Thus, on every grounder to an infielder, one or more outfielders will move so as to be ready in case the ball gets past the infielder. On flies to the outfield which are not driven directly to an outfielder, there are usually two outfielders converging towards the point where the fly is falling, one to catch it, the other deeper in the outfield as a "backer-up."

Bag.—Any base except home plate.

Barber.—A player who likes to chat with other players, particularly those of the opposing team, or with the umpires.

Bean-ball.—A pitched ball which passes close to the batter's head or which hits the batter's head.

Big Bill.—The last bounce of an infield grounder when it is a high bounce which makes it easy for the infielder to catch.

Black-hander.—A fan who writes letters to the manager, giving advice on how to run the ball club.

Blank.—When a pitcher holds the opposing team runless in an inning, a succession of innings, or in an entire game, he is said to blank the team for that extent of play. Usually used in enumerating a series of consecutive scoreless innings credited to a pitcher's record.

Blaster.—Player given to expressing his opinion of persons in authority (managers, umpires, club and league officials, etc.) in loud, blustering and denunciatory language.

Bleachers.—The section of a ball park's stands for spectators which is unroofed, usually located beyond the outfield's boundaries, the occupants unprotected from the sun's rays by any structural feature of the stands.

Bleeder.—A batted ball, usually a grounder, travelling so fast that it threatens injury to the hands of the fielder at whom it is pointed.

Blooper.—A Texas leaguer (*see* below).

Blow.—(noun) A safe hit.

Boner.—A mistake of judgment or ignorance of some playing rule or of the existing situation in the game. Originally "bonehead play," now usually contracted.

Book.—(a) The collective all-time records of baseball. (b) The rule-book. (c) A player's store of knowledge about the weaknesses of opposing players, batting, fielding or pitching. If a batter, for instance, has learned to detect some peculiarity in a pitcher's delivery which enables him to know beforehand when a curve is coming, he is said to have that pitcher "in his book."

Boot.—A fielding error. Originally it meant the missing of a grounder by an infielder expressed in verbal form as, "He booted it." Now means an error, the "booting" of a chance to retire an opposing player.

Break.—(a) A fortuitous happening which helps or hampers a player or a team in the course of a game, such as the oblique bounce of a grounder, or the direction of a hard-hit drive when it points straight at a fielder. (b) The point of deviation of a curve pitch from the straight trajectory.

Brittle.—Adjective applied to a player who is frequently out of the line-up because of injuries.

Bunched hits.—Hits are said to be bunched when they occur in the same inning, thus scoring runs. When hits occur in the same inning with bases on balls and/or fielding errors, the team making the hits is said to "bunch its hits with passes and errors."

Bush.—Term used loftily by major league players and writers to describe the baseball hinterland, the deeper minor leagues. A player new to the big leagues whose behaviour or speech does not please his associates is reprimanded by being called a "busher." When a player is transferred to the minors by a major league club, it is sometimes referred to as "sending him back to the bush," or "to the bushes."

Butterfingers.—Obsolescent name of opprobrium directed by fans at a player guilty of not holding on to a ball which he was expected to catch and hold.

Can of corn.—A long, high, easily caught fly to the outfield.

Caught napping.—A base runner is said to be caught napping when the pitcher or catcher, by a quick throw to one of the bases, succeeds in effecting a tag-out of the runner as he tries to scramble to safety.

Caught stealing.—A base runner is caught stealing when he is retired at the base for which he was trying as the result of a throw by the catcher or pitcher.

Cellar.—Last place in a league.

Change of pace.—A slow ball pitched by a fast-ball pitcher is called a change-of-pace ball or simply a change of pace.

Charley horse.—Injury of a leg muscle, marked by pain and swelling, usually the result of a sudden strain on some part of the body of the muscle, tearing some of the fibre bundles.

Choke.—When a batter advances his hands along the bat towards its striking end farther than is customary with the average batter he is said to choke the bat. Some batters choke the bat habitually. Others choke it when they are about to bunt.

Circuit clout.—A home run.

Circus-catch.—The capture of a fly by a fielder which involves leaving his feet. He usually rolls over on the ground after catching the ball, like a circus tumbler.

Classic.—(noun) The world series.

Cleanup.—(adj.) Applied to a hit which drives home as many base runners as are on bases at the time, but no fewer than two. Fourth place in the batting order is called "the cleanup position" and the player batting in that position is "the cleanup man."

Clinching the pennant.—A team clinches the pennant when it becomes mathematically impossible for any rival team to win the pennant even if it wins every remaining game on its schedule while the team in first place is losing every remaining game.

Clothes-line.—A safe hit to the outfield which travels on a low line without touching the ground or rising more than 10 ft. or 15 ft. above the ground.

Clubhouse lawyer.—A player given to argument on any or all points, particularly matters dealing with the conduct and operation of the team by its manager.

Clutch.—(noun) A crisis in the play of a ball game in which every player is on his mettle, since the fate of the game appears to be hanging in the balance. A player who becomes nervous, or jittery, or inexpert at such point is said to "choke up" or "tighten up" "in the clutch."

Clutch hitter.—A player very dangerous when he comes to bat "in the clutch," that is, at a crisis in the play of the game when a hit can play a vital part in deciding victory and when failure to hit means the almost certain loss of the game. Players are rated as good or bad clutch hitters regardless of batting averages.

Collar.—*See* Horsecollar.

College try.—When a player makes a desperate effort to field a batted ball which is hopelessly out of his reach, the attempt is called "giving the old college try" or, simply, "making a college try" for the ball.

Connect.—To hit the ball solidly, as "he connected for a 2-bagger."

Cousin.—A pitcher whose deliveries are unusually easy for one batter, as compared with his teammates, is referred to as "a cousin" of that batter.

Cripple.—When the count on a batter is two balls and no strikes, three balls and no strikes, or three balls and one strike, the pitcher is said to be "in the hole," meaning that he must try to pitch the next one over the plate, so that the batter does not reach first base on a base on balls. In his efforts to make sure the next pitch is over the plate, the pitcher often fails to use as much speed as on the previous pitches. Such a pitch is known as a "cripple," and is very often hit solidly and far by the batter.

Crooked-arm.—A left-handed pitcher.

Crowding the plate.—A batter "crowds" the plate when he stands as close to home plate as permitted by the boundaries of the batter's box and in addition uses a crouching position, leaning forward so that his chin is actually over the top of the plate's inner margin.

Cup of coffee.—A player who gets a very brief tryout with a league club is said to have had a cup of coffee with the club.

Curtain-raiser.—The first game of a doubleheader (*see* above).

Cut.—(a) Forceful swing at the ball by the batter, whether he hits it or not. Also used as a verb, to cut at the ball, with the same meaning. (b) One player's share of a lump sum of extra money won by the team as a whole. (c) A reduction in salary.

Dime player.—An infielder is said to be "playing on a dime" when he fails to move about at his position to defend it against opposing batters, or is slow afoot in his efforts to field grounders.

Doubleheader.—Two games played by the same two teams in the same park on the same day for one admission price.

Double steal.—When two base runners both advance safely to the next base without any batting of the ball occurring during the play, it is called a double steal. The term applies regardless of which two bases are stolen. The most frequent double steal comes with men on first and third. The runner on first steals second and as the catcher throws unsuccessfully to that base, the runner on third dashes safely to home plate.

DP.—Double play.

Drag.—A batter bunting a ball between the pitcher and the first-base foul line, and starting to run to first base in the act of reaching for the ball with his bat, is said to drag the ball.

Duster.—A bean-ball (*see* above), so-called because the batter, in dodging it, frequently falls to the ground and usually removes the dust from his uniform before resuming his batting position. A pitcher intentionally throwing the ball at the batter to make him dodge is said to be "dusting him off."

Fan.—(noun) A spectator at a ball game, or a person interested in baseball who discusses its events and personalities with others. (verb) To strike out.

Fancy Dan.—A fielder who puts an extra flourish on his movements in making a play, apparently posing for the public.

Foot in the bucket.—A timid batter with a tendency to fall away from the plate as he swings at the pitched ball is said to be batting "with one foot in the water bucket," a phrase handed down from days when drinking water came in buckets instead of through the ball park's plumbing system. Every players' bench used to have its own water bucket.

Fungo.—A fly batted to the outfield in fielding practice. The batter holds the bat in one hand, tosses the ball into the air immediately in front of him, takes the bat in both hands and drives the ball high in the air in the direction of an outfielder waiting to catch it. This is known as "fungo-hitting." The fungo-hitter uses a special fungo bat, lighter and thinner than the standard bats used in games. The flies he hits are sometimes called fungo flies, but usually merely "fungos."

Gonfalon.—The pennant, emblematic of the championship of the league for any given year.

Gopher ball.—A pitch which the batter hits for a long drive, derived jocularly from the way the batters "go-fer" it, hit it, and then "go-fer" two or three bases or a home run.

Grand slam.—A home run with the bases full.

Grandstander.—A player who seems to be "showing off," with an eye towards the approval of the spectators rather than concentrating all his attention on the playing of the game.

Grandstand Manager.—A spectator given to shouting condemnatory expressions at the manager and/or players of the home team during the course of ball games, from his seat in the grandstand or the bleachers.

Groove.—An imaginary line drawn across the middle of home plate from front to back. A pitched ball which crosses home plate waist high in a plane directly above this line on its way to the catcher is said to be "in the groove," though it usually is hit by the bat before reaching the catcher.

Hall of Fame.—(a) The central court of the Baseball Museum at Cooperstown, the up-state New York village where baseball was first played. (b) A non-tangible "hall" in which a pitcher secures a permanent place for his name by pitching a no-hit game. Sometimes qualified as the "No-Hit Hall of Fame."

Handcuff.—A hard-hit batted ball, which seems to break through the hands of the infielder trying to catch it, is described as handcuffing the infielder.

Hawk.—An outfielder gifted with exceptional speed and keen judgment of the flight of batted balls, so that he can fly far to make catches of long drives.

Homer.—Applied to an umpire, the inference of the description, homer, implies that he is inclined to render close decisions in favour of the home team in order to curry favour with the crowd.

Hook.—A curve pitch.

Horsecollar.—A zero opposite a player's name in the hit column of a box score, meaning he made no hits in that game.

Hot corner.—Third base, because batted balls hit towards that point are usually travelling faster than is the case when directed towards any other infielder.

In the hole.—(a) A drive which passes to the outfield halfway between two infielders is sometimes described as "in the hole" between short and third or between first and second. (b) *See* Cripple.

Iron Man.—A pitcher who pitches every inning of both games of a doubleheader and is the winning pitcher in both games.

Ivory.—New talent added to a team's personnel from leagues of lower classification or from teams outside organized baseball. The talent scouts of professional teams are also called "ivory hunters."

Jake.—A player who feigns illness or injury in order to avoid playing in games. Formerly called "stalling," it became "Jake" as a softer

word, the etymology tracing to an old-time star, Jake Stahl, who himself, however, was never noted for any such avoidance of work. "Jake" is also used in verbal forms, as "I was jaking on the job."

Jockey.—A player with a sharp tongue, a quick wit and a voice that carries from the bench to the playing field. He "rides" the opposing team's players, preferably the pitcher, his aim being to arouse their emotional reactions and distract their attention from the optimum performance of their assignments in the game.

Jug-handle.—A sharp-breaking and effective curve pitch.

Keystone.—Second base.

Kick.—(noun) A voiced or gestured objection to an umpire's decision. Also as verb, meaning to make such a protest. (verb) To "boot" a grounder.

Knocked out of the box.—When the manager makes a substitution of one pitcher for another at some point during the opposing team's inning at bat and such substitution is made because of heavy hitting by the team at bat, the pitcher taken out of the game is said to be knocked out of the box.

Lamb.—A poor batter.

Lead.—(a) The advantage which one team has over another, either in runs at some point during a game, as a "two-run lead," or in games or points in a club standing at some point during a pennant race, as a "four-game lead," or a "50-point lead." (b) A base runner takes a "lead" off a base when he moves two or three steps towards the next base as the pitcher takes his position to pitch to the batter.

Lead-off man.—The first player in a team's batting order.

Loop.—A baseball league or association.

Loose.—Adjective used to describe a pitcher whose delivery is smooth and rhythmic. Also to describe any player who preserves his aplomb and effectiveness of operation regardless of how tense or fierce the action of a game becomes.

Monkey suit.—A player's term of endearment for his uniform.

Muff.—The failure to hold a fly ball after getting hold of it, or touching it with one or both hands.

Nightcap.—The second game of a doubleheader (*see* above).

No-Hitter.—A game in which one pitcher prevents the opposing team from making a safe hit throughout the entire contest. Games of one or two hits for one of the contesting teams are termed "one-hitters," "two-hitters," etc., when describing the performance of the pitcher who thus restricted a team's batting efforts.

Number Two.—A curve pitch, so-called because in the fundamental code of signals by the catcher to the pitcher one finger means the straight fast pitch, two fingers means the curve.

On deck.—The batter who will follow the man at bat at any given point is known as the man on deck.

Orchard.—A baseball park.

Overhand delivery.—A style of pitching in which the pitcher's pitching hand passes his body at a level higher than his head and close to a vertical line drawn from the tip of his pitching shoulder.

Overrunning a base.—A base runner reaching a base but going past it, or being carried past it by the momentum of his body as he slides, is said to overrun the base.

Overthrow.—A throw to a base in an attempt to retire a base runner which is so high that the fielder cannot reach the ball at all, or block its flight enough to prevent its rolling out of control long enough for one or more base runners to advance one or more bases before control is regained.

Owl.—A player conspicuous for getting up earlier in the morning than his teammates when the team is away from home and living together in the same hotels.

Pass.—(a) A free ticket of admission to the ball park. (b) A base on balls, a "free ticket" to first base for the batter.

Passed ball.—A pitched ball within reach of the catcher which the catcher fails to hold, and which rolls far enough for a base runner to advance at least one base before its recovery, is scored as a passed ball. It is necessary for there to be one or more base runners advancing for the scoring of a passed ball, which counts as a fielding offense by the catcher, though not recorded in the error column of the box score.

Pinch.—Obsolescent noun superseded by "clutch" (*see* above).

Pinch hitter.—A player who is substituted for a man going to bat or already in the batter's box but with his turn at bat still unfinished.

Pool table.—A ball park's infield which is exceptionally well-kept, the surface level and the grass evenly cropped.

Pop.—A pop, pop-up or pop fly is a weakly hit fly which travels steeply off the bat into the air.

Powerhouse.—A long-distance hitter.

Prima donna.—Temperamental player who must be coddled by his manager and teammates in order to perform at optimum efficiency.

Pull the string.—Every time a pitcher of good speed mixes in a slow ball, or "change of pace," he is said to pull the string.

Pull-hitter.—One who tends to drive the ball to the part of the playing field on the same side of home plate as the batter's box in which he is standing, *e.g.*, a right-handed batter who "pulls," hits his hardest drives to left field; a left-hand pull-hitter drives them to deep right.

Rabbit-ears.—A player, usually a pitcher, who is touchy and quick to flare into a rage. Pitchers and players in general, when the game is going on, give ear only to the voices of their own teammates, their manager and coaches. A player with rabbit-ears can be disturbed and his efficiency impaired by comments from the opposing team's bench or from the coachers' boxes.

Rally.—An offensive outburst, usually two or more hits, made by a team which is behind in the score in a late inning of the game, whether or not the outburst is successful in tying or passing the other team.

Relieving a pitcher.—When one pitcher takes the place of another in the course of an inning, the new man is said to relieve the one who is leaving the game.

Riding the bench.—A substitute player who is not playing in his team's line-up for a long succession of games describes his activities, "I'm riding the bench."

Rock.—A boner (see *above*).

Rookie.—A new player in the league, especially if he is awkward or naive.

Roundhouse.—A slow curve pitch.

Round-tripper.—A home run.

Rubber-arm.—A pitcher who can pitch often and long without suffering any soreness of his arm or impairment of his pitching strength.

Run-down.—When a base runner stops between bases, and players of the fielding team toss the ball back and forth in their efforts to tag him out before he reaches a base safely, it is described as a run-down. They are running the base runner down.

Scatter-arm.—An infielder inaccurate in his throwing.

Scattered hits.—Hits are said to be scattered when they occur in different innings of a game so that they are ineffective from the standpoint of scoring runs.

Scribe.—A baseball writer. Also reporters and journalists in general.

Seventh-inning stretch.—A time-honoured baseball custom dating from the 19th century and in universal practice. As the home team prepares to go to bat in its 7th inning, nearly all the spectators stand up and remain standing until the first home batter steps into the batter's box. Fans rooting for the visiting team "stretch" at the start of the first half of the 7th inning. The idea is to bring luck to one's favoured team.

Shagging flies.—Pre-game practice in which a succession of fungo (*see* above) flies are batted to the outfield for the outfielders to use in gauging the wind direction and velocity prevalent produce a scene described as fly-shagging. The activity of the outfielders (and also of pitchers and substitutes running around the outfield for exercise purposes) is described as shagging flies.

Shake-off.—A pitcher seeing the catcher signalling for a fast ball may want to throw a curve, or vice versa. If so, he shakes his head. This is called giving the catcher the shake-off, or shaking him off.

Shave.—A player who is being talked to by a talkative player, or "barber," is said to be getting a shave, or is being given a shave.

Showboat.—A player who struts, or who does his playing in a stagy manner, for the applause of the fans.

Shutout.—A game in which one team fails to score any runs. The opposing pitcher is said to have shut out the team and to have pitched a shutout.

Sidearm delivery.—A pitching style in which the pitcher's arm extends laterally from his shoulder in the act of pitching the ball toward home plate, his hand keeping at about the level of his shoulder throughout the throwing action.

Skipper.—The manager.

Slide.—A base runner approaching a base on a close play on which it is necessary for him to beat the ball and at the same time retain contact with the base after reaching it uses a "slide" to achieve his double purpose. The runner usually flings his body in the direction of the bag, feet first, aiming to stab the bag with one foot and to keep that foot in contact with the bag until his forward impetus expends itself. Some prefer the head-first slide, in which the runner dives face down toward the bag, usually not directly at it, but passing it within reach of one arm, so that his fingers clutch some part of the bag. This not only affords a better grasp of the objective, but also gives him more chance of eluding the tag of the fielder. Conversely, in sliding head first the runner does not have the advantage of his spikes, whose points form a mental hazard for a fielder guarding the bag when the play is close.

Slugger.—A batter who hits long drives.

Slump.—A continued succession of diminished success in winning games, when it involves a team. A continued period of ineffectual batting, if it's an individual.

Southpaw.—A left-handed pitcher.

Spheroid.—A baseball.

Stoolie.—A player suspected of carrying tales to the manager about his fellow players' breaches of team rules and their conduct and statements in general.

Strawberry.—An abrasion of the skin on the outside of the leg above the knee, caused by sliding to a base.

Streak.—A number of successive victories, defeats, hits, etc.

Stuff.—A pitcher whose fast ball is effective against opposing batters is said to have a lot of stuff. Curves, knuckle-balls, screw-balls, etc., are classified together as "slow stuff."

Taking a pitch.—A batter is said to take a pitch when he makes no effort to swing or to bunt a ball pitched past him to the catcher.

Tally.—A run. (verb) To score a run.

Tee off.—Against a pitcher without much ability, or against a good pitcher when he has weakened, the batters are able to take full swings at the ball without waiting to gauge its speed or its degree of deviation from the straight trajectory. This lusty swinging is called teeing off when it results in long drives.

Texas leaguer.—A weakly hit fly which drops safe for a hit within a zone too far beyond the infield for the nearest infielder to catch it before it falls to earth and too close to the infield for the nearest outfielder to reach it before it falls.

Trapped ball.—A fly or line drive caught by a fielder just after touching the ground for the first time and before rebounding more than an inch or two off the ground is said to be trapped by the fielder.

Triple steal.—When all three bases are occupied, and the man on third steals home, the other runners advancing to third and second bases respectively, without the ball having been hit by the batter, it is called a triple steal, even though no play is made on two of the base runners in question.

Triple-header.—Three games played by the same two teams in the same park on the same day, with admission charged only once.

Tunneler.—Player who undermines the manager's authority by off-stage comments, whispering campaigns, actions tending to weaken his teammates' confidence in their leader.

Twin bill.—A double-header, two games for one admission.

Twi-night twin bill or *double-header.*—A double-header in which the first game starts about $2\frac{1}{2}$ hours before sunset, the second under artificial lighting.

Two o'clock hitter.—A player who hits long hard drives during batting practice but bats weakly in the ball game.

Underhand delivery.—A pitching style in which the pitcher's hand passes his body below the level of his waist line in the act of pitching the ball to home plate.

Waivers.—When a club in organized baseball wishes to send a player to a club in a league of lower classification, it must first obtain permission to do so from all the other clubs in its league. The other clubs are asked to waive claim to the player. If any club refuses to waive claim, the club owning the player's contract may either call off the deal and keep the player or it may make a deal with one of the clubs in its own league, transferring the player to such club. It may also, without making any special arrangement, hand over the player to the club refusing to waive claim, to the lowest ranking club among those refusing to waive claim, if more than one club refuses. There is a fixed price in each league that must be paid by the club obtaining a player by this waiver method. The player is said to be sent by club A to club B on waivers.

Walk.—(noun) A base on balls. (verb) A batter receiving a base on balls "walks." Also used transitively, as "the pitcher then walked the next two batters."

Whitewashing.—A team which is held scoreless throughout a game is said to receive a whitewashing.

Wild pitch.—A pitched ball which strikes the ground before reaching the catcher or which is so high or so wide of its mark that the catcher cannot reach it. In scoring it is necessary for a base runner to advance on such a pitch before it can be marked into the records. It is not a wild pitch, no matter how far the ball rolls, when there are no base runners on bases or when, with one or more runners on bases, none of them advances at least one base.

Wild throw.—A thrown ball which misses its mark so widely that the fielder cannot catch it in time to make the play.

Windup.—The preliminary swinging of the pitcher's arms as he prepares to make his pitch to the plate. With base runners on one or more bases, the pitcher dispenses with his windup, starting his pitch from a stationary position by merely drawing back his arm and throwing the ball, pivoting on one foot. In the windup, he rocks back and forth once or twice, with the ball in his bare hand, rotates the pitching arm in the shoulder-socket at least once, then brings both hands together above his head, before starting the actual pivoting and drawing back of the pitching arm for the throw.

Wolves.—Spectators at a baseball game.

Wrinkle.—A curve pitch without much curve. (W. E. Bt.)

BASEDOW, JOHANN BERNHARD (1723–1790), German educational reformer, was born at Hamburg, the son of a hairdresser. He received an education at the Johanneum in that town. In 1753 he was chosen professor of moral philosophy and belles-lettres in the academy of Sorö in Denmark. On account of his theological opinions he was in 1761 removed from this post and transferred to Altona, where some of his published works brought him into great disfavour with the orthodox clergy. Towards the end of 1767 he abandoned theology to devote himself with the same ardour to education, of which he conceived the project of a general reform in Germany. In 1768 appeared his *Vorstellung an Menschenfreunde für Schulen, nebst dem Plan eines Elementarbuches der menschlichen Erkenntnisse,* which was strongly influenced by Rousseau's *Émile.* His *Elementarwerk,* 1774, contains a complete system of primary education, intended to develop the intelligence of the pupils and to bring them, so far as possible, into contact with realities, not with mere words. The work was received with great favour, and Basedow obtained means to establish an institute for education at Dessau, which he named *Philanthropin.* Similar institutions sprang up all over the land. Basedow, unfortunately, was little calculated by nature or habit to succeed in an employment which required the greatest regularity, patience and attention; he resigned his directorship of the institution in 1778, and it was finally closed in 1793.

See H. Rathmann, *Beiträge zur Lebensgeschichte Basedows* (Magdeburg, 1791); J. C. Meyer, *Leben, Charakter und Schriften Basedows* (Hamburg, 1791–92); G. P. R. Hahn, *Basedow und sein Verhältnis zu Rousseau* (Leipzig, 1885); A. Pinloche, *Basedow et le philanthropinisme* (1890); C. Gössgen, *Rousseau und Basedow* (1891).

BASE FEE, in law, a freehold estate of inheritance, which is limited or qualified by the existence of certain conditions. In modern property law the commonest example of a base fee is an estate created by a tenant in tail, not in possession, who bars the entail without the consent of the protector of the settlement. Though he bars his own issue, he cannot bar any remainder or reversion, and the estate (*i.e.,* the *base fee*) thus created is determinable on the failure of his issue in tail. An example of this kind of estate was introduced by George Eliot into the plot of *Felix Holt.* Another example of a base fee is an estate descendible to heirs general, but terminable on an uncertain event; *e.g.,* a grant of land to A and his heirs, tenants of the manor of Dale. The estate terminates whenever the prescribed qualification ceases. An early meaning of base fee was an estate held not by free or military service, but by base service, *i.e.,* at the will of the lord.

BASE HOSPITAL, a hospital created and used by the Government for the care of the sick and wounded in time of war. Such hospitals are located sufficiently far from the firing lines to be permanent and stationary. The seriously wounded are removed from the various dressing stations at the front to these hospitals. In the United States certain hospitals receiving chronic or seriously wounded soldiers during the World War were called base hospitals.

BASEL, CONFESSION OF. The Reformation was somewhat stormily introduced at Basel in 1529; and in 1531 a Confession was drafted by Oecolampadius, the friend and follower of Zwingli; and adopted in a revised form by the city authorities in 1534, and shortly afterwards by the city of Mühlhausen in Alsace. It is known as the First Confession of Basel (or the Confession of Mühlhausen), and must be distinguished from the First and Second Helvetic Confessions (the former of which is sometimes called the Second Confession of Basel). It gives in 12 articles a moderate statement of the Zwinglian doctrine: declaring, for example, that in the Lord's Supper Christ is present as *the food of the soul* to everlasting life. It held its place in the Church of Basel down to 1872, when its use was discontinued.

See Zwingli (with reff.); W. A. Curtis in Hastings, *Dictionary of Religion and Ethics, s.v.* "Confessions," sec. 15; Schaff, *Creeds of the Evangelical Protestant Churches* (5th ed., 1887); Müller, *Symbolik,* pp. 95 ff. (1896).

BASEL, COUNCIL OF. The third of the three reforming councils of the 15th century, after the councils of Pisa (1409) and Constance (1414–18). In these councils the aim of the majority was to destroy the absolute supremacy of the Pope and curb the rule of the Roman curia, in order that the power of oecumenical or general councils and the authority of the episcopate might be aggrandized. The fathers of Constance succeeded in showing their superiority to the pope by bestowing the papal chair on Martin V. and by insisting that another such council be called in five years. The council called in obedience to this instruction was first appointed to meet at Pavia, then at Siena; but Basel was at last decided upon. At the very beginning Martin died, but his successor Eugenius IV. sanctioned his decrees and the council met in July 1431, under the presidency of Cardinal Julian Cesarini.

The democratic character of the assembly at Basel was the result both of its composition and of its organization; not only was the number of prelates in it always small in comparison with that of the doctors, masters, representatives of chapters, monks or

clerks of inferior orders, but the influence of the superior clergy had all the less weight because, instead of being separated into "nations," as at Constance, the fathers divided themselves according to their tastes or aptitudes into four large committees or "deputations" (*deputationes*), one concerned with questions of faith (*fidei*), another with negotiations for peace (*pacis*), the third with reform (*reformationis*), the fourth with what they called "common concerns" (*pro communibus*). A decision accepted by three of these "deputations"—and in each of them the lower clergy formed the majority—could be proposed in a general session. This procedure differed from that of the Council of Constance as well as from ancient practice.

The principal subjects assigned to the council were the re-union of the Greek and Latin Churches, the reconciliation of the Hussite Bohemians, and the reform of the Church according to the resolutions of Constance. Soon after the opening of the council the Roman curia took alarm at its aims, and by intrigues compelled the pope, who was really anxious for reform, to do all he could to hinder its work. He twice tried to dissolve it; but it resisted, maintaining that an oecumenical council, being superior to the pope, could not be dissolved. Eugenius yielded; and the bishops refused to admit his legates until they admitted the supremacy of the council and promised to obey its decrees.

The first business to which the members addressed themselves was to curb the power of the pope and of the Roman curia. They tried to do this by stopping the flow of money from all parts of Europe to Rome. They abolished the Annates (*q.v.*); they declared it illegal in a bishop to send the sum of money commonly presented on his investiture; and they passed disciplinary measures regulating the elections, the celebration of divine service, the holding of diocesan synods and provincial councils and so forth.

Eugenius, however much he may have wished to keep on good terms with the fathers of Basel, was neither able nor willing to accept or observe all their decrees. The question of the union with the Greek Church, especially, gave rise to a misunderstanding between them which soon led to a rupture. The emperor John Palaeologus, pressed hard by the Turks, showed a great desire to unite himself with the Catholics; he consented to come with the principal representatives of the Greek Church to some place in the west where the union could be concluded in the presence of the pope and of the Latin council. Hence arose a double negotiation between him and Eugenius IV. on the one hand and the fathers of Basel on the other. The chief object of the latter was to fix the meeting-place at a place remote from the influence of the pope, and they persisted in suggesting Basel or Avignon or Savoy, which neither Eugenius nor the Greeks would on any account accept. The result was that Palaeologus accepted the offers of the pope, who, by a bull dated Sept. 18, 1437, again pronounced the dissolution of the council of Basel, and summoned the fathers to Ferrara, where on Jan. 8, 1438, he opened a new synod which he later transferred to Florence. In this latter town took place the momentary union, which was more apparent than real, between the Latin and the Greek Church (July 6, 1439). During this time the council of Basel, though abandoned by Cesarini and most of its members, persisted none the less, under the presidency of Cardinal Aleman, in affirming its oecumenical character. On Jan. 24, 1438, it suspended Eugenius IV., and went on in spite of the intervention of most of the powers to pronounce his deposition (June 25, 1439), finally giving rise to a new schism by electing on Nov. 4 Amadeus VIII., duke of Savoy, as pope, who took the name of Felix V.

This schism lasted fully ten years, although the antipope found hardly any adherents outside of his own hereditary states, those of Alphonso of Aragon, of the Swiss confederation and certain universities. Germany remained neutral; Charles VII. of France confined himself to securing to his kingdom the benefit of a great number of the reforms decreed at Basel by the "Pragmatic Sanction" of Bourges, which became law on July 13, 1438. England and Italy remained faithful to Eugenius. The prestige of the council grew rapidly weaker. In June 1448 it migrated to Lausanne, and the antipope, at the instance of France, ended by abdicating (April 1449). Eugenius IV died in Feb. 1447, and the fathers of Lausanne, to save appearances, gave their support to his successor, Nicholas V., who had already been governing the Church for two years. Trustworthy evidence, they said, proved to them that this pontiff accepted the dogma of the superiority of the council as it had been defined at Constance and at Basel. In reality, the struggle which they had carried on in defence of this principle for 17 years, with a good faith which it is impossible to ignore, ended in a defeat. The papacy, which had been so fundamentally shaken by the great schism of the west, came through this trial victorious. The era of the great councils of the 15th century was closed; the constitution of the Church remained monarchical.

See Hefele-Leclercq, *Histoire des conciles* (1916), VII, 663–1137; Mansi, *Sacrorum conciliorum nova et amplissima collectio*, t. xxix–xxxi; J. Haller, *Concilium Basileense* (1896–1926); M. Creighton, *A History of the Papacy during the Period of the Reformation. II. The Council of Basel* (1882); N. Valois, *La crise religieuse du XVe siècle* (1909).

BASEMENT, in a building, a story partly below the surrounding ground level; more loosely the ground story of a building when that story is of subsidiary importance. The term is applied specifically when the exterior treatment of this story is simpler or more rugged than that of the superstructure. The basement then serves the function of a pedestal.

BASE METABOLISM: *see* METABOLISM.

BASHAHR, a Rajput hill state, India, within the Punjab, amid the Himalaya mountains, with an area of 3,439 sq. mi. and a population in 1941 of 116,305.

The revenue is obtained chiefly from land and forests. The latter are very valuable.

BASHAN, a district east of the Jordan whose bounds cannot be determined with accuracy. On the east it would seem to have been bounded by Jebel Hauran and Salkhad (Salcah) (Deut. iii. 10, Josh. xii. 4, xiii. 11), on the south by the river Yarmūk (Hieromax) and a line drawn through Dera'a (Edrei) and Salkhad, on the west by the districts Geshur and Maacah (Josh. xii. 5) which may possibly have been strips of territory separating it from the Jordan valley, whilst on the north it stretched out towards the Hermon range (Deut. xxxiii. 22). The extent of the region to which the name Bashan could be applied appears to have fluctuated. In a wide sense it was applied to the northernmost of the three great divisions into which Eastern Palestine fell (Moab, Gilead, Bashan: Deut. iv. 43, II. Ki. x. 33). In the time of Og, Bashan included Edrei and Salcah (Deut. iii. 10, etc.). The graecized name Batanaea was later applied to the southern portion only of the region indicated, other portions being particularized as Auranitis, Golanitis, Trachonitis (Josephus, *Antiq.* iv. v. 3). Golan was a "city of refuge" in Bashan (Deut. iv. 43), and is perhaps one of the sites in the modern Jaulān. The Argob (I. Ki. iv. 13) in Bashan was probably a district whose western boundary was the Wady-er-Rukkād with southern extension to include northern Gilead. Whatever the variations of Bashan's area may have been, there seems no doubt that its core was the fertile plain now known as En-Nukra ("hearth-hole") west of Jebel Hauran and the volcanic mass of El Leja or Trachon.

The chief towns of Bashan to which reference is made in the Old Testament are Ashtaroth-Karnaïm (Carneas,—now perhaps Tell-'Ashtara or Tell-Ash'ari, both south-west of Sheikh Sa'ad), Edrei (Dera'a, identified probably mistakenly with Aduri of the Amarna letters), Golan (somewhere in Jaulān), Salcah (Salkhad) and Bosra (Bostra, mod. Busrā). As the ruins on these sites date from the first century A.D., excavation alone can establish whether they were occupied prior to that time. In this neighbourhood and more especially in the Lejā and Jebel Hauran are found the remains of many deserted towns of a former day. According to Wetzstein the Jebel Hauran has 300 such on its east and south slopes. An edict of A.D. 40 (Herod Agrippa) reveals how the population lived in caverns and subterranean cities as a protection against Arab nomads, and enjoins them to abandon this "bestial mode of life" (*θηριώδης κατάστασις*). The abodes of the people, as the sites testify, were either caverns hollowed out of the mountain (as on the east of Jebel Hauran), or underground homes entered by concealed shafts (as west of Jebel ez-Zumla). At Edrei there is an entire city underground, now partially destroyed. Their buildings above ground have been built of huge blocks of

black basalt, the almost entire absence of wood being a curious feature, doors, staircases, galleries, roofs, etc., being of basalt. "An awful silence fills the sable ruins, there is never a face nor a flower, nor the flutter of a robe in all the bare black streets" (G. A. Smith).

Bashan was famous of old for its oaks (Is. ii. 13, Zech. xi. 2, Ezek. xxvii. 6). The Nukra is a treeless plain but on the ridges of Gilead to the south and on the western slopes of Jebel Hauran trees flourish, among them oaks. Bashan was famous too, for its cattle (Deut. xxxii. 14, Ps. xxii. 12). The haughty women of Samaria are likened by Amos to kine of Bashan (iv. 1).

History.—In Numbers xxi. 33 *seq.* we are told how the Israelites defeated Og at his frontier city Edrei and took his land. The territory of Bashan was assigned to the half-tribe Manasseh (Deut. iii. 13, iv. 43; Josh. xiii. 29). It was one of Solomon's commissariat districts (I. Ki. iv. 13), and was smitten by Hazael (II. Ki. x. 33). Judas Maccabaeus, in a victorious campaign against the Greeks and their native allies, penetrated to Bosra. From 84–81 B.C. Bashan was under the rule of Alexander Jannaeus, but the rest of the land to the east belonged to the Nabataeans. Pompey and his legions drove the latter southward (64 B.C.) and Bosra and Salcah became their northernmost towns. Herod who had conducted war in this region (32 B.C.) was made its ruler by Augustus. By means of fortresses and a garrison of 3,000 legionaries he maintained a precarious peace and by proclaiming freedom from taxation attracted an ample population. Herod's son succeeded to a tetrarchy comprising Gaulanitis, Batanaea, Trachonitis, Auronitis (4 B.C.) which later passed to Herod Agrippa (A.D. 37–44). In A.D. 106 Trajan brought the whole Nabataean kingdom under the empire in creating the province of Arabia with Bosra as capital, thus ensuring within the frontier, extended far eastwards, security for the fertile plains of Bashan. Cities rapidly grew out of villages, boasting that which was Rome in colonnaded streets, basilicas, theatres, aqueducts, only to sink back into oblivion when the frontier had been broken, the Roman power had passed away, and the desert had resumed its invasion of the town. When southern Arabian Christian stems founded the Ghassanid kingdom (A.D. 200) Bashan bloomed again. Bosra eventually became the ecclesiastical capital of the Hauran (cathedral built in 512) and as a trading centre was second only to Damascus. Thither came Mohammed from Mecca with his camel-train to learn in the intervals of trade all he knew of Christianity. By 635 Damascus had fallen to the Arabs and a blight had settled permanently on the broad acres of Bashan and on ruined cities in whose deserted streets bewildered nomads still wander. The crusaders made two expeditions to Bosra (1113 and 1119). Bashan they called the territory of Suhete or Suete (Suweida?) but they made no settlement there. To-day the Hauran is one of the strongholds of the Druses (*q.v.*) of whom it shelters some 50,000. The independence of the territory of Jebel ed-Duruz (Jebel Hauran) was recognized by the Mandatory power (France) in an agreement with Druse chiefs (1921). Its independence was officially proclaimed on April 5, 1922.

Archaeology.—French control of the Hauran district has given a stimulus to archaeological investigation. A fine basalt lion of Syro-Hittite style, discovered long ago at Sheikh Sa'ad (north of Dera'a), has been removed to the museum at Damascus. At Kanawat, a church in the middle of a temple of the Roman epoch, at Shuhba (Philippopolis) a great temple, theatre and a Roman villa with mosaics claimed to be the finest yet found in Syria, have been laid bare. At Suweida, the capital, where is now a lapidary museum, a small church and a Roman villa have been excavated. An archaeological survey of the region has been carried out by the French and a large number of new inscriptions (400 Greek texts and 300 Safaitic as well as some Nabataean) along with monuments have been brought to Suweida (1925).

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BASHI-BAZOUK, the name given to a species of irregular mounted troops employed by the Turks, which earned notoriety during the 19th century. They were armed and maintained by the Government but did not receive pay nor wear uniform. Their uncertain discipline and temper sometimes made it necessary for the Turkish regular troops to disarm them by force, but they were often useful in the work of reconnaissance and in outpost duty. They were accused, and generally with justice, of robbery and maltreatment of the civil population, resembling in those things, as in their fighting methods and value, the Croats, Pandours and Tolpatches of 18th-century European armies. The term was also used of a mounted force, existing in peace time in various provinces of the Turkish empire, which performed the duties of gendarmerie.

BASHKALE or BASKALE, a town of a *kaimmakamlik* in the vilayet of Van in Turkey. It is a military station, situated at an elevation of 7,500 ft. above sea-level in the valley of the Great Zab, and is the centre of the Hakkiari Kurds. Pop. 5,164.

BASHKIR REPUBLIC, an Autonomous Soviet Socialist Republic, created May 1919. Its boundaries are, N. and E., the new area of Uralsk (centre Sverdlovsk, formerly Ekaterinburg and quite distinct from the Uralsk of the Southern Ural Province); S.E. and S.W., Chkalov, formerly Orenburg; W., Kuibyshev, formerly Samara, and the Autonomous Tatar S.S.R. Area 54,247 sq.mi. Pop. (1939) 3,144,713; urban 531,096, rural 2,613,617. The area consists mainly of the densely wooded, craggy western slopes and foothills of the Ural mountains (3,900–5,230 ft.) and the plateau (*c.* 1,000 ft.) extending south-west from them. The Byelaya, Ufa and Dema rivers and their tributaries have deeply entrenched the plateau, and the town of Ufa is in a plain where the entrenched valleys meet. A tongue of the Uralsk area extends south-westwards into the republic and includes the famous Zlatoust mining area: thus the lake and forest dotted canton of Argayash, pop. 100,581, entirely rural, is isolated from the rest of the republic. In the south-west of the main area the forest is replaced by steppe, while in the west and north-west the forest only remains in patches. From the left bank of the Byelaya, south of its junction with the Ufa, there extends westward a broad belt of thick and fertile black earth soil; eastwards into the hill zone the black earth is degraded and liched and passes into a podzolised type in the forest zone (*see* RUSSIA). The climate is severe; the rivers being frozen 158 days at Ufa, average temp. Jan. 5.5°, July 68°, and the rainfall is scanty and variable in the west and south-west especially. During the civil war following the 1917 revolution, Bashkiria suffered severely: some regions changed hands as many as 15 times and the tribesmen could not follow the course of events, since they were mainly illiterate. Following on the exhaustion of the people and the commandeering of their horses, carts, sheep, goats and food for the conflicting armies, came the famine of 1921–22. The number of horses, cattle, sheep, pigs and goats was catastrophically diminished. The following figures illustrate the extent of the agricultural disaster:—

Harvest in Poods per dessiatin

	Rye	Wheat	Spelt	Barley	Oats	Millet
1913	59	53	62	72	67	50
1921	1·6	2·4	..	1·9	1·7	5·6

	Buck-wheat	Peas	Potatoes	Flax	Hemp
1913	45	52	450	34	46
1921	7·7	..	..	..	..

The reorganization of agriculture is hampered by the lack of cattle and farm implements and also by the difficulty which the tribesmen find in adapting themselves to the Communist system of land tenure, which is radically different from their own. Many Bashkirs are still nomadic herders of cattle, sheep and horses. Dairying and beekeeping are extensively carried on and honey, wax, butter and eggs are produced. Kumiss (fermented mare's milk) sanatoria are established on the west bank of the Dema. The area of settled agriculture is slowly extending from the west. Bashkiria has much mineral wealth, including gold, copper and coal; iron and copper are smelted at Ufa, and copper in the south, especially at Zilair (formerly Preobrazhensk). There are several timber mills and glass and crockery factories. Other industries are flour-milling, brandy distilling, the making of cloth, leather tanning, paper-making, brick-making, etc. Ufa (*q.v.*), the administrative centre, has extensive printing works.

The Bashkirs formerly inhabited the Russian governments of Ufa, Chkalov, Perm and Kuibyshev and parts of Vyatka, especially on the slopes and confines of the Ural, and in the neighbouring plains. They speak a Tatar language. The name Bashkir or Bash-kûrt (a mere nickname) appears for the first time in the beginning of the 10th century in the writings of Ibn-Foslan, who, describing his travels among the Volga-Bulgarians, mentions the Bashkirs as a warlike and idolatrous race. Joannes de Plano Carpini (*c.* 1200–60) and William of Rubruquis (1220–93) are the first European writers to mention them. Hamy considered them to be intermediate between the Turki and the Mongol type.

They were independent and troublesome to their neighbours, the Bulgarians and Pechenegs, until the Mongolian invasion of the mid-13th century. In 1556 they submitted to Russia and paid a fur tax, and Ufa was built to protect them against the Kirghiz. They rebelled in 1676 (under Seit), in 1707 (under Aldar) and again from 1735–41. In 1786 they were freed from taxes, and in 1798 an irregular army was formed among them. The problem of the Bashkir republic is complicated by the racial diversity of the population, which includes about 51% of Bashkirs and Tatars, 34% of Great Russians and small numbers of Little Russians, Marii, Chuvash, Mordva, White Russians, Votyaks, Latvians, Germans, Jews, Poles and Estonians. A further difficulty is that the town population is mainly Russian (77·7%). The general cultural level is low; apart from the Russian element, the percentage of illiteracy is possibly in places as high as 90%. The disorganization wrought by civil war and famine is such that it is difficult to provide education. There is a lack of teachers, of school premises and of equipment, and only about 25% of non-Russian children of school age are receiving education. This illiteracy and the diversity of the spoken languages reacts unfavourably on the economic and social life of the republic.

The Bashkirs are divided into settled and nomadic. The former are engaged in agriculture, cattle-rearing and bee-keeping, and live without want. The nomadic portion is subdivided, according to the districts in which they wander, into those of the mountains and those of the steppes. Almost their sole occupation is the rearing of cattle; and they attend to that in a very negligent manner, not collecting a sufficient store of winter fodder for all their herds, but allowing part of them to perish. The Bashkirs are usually very poor, and in winter live partly on a kind of gruel called *yûryu,* and badly prepared cheese named *skûrt.* They are hospitable but suspicious, apt to plunder and to the last degree lazy. They have large heads, black hair, eyes narrow and flat, small foreheads, ears always sticking out and a swarthy skin. In general, they are strong and muscular, and able to endure all kinds of labour and privation. They profess Mohammedanism, but know little of its doctrines and know practically nothing of its scriptures.

See J. P. Carpini, *Liber Tartarorum,* edited under the title *Relations des Mongols ou Tartares,* by d'Avezac (Paris, 1838); Gulielmus de Rubruquis, *The Journey of William of Rubruck to the Eastern Parts of the World,* translated by W. W. Rockhill (London, 1900); Semenoff, *Slovar Ross. Imp., s.v.;* Frähn, "De Baskiris," in *Mém. de l'Acad. de St.-Pétersbourg* (1822); Florinsky, in *Westnik Evropi* (1874); and Katarinskij, *Dictionnaire Bashkir-Russe* (1900). *See* also *Soviet Union Year Book* (1927).

BASHKIRTSEFF, MARIA CONSTANTINOVNA [MARIE] (1860–1884), Russian artist and writer, was born at Gavrontsi, in the government of Pultowa, in Russia, on Nov. 23, 1860. Her parents lived apart, and the child spent her early life with her mother in various health resorts in Germany and the Riviera. She received a good education in ancient and modern languages, and began to study singing. But her voice failed her, and she began the serious study of painting in Tony Robert-Fleury's studio in Paris in 1877. In 1880 she exhibited in the salon a portrait of a woman; in 1881 she exhibited the "Atelier Julian"; in 1882 "Jean et Jacques"; in 1884 the "Meeting," and a portrait in pastel of a lady—her cousin—now in the Luxembourg gallery, for which she was awarded a *mention honorable.* Her health, always delicate, could not endure the double strain of artistic work and social life, and she died of tuberculosis on Oct. 31, 1884. But it is not as an artist that Marie is remembered, though she had marked talent.

From her childhood Marie Bashkirtseff kept an autobiographical journal, part of which was published after her death. These brilliant confessions (*Journal de Marie Bashkirtseff,* 1890) bear the stamp of truth, and constitute a record of extraordinary interest, though the editing aroused some protest.

A further instalment of Marie Bashkirtseff literature was published in the shape of letters between her and Guy de Maupassant, with whom she started a correspondence under a feigned name and without revealing her identity.

See Mathilde Blind, *A Study of Marie Bashkirtseff* (1892); *The Journal of Marie Bashkirtseff,* trans. with an intro., by Mathilde Blind (1890); *The Letters of Marie Bashkirtseff* (1891); Alberic Cahuet, *Moussia: The Life and Death of Marie Bashkirtseff* (1929).

BASIC SLAG, a by-product of steel manufacture, is formed when phosphatic ores are used in converters lined with lime or magnesia, as in the Thomas-Gilchrist or "basic" process. The phosphorus containing material of the ore combines with the lining material of the converter to form basic phosphates. This material, if finely ground, serves as a valuable fertilizer. Its value is due in large part to its phosphatic content, although the lime content also is valuable. (*See* METALLURGY; FERTILIZERS.)

BASIL THE GREAT (*c.* 330–379), bishop of Caesarea (and founder of monastic institutions) came of a famous family, which gave a number of distinguished supporters to the Church. His eldest sister, Macrina, was celebrated for her saintly life; his second brother was the famous Gregory of Nyssa; his youngest was Peter, bishop of Sebaste; and his eldest brother was the famous Christian jurist Naucratius. Basil was born at Caesarea in Cappadocia. While he was still a child, the family removed to Pontus, but he soon returned to Cappadocia to live with his mother's relations. Eager to learn, he went to Constantinople (*c.* 346) and after four or five years there, to Athens, where he had Gregory of Nazianzus (*q.v.*) for a fellow-student. Both men were deeply influenced by Origen, and compiled the famous anthology of his writings, known as *Philocalia* (edited by J. A. Robinson, Cambridge, 1893). It was at Athens that he seriously began to think of religion, and resolved to seek out the most famous hermit saints in Syria and Egypt in order to learn from them how to attain to sincere piety, and how to practise asceticism. About 360, we find him leading the monastic life at Annesi in Pontus, near the convent in which his mother Emilia, now a widow, and his sister Macrina were living. He was not ordained priest until (*c.*) 365, and his ordination was probably the result of the entreaties of his ecclesiastical superiors, who wished to use his talents against the Arians, so numerous in that part of the country and favoured by the Arian emperor, Valens, then reigning in Constantinople. In 370 Eusebius, bishop of Caesarea, died, and Basil was chosen to succeed him. It was then that his great powers were called into action to stamp out Arianism and to unite the scattered orthodox elements in the East. Caesarea was an important diocese, and its bishop was *ex officio,* exarch of the great diocese of Pontus. Hot-blooded and somewhat imperious, Basil was also generous and sympathetic as may be seen from his letters. "His zeal for orthodoxy did not blind him to what was good in an opponent; and for the sake of peace and charity he was content to waive the use of orthodox terminology

when it could be surrendered without a sacrifice of truth." Basil is also important for his improvement of the liturgy (the liturgy of St. Basil still being used in the Eastern Church) and for his propagation of a monastic life that substituted hard labour, works of charity and the common life, for the existing hermitical asceticism (*see* BASILIAN MONKS). He died in 379.

The principal theological writings of Basil are his *De Spiritu Sancto,* a lucid and edifying appeal to Scripture and early Christian tradition, and his three books against Eunomius, the chief exponent of Anomoian Arianism. He was a famous preacher, and many of his homilies, including the *Hexaëmeron,* a series of sermons on the opening verses of Genesis and an exposition of the psalter, have been preserved. His ascetic writings include the *Moralia* and *Regulae,* ethical manuals for use in the world and the cloister respectively. His numerous letters reveal a rich and observant nature, which, despite the troubles of ill-health and ecclesiastical unrest, remained optimistic, tender and even playful.

The name Basil also belongs to several other distinguished churchmen. (i.) Basil, bishop of Ancyra from 336 to 360, a semi-Arian, highly favoured by the emperor Constantine, and a great polemical writer; none of his works are extant. (ii.) Basil of Seleucia (fl. 448–458), a bishop who shifted sides continually in the Eutychian controversy, and who wrote extensively; his works were published in Paris in 1622. (iii.) Basil of Ancyra (fl. 787); he opposed image-worship at the second council of Nicaea, but afterwards retracted. (iv.) Basil of Achrida, archbishop of Thessalonica about 1155; he was a staunch upholder of the claims of the Eastern Church against the widening supremacy of the papacy.

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BASIL I. (d. 886), known as the "MACEDONIAN," Roman emperor in the East, was born of a family of Armenian (*not* Slavonic) descent, settled in Macedonia. He spent a part of his boyhood in captivity in Bulgaria, whither his family was carried by the Bulgarian prince Krum in 813, but returned to Constantinople, where he ultimately became the favourite of Michael III., and was appointed chamberlain (*parakoemōmenos*). To please his master he divorced his wife and married a mistress of Michael, Eudocia Ingerina. In April 866, with Michael's consent, he murdered the powerful Caesar Bardas, and a few weeks later was made emperor. In Sept. 867 he caused Michael to be assassinated, and reigned alone. On the throne this unprincipled adventurer showed his exceptional capacities for administration. He inaugurated a new age in the history of the empire, associated with the dynasty which he founded—"the Macedonian dynasty" it is usually called; it would be more instructive to call it "Armenian." It was a period of territorial expansion, during which the empire was the strongest power in Europe. The great legislative work which Basil undertook and his successor completed, and which may be described as a revival of Justinianean law, entitles him to the designation of a second Justinian (the *Basilica,* a collection of laws in 60 books; and the manuals known as the *Prochiron* and *Epanagogē*. For this legislation *see* BASILICA and ROMAN EMPIRE, LATER). His financial administration was prudent. His ecclesiastical policy was marked by a wish to keep on good terms with Rome. One of his first acts was to exile the patriarch Photius and restore his rival Ignatius, whose claims were supported by the pope. Yet he had no intention of yielding to Rome's pretensions beyond a certain point. The decision of the Bulgarian tsar Michael to submit the new Bulgarian Church to the jurisdiction of Constantinople was a blow to Rome. In 877 Photius became patriarch again, and there was a virtual breach with Rome. Thus the independence of the Greek Church may be said to date from the time of Basil. His reign was marked by a troublesome war with the Paulician heretics, an inheritance from his predecessor; the death of their able chief Chrysochir led to the definite subjection of this little state, of which the chief stronghold was Tephrice on the upper Euphrates, and which the Saracens had helped to bid a long defiance to the government of Constantinople. There was the usual frontier warfare with the Saracens in Asia Minor. Cyprus was recovered but only retained for seven years. Syracuse was lost but Bari was won back and those parts of Calabria which had been occupied by the Saracens. The last successes opened a new period of Byzantine domination in southern Italy. Above all, New Rome was again mistress of the sea, and especially of the gates of the Adriatic. Basil died on Aug. 29, 886. He is one of the most remarkable examples of a man, without education and exposed to the most demoralizing influences, manifesting extraordinary talents in the government of a great state, when he had climbed to the throne by acts of unscrupulous bloodshed.

BIBLIOGRAPHY.—*Ancient Sources: Vita Basilii,* by his grandson Constantine VII. (bk. v. of the *Continuation of Theophanes,* ed. Bonn); Genesius (ed. Bonn); *Vita Euthymii,* ed. De Boor (1888). Of the Arabic sources Tabari is the most important. *See* Brooks in *Byzantinische Zeitschrift* (vol. xx., pp. 486–491) for a different view of the chronology of Basil's reign. *Modern Works:* Hergenröther, *Photius, Patriarch von Constantinopel,* vol. ii. (Regensburg, 1867); Finlay, *History of Greece,* vol. ii. (1877); Gibbon, *Decline and Fall,* vol. v. and vi. (ed. Bury, 1898); *Cambridge Mediaeval History* (1927), vol. iv., ch. iii., v., ix., with bibliography. (J. B. B.)

BASIL II. (*c.* 958–1025), known as BULGAROKTONOS (slayer of Bulgarians), Roman emperor in the East, son of Romanus II. and Theophano, and great-great-grandson of Basil I., born about 958 and crowned on April 22, 960. After their father's death (963) he and his younger brother Constantine were nominal emperors during the actual reigns of Nicephorus Phocas, their stepfather, and John Tzimisces. On the death of the latter (Jan. 10, 976) they assumed the sovereignty without a colleague, but throughout their joint reign Constantine exercised no power. Basil did not at first display the full extent of his energy. The administration remained in the hands of the eunuch Basileios. Basil waited and watched without interfering, and devoted himself to learning the details of administrative business and instructing himself in military science. During this time the throne was endangered by the rebellion of an ambitious general, Bardas Sclerus, on the eastern frontier. To oppose him, Bardas Phocas, another general who had revolted in the previous reign, was recalled and suppressed the revolt (979). Phocas remained general in the East till 987, when he was proclaimed emperor by his troops, apparently with the connivance of Basileios. Basil advanced to Abydos, which Phocas was besieging, but before a battle could be fought, the rebel died suddenly, and the rising collapsed. Basileios was exiled and his property confiscated.

Basil made ruthless war upon the system of immense estates which had grown up in Asia Minor and which his predecessor, Romanus I., had endeavoured to check. (For this evil and the legislation which was aimed at it *see* ROMAN EMPIRE, LATER.) He sought to protect the lower and middle classes.

Basil gained some successes against the Saracens (995); but his most important work in the East was the annexation of Armenia. He created in those highlands a strongly fortified frontier, which, if his successors had been capable, should have proved an effective barrier against the invasions of the Seljuk Turks. The greatest achievement of the reign was the subjugation of Bulgaria. After the death of Tzimisces (who had reduced only the eastern part of the Bulgarian kingdom), the power of Bulgaria was restored by the tsar Samuel who extended his rule along the Adriatic coast and imposed his lordship on Serbia. War was renewed in 996, and Eastern Bulgaria was recovered in 1000; but the war continued till 1014, when the Bulgarian army suffered an overwhelming defeat. Basil blinded 15,000 prisoners, leaving a one-eyed man to every hundred to lead them to their tsar, who fainted at the sight and died two days later. The last sparks of resistance were extinguished in 1018, and the great Slavonic realm lay in the dust. The power of Byzantium controlled once more the Illyrian peninsula. Basil died in Dec. 1025 in the midst of preparations to send a naval expedition to recover Sicily from the Saracens.

Basil's reign marks the highest point of the power of the Eastern empire since Justinian I. Part of the credit is due to Nicephorus and Tzimisces, but the greater part belongs to him. He dedicated himself unsparingly to the laborious duties of ruling, and he had to reckon throughout with the ill-will of a rich and powerful section of his subjects. He was hard and cruel, without any refinement or interest in culture. In a contemporary psalter (preserved in the library of St. Mark at Venice) there is a portrait of him, with a grey beard, crowned and robed in imperial costume.

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BASIL (Russ. VASILY), the name of four grand-dukes of Moscow and tsars of Muscovy.

BASIL I., DMITREVICH (1371–1425), son of Dmitri (Demetrius) Donskoi, whom he succeeded in 1389, married Sophia, the daughter of Vitovt, grand-duke of Lithuania. Basil annexed the principality of Suzdal, with the city of Nijni Novgorod, to Muscovy, together with Murom, Kozelsk, Przemysl, and other places; reduced the grand-duchy of Rostov to a state of vassalage; and acquired territory from the republic of Great Novgorod by treaty. In his reign occurred the invasion of Timur (1395), who ruined the Volgan regions, but did not penetrate so far as Moscow. Indeed Timur's raid was of service to the Russian prince as it all but wiped out the Golden Horde (q.v.); which for the next 12 years was in a state of anarchy. During the whole of this time no tribute was paid to the khan, though vast sums of money were collected in the Moscow treasury for military purposes. In 1408 the Mirza Edigei ravaged Muscovite territory, but retired on receiving a sum of money. In 1412, however, Basil found it necessary to pay the long-deferred visit of submission to the Horde. During this reign the Bulgarian, Gregory Tsamblak was appointed to the metropolitan see of Kiev (1425), by the grand duke of Lithuania; an event blamed by some for the weakening of Muscovy's hold on the south-western Russian states. During Basil's reign a terrible visitation of the "Black Death" decimated the population.

See T. Schiemann *Russland bis ins 17. Jahrhundert* (Gotha, 1885–87).

BASIL II., called TEMNY ("the BLIND") (1415–62), son of the preceding, succeeded his father as grand-duke of Moscow in 1425. In 1430 Basil was seized by his uncle, Yury of Halicz, and sent a prisoner to Kostroma, but Basil was reinstated with the concurrence of the khan. On the death of Yury, Basil was at constant variance with Yury's children, one of whom (Basil) he had blinded; but in 1445 the grand-duke fell into the hands of blind Basil's brother, Shemyak, and was himself deprived of his sight and banished (1445). The clergy and people, however, reinstated him, put Shemyak to flight, and seized Halicz, his patrimony. During the remainder of Basil II.'s reign he slowly and unobtrusively added district after district to the grand-duchy of Muscovy, so that in time, only the republics of Novgorod and Pskov and the principalities of Tver and Vereya remained independent of Moscow. All this time the realm was overrun continually by the Tatars and Lithuanians, and suffered severely from their depredations. Basil was for a short time a prisoner of the Tatar ruler of Kazan in 1443, and in 1451 the Tatars appeared before Moscow, only to be repulsed. His reign saw the foundation of the Solovetsk monastery and the rise of the khanate of the Crimea. In 1448 the north Russian Church became virtually independent of the patriarchal see of Constantinople by adopting the practice of selecting its metropolitan from among native priests and prelates exclusively.

BASIL III., IVANOVICH (1479–1533), tsar of Muscovy, son of Ivan III. and Sophia Palaeologa, succeeded his father in 1505. A crafty prince, with all the tenacity of his race, Basil succeeded in incorporating with Muscovy the last remnants of the ancient independent principalities, by accusing the princes of Ryazan and Syeversk of conspiracy against him, seizing their persons, and annexing their domains (1517–23). Seven years earlier (Jan. 24 1510) the last free republic of old Russia, Pskov, was deprived of its charter and assembly bell, which were sent to Moscow. Basil also captured Smolensk, the great eastern fortress of Poland (1512), chiefly through the aid of the rebel Lithuanian, Prince Michael Glinsky, who provided him with artillery and engineers from western Europe. Although in 1519 he was obliged to buy off the khan of the Crimea, Mohammed Girai, under the very walls of Moscow, towards the end of his reign he established the Russian influence on the Volga, and in 1530 placed the pretender Elanyei on the throne of Kazan. Basil was the first grand-duke of Moscow who adopted the title of tsar and the double-headed eagle of the East Roman empire. By his second wife, Helena Glinska, whom he married in 1526, Basil had a son Ivan, who succeeded him as Ivan IV.

See Sigismund Herberstain *Rerum Moscoviticarum Commentarii* (1549).

BASIL IV., SHUISKY (d. 1612), tsar of Muscovy, was during the reigns of Theodore I. and Boris Godunov, one of the leading *boyars* of Muscovy. It was he who, in obedience to the secret orders of Tsar Boris, went to Uglich to enquire into the cause of the death of Demetrius, the infant son of Ivan the Terrible, who had been murdered there. Shuisky reported that he had died in a fit of apoplexy, by falling on a knife. Nevertheless, after the death of Boris and the murder of his young son and successor, Theodore, Shuisky first acknowledged the pretender, the "false Demetrius" and then secretly denounced him. This came to Demetrius' ears who pardoned Shuisky in the hope of winning him over. But in May 1606 Shuisky procured Demetrius' death, and had himself proclaimed tsar. His authority was never generally acknowledged, and even in Moscow his authority was small. He was deposed on July 19 1610. Only the popularity of his heroic cousin, Prince Michael Skopin-Shuisky, who led his armies and fought his battles for him, and soldiers from Sweden, whose assistance he purchased by a disgraceful cession of Russian territory, kept him for a time on his unstable throne. In 1610 he was deposed, made a monk, and finally carried off as a trophy by the Polish grand hetman, Stanislaus Zolkievski. He died at Warsaw in 1612.

See R. Nisbet Bain, *Slavonic Europe*, ch. viii. (Cambridge, 1907).

BASILAR MEMBRANE, a tissue lying under the organ of Corti in the cochlea of the internal ear of the higher vertebrates. It consists of transverse fibres which are not free but are packed together tightly side by side and embedded in a cementing substance and covered on both upper and lower surfaces by a layer of cells. As it approaches the apex of the spiral of the cochlea, it becomes gradually wider; Keith's measurements of the membrane in man gave a width of 0·17mm. at the base and 0·40mm. at the apex of the cochlea. The average length of the membrane is 35 millimetres. Its function in hearing has been the subject of much controversy and no satisfactory theory has as yet been developed. According to the "resonance" theory of hearing, commonly associated with the name of Helmholtz, the transverse fibres are a graduated set of resonators, each of which, by reason of its mass and length, the tension exerted on it by the spiral ligament and the loading produced by the columns of lymph lying between it and the two windows of the cochlea, is attuned to a tone of definite pitch and is thrown into sympathetic vibration which excites the hair-cells connected with the auditory nerve when the appropriate tone is transmitted to the cochlea. The partial vibrations of which a complex vibration is composed excite different fibres, and the ability of the ear to analyze complex tones is thus explained. Max Meyer's theory is that the membrane responds by forced, not by sympathetic vibration, that the frequency rather than the place of excitation of the hair-cells determines the pitch heard, and that the longitudinal extent of the membrane involved in the vibration, and thus the number of cells stimulated, is the correlate of loudness. Other theories assume that the membrane vibrates as a whole. Ewald held that it vibrates as a whole with nodes or lines of rest in different places according to the pitch of the tone. Still

another theory attributes no particular function to this membrane but claims that the essential tissue concerned in the excitation of the hair-cells is the tectorial membrane. (*See* HEARING.)

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BASILIAN MONKS, those who follow the rule of Basil the Great. The chief importance of the monastic rule and institute of St. Basil lies in the fact that to this day his reconstruction of the monastic life is the basis of the monasticism of the Greek and Slavonic Churches, though the monks do not call themselves Basilians. St. Basil's claim to the authorship of the Rules and other ascetical writings that go under his name, has been questioned; but the tendency now is to recognize as his, at any rate, the two sets of Rules. Probably the truest idea of his monastic system may be derived from a correspondence between him and St. Gregory Nazianzen at the beginning of his monastic life, the chief portions whereof are translated by Newman in the *Church of the Fathers,* "Basil and Gregory," secs. 4, 5. On leaving Athens Basil visited the monasteries of Egypt and Palestine; in the latter country and in Syria the monastic life tended to become more and more eremitical and to run to great extravagances in the matter of bodily austerities. (*See* MONASTICISM.) When (about 360) Basil formed his monastery in the neighbourhood of Neocaesarea in Pontus, he deliberately set himself against these tendencies. He declared that the "cenobitic" or community life is superior to the "eremitic" of the isolated hermit; that fasting and austerities should not interfere with prayer or work; that work should form an integral part of the monastic life, not merely as an occupation, but for its own sake and in order to do good to others; and therefore that monasteries should be near towns. All this was a new departure in monachism. The life St. Basil established was strictly cenobitical, with common prayer seven times a day, common work, common meals. It was, in spite of the new ideas, an austere life, of the kind called contemplative, given up to prayer, the reading of the Scriptures and heavy field-work.

St. Basil's influence, and the greater suitability of his institute to European ideas, ensured the propagation of Basilian monachism; and Sozomen says that in Cappadocia and the neighbouring provinces there were no hermits but only cenobites. However, the eastern hankering after the eremitical life long survived, and it was only by dint of legislation, both ecclesiastical (Council of Chalcedon) and civil (Justinian Code), that the Basilian cenobitic form of monasticism came to prevail throughout the Greek-speaking lands, though the eremitical forms have always maintained themselves.

The other creative name in the history of Greek monachism is that of Theodore, who became abbot of the monastery of the Studium in Constantinople. He set himself to reform his monastery and restore St. Basil's spirit in its primitive vigour. But to effect this, and to give permanence to the reformation, he saw that there was need of a more practical code of laws to regulate the details of the daily life, as a supplement to St. Basil's Rules. He therefore drew up constitutions, afterwards codified (*see* Migne, *Patrol. Graec.* xcix., 1704–57), which became the norm of the life at the Studium monastery, and gradually spread thence to the monasteries of the rest of the Greek empire. Thus to this day the Rules of Basil and the Constitutions of Theodore the Studite, along with the canons of the Councils, constitute the chief part of Greek and Russian monastic law.

The spirit of Greek monachism, as regenerated by Theodore, may best be gathered from his *Letters, Discourses and Testament.* Under the abbot were several officials to superintend the various departments; the liturgical services in the church took up a considerable portion of the day, but Theodore seems to have made no attempt to revive the early practice of the Studium in this matter (*see* ACOEMETI); the rest of the time was divided between reading and work; the latter included the chief handicrafts, for the monks, only ten in number, when Theodore became abbot, increased under his rule to over a thousand. One kind of work practised with great zeal and success by the Studite monks, was the copying of manuscripts, so that to them and to the schools that went forth from them we owe a great number of existing Greek mss. and the preservation of many works of classical and ecclesiastical antiquity. In addition to this, literary and theological studies were pursued; and the life, though simple and self-denying and hard, was not of extreme austerity.

Basilian monachism spread from Greece to Italy and Russia. Rufinus had translated St. Basil's Rules into Latin (*c.* 400) and they became the rule of life in certain Italian monasteries. They were known to St. Benedict, who refers his monks to "the Rule of our holy Father Basil," indeed, St. Benedict owed more of the ground-ideas of his Rule to St. Basil than to any other monastic legislator. Prof. Kirsopp Lake has (1903) written four valuable articles (*Journal of Theological Studies,* iv., v.) on "The Greek monasteries of South Italy"; he deals in detail with their scriptoria and the dispersal of their libraries, a matter of much interest, in that some of the chief collections of Greek mss. in western Europe—as the Bessarion at Venice and a great number at the Vatican—come from the spoils of these Italian Basilian houses.

Of greater importance was the importation of Basilian monachism into Russia, for it thereby became the norm of monachism for all the Slavonic lands. The monasteries are of three kinds: *cenobia* proper, wherein full monastic common life, with personal poverty, is observed; others wherein the monks are allowed the use of their private means and lead a generally mitigated and free kind of monastic life; and the *lauras,* wherein the life is semi-eremitic.

The visits of Western scholars in modern times to Greek monasteries in search of mss.—notably to St. Catherine's on Mt. Sinai, and to Mt. Athos—has directed much attention to contemporary Greek monachism, and the accounts of these expeditions commonly contain descriptions, more or less sympathetic and intelligent, of the present-day life of Greek monks. The first such account was Robert Curzon's in parts iii. (1834) and iv. (1837) of the *Monasteries of the Levant;* the most recent in English is Athelstan Riley's *Athos* (1887). The life is mainly given up to devotional contemplative exercises; the church services are of extreme length; intellectual study is little cultivated; and manual labour has almost disappeared.

The ecclesiastical importance of the monks in the various branches of the Eastern Orthodox Church lies in this, that as bishops must be celibate, whereas the parochial clergy must be married, the bishops are all recruited from the monks. But besides this they have been a strong spiritual and religious influence, as is recognized even by those who have scant sympathy with monastic ideals (*see* Harnack, *What is Christianity?* Lect. xiii., end).

A number of Basilian monasteries have always been in communion with the Roman Catholic Church: among these are the surviving houses founded in Italy and Sicily, especially the once famous monastery of Grotta Ferrata near Rome.

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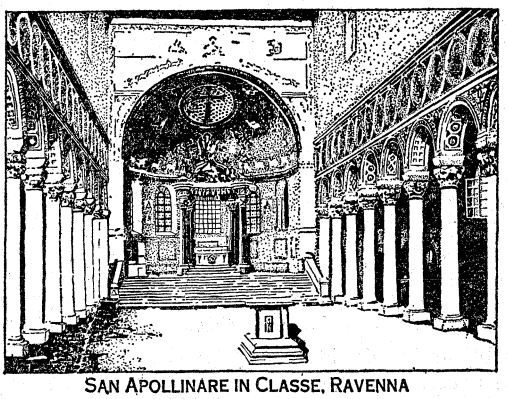
BASILICA, a word frequently used in Latin literature to designate a large, roofed building dedicated to public use. Markets, court-houses, covered promenades and meeting halls are all occasionally so known. Little by little the word was limited to buildings of a more or less definite form, having a central area, aisles or galleries at the sides and a raised platform, sometimes apsidal. These elements, nevertheless, are not constant, the Basilica Julia in Rome having no apse, and that at Timgad no aisles. The basilica was usually in a forum (Basilica Julia, Trajan's basilica, the basilica at Pompeii). For what a Roman architect considered a normal basilica one may consult Vitruvius v. 1.4 and vi. 3.9.

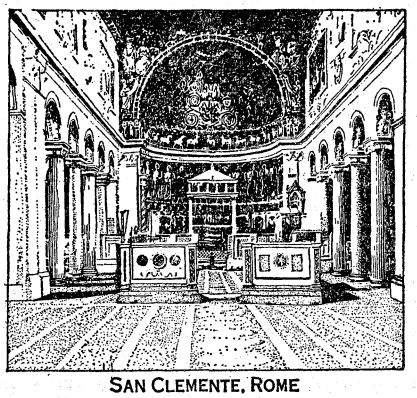
The earliest basilica known is that at Pompeii, which dates,



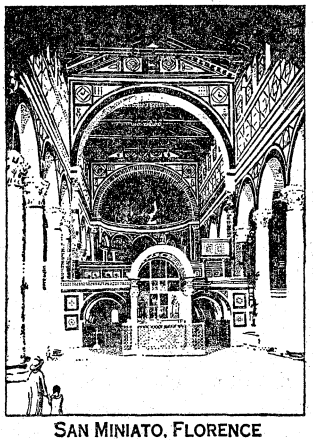
SANTA MARIA MAGGIORE, ROME 4TH CENT.
ALTERED 8TH CENT.



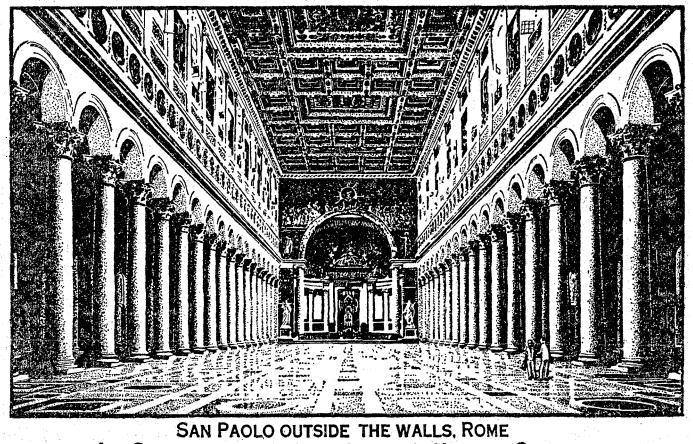
SAN APOLLINARE IN CLASSE, RAVENNA
6TH CENTURY



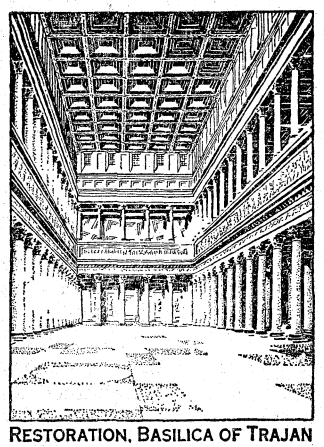
SAN CLEMENTE, ROME
12TH CENTURY



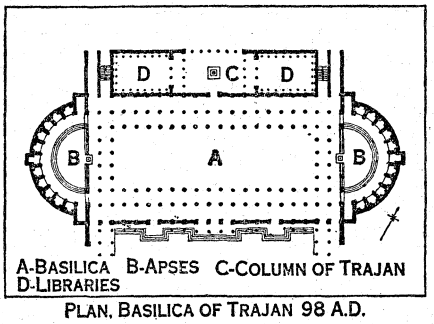
SAN MINIATO, FLORENCE
11TH CENTURY



SAN PAOLO OUTSIDE THE WALLS, ROME
4TH CENTURY, REBUILT 19TH CENTURY, MOSAICS ORIGINAL

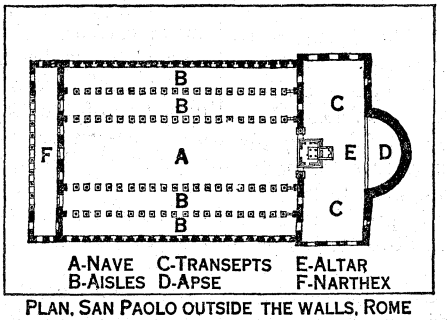


RESTORATION, BASILICA OF TRAJAN
ROME 98 A.D.



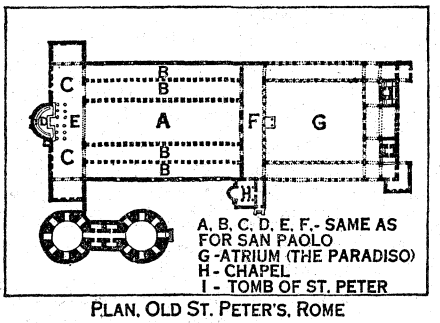
A-BASILICA B-APSES C-COLUMN OF TRAJAN
D-LIBRARIES

PLAN, BASILICA OF TRAJAN 98 A.D.



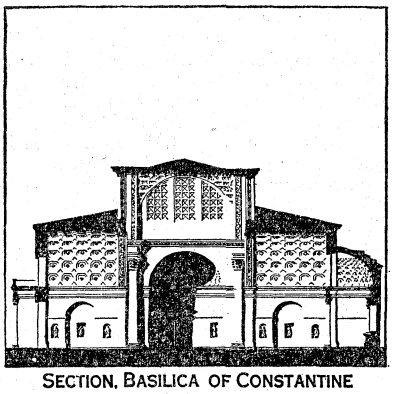
A-NAVE C-TRANSEPTS E-ALTAR
B-AISLES D-APSE F-NARTHEX

PLAN, SAN PAOLO OUTSIDE THE WALLS, ROME
4TH CENTURY

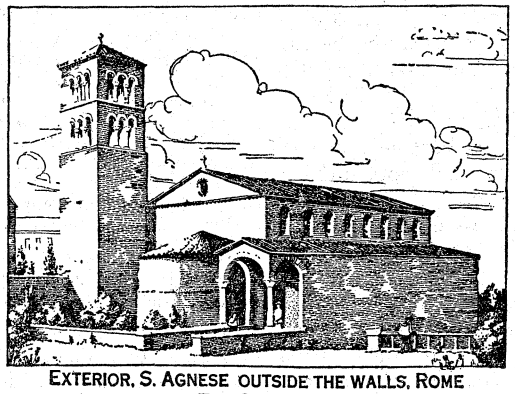


A, B, C, D, E, F.- SAME AS
FOR SAN PAOLO
G -ATRIUM (THE PARADISO)
H - CHAPEL
I - TOMB OF ST. PETER

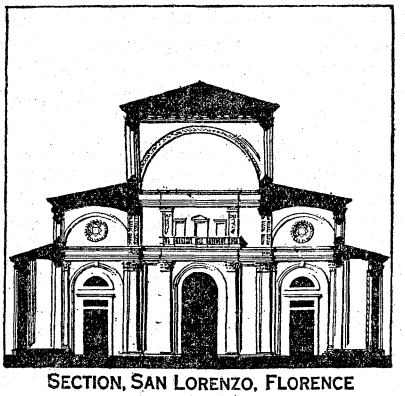
PLAN, OLD ST. PETER'S, ROME



SECTION, BASILICA OF CONSTANTINE
4TH CENTURY



EXTERIOR, S. AGNESE OUTSIDE THE WALLS, ROME
7TH CENTURY



SECTION, SAN LORENZO, FLORENCE
15TH CENTURY
(F. BRUNELLESCHI, ARCH.)

O Fisher

PLANS AND TYPES OF BASILICAS, FROM THE FIRST TO THE 19TH CENTURY

The simple timber roofed type of Basilica (like that of Trajan) developed into one of the principal types of Christian Church, after the secular Basilica of Imperial Rome had departed from earlier tradition. S. Paolo, outside the walls, and S. Maria Maggiore represent this early development, and S. Agnese outside the walls shows the simple exterior. S. Apollinare in Classe is an example of Byzantine basilica, and S. Clemente shows the type which continued into the 12th century. In S. Miniato, at Florence the raised chancel represents a mediaeval Italian variation. S. Lorenzo, at Florence is an example of highly developed basilica.

probably, from the 2nd century B.C. It shows an already highly developed form in which the aisle runs entirely around the central area with the raised platform appearing as an alcove, screened by columns, at the end opposite the entrance. This seems the normal plan for the larger basilicas. The basilica of Maxentius or Constantine, begun by Maxentius and completed by his successor, Constantine, is, however, of an entirely different type. Here the attempt was made to dispense with the colonnades and to concentrate the supports into a few enormous piers, which carry the three bays of the groined vault over the central area and at the same time furnish the dividing line between the bays of the lower side aisles. It was the application to the basilica problem of the type of construction and decoration developed in the great halls of the Roman baths.

Besides these large basilicas there were many smaller examples, and in some of these, as in the basilica of the palace of Domitian on the Palatine hill, the type comprising a nave with aisles at the sides only and an apse at the end had appeared. It was this type that the early Christians adopted for their churches, possibly because similar halls, in large private houses, had been used for Christian worship prior to the Edict of Toleration. It would appear that, in the earliest examples, side aisles were frequently lacking. After the time of Constantine, however, the existence of side aisles is universal, and is perhaps due to the fact that they were included in the three enormous basilicas—those of St. Peter, St. Paul and St. John Lateran—which he built. The church of St. Maria Maggiore, dating in its present form from the early 5th century, is similar to its three predecessors. In the Constantinian basilicas another unit, the transept (*q.v.*), made its appearance, and the cross-shaped plan thus developed became the controlling plan of the larger Christian churches in the West throughout the middle ages.

In the typical early Christian basilica the nave (*q.v.*) was separated from the side aisles by borders of columns which carried either arches or an entablature. In the later basilicas these columns, having been taken from older pagan buildings, frequently had misfit capitals. Above the entablature or arches rose the blank wall behind which were the side aisle roofs; this wall continued up as a clerestory and was pierced with a row of either square or arched windows. The nave roof was of timber, sometimes with exposed beams and sometimes with a rich, panelled wooden ceiling, carved and gilded. Side aisles (*see* AISLE) were either single or double, and occasionally of two stories, the upper serving as a gallery for women. The side aisle ceilings, with the roof immediately above, were usually as low as the columns would permit; but in old St. Peter's, Rome, the inner aisles were much higher than the outer, which were vaulted. The apse (*q.v.*) opened from the nave by a great arch known as the triumphal arch. Occasionally, when there were transepts, another triumphal arch separated the transept from the nave. A narthex (*q.v.*), or vestibule, extended the entire width of nave and aisles, frequently open at the front with a colonnade. In addition to these general elements, there was frequently a transept, usually without aisles, at the extreme end. At the entrance end, in addition to the narthex, there was often a court or atrium (*q.v.*), surrounded by either colonnades or arcades. After the 10th century a campanile (*q.v.*), round or square, of great simplicity and usually very high, was added.

Such a building was basically simple; the exterior design was crude to the point of being barn-like, although there were occasional exceptions: old St. Peter's at Rome had a façade richly covered with mosaic, and San Lorenzo, Rome, has a handsome colonnade across the front. After the fall of Rome the interiors likewise show architectural poverty, all sorts of pagan Roman fragments being put together in meaningless and incoherent jumbles. All, however, possess interior interest and an inherent beauty due largely to the richness of their furniture and ornamentation. The decorative scheme shows that the feeling for colour and texture increased as the purely architectural sense decayed, and the development of a technique of glass mosaic offered great opportunities for impressive effects. The lower portions of the walls were usually sheathed in coloured marbles which were frequently of rich design around the apse. Above the arches or entablatures of its flanking columns the nave wall was sometimes completely covered with mosaic; where this is absent, painting of similar character doubtless existed. The church of Sta. Maria Antiqua, at the base of the Palatine hill, shows many examples of such painting.

The climax of the decorative scheme was the triumphal arch and the mosaic of the dome of the apse. There is no formula for these decorations. They vary from the Byzantinesque figures of Sta. Maria in Trastevere to the rich spirals of the vine of San Clemente. They are always full of complete symbolism (*see* Strzygowski's *The Origin of Christian Art*). The furniture consisted of a choir screen with one or two ambones (*see* AMBO), the clergy seats and the bishop's throne in the apse, and the altar, with a baldachino (*q.v.*) or canopy above it. All this furniture was as lavishly ornamented as possible. Its framework was usually of white marble, in which were inserted plaques and roundels of dark marble and bands of mosaic, gold, red and green. Frequently the floor was also rich with marble and mosaic (*q.v.*) of this type, known as *opus Alexandrinum.*

Although the basilica is primarily characteristic of Rome, there are many examples elsewhere. In addition to the one at Parenzo, the basilica of S. Apollinare Nuovo, erected by Theodoric at the beginning of the 6th century and that of S. Apollinare in Classe 50 years later, both at Ravenna, are particularly noteworthy. In the east, the great church of St. Simeon Stylites in Syria is of modified basilica type. The church of the Nativity at Bethlehem is a basilica, as is also the church of St. John Studios in Constantinople, but the finest example in the eastern empire was St. Demetrius at Thessalonica (Salonika). Owing, however, to the example set by Justinian's great church of S. Sophia at Constantinople, the basilica form gradually passed out of use in the eastern church. Few remains exist of the earliest churches built in the north and west of Europe. England shows occasional fragmentary ruins, such as the foundation of the 4th century basilica at Silchester. Romanesque rebuilding everywhere except in Italy destroyed these early churches, yet the basilica type left an ineradicable stamp on all church building that succeeded and the basilica plan, with its nave, aisles and apse, became, with the development of vaulting, and the changes necessitated by it, the typical church building of the western church.

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BASILICA, a code of law, drawn up in the Greek language, with a view to putting an end to the uncertainty which prevailed throughout the East Roman empire in the 9th century as to the authorized sources of the law. This uncertainty had been brought about by the conflicting opinions of the jurists of the 6th century as to the proper interpretation to be given to the legislation of the Emperor Justinian, from which had resulted a system of teaching, which had deprived that legislation of all authority, and the imperial judges at last were at a loss to know by what rules of law they were to regulate their decisions. There has been considerable controversy as to the part which the Emperor Basil took in fram-

ing the new code. There is, however, no doubt that he abrogated in a formal manner the ancient laws, which had fallen into desuetude, and the more probable opinion would seem to be that he caused a revision to be made of the ancient laws which were to continue in force, and divided them into 40 books, and that this code of laws was subsequently enlarged and distributed into 60 books by his son Leo the Philosopher.

No perfect ms. has been preserved of the text of the Basilica, and the existence of any portion of the code seems to have been ignored by the jurists of western Europe, until the important bearing of it upon the study of the Roman law was brought to their attention by Viglius Zuichemus, in his preface to his edition of the Greek *Paraphrase of Theophilus,* published in 1533. A century, however, elapsed before an edition of the 60 books of the Basilica, so far as the mss. then known to exist supplied materials, was published in seven volumes, by Charles Annibal Fabrot, under the patronage of Louis XIII of France. A newly restored and far more complete text of the 60 books of the Basilica was published at Leipzig in six volumes (1833–70), edited by K. W. E. Heimbach and G. E. Heimbach. The great bulk of the code was an obstacle to the multiplication of copies of it, while the necessity for them was in a great degree superseded by the publication from time to time of synopses and encheiridia of its contents, composed by the most eminent jurists, of which a very full account will be found in the *Histoire du droit byzantin,* by Mortreuil, published in Paris in 1846.

BASILICATA: *see* LUCANIA.

BASILIDES, one of the most celebrated of the Gnostics (*see* GNOSTICISM), flourished probably about A.D. 125 in Alexandria. Very little is known of his life; and of his doctrine there are two fundamentally different accounts: that of Irenaeus, in his great work against heresies, and that of Hippolytus in his *Philosophoumena* (also a refutation of heresies). This work was not published until 1851, having been discovered a few years earlier. In addition to this, there are variations in points of greater or less importance in the fragments of information given by Clement of Alexandria, Origen, Eusebius and the author of *The Acts of Archelaus* (of which a complete Latin translation was discovered by Traube and published by Beeson in 1906). The conflicting statements may be partly accounted for by the failure of these writers to distinguish clearly the ideas of Basilides himself, first from those of his son Isidorus, and secondly from those of the school which he (Basilides) founded.

According to Irenaeus, the system resembled that of Valentinus (*q.v.*), and, like the Gnostic systems generally, had its root in an endeavour to explain the origin of evil. The First Principle or Supreme God, called "the Father," is incomprehensible and uncreated. From Him proceeded in succession five *emanations: νοῦς, λόγος, φρόνησις, σοφία, δύναμις.* Clement of Alexandria adds that from the last-named proceeded *δικαιοσύνη* and *εἰρήνη*, and these seven with "the Father" formed the first "ogdoad" or octave of existence, creating or constituting the highest heaven. From them emanated other powers, by whom the second heaven was made, and so on in succession through 365 "heavens," each system being an inferior type or reflex of the original. The powers of the lowest heaven, of whom the chief was called the Archon (*ἄρχων*), created this world. He is the God of the Jews, a being of limited goodness, wisdom and power. To alleviate the misfortunes of the world the *νοῦς* or first Emanation descended to the earth and became incarnate in Jesus Christ. But the *νοῦς* could not suffer death; he therefore changed forms with Simon of Cyrene who actually suffered in his place. Salvation is purely spiritual, pertaining only to the soul. From this principle according to Irenaeus, Basilides and his followers derived the doctrine of "moral indifference,"—that outer actions, being merely material events, are not in themselves either good or bad.

A widely different account is given by Hippolytus. According to him, "the Father," or the Supreme Being (of whom nothing can be predicated, because his essence is beyond the power of language to express or thought to comprehend) created the *πανσπερμία*, or "seed," which contained in itself the germs or elements of all things: but also, as it were embedded therein, are three degrees or kinds of Divine Sonship, *consubstantial* with the Supreme Being. All things naturally tend towards God, and the first Sonship, which was pure, ascended to "the Father." The second Sonship also strove to ascend, but being less pure, could ascend only part of the way. The third Sonship remained immersed in matter and constituted the spiritual element in the elect. Then from the world-seed there burst forth the great *ἄρχων* or ruler, who ascended as far as the firmament, and, imagining there was nothing beyond, glorified himself as the best and strongest of all beings: but he produced a son wiser and better than himself, by whose aid he laid the foundations of the world. The seat of their rule extended from the upper firmament down to the sphere of the moon (the earth being supposed to be the stationary centre of the universe). The earth and the region beneath the moon are ruled by a second and inferior *ἄρχων*, the God of the Jews, who also had produced a son.

As in all Gnostic systems, freedom is given by the truth, *i.e.,* by a knowledge of the true system of things; and this is given by a series of illuminations. The mind of the son of the higher Archon is enlightened; and he instructs his father, who learns with fear and repentance that there is a sphere of being higher than his own. The light then passes to the son of the lower Archon, who likewise instructs his father. Finally the mind of Jesus was enlightened, and he became Christ, and instructed those of mankind who were able to receive the truth. There are thus three great stages in the world's religious history,—the Ante-Jewish, the Jewish and the Christian. All the souls capable of receiving the light ascend upwards, while their bodies return to the primeval chaos; the minds of all others are shrouded in eternal night, the night of ignorance.

This brief sketch is sufficient to show that the two versions of the system of Basilides are irreconcilable. The various divergent accounts have been the source of much discussion and difference of opinion. It cannot be said the question has yet been satisfactorily settled. And in addition to this, a series of detailed problems is raised by the symbolical and mythological forms in which the ideas are expressed, and which are evidently not all original inventions of the teacher himself.

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BASILISCUS (d. 477), emperor of the east from 475–477. His sister, Verina, was married to the Byzantine emperor Leo I and was able to prevail on Leo in 468 to appoint her brother eastern commander of the expedition against the Vandal leader Genseric.

The expedition, a joint effort of the eastern and western sections of the Roman empire, was intended to rid Italy and the Mediterranean region of the threat of Vandal conquest. More than 1,000 ships sailed from Constantinople for Carthage, where Genseric was entrenched, but when Basiliscus arrived he ill-advisedly agreed to a five day truce with the Vandal leaders. During that time, Genseric attacked and was able to destroy a large part of the eastern fleet. Basiliscus, badly defeated, was forced to retreat; and on his return to Constantinople, he was banished for his incompetence.

He returned during the reign of Zeno, Leo's successor, and was able to lead a successful revolt against Zeno and to usurp the throne. He proved no more competent as an emperor than he had been as a general, however; and Zeno, taking advantage of popular discontent, was soon able to overthrow Basiliscus and resume his position as Byzantine emperor.

Basiliscus was banished to Phrygia, where he died shortly thereafter.

BASILISK, a name given by the ancients to a horrid monster

of their own imagination, to which they attributed the most malignant powers and an equally fiendish appearance. The term is now applied, owing to a certain fanciful resemblance, to an American genus of lizards (family Iguanidae), the species of which are characterized by the presence, in the males, of an erect crest on the head, on the back, and at the base of the long tail. *Basiliscus basiliscus* reaches the length of one yard; its colours are green and brown, with dark crossbars, while the crest is reddish. This beautiful omnivorous creature is abundant on the banks of rivers and streams of Central America and Mexico. The lizards lie upon the branches of bushes overhanging the water, into which they plunge at the slightest alarm. They may dive to the bottom, or, more remarkably, dash across the surface of the water in a semi-erect position propelled by rapid strokes of their hind limbs, with a shower of spray rising on each side. (K. P. S.)

BASIM, a town and subdivision in the Akola district, Berar, India, 52 miles S.S.E. from Akola station of the Great Indian Peninsula railway. Pop. (1941) 17,928. Until 1905 it was the headquarters of the district of Basim which had an area of 2,949 square miles, but in that year the district was abolished, its component *taluks* being divided between the districts of Akola and Yeotmal. The Basim *taluk* consists of a fertile tableland, 1,000 ft. above sea-level, sloping westward and southward to the rich valley of the Penganga river. Since the reduction in status of the district, the town of Basim has declined in importance.

BASIN, THOMAS (1412–1491), bishop of Lisieux and historian, was born probably at Caudebec in Normandy, and in 1447 he became bishop of Lisieux. In 1464 the bishop joined the League of the Public Weal, and the king seized the temporalities of his see. In 1474 Pope Sixtus IV. bestowed upon him the title of archbishop of Caesarea.

Basin's principal work, *Historiae de rebus a Carolo VII. et Ludovico XI. Francorum regibus eorumque in tempore in Gallia gestis,* is of considerable historical value, but is marred to some extent by the author's dislike for Louis XI. At one time it was regarded as the work of a priest of Liége, named Amelgard, but it is now practically certain that Basin was the writer. His other works include a defence of Joan of Arc entitled *Opinio et consilium super processu et condemnatione Johanne, dicte Puelle.*

See the edition of the *Historiae* by J. E. J. Quicherat (1855–59); also G. du F. de Beaucourt, *Charles VII. et Louis XI. d'après Thomas Basin* (1858).

BASIN or **BASON,** a round vessel for holding liquids (the older form *bacin* is found in many of the Romanic languages, from the Late Lat. *baccinus* or *bacchinus,* probably derived from *bacca,* a bowl). Hence the term has various technical uses, as of a dock constructed with flood-gates in a tidal-river, or of a widening in a canal for unloading barges; also, in physical geography, of the drainage area of a river and its tributaries. In geology, a basin is a broad shallow syncline, *i.e.,* it is a structure proper to the bed rock of the district covered by the term; it must not be confused with the physiographic river basin, although it occasionally happens that the two coincide to some extent. Some of the better known geological basins in England are, the *London basin,* a shallow trough or syncline of Tertiary, Cretaceous and Jurassic rocks; the *Hampshire basin,* of similar formations; and the numerous *coal basins, e.g.,* the South Wales coalfield, the Forest of Dean, North Staffordshire coalfield, etc. The Paris basin is made of strata similar to those in the London and Hampshire basins. Lakes sometimes occupy basins that have been caused by the removal in solution of some of the more soluble constituents (rock salt, etc.) in the underlying strata; occasionally lake basins have been formed directly by crustal movements.

BASINET, a diminutive of "basin"; a form of helmet or headpiece. The original small basinet was a light open cap, with a peaked crown. This was used as an alternative to, or even in conjunction with, the large heavy heaume. But in the latter half of the 13th century the basinet was developed into a complete war head-dress and replaced the heaume. In this form it was larger and heavier, had a vizor (though not always a pivoted vizor like that of the later armet), and was connected with the gorget by a "camail" or mail hood, the head and neck thus being entirely covered. It is always to be recognized by its peaked crown. The word is spelt in various forms, "bassinet," "bascinet," "bacinet" or "basnet." The form "bassinet" is used for the hooded wicker cradle or perambulator for babies (*see* HELMET).

BASINGSTOKE, municipal borough in the Basingstoke parliamentary division of Hampshire, England, 48 mi. W.S.W. of London. Pop. 14,650 in 1938. Area 8.1 sq.mi. The town is placed on the northeast side of the Loddon gap, where the chalk dies down and provides an open way between the London and the Hampshire basins. The neighbourhood is rich in prehistoric antiquities; and the town is a very old foundation. There are traces of Roman occupation. The first recorded historical event is the victory of Aethelred and Alfred over the Danes in 871. It appears in the Domesday survey as a royal manor, with three mills and a market. Charters were granted from the 13th century, and in 1392, as compensation for loss sustained by a serious fire, rights of a corporation were given. Charters of incorporation of 1622 and 1641 confirmed the mediaeval grants of fairs. The latter remained in force until 1835. The wool trade flourished from an early date, but declined in the 17th century. The Church of St. Michael and All Angels is a fine example of late Perpendicular architecture. Close to the neighbouring village of Old Basing are remains of Basing House, famous for its prolonged defense (1643–45) against the parliamentarian forces. A castle occupied its site from Norman times. Basingstoke is chiefly a market town; the main industry is the manufacture of agricultural implements though there are also clothing and leather factories. The Basingstoke canal, which connects the town with the river Wey and so with the Thames, was opened about 1794, but lost its trade owing to railway competition. The town is on the main S.R. line to Salisbury, and has a station on the G.W.R. It is also a road centre of importance.

BASIN-STAND, a piece of furniture consisting of a small stand, usually supported on three legs, and most commonly made of mahogany or rosewood, for holding a wash-hand basin. The smaller varieties were used for rose-water ablutions, or for the operation of hair-powdering. The larger ones, which possessed sockets for soap-dishes, were the predecessors of the ample modern wash-hand stand. Both varieties, often of very elegant form, were in extensive use throughout a large part of the 18th century.

BASKERVILLE, JOHN (1706–1775), English printer, was born at Wolverley in Worcestershire. About 1726 he became a writing master at Birmingham, and he seems to have had a talent for calligraphy and for cutting inscriptions in stone. About the year 1750 he began to make experiments in type-founding, producing types much superior in distinctness and elegance to any that had hitherto been employed. He set up a printing-house, and in 1757 published his first work, a *Virgil* in royal quarto, followed, in 1758, by his famous edition of Milton. In that year he was appointed printer to the University of Cambridge, and undertook editions of the Bible and the Book of Common Prayer. He published a *Horace* in 1762, a second edition appearing in 1770 in quarto; and its success encouraged Baskerville to publish a series of quarto editions of Latin authors, which included Catullus, Tibullus, Propertius, Lucretius, Terence, Sallust and Florus. These books are admirable specimens of typography; and Baskerville is deservedly ranked among the foremost of those who have advanced the art of printing. His contemporaries asserted that his books owed more to the quality of the paper and ink than to the type itself, but the difficulty in obtaining specimens from the Baskerville Press shows the estimation in which they are now held.

See *Memoir* by R. Straus and R. K. Dent (1907); J. H. Benyon, *John Baskerville, type-founder and setter* (1914).

BASKET, a vessel made of twigs, cane, or rushes, as well as of a variety of other materials, interwoven together, and used for holding, protecting or carrying any commodity. The process of interweaving twigs, rushes or leaves, is practised among the rudest nations of the world; and as it is one of the most universal of arts, it ranks among the most ancient industries. The huts of the earliest settlers in Rome and in western Europe generally were made of osier work plastered with clay. Some interesting remains of British dwellings of this nature found near Lewes

in 1877 were described by Major-General H. L. F. Pitt-Rivers in *Archaeologia,* vol. xlvi. pp. 456–58. Boats of the same material, covered with the skins of animals, attracted the notice of the Romans in Britain; they seem to have been of the ordinary boat-shape. The basketwork boats mentioned by Herodotus as being used on the Tigris and Euphrates were round and covered with bitumen. Boats of this shape are still used on these rivers, and boats of analogous construction are employed in crossing the rivers of India, in which the current is not rapid. Nor have methods of making much changed. General Pitt-Rivers, on comparing the remains excavated near Lewes with a modern hamper in his possession, found the method to be identical. (T. O.)

PRIMITIVE BASKETRY

The word basket does not occur in Teutonic or Romance languages; its first appearance in the English tongue is in the 13th century, and the modern Celtic words (Welsh, *basged;* Irish, *basceid,* etc.) are probably adapted from the English. Basketry is a convenient, though ill-defined term, including actual baskets, wattlework, matting and ornamental plaitwork, made by hand without the aid of a frame or loom.

The industry is almost universal in time and in space. In the larger areas in which it is not found the lack may be traced either to the scarcity of suitable materials (as in much of Arctic America) or to the substitution of skins (as in the plains of North America, or across central Asia). The antiquity of basket-making is shown by its mention in folklore and creation myths in many parts of the world (Torres straits, Malay area, North America, etc.). The Potawatami (Wisconsin) believe that there is an old woman up in the moon making a basket. When it is finished the world will be destroyed; but a dog from time to time ruins her work (an eclipse), and she has to start over again.[1] Basket-making may well have been the earliest human industry, though the perishable materials are not preserved like flints and potsherds. It certainly preceded pottery-making in western America, and possibly in other parts of the world, and the invention of pottery has been ascribed to the clay coating or lining of baskets, subsequently burnt (*see* POTTERY AND PORCELAIN). But in the Andaman islands A. R. Brown traces evolution in an opposite direction, that of baskets from pottery. Each pot is wrapped up in a covering of leaves in North Andaman; in South Andaman the leaf-covering has become a basket exactly fitting the pot.

The earliest baskets that can be approximately dated are the large circular granaries found embedded in the sand in the Fayum, used for storing grain 4000 or 5000 B.C. (Plate I., fig. 2.); Exodus records the basket (made of papyrus coated with mud) in which the infant Moses was hidden and discovered; Herodotus in the 5th century B.C. describes the round basket-work *gufa* on the Euphrates and Tigris, where similar boats may be seen to-day. Wattle and daub huts—essentially a basket-work process—were characteristic of the bronze age in Britain, and are still a common type of dwelling in many parts of Africa. Nor has basketry technique changed. The strokes used in the baskets in Etruscan tombs, preserved in the Museo Etrusco in Florence, are those used by the English basket-maker; the late Roman baskets of A.D. 300 to 450 dug up at Karanis in 1924–26 are modern in all respects (Pl. I., fig. 1); the method of mat and basket-making found in prehistoric Egypt may be recognized in the tool basket (probably from Portugal) of the English workman.

Uses.—Among uncivilized peoples at the present day, basket-work provides clothing (girdles, petticoats, mats, hats, sandals, ornaments), shelter (wattle-work screens and huts, sleeping mats, cradles), transport (canoes, travelling chairs, coffins), all the domestic furniture, cooking and water vessels, besides many of the fish and game traps, winnowing trays and granaries. The uses are not confined to domestic work. Wicker shields are still used in war, as in the days of Xenophon, while the coir armour of the Gilbert islands, the Hawaiian helmets and the slatted cuirasses of the Indians of north-west America, are dependent on basketry technique. Basketry is still the one industrial art in which human hands excel the machine and can defy mechanical competition; in choice of form, colour and design, the basket-maker can show true artistic gifts, and the use of symbolism may enshrine magic or religious motives. Further, it is the one art in which the savage excel the civilized. Collections from Africa, Malay and Pacific regions show beauty as well as dexterity, and the North American ware, especially the Californian, is famous throughout the world. The Indian woman takes a personal pride in her work; her status in the tribe is estimated by her skill, and she often reserves her finest work to be buried with her in her grave.

Materials.—The superiority of savage over civilized basket-work is not due solely to hereditary skill, and the disregard of time characteristic of primitive societies; the cause is partly geographical, depending on the basketry materials provided by nature. "The sallow knows the basket-maker's thumb" both in America and England; but while willows, reeds and grass are almost the only native materials found in Great Britain, more than 87 different plants used in making or dyeing Indian baskets were identified in the Agricultural Department at Washington in 1902, and many more are still unidentified. Throughout tropical America, tropical Africa, the East Indian archipelago and the Pacific region various palms provide ideal leaf-strips, as they do in less profusion and variety round the shores of the Mediterranean. In Africa and the Pacific region banana leaves are in common use, and in the latter area screw-pine (*Pandanus*) affords strips for stronger work. Certain materials are characteristic of their respective regions. Such are the spruce (*Picea sitchensis*), of whose split roots water tight baskets are made by the Tlingit of Alaska, the bamboo used in China and Japan, and the "flax" (*Phormium tenax*) of New Zealand. Maiden-hair fern (*Adiantum pedatum*) is as characteristic of Californian decoration as khus-khus grass (*Anatherum muricatum*) of India and the East Indies, or the yellow orchid skin (*Dendrobium*) of New Guinea or Little Andaman. Among other materials may be enumerated the fronds of the palm of the Seychelles, *Lodoicea sechellarum,* which are used for very delicate basket-work in those islands. Esparto fibre is used in Spain and Algeria for rude fruit baskets. Various species of *Maranta* yield basket materials in the West Indies and South America; and the *Tirite,* a species of *Calathea,* a member of the order *Zingiberaceae,* is also employed similarly in Trinidad. Baskets are also frequently made from straw, from various sedges (*Cyperus*), and from shavings and splints of many kinds of wood.

Plaited Work.—All basket-work may be described as either (*a*) *plaited* (or woven), or (*b*) *coiled.* Plaited basket-work is made by the crossing of two or more sets of elements, often called (by analogy with weaving) warp and weft, although, when the warps are indistinguishable by rigidity or direction, both sets of elements may be called wefts. Its main varieties (illustrated on Plate III.) are: (1) *Check,* in which the warp and weft pass over and under each other singly, like the rand in wicker-work. This includes *wattle-work,* in which the warp stakes are planted in the ground and the weft branches bent in and out between them. (2) *Twilled,* in which each weft passes over and then under two or more warps, producing, by varying width and colour contrasts, endless variety (Pl. I., fig. 5). (3) *Wrapped,* in which flexible wefts are wrapped round (take a circular bend right round) each warp in passing. (4) *Twined,* when two or more wefts pass alternately in front of and behind each of the warps, crossing them obliquely. Twining with two or three wefts is technically "fitching" and "waling" respectively. There are many varieties in twined work, *e.g.,* plain twined and twilled-twined, when two warps are passed (Pl. I., fig. 4) over each time; while warps may be upright, crossed or split. In wrapped-twined, "bird-cage" or lattice-work the foundation consists of both horizontal and vertical elements, often rigid, at the crossings of which the weft or wefts may be wrapped or twined. In finished specimens wrapping and twining are often indistinguishable on the surface, though usually distinguishable on the reverse side. (5) In *hexagonal* work the wefts, instead of being horizontal and vertical, are worked in three directions, forming in open work hexagonal spaces, and in close work six-pointed stars. The well known *Anyam Gila* or "mad weave" of Malacca is a more complicated hexagonal weave, in which the wefts are doubled back, not simply interlaced in the flat. It starts with


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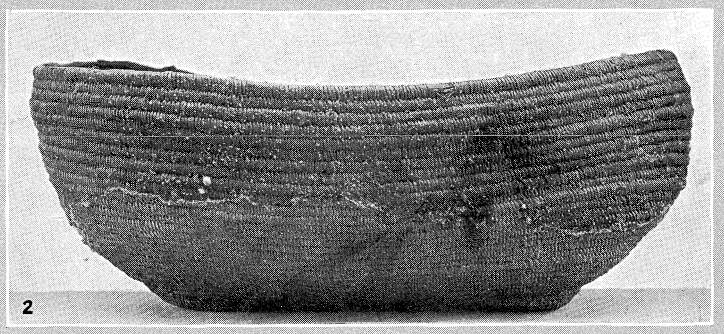
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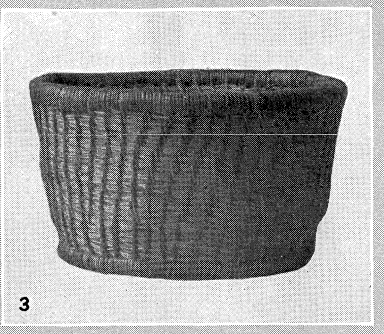
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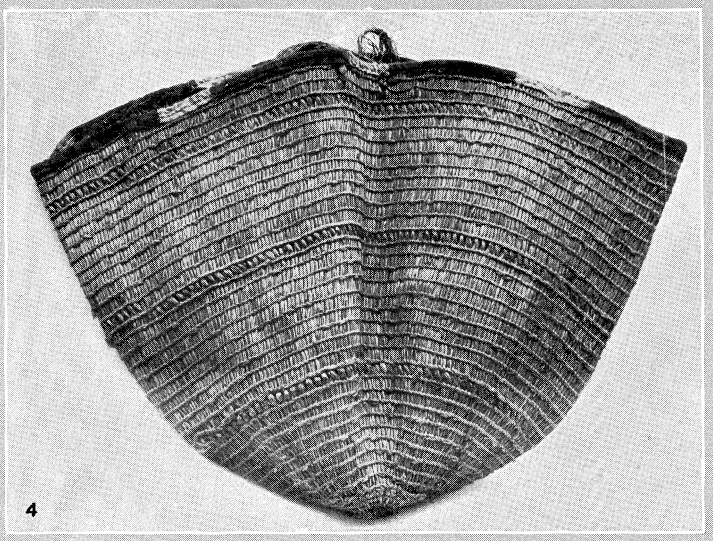
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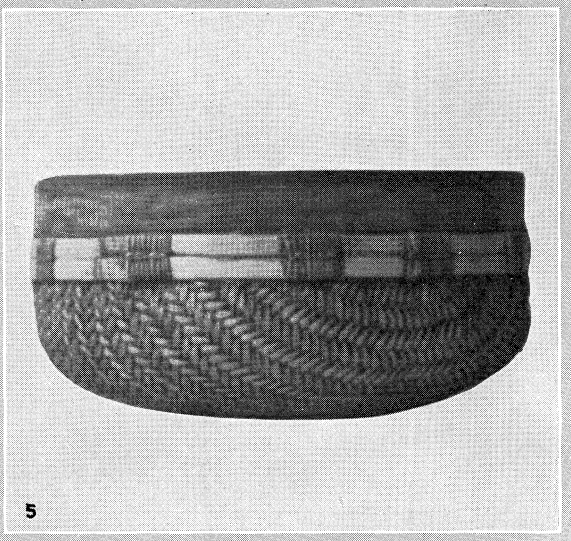
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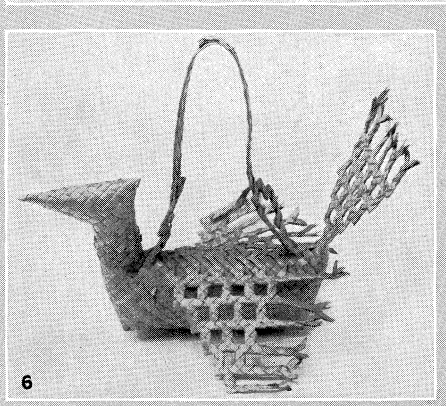
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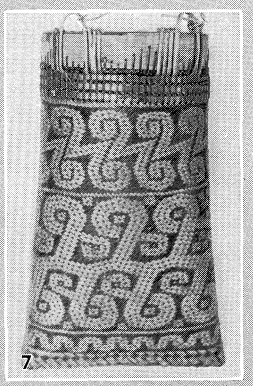
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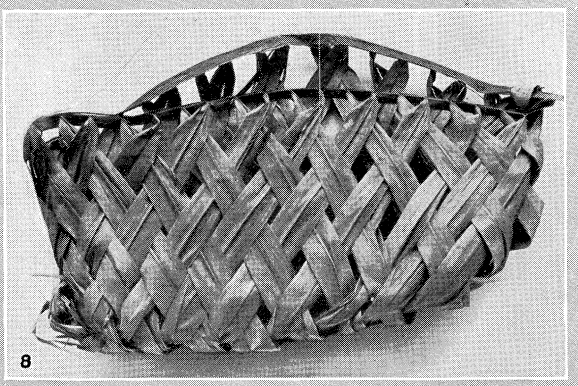
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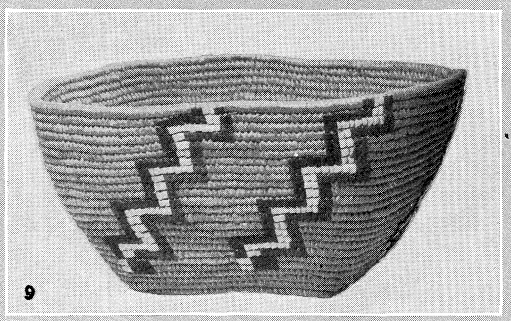
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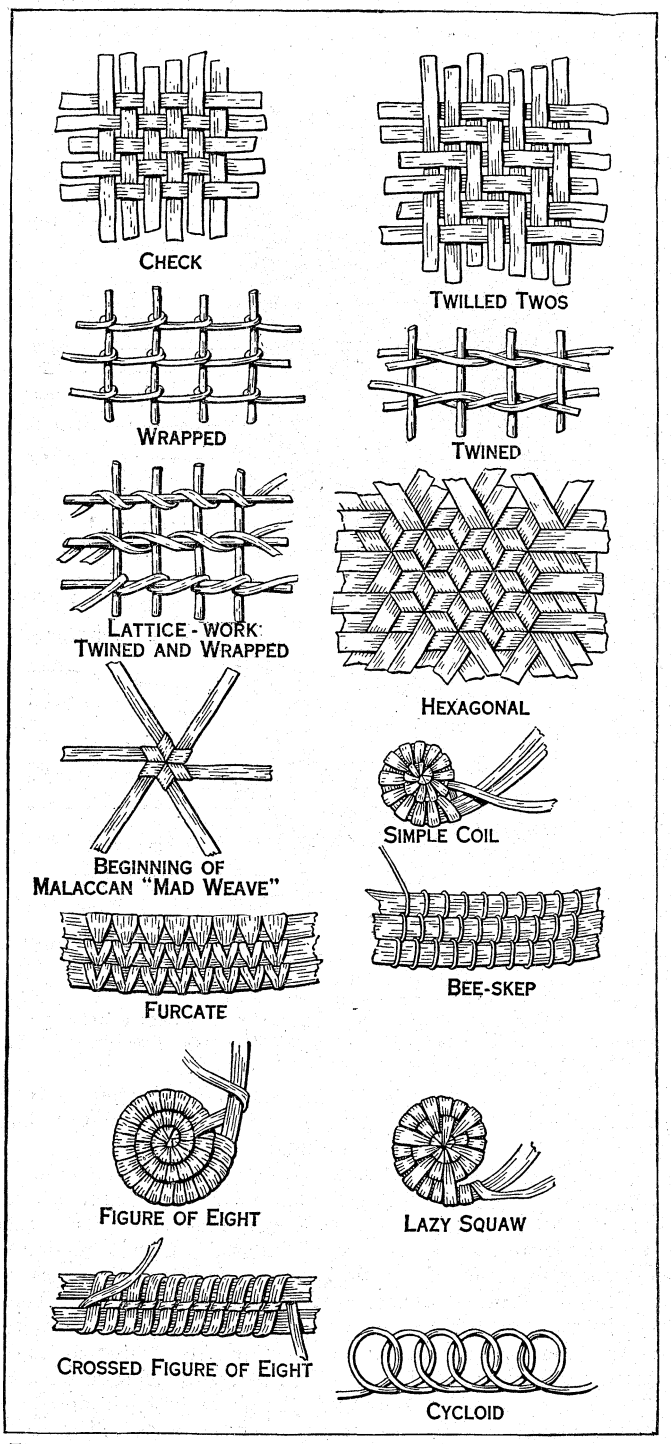
PHOTOGRAPH, (2) MISS CATON THOMPSON IN "ANTIQUITY," (4, 8) IN THE HADDON COLLECTION, CAMBRIDGE

BASKETS MADE IN ANCIENT AND MODERN TIMES

1. Late Roman basket, twilled in palm leaf, and found at Karanis, Egypt
2. Large coiled basket from Fayum, Egypt, used for storing grain between 5000 and 4000 B.C.
3. Hebridean basket
4. Torres Straits rush basket twined or fitched
5. Plaited Angoni beer bowl
6. Malay presentation rice basket representing a peacock
7. Basket from Borneo, twilled with designs of Ficus, snakes and pigeon-eyes
8. Torres Straits plaited basket, in plain check, made of midrib and pinnules of coconut palm
9. Coiled imbricated (Klikitat) basket made by the Thompson river Indians in British Columbia
10. Pima coiled basket
11. Twined wallet from Sitka, Alaska

a six-pointed star in the centre, round which other stars are added; and when the basket reaches the upper rim, all the wefts are doubled over a rattan ring and interlaced back again to the point from which they started, the interlacing being assisted by a brass *penysep* (inserter) much like the pricker used in coiled work in America.



THE CRAFT OF BASKETRY, SHOWING THE MAIN VARIETIES OF PLAITED AND COILED WORK

Coiled Work.—The main varieties of known coiled basket work are (1) *Simple oversewn coil,* where each stitch passes over the new coil and pierces a portion of the coil below. (*a*) Furcate coil. If the new stitch splits the stitch in the preceding coil a forked effect is produced, having a superficial suggestion of crochet. (*b*) Bee-skep coil. Sometimes the stitching catches the foundation together at wide intervals, each stitch passing through the foundation just to the right of the stitch in the coil below. If the stitch passes over two coils it gives a twilled appearance. (*c*) Sometimes the sewing strip is wound several times round the foundation between every stitch (as in "lazy squaw" below) which may develop into openwork. (2) *Figure of 8.* This, on the surface, looks like the simple oversewn coil, but it is worked in the figure of 8, the stitch passing behind, up and over and down in front of the fresh coil; then behind, down and out under the preceding coil. (3) "Lazy squaw" has a twilled effect; the stitch passes in front, up and over the new coil, winding completely round it once, twice or more times as desired, then passes behind and down under the preceding coil and over the new coil, making the characteristic long stitch. If the sewing is wrapped many times round the foundation for an inch or more, and stitched down only occasionally to the preceding coil, it becomes openwork. (4) *Crossed figure of 8,* also called "Knot-stitch" or *Mariposa.* The stitch passes in front, up and over the new coil, and then behind, down and under the preceding coil, as in the long stitch in "lazy squaw," but the sewing is next brought out between the two coils to the right of the long stitch, which it crosses, giving the appearance of a knot. (5) *Cycloid* or *single-element* work may be grouped with coiled work, but there is no foundation, the coils, usually of cane or similarly independent material, being coiled or looped into each other. This is especially characteristic of the Malay area.

In both plaited and coiled work patterns are made by overlaid wefts, often of contrasting shades or colours, which appear only on the surface. The "Klikitat" or imbricated ware of the Thompson river Indians, British Columbia, gives a good example. The surface weft is doubled back before being stitched to the coil, and the coil-stitch concealed under it (Pl. I., fig. 9).

Decoration and Design.—Symmetry of form, variety in strokes or sewing, contrasts in colour, and definite designs all afford opportunity for artistic expression. Rough baskets for temporary use may be ill-shapen, but in better specimens great care is taken to obtain a pleasing outline, a regular spread, a gradual curve from a square base to a cylindrical body, or to fix the just relation of height to girth. The neat-fingered Malay make presentation rice-baskets in the shape of birds (Pl. I., fig. 6), stepped pyramids or dangling cylinders (to baffle evil spirits), plaited not in simple but in the most complicated strokes, showing extraordinary skill. The varieties of strokes and sewings may be used singly or in combination, making patterns running in bands of varying width, horizontal or vertical. As in the Iban example (Pl. I., fig. 5), these patterns may be emphasized by the use of wefts coloured by nature or artificially dyed. Black wefts are obtained by soaking the strips in black mud, or staining them with elderberry or sumach, oak galls or rusty iron; purple is obtained from amaranth or iris petals; alder roots give orange, berberis yellow; the outer sheath of guinea corn (*Sorghum*) gives the dull red used in Nigeria, and the Indians of Washington mix chewed alder bark and salmon eggs for their vermilion.

Some basket-makers aim only at making attractive baskets, others, perhaps using the same designs, illustrate and enshrine in them religious or magical beliefs, stories of the creation or prayers for good luck. Each design is merely what its maker intends it to be, and can be interpreted only by her. The six-pointed star which is the nucleus of the Malay "mad weave" is the *Pusat Belanat* (navel of the mullet), but the twisted ornamentation represents rice-grains, and the twisted star the flowers of *Mimusops.* Natural and supernatural objects are often represented, *e.g.,* the crab's foot-prints, bending spirit, or shark's wife of Torres straits; the *Ficus,* pigeon's eyes, paddle heads or baited hooks of Borneo (Pl. I., fig. 7); the butterflies and eagles, snakes and raven of the Pacific coast; the grave-house of the Tlingit shaman; the svastika of the Navaho; or the rain-clouds of the Hopi of Arizona.

(A. H. Q.)

MODERN BASKETRY

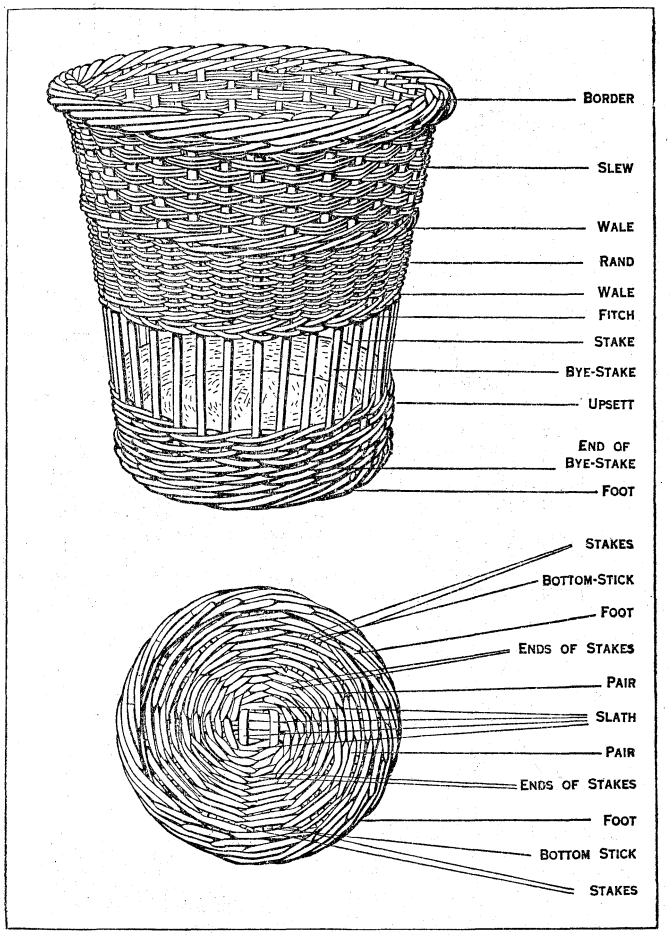
Since about the middle of the 19th century the character of basket-work in England has been greatly modified. The old English cradle, reticule, and other small domestic wares, have been driven out of the market by cheap goods made on the continent of Europe, and the coarse brown osier packing and hampers have been largely superseded by rough casks and cases made from cheap

imported timber. This loss has, however, been more than counterbalanced by the production of work of a higher class, such as finely made chairs, tables, lounges and other articles of furniture; luncheon and tea-baskets and similar requisites of travel. In addition to the foregoing the chief categories of English manufacture are: vegetable and fruit baskets, transit and travelling hampers, laundry and linen baskets, partition baskets for wine, and protective wicker cases for fragile ware such as glass carboys, stone and other bottles. Wicker shields or cases made from cane pith, for the protection of shells, have been introduced by the English military authorities. Some evidence of the above-mentioned developments is afforded by a comparison of the wages lists of the London Union of Journeymen Basketmakers issued in 1865 and in 1916. The former consists of 87 printed pages; the latter of 164 pages.

A Handicraft.—No machinery is used in basket-making, and every stroke made has a permanent effect on the symmetry of the whole work and no subsequent pressure will alter it. Wages in London vary from 50/– to 70/–, skilled cane-chair workers from £5 to £6 per week. The Basketmakers' Company is one of the oldest craft gilds of the city of London and still exists. Employment is given by the London Association for the Welfare of the Blind to a number of partially or wholly blind workpeople, who are engaged in the making of some of the coarser kinds of baskets; but the work, which bears obvious traces of its origin, is not commercially remunerative, and the association depends for partial support on the contributions of the charitable, and on supplementary sales of fine or fancy work produced under ordinary conditions and largely imported. The materials which are actually employed in the construction of basket-work are numerous and varied, but it is from certain species of willow that the largest supply of basket-making materials is produced. (*See* OSIER.)

Willows are roughly classed by the basket-maker into "osier" and "fine." The former consists of varieties of the true osier, *Salix viminalis;* the latter of varieties of *Salix triandra, S. purpurea* and some other species and hybrids of rougher texture. For the coarsest work, dried unpeeled osiers, known as "brown stuff," are used; for finer work, "white (peeled) stuff" and "buff" (willows stained a tawny hue by boiling them previous to peeling). The rods are used whole for ordinary work, but for baskets of slight and finer texture each is split into "skains" of different degrees of size. "Skains" are osiers cleft into three or four parts, by means of an implement called a "cleave." They are next drawn through an implement resembling the common spokeshave, and in order to bring the split into a shape still more regular, it is passed through another implement called an "upright." The tools required by a basket-maker are few and simple. They consist, besides the foregoing, of a shop-knife for cutting out material; a picking knife for cutting off the protruding butts and tops of the rods after the work is completed; two or three bodkins of varying sizes; a flat piece of iron somewhat narrowly triangular in shape for driving the work closely together; a stout pair of shears and a "dog" or "commander" for straightening sticks. The employer supplies a screw block or vice for gripping the bottom and cover sticks of square work, and a lapboard on which the workman fixes the upsetted bottom while siding up the basket. This is the full outfit. A common round or oval basket may, however, be made with no other tools than a shop-knife and a bodkin. On the continent of Europe shapes or blocks are in use on which the fabric is in some cases woven.

How Baskets Are Made.—The technicalities of basket-making may be easily followed by a glance at the illustration here reproduced by the courtesy of the Society of Arts.[1] It will be seen that the "bye-stakes" are merely inserted in the "upsett," whereas the stakes are driven in at each side of the "bottom-sticks" and pricked up to form the rigid framework of the side. When the "bottom-stick" and "stake" are formed of one and the same continuous rod, it is termed a "league." If the bottom is made on a hoop the butts of the stakes are "sliped," *i.e.,* cut away with a long cut of the shop-knife, and turned slightly round the hoop; they are then said to be "scallomed" on. The chief strokes used in constructing an ordinary basket are: the "slew"—two or more rods woven together; the "rand," rods woven in singly; the "fitch," two rods tightly worked alternately one under the other, employed for skeleton work such as cages and waste-paper baskets; the "pair," two rods worked alternately one over the other, used for filling up bottoms and covers of round and oval baskets; and the



BY COURTESY OF THE "JOURNAL OF THE ROYAL SOCIETY OF ARTS"

CONSTRUCTIONAL PARTS OF A SIMPLE WICKER-WORK BASKET
The process of manufacture to-day differs little from that employed by primitive weavers several thousand years ago

"wale," three or more rods worked alternately, forming a string or binding course. Various forms of plaiting, roping and tracking are used for bordering off or finishing.

An ordinary oval basket is made by preparing the requisite number of bottom sticks, preserving their length greater than the required width of the bottom. They are ranged in pairs on the floor parallel to each other at small intervals, in the direction of the longer diameter of the basket, thus forming what may be called the "woof," for basket-work is literally a web. These parallel rods are then crossed at right angles by two pairs of the largest osiers, on the butt ends of which the workman places his feet; and they are confined in their places by being each woven alternately over and under the parallel pieces first laid down and their own butts which form the end bottom sticks. The whole now forms what is technically called the "slath," which is the foundation of the basket. Next other rods are taken and woven under and over the sticks all round the bottom until it be of sufficient size, and the woof be occupied by them. Thus the bottom or foundation on which the superstructure is to be raised is finished. This latter part is accomplished by sharpening the large ends of as many long and stout osiers as may be necessary to form the stakes or skeleton. These are forced between the bottom sticks from the edge towards the centre, and are turned up or "upset" in the direction of the sides; then other rods are

[1] *See* the report of a paper by T. Okey published in the *Journal* of the Society of Arts, Jan 11, 1907.

woven in and out between each of them, until the basket is raised to the intended height, or, more correctly speaking, the depth it is to receive. The edge or border is finished by turning down the ends of the stakes, now standing up, behind and in front of each other, whereby the whole is firmly and compactly united, and it is technically known as the "belly." A lid is constructed on the same plan as that of the bottom, and tied on with hinges formed of twisted rods; simple handles may be made by inserting similar rods by the sides of two opposite stakes and looping them under the border to form rope-like handles of three strands.

In addition to willows many other materials are employed in the fabrication of wicker-work. Among the more important of these is the stem of *Calamus viminalis* or other allied species (the cane or rattan of commerce) which is used whole or made into skains. Since 1880 the central pith of this material, known as "centre cane" has been largely used in Great Britain and on the continent of Europe in the manufacture of furniture and other finer classes of work. About the same period plaited rush and straw, often coloured, came into use together with enamelled skains of cane. With splits of various species of bamboo the Japanese and Chinese manufacture baskets of unequalled beauty and finish. The bamboo wicker-work with which the Japanese sometimes encase their delicate egg-shell porcelain is a marvellous example of manipulation, and they and the Chinese excel in the application of bamboo wicker-work to furniture. In India "Cajan" baskets are extensively made from the fronds of the Palmyra palm, *Borassus flabelliformis,* and this manufacture has been established in the Black forest of Germany, where it is now an important and characteristic industrial staple. Although foreign osiers, cane and wood splints are imported into Britain in large quantities, native willows still provide the best material and ware. Much skill is necessary in dealing with such unyielding material; long training and practice are required before well-planned symmetrical baskets can be made; while the larger specimens demand both dexterity and considerable bodily strength. The willows, "osiers" (*Salix viminalis*) and "fine" (*Salix triandra, S. purpurea* and others) are treated in various ways to produce different effects. Coarse work such as a common hamper is made with unpeeled osiers, but for better work the rods are peeled, and for fine work they are split into three or four "skains." Contrasting effects are obtained by boiling for a few hours before peeling. Except for the stiff pieces used for bottoms or lids, the rods are all soaked, some for a few hours, some for as long as a week, to render them sufficiently pliable to be bent in and out, and driven securely home.

The chief centres of English basket manufacture outside London are Leicester, East Leake, Newark, Basford near Nottingham, and Grantham. Large but decreasing quantities of light basket-work are made for the English market in Verdun, in the department of the Aisne, and in other parts of France; and great quantities of fancy and other work are produced in Belgium, in the Netherlands and in Germany, notably at Lichtenfels in Bavaria, at Sonnefeld in Saxony and in the Black Forest. The import and export values of baskets and basket-ware, and of willows and rods for basket-making, have been enumerated in the board of trade returns for the United Kingdom since 1900, in which year basket-ware from foreign countries was imported to the value of £239,402. In 1926 imports reached £400,300. (T. O.)

See O. T. Mason, "Aboriginal American Basketry" *Rep. U.S. National Mus.* (1904, bibl.), "Vocabulary of Malaysian Basket-work," *Proc. U.S. Nat. Mus.,* vol. xlv. (1908, bibl.); T. Okey, *Art of Basketmaking.*

BASKETBALL is the only major sport of wholly American origin. Easy to comprehend and simple to play, the game has a greater total attendance and more participants than any other competitive sport in the United States, and its popularity has spread to all corners of the globe. It is estimated that the annual attendance at college, scholastic, independent and professional games in America is 100,000,000.

Origin.—Basketball, deriving its name from the ball and basket used in the first game, was invented by Dr. James A. Naismith in 1891. He was then an instructor at the International Y.M.C.A. Training school, Springfield, Mass., now Springfield college. Dr. Naismith, a Canadian, was born Nov. 6, 1861, and spent his childhood in Almonte, Ont. He attended McGill university where he was an outstanding athlete. Later he entered Presbyterian Theological college to study for the ministry, but in 1890 he transferred to Springfield as an athletic instructor. Dr. Naismith died in 1939. He devised basketball to fill a need for a vigorous, exciting indoor game to keep his athletes physically fit and entertained between football and baseball seasons.

Equipment.—The original rules called for nine players on each team—three forwards, three centres and three guards. Today there are five players. The first uniforms were full-length gymnasium trousers and long-sleeved jerseys. The first basketball was a soccer ball and the initial goals two peach baskets, one nailed at each end of the 35′x50′ court. Equipment and rules changed considerably through the years. The peach baskets were replaced by steel rims with cord nets and wood or glass backboards; the long trousers and jerseys by scanty satin or silk uniforms; and the wrestlers-type footgear by rubber-soled, slip-proof shoes constructed for fast starts, quick turns and instant stops. The soccer ball was replaced by a special laceless ball that must be uniform in weight, circumference, bounce and pressure.

For many years the game was played in stuffy gymnasia and poorly lighted basements of schools and churches or above markets, in dance halls and armouries. Now basketball is played in spacious, specially lighted, air-conditioned gyms, fieldhouses, Madison Square Garden, Chicago Stadium, Philadelphia's Convention hall, the Buffalo Memorial auditorium and arenas in other large cities.

Rule Changes.—Basketball's history is one of experimentation and rule changes, but Dr. Naismith's five basic principles remain: (1) throwing the ball in any direction; (2) no running with the ball; (3) no hard personal contact of players; (4) elevated goals; (5) continuous attempt to gain possession of the ball.

Original rules legislated out in succeeding years included: (a) two-handed dribble (bouncing ball on floor); (b) after second personal foul (pushing, holding, blocking, etc.) player was disqualified until next basket was made; (c) if one team made three straight fouls it counted a goal for the opponents; (d) out-of-bounds ball belonged to person first touching it; (e) the game was won by goals, not total points; (f) no foul shots (free throws after a personal foul) were tried.

Popularity.—Basketball was popularized in the United States by the Y.M.C.A. and introduced abroad by that organization in the early 1900s. American colleges adopted the sport in 1893 and professional teams soon appeared. Mrs. Senda Abbott of Smith college wrote the girls' rules in 1900; the first intercollegiate league was formed in 1902 and the Western conference took up the game in 1905. Growth of the sport was impaired by three different codes of rules—the collegiate, the Amateur Athletic union and the professional, but in 1915 the Joint Basketball committee was organized and resulted in the adoption of a standard set of rules.

United States soldiers took the game to the Philippine Islands in 1900; the U.S. army of occupation taught it to Germans after World War I; basketball was played at the Inter-Allied games in Paris in 1919, and in 1936 twenty-one nations sent teams to the Olympic games at Berlin. In 1943 the first foreign team played in New York city's Madison Square Garden when the University of Havana beat Long Island university. (L. Sco.)

Rules.—A synopsis of the present rules is as follows:

(1) *The Court.*—The playing court shall be a rectangular surface free from obstructions and shall have maximum dimensions of 94 ft. by 50 ft. and minimum dimensions of 74 ft. by 42 ft.

(2) *The Backboard.*—Backboards must be provided, the dimensions of which shall be 6 ft. horizontally and 4 ft. vertically. These backboards shall be made of plate glass or wood, or of any other material that is flat and rigid and painted white.

(3) *The Goals.*—The baskets shall be nets of white cord suspended from black metal rings 18 in. in inside diameter, set out horizontally 6 in. from the backboard and 10 ft. from the ground.

(4) *The Ball.*—The ball shall be round; it shall be made of a rubber bladder covered with a leather case; it shall not be less than 29½ in. nor more than 30 in. in circumference; it shall weigh not less than 20 oz. nor more than 22 oz.; and it shall be inflated to 12 lb. air pressure.

(5) *The Players and Substitutes.*—Each team shall consist of five players, one of whom shall be captain.

(6) *The Officials.*—The officials shall be a referee, an umpire, two timekeepers and two scorers.

(7) *Definitions of the Terms Used:*

1. A player is out of bounds when any part of his body touches the boundary line or the floor outside of the boundary line.
2. The ball is out of bounds when any part of it touches the boundary line, the floor or any object outside of the boundary line, or when it is touched by a player who is out of bounds.
3. A goal is made when the ball enters the basket from above and remains in it or passes through.
4. A held ball is declared when two players of opposing teams have one or both hands firmly on the ball, or when one closely guarded player is withholding the ball from play.
5. A jump ball is the term used when the referee tosses the ball up between two opposing players.
6. Time out is declared whenever the game is legally stopped without the loss of playing time.
7. Own goal is the basket for which a team is throwing.
8. The ball is dead any time when neither side can play it.
9. A pivot takes place when a player who is holding the ball stops in any direction with one foot; the other foot, called the pivot foot, cannot be moved from its position.
10. Running with the ball is progressing in any direction.
11. A dribble is made by a player giving impetus to the ball by throwing, batting, bouncing, rolling and touching it again before it touches another player.
12. Holding is personal contact with an opponent that interferes with the opponent's freedom of movement.
13. Blocking is changing position for the purpose of impeding the progress of an opponent who has not the ball.
14. A foul is an infraction of the rules involving the penalty of one or more free throws for the other side.
15. A violation is an infraction of the rules not involving a foul.
16. A free throw for goal is the privilege given a team to throw for goal from a position directly behind the free-throw line.
17. Delaying the game is unnecessarily interfering with the progress of the game by a player.
18. An extra period is the extension of playing time necessary to break a tie score.

(8) *Playing Regulations:*

1. The game shall be started by the referee, who shall toss the ball up between two players of opposite teams, as provided in the rules.
2. The game shall consist of two halves of 20 minutes each, with an intermission of 15 minutes between halves.
3. The ball may be passed, thrown, batted, bounced, rolled or dribbled in any direction.

(9) *Time Out.*—Time shall be taken out only when ordered by the referee.

(10) *A Held Ball.*—A held ball shall be put in play at the spot by the players in contact with the ball, in a manner similar to that at centre.

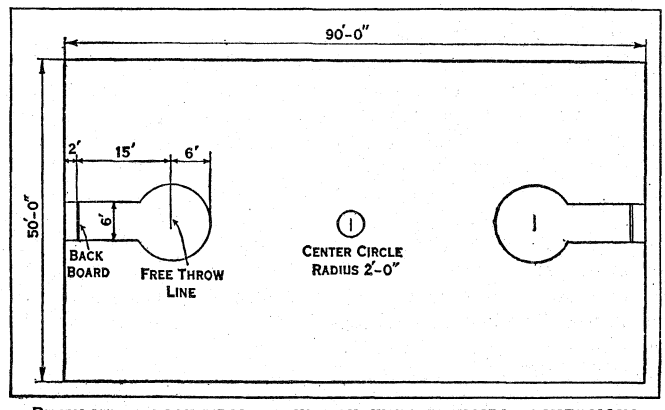
(11) *Personal Fouls:*

1. To hold, trip, charge into, or push an opponent.
2. To use unnecessary roughness.
3. To block an opponent.

(12) *Disqualification.*—A player who makes his fifth personal foul is disqualified.

Philosophy.—Basketball is a team game demanding a high degree of accuracy, judgment, individual skill, initiative, self-control and the spirit of co-operation. It demands that each player be skilled in all phases of the game, thus developing all-round rather than highly specialized ability. Since the object of the game is to have the players of one team put the ball into their own basket and to prevent the opponents from putting it into the other basket, it is frequently necessary for one player to pass the ball to another in order to keep possession of it until a favourable opportunity to make a goal occurs. This necessitates co-operation on the part of the members of the team and skill on the part of each man to score.

Strategy.—All games are divided into attack and defense. In basketball the offense is the more important because so long as the players of one team are able to retain the ball it is impossible for the other team to score. In the offense there are two main objects: first, to put the ball into the basket; second, to play the



REGULATION BASKETBALL COURT SHOWING PRINCIPAL DIMENSIONS

ball in such a way that it may be caged by some other person or again passed to one who is in a still better position. The watchword for a player on the offense is to keep away as far as possible from his opponent so as to give his teammates an opportunity to make a clean pass to him, or to get into a position from which he will be able to shoot for a goal. The ball may be passed in any one of several ways: (1) the underhand pass; (2) the overhead pass; (3) the side pass; (4) the push pass, with one or both hands; (5) the bounce; (6) the curve.

The choice of these depends upon the position of the passer's teammates and of his opponents.

As every man is entitled to his position on the floor, the one who is behind must necessarily circle around his opponent, and is thus at a disadvantage in obtaining the ball, as it comes down the field. The straight pass is used when one's teammate is nearer than the opponent, and the curve pass is used when the opponent is nearer than the teammate.

In dribbling, the ball may be hit with either hand but never with both hands at the same time, nor must it come to rest in one or both hands. In either of these cases the dribble must immediately cease.

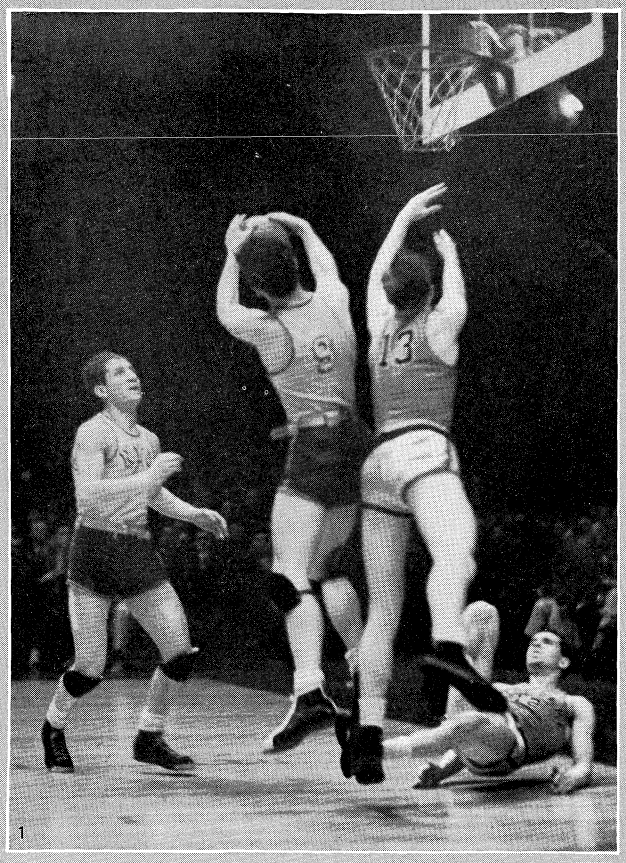
The dribble is especially useful where there is no opponent near at hand, where the shot for goal is too far for accuracy, or while the holder's teammates are planning an opening where the ball may be passed safely.

The players are divided into three groups—forwards, centres and guards. The duty of the forwards is primarily to make goals; of the guards, to prevent the opponents from making goals and to advance the ball toward their own basket; and of the centres, to put the ball into play and to assist the forwards or guards as necessity arises. Since each player has an opportunity to do the work of the others, a player to be of the greatest service should be expert in all phases of the game.

Tournaments.—There are national tournaments in which national championships are decided: the National Collegiate Athletic association; The National Invitation tourney; the National Intercollegiate, comprising a group of the smaller colleges; the Amateur Athletic union and the professional. Sites of these tournaments vary from time to time. (J. NA.; X.)

BASLE, a canton of north Switzerland (Ger. *Basel;* Fr. *Bâle*). It is traversed by the Jura, and watered by the Birs and the Ergolz, both tributaries (left) of the Rhine. From 1803 to 1814 the canton was one of the six "directorial" cantons of the confederation. Since 1833 it has been divided into two half cantons, with independent constitutions.

BASKETBALL



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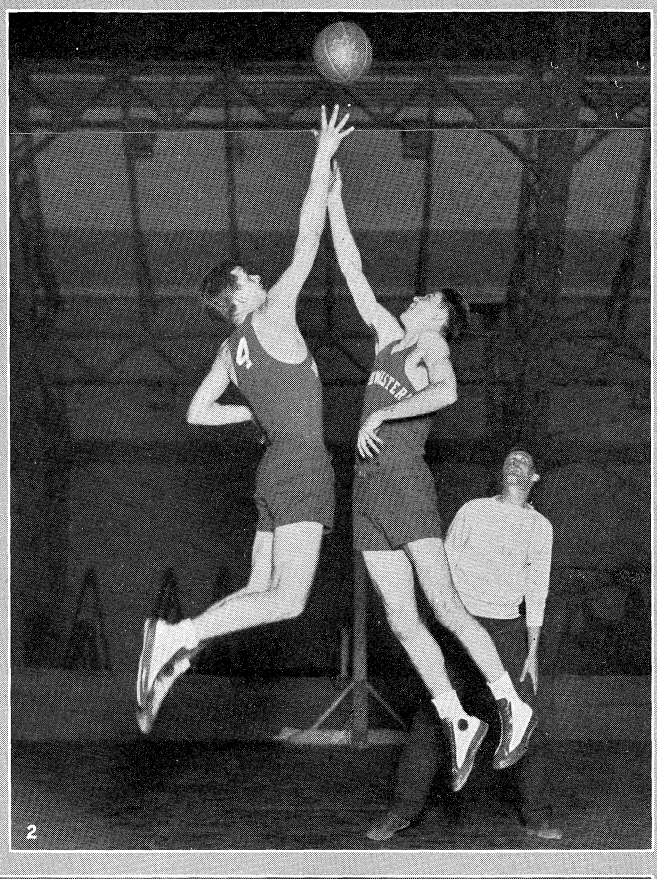

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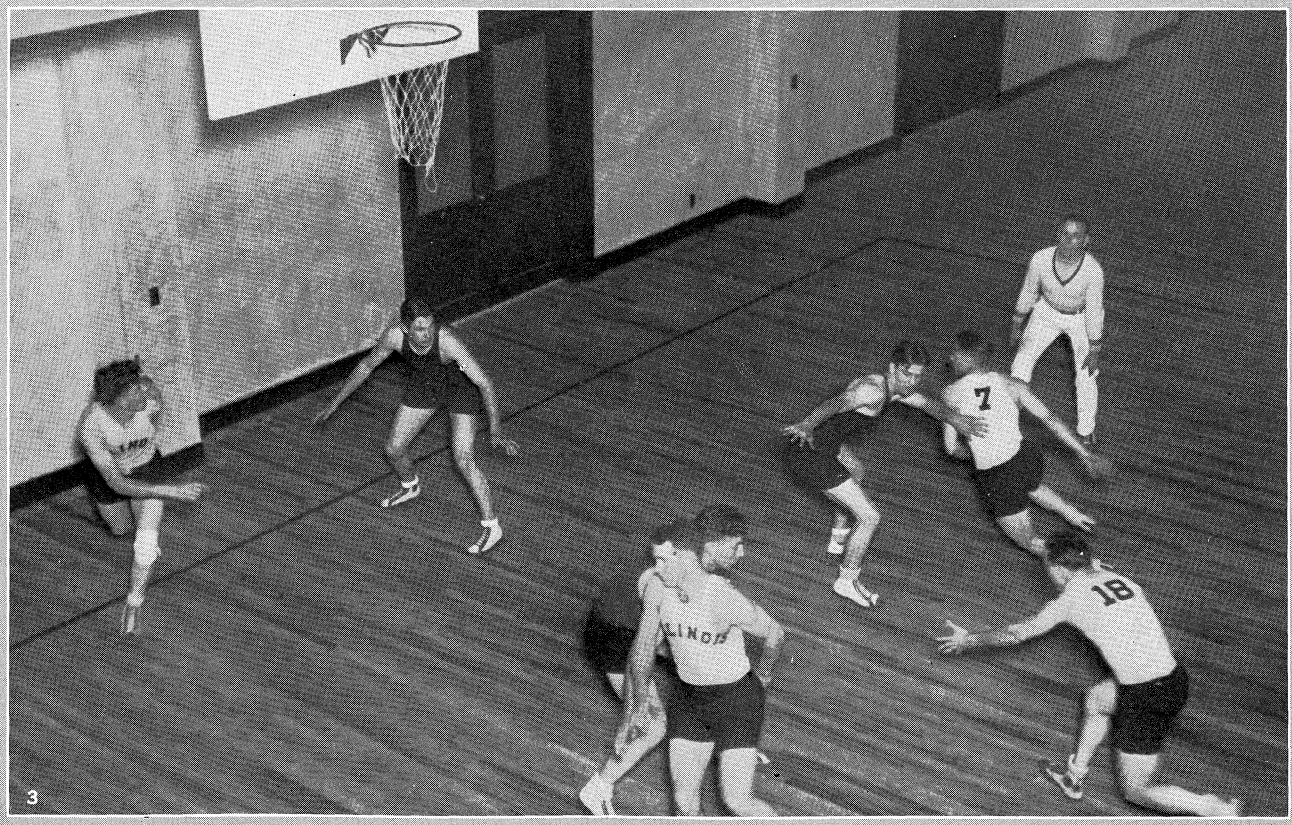

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PHOTOGRAPHS, (1) ACME PHOTO, (2, 3) UNDERWOOD AND UNDERWOOD

DETAILS OF A BASKETBALL GAME

1. Action under the basket in game between Notre Dame and New York university at Madison Square Garden
2. A "jump ball," thrown by the referee above two opposing players at the start of the game or after two opposing players have effectively deadlocked the ball out of play. After a basket is made, the ball is thrown into play from behind the endlines
3. An out-of-bounds play. The player to the left has just thrown the ball back into the court. The ball is evidently behind the two players in the foreground. Player No. 18 is about to receive the ball

One is that of Basel Stadt or Bâle Ville, including the city and some rural districts north of the Rhine. Its area is 14 sq.mi., with estimated population (1941) 169,333, mainly German-speaking and Protestant. The cantonal constitution dates from 1889. Since 1875, 1,000 citizens can claim a popular vote (*facultative referendum*) on all bills, or can exercise the right of *initiative* whether as to laws or the revision of the cantonal constitution.

The other half canton is that of Basel Land or Bâle Campagne, which is divided into four administrative districts and comprises 74 communes, its capital being Liestal. Area, 163 sq.mi., with estimated population (1941) 94,435, nearly all German-speaking. The cantonal constitution dates from 1892. The "obligatory referendum" obtains in the case of all laws, while 1,500 citizens have the right of "initiative" whether as to laws or the revision of the cantonal constitution. Each canton-division sends one member to the state council. Together they contribute 11 representatives (on the basis of the 1941 census) to the national council. These, with the executive, are all elected by a direct popular vote for the term of three years. For industries and bibliography, *see* BASLE (Town).

BASLE, the capital of the Swiss half-canton of Basel Stadt or Bâle Ville. It is now the second most populous town (ranking after Zürich) in the Swiss confederation, while it is reputed to be the richest. The population in 1941 had increased to 161,380.

Both facts are largely due to the opening (1882) of the St. Gotthard railway, as merchandise collected from every part of north and central Europe is stored in Basle previous to being redistributed by that line.

The town had its origin in an *oppidum* of the Rauraci. Its name appears for the first time when the emperor Valentinian built a *castellum, Basilia, i.e.,* the city by the water in the neighbourhood. Later the name was interpreted as *Basilea, i.e.,* the royal (city). At the beginning of the 7th century the bishop of Augusta Rauracorum (now called Kaiser Augst), 7½m. E., moved his see thither. The power of the bishops grew for a long time, but their secular influence was supplanted in the 14th century by that of the burghers. After long swaying between the neighbouring Rhine cities and the Swiss confederation, it was admitted into the latter in 1501. It later became one of the chief centres of the Reformation movement in Switzerland, so that the bishop retired in 1528 to Porrentruy, where he resided till 1792. On the reorganization of the bishopric, a new bishop was established at Soleure in 1828. The 1930 census showed 92,183 Protestants, 47,623 Catholics and 2,563 Jews. As in other Swiss towns the trade guilds got all political power into their hands by the 18th century. They naturally favoured the city at the expense of the rural districts, so that in 1832 the latter proclaimed their independence, and in 1833 were organized into the half-canton of Basel Landschaft, the city forming that of Basel Stadt. The city is divided by the Rhine into Gross Basel (south) and Klein Basel (north). There are several bridges, the old wooden bridge having been replaced in 1905 by one built of stone. The central or main railway station is in Gross Basel, while the German station is in Klein Basel. The most prominent building in the city is the cathedral or münster, built of deep red sandstone, on a terrace high above the Rhine. Consecrated in 1019, it was mainly rebuilt after the disastrous earthquake of 1356 that nearly ruined the city. The public meetings of the great oecumenical council (1431–49) were held in the choir, while the committees sat in the chapter-house. Erasmus lived in Basle 1521–29, and on his death there (1536) was buried in the cathedral. The Rathaus or town hall (restored) dates from the 16th century. In the museum is a fine collection of works of art by Holbein (who lived in Basle from 1515 to 1531), while the historical museum (in the old Franciscan church) contains, among many treasures, the fragments of the famous *Dance of Death,* wrongly attributed to Holbein. The university (founded by Pius II. in 1460) is the oldest in Switzerland; detached buildings include the new schools of physics and chemistry. The university library is very rich, and contains the original mss. of the acts of the great oecumenical council. Basle is the seat of the chief missionary society in Switzerland, the training school for missionaries being at St. Chrischona, 6m. out of the city. It is a great railway, banking and distributing centre, and has chemical and ribbon works. Shipping on the Rhine developed greatly after 1923. The chief commercial fair of Switzerland is held in Basle every April. In 1930 Basle became the seat of the Bank for International Settlements.

See *Basler Biographien* (3 vols., 1900–05); *Basler Chroniken* (original chronicles) (7 vols., Leipzig, 1872–90); and *Geschichte d. Kant. Basel;* A. Burckhardt, *Bilder aus d. Geschichte von Basel* (3 vols., 1869–82); *Festschrift z. 400ten Jahrestage d. ewig. Bundes zwisch. B. und den Eidgenossen* (1901); *Burgerhaus d. Schweiz,* vol. xvii.; A. Heusler, *Verfassungsgeschichte d. Stadt Basel im Mittelalter* (1860), *Rechtsquellen von Basel* (2 vols., 1856–65); F. Stähelin, *Die Schweiz in röm Zeit,* 1927; L. Stouff, *Pouvoir temporel des évêques de Bâle* (2 vols., Paris, 1891); R. Thommen, *Gesch. d. Universität B., 1532–1632* (1889); *Urkundenbuch d. Landschaft* B.—1883, 3 vols., and ditto for the city (1890–1910, 11 vols.); W. Vischer, *Gesch. d. Universität B., 1460–1529* (1860); R. Wackernagel, *Gesch. d. Stadt Basel* (3 vols., 1906 *sqq.*); K. Weber, *Die Revolution im Kanton Basel, 1830–1833* (1907); G. Gautherot, *La République rauracienne* (1908).

BASNAGE, JACQUES (1653–1723), French Protestant divine, was the eldest son of the eminent lawyer Henri Basnage, sieur de Franquenay (1615–95), and was born at Rouen in Normandy on Aug. 8 1653, and died at The Hague on Dec. 22 1723. He studied classical languages at Saumur and afterwards theology at Geneva. He was pastor at Rouen (his native place) from 1676 till 1685, when, on the revocation of the edict of Nantes, he obtained leave of the king to retire to Holland. He settled at Rotterdam as a minister pensionary till 1691, when he was chosen pastor of the Walloon church. In 1709 the grand pensionary A. Heinsius (1641–1720) secured his election as one of the pastors of the Walloon church at The Hague, intending to employ him mainly in civil affairs. He was engaged in a secret negotiation with Marshal d'Uxelles, plenipotentiary of France at the Congress of Utrecht. In 1716 Dubois, who was at The Hague at the instance of the regent Orleans, for the purpose of negotiating the Triple Alliance between France, Great Britain and Holland, sought the advice of Basnage, and the French government also turned to him for help in view of the threatened rising in the Cevennes. True to the principles of Calvin, he denounced the rebellion of the Camisards (*q.v.*) in his *Instructions pastorales aux Réformés de France sur l'obeissance due aux soverains* (Paris 1720), which was printed by order of the court, and scattered broadcast in the south of France. Basnage died on Sept. 22, 1723.

His works include: *Histoire de la religion des églises réformées* (Rotterdam, 1690), the *Histoire de l'église depuis Jésus-Christ jusqu'à présent* (*ib.* 1699)—both of them written from the point of view of Protestant polemics—and, of greater scientific value, the *Histoire des Juifs* (Rotterdam, 1706, Eng. trans. 1708) and the *Antiquités judaiques ou remarques critiques sur la république des Hébreux* (1713).

BASOCHE or **BAZOCHE,** with the analogous forms BASOQUE, BASOGUE and BAZOUGES, a French gild of clerks, from among whom legal representatives (*procureurs*) were recruited. This gild was very ancient, even older than the gild of the *procureurs,* with which it was often at variance. It dated, no doubt, from the time when the profession of *procureur* (procurator, advocate or legal representative) was still free in the sense that persons rendering that service to others when so permitted by the law were not yet public and ministerial officers. For this purpose there was established near each important juridical centre, a group of clerks, that is to say, of men skilled in law who at first would probably fill indifferently the rôles of representative or advocate. Such was the origin of the Basoche of the parlement of Paris, which naturally formed itself into a gild, like other professions and trades in the middle ages. But this organization eventually became disintegrated, dividing up into more specialized bodies: that of the advocates, whose history then begins; and that of legal representatives, whose profession was regularized in 1344, and speedily became a saleable charge. The remnant of the original clerks constituted the new Basoche, which thenceforward consisted only of those who worked for the procureurs, the richer clerks aspiring to attain the position of procureur. They all, however, retained some traces of their original conditions. The Basoche had besides its *maîtres des requêtes,* a grand court-crier, a referendary, an advocate-general,

a *procureur-général,* a chaplain, etc. In early days, and until the first half of the 16th century, it was organized in companies in a military manner and held periodical reviews or parades (*montres*), sometimes taking up arms in the king's service in time of war. Of this there survived later only an annual *cavalcade,* when the members of the Basoche went to the royal forest of Bondy to cut the maypole, which they afterwards set up in the courtyard of the Palais. We hear also of satirical and literary entertainments given by clerks of the Palais de Justice, and of the moralities played by them in public, which form an important element in the history of the national theatre; but at the end of the 16th century these performances were restricted to the great hall of the Palais.

To the last the Basoche retained two principal prerogatives: (1) In order to be recognized as a qualified procureur, it was necessary to have gone through one's "stage" in the Basoche, to have been entered by name for ten years on its register. (2) The Basoche had judiciary powers recognized by the law. It had disciplinary jurisdiction over its members and decided personal actions in civil law brought by one clerk against another or by an outsider against a clerk. The Châtelet of Paris had its special Basoche, which claimed to be older even than that of the Palais de Justice, and there was contention between them as to certain rights. The clerks of the procureurs at the *cour des comptes* of Paris had their own Basoche of great antiquity, called the "empire de Galilée." The Basoche of the Palais de Justice had in its ancient days the right to create provostships in localities within the jurisdiction of the parlement of Paris, and thus there sprang up a certain number of local Basoches. Others were independent in origin; among such being the "regency" of Rouen and the Basoche of the parlement of Toulouse.

See also *Répertoire de jurisprudence des Guyot; Recueil des Statuts du royaume de la basoche* (1654); L. A. Fabre, *Études historiques sur les clercs de la basoche* (1856). (J. P. E.)

BASQUE LANGUAGE. The original and proper name of the language is Eskuara (euskara, uskara), a word the exact meaning of which has not yet been ascertained but which probably corresponds with the idea "clearly speaking." The language is highly interesting and stands as yet absolutely isolated from other European linguistic families.

Basque has no graphic system of its own and uses the Roman character, either Spanish or French; a few particular sounds are indicated in modern writings by dotted or accented letters. The alphabet would vary according to the dialects. Prince L. L. Bonaparte counts, on the whole, 13 simple vowels, 38 simple consonants. Nasal vowels are found in some dialects as well as "wet" consonants—*ty, dy, ny,* etc. The doubling of consonants is not allowed, and in actual current speech most of the soft consonants are dropped. The letter *r* cannot begin a word, so that *rationem* is written in Basque *arrazoin.*

Declension is replaced by a highly developed post-positional system; first, the definite article itself *a* (plural *ak*) is a postposition—*zaldi,* "horse"; *zaldia,* "the horse"; *zaldiak,* "the horses." The declensional suffixes or postpositions, which, just like our prepositions, may be added to one another, are postponed to the article when the noun is definite. The principal suffixes are *k,* the mark of the plural, and of the singular nominative agent; *n,* "of," and "in"; *i,* "to"; *z,* "by"; *ik,* "some"; *ko,* "from," "of" (Lat. *a*); *tik,* "from" (Lat. *ex*); *tzat, kotzat, tzako,* "for"; *kin, gaz,* "with"; *gatik,* "for the sake of"; *gana,* "towards"; *ra, rat,* "to," "into," "at," etc. Of these suffixes some are joined to the definite, others to the indefinite noun, or even to both.

The personal pronouns are *ni,* "I"; *hi,* "thou"; *gu,* "we"; *zu,* "you"; in modern times, *zu* has become a polite form of "thou," and a true plural "you" (*i.e.,* more than one) has been formed by suffixing the pluralizing sign *k - zuek.* The pronouns of the third person are mere demonstratives. There are three: *hura* or *kura,* "that"; *hau* or *kau,* "this"; *ori* or *kori,* "this" or "that." Other unexplained forms are found in the verbal inflections, *e.g., d,* "it," and *t,* "I" or "me"; *d-akus-t,* "it see I"="I see it"; *d-arrai-t,* "it follows me." The demonstratives are used as articles: *gazt-en-or,* "this younger one"; *andre-ori,* "this lady at some distance." The reflective "self" is expressed by *buru,* "head." The relative does not exist, and in its place is used as a kind of verbal participle with the ending *n: doa,* "he goes"; *doana,* "he who is going"; in the modern Basque, however, by imitation of French or Spanish, the interrogative *zein, zoin,* is used as a relative. Other interrogatives are *nor,* "who"; *zer,* "what"; *zembait,* "how much," etc. *Bat,* "one"; *batzu,* "several"; *bakotch,* "each"; *norbait,* "some one"; *hanitz* or *hainitz,* "much"; *elkar,* "both"; are the most common indefinite pronouns. The numeral system is vigesimal; *e.g.,* 34 is *hogoi ta hamalaur,* "20 and 14." The numbers from one to ten are: 1, *bat;* 2, *bi;* 3, *hiru;* 4, *lau;* 5, *bortz* or *bost;* 6, *sei;* 7, *zazpi;* 8, *zortzi;* 9, *bederatzi;* 10, *hamar;* 20, *hogoi* or *hogei;* 40, *berrogoi* (*i.e.,* twice twenty); 100, *ehun.* There is no genuine word for a thousand.

The genders in Basque grammar are distinguished only in the verbal forms, in which the sex of the person addressed is indicated by a special suffix; so that *eztakit* means, "I do not know it"; but to a woman one says also: *eztakinat,* "I do not know it, O woman!" To a man one says: *eztakiat* (for *eztakikat*), "I do not know it, O man!" Moreover, certain dialectic varieties have a respectful form: *eztakizut,* "I do not know it, you respectable one," from which also a childish form is derived, *eztakichut,* "I do not know it, O child!"

The Basque conjugation incorporates not only the subject pronouns, but, at the same time, the indirect and direct complement. Each transitive form may thus offer 24 variations—"he gives it," "he gives it to you," "he gives them to us," etc., etc. Primitively there were two tenses only, an imperfect and a present, which were distinguished in the transitive verb by the place of the personal subject element: *dakigu,* "we are knowing it"; (*gu, i.e.,* we), and *ginaki,* "we were knowing it"; in the intransitive by a nasalization of the radical: *niz,* "I am"; *nintz,* "I was." In modern times a conjectural future has been derived by adding the suffix *ke, dakiket,* "I will, shall, or probably can know it." No proper moods are known, but subjunctive or conjunctive forms are formed by adding a final *n,* as *dakusat,* "I am looking at it"; *dakusadan,* "if I see it." No voices appear to have been used in the same radical, so that there are separate transitive and intransitive verbs.

In its present state Basque only employs its regular conjugation exceptionally; but it has developed, probably under the influence of neo-Latin, a most extensive conjugation by combining a few auxiliary verbs and what may be called participles, in fact declined nouns; *ikusten dut,* "I have it in seeing," "I see it"; *ikusiko dut,* "I have it to be seen," "I will see it," etc. The principal auxiliaries are: *izan,* "to be"; and *ukan,* "to have"; but *edin,* "to can"; *eza,* "to be able"; *egin,* "to make"; *joan,* "to go"; *eroan,* "to draw," "to move," are also much used in this manner.

The syntax is simple; the phrases are short, and generally the order of words is: subject, complement, verb. The determining element follows the determined: *gizon handia,* "man great the"—the great man: the genitive, however, precedes the nominative—*gizonaren etchea,* "the man's house." Composition is common and it has caused several juxtaposed words to be combined and contracted, so that they are partially fused with one another—a process called *polysyntheticism; odei,* "cloud," and *ots,* "noise," form *odots,* "thunder"; *belar,* "forehead," and *oin,* "foot," give *belaun,* "knee," front of the foot. The vocabulary is poor; general and synthetic words are often wanting, but particular terms abound. There is no proper term for "sister," but *arreba,* a man's sister, is distinguished from *ahizpa,* a woman's sister. We find no original words for abstract ideas, and God is simply "the Lord of the high."

The vocabulary, however, varies extremely from place to place and the dialectic varieties are very numerous. They have been summed up by Prince L. L. Bonaparte as eight; these may be reduced to three principal groups: the eastern, comprising the Souletine and the two lower Navarrese; the central, formed by the two upper Navarrese, the Guipúzcoan and the Labourdine; and the western, formed by the Biscayan, spoken, too, in Álava. These names are drawn from the territorial subdivisions, although the dialects do not exactly correspond with them.

BIBLIOGRAPHY.—*See* Wm. Rollo, *The Basque Dialect of Marquina* (1925); Meillet and Cohen, *Les Langues du Monde* (1926); W. Schmidt, *Die Sprachenfamilien und Sprachenkriese der Erde* (1927), both for detailed bibliography and for a discussion of its relationships.

BASQUE PROVINCES (*Provincias Vascongadas*), a division of N.E. Spain in the angle of the Bay of Biscay, comprising the three provinces of Alava, Biscay and Guipúzcoa. Pop. (1940) 955,764; area, 2,740 sq.mi.; density per sq.mi. 348.8. The boundary of the Basque provinces extends southwestwards from the French frontier at the Bidassoa, along the Pyrenean foothills and the Sierra de Aralar, and across the western part of the Sierra de Andia to the Ebro at Logroño, whence it follows the river to Paentelarra beyond Miranda and then goes northward to the sea on the fringe of the highlands leaving the basin of the Nervion in Biscay. The area thus included forms a triangle with its base at the coast, each side measuring approximately 70 mi. in a straight line. In every way the two maritime provinces of Biscay and Guipúzcoa stand out in contrast to the inland Alava. Guipúzcoa, in particular, remains most intensively Basque, though the growth of San Sebastian and the increased use of the coastal route from France tend to weaken their cultural continuity. In Biscay, too, industry produces the same effect. (*See* under the separate provinces; also BASQUE LANGUAGE; EUROPE: *Races and Peoples*.) The combined area of the two northern provinces is little more than that of Alava, but their population is seven times as great. This concentration on the more fertile coastlands has been a feature of settlement in Spain from the earliest times. Inland, the boundary with Alava is clearly defined; it runs along the hill-lines which represent the local weakening of the great Tertiary mountain-building forces that produced the Pyrenees to the east and the Cantabrians to the west. To the north of this lies a very broken country of rounded gorse-covered hills, ending seawards in high cliffs, and deeply cut wooded valleys dotted with the large Basque homesteads, well watered throughout the year and having not less than 40in. of rain per annum. Movement from east to west is extremely difficult, and this fact, together with the presence of excellent harbours, such as that of Pasajes, early brought coastwise communications into prominence. It resulted, further, in the preservation of the physical type and ancient culture of the Basques, for penetration into Spain until the 17th century was almost solely confined to the Pyrenean passes of Navarre, notably Roncevaux. (*See* RONCESVALLES.)



BY COURTESY OF LE VOYAGEUR EN FRANCE, INC.

INHABITANTS OF THE BASQUE PROVINCES IN THE COSTUMES WHICH THEY STILL RETAIN AND WHICH FOR MANY CENTURIES HAVE DISTINGUISHED THEM FROM THE OTHER PEOPLES OF SPAIN

The contrast with Alava is great. The climatic boundary corresponds to the physical, and lies along the edge of the high, tributary basin which slopes southwards to the Ebro and includes the fertile open plains of Vitoria. Alava is thus comparatively dry (though the rainfall is fairly evenly distributed) and exposed to the extremes of temperature which characterize the Spanish "meseta." The wooded valleys of the coastal strip are rare in Alava, and the vegetation takes on the character which belongs to regions of hot dry summers. The province has similarly lain open to human penetration, and it is interesting to note that the Basque language is here weakest. Its capital, Vitoria, is said to have been founded by the Gothic king, Leovigild (581). Throughout the middle ages, while the coast was comparatively unaffected by the great movements of men and culture, Alava was influenced in many ways, since it lay on the northern flank of the pilgrim route from Pamplona to Santiago through Logroño.

HISTORY

In Biscay the counts of Haro were lords of Biscay from 1093 to 1350. There was a short union with Castile under Pedro the Cruel, but the definitive union did not take place till 1370. In Alava the ruling power was the confederation of Arriaga, which united the province to the crown of Castile in 1332. Guipúzcoa, which had been dependent sometimes on Navarre, sometimes on Castile, was definitively united to Castile in 1200. From the year 1425 the provinces were desolated by party wars among the lesser nobles (*parientes mayores*) but these came to an end in 1460–98, when Henry IV. and Ferdinand the Catholic strengthened the power of the towns and forbade the erection of any fortified house in the country. Though the three Basque Provinces were thus united to the crown of Spain, they still remained a land apart (*tierra apartada*). Their juntas acted to some extent in common; and although no written federal pact is known to have existed, they employed, as the symbol of their unity, a seal with the word *Iruracbat*, "The Three One," engraved upon it. They preserved their own laws and customs, which the Spanish kings swore to observe and maintain. Unless countersigned by the juntas, the decrees of *cortes* and Spanish legislation or royal orders had no force in the provinces. In the junta of 1481 Guipúzcoa alone proposed a treaty of friendship, peace and free trade for ten years with England, and this was signed in Westminster on March 9, 1482 (*see* Rymer, *Foedera*). The Basques are mentioned apart from Spain in the Treaty of Utrecht (1713), and long preserved in their municipal institutions the old style of *republicas*.

This kind of independence and autonomy lasted until the death of Ferdinand VII. in 1833, when, in default of male heirs, his brother, Don Carlos, claimed the throne, and raised the standard of revolt against his niece, Isabel II. The ensuing wars ended in 1876 in the utter defeat of the Carlist forces, and left the provinces at the mercy of the Government. In general government and legislation the provinces were then assimilated to the rest of Spain, the provincial parliaments (*diputaciones*) being elected like the other provincial councils of Spain, and subjected to the ordinary interference of the civil governors. But their representatives, assisted by the senators and deputies of the Basque Provinces in the Cortes, negotiated successive pacts, each lasting several years, securing for the three provinces their municipal and provincial self-government, and the assessment, distribution and collection of their principal taxes and octroi duties, on the understanding that an agreed sum should be paid annually to the State. In Dec. 1906, the contribution of the Basque Provinces to the State was fixed as follows: for 1906–16 at 8,500,000 pesetas; for 1917–26 at pts. 9,000,000. On Oct. 8, 1936, after the outbreak of civil war in Spain, an autonomous Basque government was set up at Guernica. In June 1937, after the insurgent forces had entered Bilbao, the capital of the province of Biscay, General Franco confirmed for the province of Alava, but annulled for the provinces of Guipúzcoa and Biscay, the financial autonomy granted them in 1925.

In agriculture the Basque provinces are great cider countries and the apple is the characteristic fruit tree. During the 19th century, however, wine-growing increased; it has long been famous in Alava.

The chief industries are the sea fisheries and iron mining. Some of the mines round Bilbao have been worked from prehistoric times. Great Britain is ordinarily the principal market for the iron ore produced in the three provinces. The swords of Mondragon in Guipúzcoa were renowned before those of Toledo. In the 19th century Señor Zuloaga successfully revived at Eibar the artistic inlaying of gold and silver in steel and iron. In the 20th century great strides were made in harnessing streams to produce electric power for application to industry.

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(1802) is full of local information. The best works on the various editions of the *fueros* are: A. Marichalar, Marques de Montesa, and Cayetano Manrique, *Historia de la Legislacion . . . civil de España* (1863); *Fueros de Navarra Vizcaya, Guipúzcoa y Alava* (Madrid, 2nd ed., 1868); D. Pablo de Gorosabel *Noticia de las cosas memorables de Guipúzcoa* (1899–1901), the last volume of which, by C. de Echegaray, gives the legislative acts down to May 1900; D. Carmelo de Echegaray, *Las Provincias Vascongadas a Fines de la Edad Media* (1895); Dr. E. de Labayru, *Historia de Bizcaya* (1903); G. de Balparda, *Historia critica de Vizcaya y de sus Fueros* (1924). Several discoveries of important missing documents and mss. were made in the process of cataloguing and indexing the archives of the towns. The development of the Basque mining industry is described in *Las Minas de hierro de la provincia de Vizcaya, progresos realizados en esta region desde 1870 hasta 1899* (1900).

BASRA (also spelt BUSRA, the BASSORAH of the Arabian Nights), the name of a liwa (pop. [est. 1935] 286,312) and of the third most important town in 'Iraq and its port (pop. [est. 1938] 180,000).

The original city was founded by Caliph Omar in A.D. 636 at Zobeir, about 8 mi. from the modern town. Bassorah was famous in the time of Hārūn al-Rashīd but declined in importance with the decay of the Abbasid caliphs. As time went on the canals were neglected; and finally, as the silt accumulated, all communication with the Persian gulf was cut off. The town was taken by the Turks in 1668 and later underwent many changes of fortune till, finally during World War I, Basra once more came to its own as the port whereby communication was kept up between Mesopotamia and India. Many improvements were effected, and both town and port grew in importance.

Position and Geographical Relations.—The town lies near the western bank of the Shatt-al-Arab (*q.v.*) in long. 47° 51′ E. and lat. 30° 28′ N., the actual port being about 75 mi. from the Persian gulf. It is connected with Baghdad by a railway running along the Euphrates and by the Tigris, the Euphrates being navigable only in stretches. Of the ocean-going steamers which proceed up the Shatt-al-Arab only about a third reach Basra, the remainder stopping at Abadan some 35 mi. away. The growth of the deltaic region of the rivers has been continuously threatening Basra, as in former days Eridu was threatened; but engineering works at the Fao bar have, however, at least for a time assured the continuance of the port. There is now 17 ft. of water at low tide and over 26 ft. at high.

Basra is the main port for the export of dates, chiefly produced in the Shatt-al-Arab floodland. Besides dates, barley, wool and wheat are exported. In 1939–40, 251 vessels of a gross registered tonnage of 1,259,686 tons entered the port of Basra.

Basra is important in commercial aviation, as it lies on the air line from Europe to India; it is also one of the links in the Imperial wireless chain, and is in touch with Cairo. Much attention has been paid to the health of the city, which now possesses a well equipped hospital (the Maude Memorial hospital), and some progress has been made in rebuilding and paving the town and also in carrying out a survey of the neighbourhood. In World War II it was the scene of brief fighting during the axis-inspired 'Iraqi rebellion of April–May 1941. German officers attempted unsuccessfully to organize 'Iraqi troops for an assault on Basra. The British fleet occupied strategic points on the Persian gulf and landed Imperial troops who moved north to capture the port.

See besides the general works of reference and the annual Colonial office reports, F. E. Crow, *The Cultivation of Dates in Mesopotamia.*

(L. H. D. B.; X.)

BAS-RHIN, a department of eastern France, formed originally after the French Revolution and resuscitated in 1919. Pop. (1936) 711,830. From the war of 1870–71 until World War I it was included in the German imperial territory of Alsace-Lorraine (*q.v.*), of which it formed the northeastern portion. It is bounded on the east by the Rhine, which runs in a general north-northeasterly direction, north by the Bavarian Palatinate, northwest by the department of Moselle, west by that of Vosges and south by that of Haut-Rhin. The Rhine is joined within the department by the Ill, which follows a long northward course parallel to the main river and is joined at Strasbourg by the Bruche, the fertile valley of which cuts to the west of the Hochfeld *massif* (3,602 ft.) in the southwest corner of the department. Beyond Saverne, the Zorn comes in from Moselle, and flows east until joined by the Moder, when it turns northeast parallel to the Rhine before joining it.

A similar tendency is to be seen in the lower course of the Sauer which rises over the northern border in the Palatinate. Here also rises the Lauter, which forms the northern frontier for some twelve miles. Structurally the area is best understood as part of Alsace, the region between the Vosges and the Rhine, with this important point of difference from Haut-Rhin—that the hills to the west, and with them the boundary, are nothing like so definite. From the southwest corner at Saales, it is true, the steep wooded flanks of ancient hills that form a prolongation of the Vosges reach heights of over 3,281 ft. (as in the Donon), but beyond the Zorn valley begins the broken country which constitutes the northwestern portion of the department, including the rectangular lobe which it pushes west to embrace a portion of the upper Saar valley.

Historically this region, with its heavily forested Triassic sandstones, has ranked as a thinly peopled "zone of difficulty"; and the importance of the pass by Saverne to Lorraine was therefore greatly enhanced.

A wide strip between the hills and the Rhine is composed of rich alluvial soils, with fertile stretches of *loess* (Kochersberg) between Saverne and Strasbourg. Notably the ancient thoroughfare from Bavaria around the north of the Black Forest finds its natural end here in the patches of loess, the last of a long series from Central Europe.

Population is densest in and about Strasbourg which, with its unique system of canals, is the great industrial, commercial, educational and administrative centre of the department: it is scantiest in the Forest of Haguenau, in the Vosges and along the northwest border.

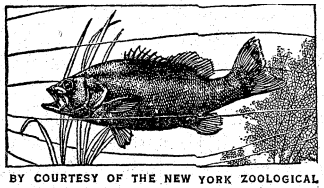
Strasbourg (*q.v.*) derives its importance from its site at the natural limit of Rhine navigation (though it lies west of that river, on the Ill) and within reach of the historic routes to Lorraine and the Paris Basin. The Col de Saverne concentrates canal, road and rail traffic along this line. To the north the Moder valley carries the railway from Haguenau to the Saar. The Rhine is followed, though at a distance of from 2–5 mi., by the main line to Mannheim, with branches to Haguenau and Karlsruhe.

Most of the towns of the department are either on the plain or at the edge of the hills, but all are dwarfed by the capital. Strasbourg had 192,680 inhabitants in 1936; other chief towns are Schiltigheim (21,998), Haguenau (20,629), Bischheim (11,054), Sélestat (10,163), Bischwiller (8,248) and Saverne (9,006). The department is divided into 8 arrondissements, 35 cantons and 562 communes. The area is 1,354 sq.mi.; pop. (1936) 711,830.

BASS, the name of a family of English brewers. The founder of the firm, William Bass (b. 1720), was originally a carrier, who, seeing the growing demand for Burton beer, started in 1777 as a brewer himself. The principal market for Burton beer at that time was in St. Petersburg [Leningrad], but in 1822 the Russian government placed a prohibitory duty on Burton ales, and the brewers were forced into cultivating the home market. William Bass opened up a connection with London, and established a fairly profitable home trade. A misunderstanding between the East India company and the London brewers who were the proprietors of Hodgson's India pale ale, at that time the standard drink of the Englishmen in the east, resulted in Bass being asked to supply a beer which would withstand the Indian climate and be generally suitable to the Indian market. After a series of experiments he produced what is still known as Bass's pale ale. This new and lighter beer at once became popular all over India, and Bass's firm became the largest in Burton. After William Bass's death the business was carried on by his son, M. T. Bass, and then by his grandson, Michael Thomas Bass (1799–1884). In 1827 a vessel laden with Bass's beer was wrecked in the Irish channel. A large proportion of the cargo was, however, salved and sold at Liverpool, where it met with great approval in the local market, and through this chance circumstance the firm opened up a regular trade in the northwest of England and Ireland. "Bass" was, however, little drunk in London till 1851, when it was supplied

on draught at the Exhibition of that year, since which time its reputation has been world-wide. In 1880 the business was turned into a limited liability company. On the death of Michael Thomas Bass, who was a man of great public spirit, the control of the firm passed to his sons, Michael Arthur Bass and Hamar Bass (d. 1898). Michael Arthur Bass (1837–1909), after 21 years in parliament as member first for Stafford, then for two divisions of Staffordshire, was in 1886 raised to the peerage as Baron Burton, the peerage descending to his daughter Nellie (Mrs. J. E. Baillie), Baroness Burton.

BASS (*Morone labrax*), a fish of the sea-perch family (Serranidae) found in the Mediterranean and on the Atlantic coasts of Europe. It is a silvery, blue-backed fish, with a strong spinous dorsal fin; it grows to 3 ft. in length. Bass swim in shoals near the coasts and often ascend rivers. There are four American species of *Morone*, and the name bass is also given in America to other sea-perches, as well as to the black bass (*Micropterus*) and other highly prized fresh-water game fishes of the family Centrarchidae.



BY COURTESY OF THE NEW YORK ZOOLOGICAL SOCIETY
THE SMALL-MOUTHED BLACK BASS (MICROPTERUS DOLOMIEU)

BASS (the same word as "base" and so pronounced, but influenced in spelling by the Ital. *basso*), deep, low, especially in music, the lowest part in the harmony of a composition, the lowest male voice, or the lowest-pitched of a class of instruments, as the bass-clarinet.

Bass or bast (a word of doubtful origin, pronounced *băs*) is the fibrous bark of the lime-tree, used in gardening for tying up plants, or to make mats, soft plaited baskets, etc. Basswood is the American lime-tree, *Tilia americana* (*see* BASSWOOD).

BASSA, district of Northern Nigeria, occupying the angle made by the meeting of the Benue river with the Niger. It lies south of the Benue and east of the Niger. It is heavily forested, and has not been penetrated by Moslem influence. The Bassas are a remarkable pagan race who are to be found in small colonies in almost every province of Northern Nigeria. They are clever agriculturists, naturally peaceful and industrious. Other tribes of the district, the Munshi and the Okpoto, are of a turbulent and warlike disposition. In 1903 the murder of the British resident led to punitive measures, and finally to the full establishment of British authority and the suppression of the slave trade. At first a separate province, Bassa is now part of Kabba province.

BASSANO, JACOPO, or **GIACOMO DA PONTE,** (1510–1592), Venetian genre painter, was born at Bassano in 1510, and died there on Feb. 13, 1592. He was first a pupil of his father, Francesco da Ponte, then of Bonifazio Veneziano in Venice, a follower of the school of Titian. His subjects were generally peasants and villages, cattle and landscape, with some portraits and historical subjects. One of his earliest subjects was "Samson slaying the Philistines"; the remains of this fresco can still be seen on the outside of the Casa Michieli, Venice; he painted portraits of Sebastiano Venerio Doge of Venice, Tasso, Ariosto, etc. His genuine works are somewhat rare and valuable, many of those which are called originals being copies either by his sons or by others. Bassano's style varied considerably during his lifetime; at first his style was modelled on his father's, and he was then strongly influenced by Titian before he developed his own characteristic manner. Although he painted few great pictures, his altar-piece of the Nativity at Bassano is estimated highly by the best judges, and in Lanzi's opinion is the finest work of its class. One of his best pictures is the "Good Samaritan" in the National Gallery, London, where there is also "A Portrait of a Gentleman," and "Christ Driving the Money Changers out of the Temple." There are also pictures by him at Dublin, Florence, Milan, Naples, in the Louvre and at Venice. His four sons were all painters, and assisted their father: Francesco (1543–91); Giovanni Battista (1553–1613); Leandro (1558–1623), and Girolamo (1540–1622). Pictures by Leandro are at Dresden, Dublin, Madrid, Munich and Venice.

See Hadeln Detle van Baron, *Über die zweite Manier des Jacobo Bassano* (1914).

BASSANO DEL GRAPPA, town of Venetia, Italy, province of Vicenza, 24 mi. N.E. of Vicenza and 30 mi. N. of Padua, at the foot of the Venetian Alps. Pop. (1936), town 11,774, commune 21,750. The Brenta is here spanned by a covered wooden bridge, and commands fine views. The 13th century castle of the Ezzelini (of German origin) stands above the river with a tower, erected by one of the family. The museum and cathedral and some churches contain pictures by the da Ponte family (16th and early 17th centuries) surnamed Bassano from their birthplace; Jacopo is the most eminent of them. The museum also contains drawings and letters of the sculptor Antonio Canova. The church of S. Francesco shows remains of 12th century Lombard Romanesque and 13th century Gothic architecture. Some houses have traces of paintings on the façades. Bassano is first mentioned as a village in a document of 1085, and as a "castello" (fortified place) in 1175. At the beginning of the 15th century, it went over to Venice and its printing-press and manufacture of majolica flourished; the latter still continues.

See G. Gerola, *Bassano* (Arti Grafiche, Bergamo, 1910)—well illustrated.

The town was the scene of a battle won by the French Army of Italy under Napoleon Bonaparte against the Austrians under Marshal Wurmser on Sept. 8, 1796. At the end of August Bonaparte decided to attack the Austrians, who after their defeat at Castiglione delle Stiviere (*q.v.*) had withdrawn into Tirol, and were preparing for a new offensive to relieve Mantua. Collecting 30,000 men, he defeated their right wing, occupied Trent, and turning eastwards into the upper Brenta valley, came down on to the rear of Wurmser just as the latter was concentrating his centre at Bassano and pushing forward his left towards the middle Adige. The scattered Austrian detachments were defeated in a series of combats, and on Sept. 8 the French, advancing down the valley with Masséna on the left bank of the Brenta and Augereau on the right bank, in all 15,000 men, found the main enemy army, 11,000 strong, massed north of the town of Bassano, covered by advanced troops on either bank. These forward troops were rapidly driven in, and Masséna, pressing forward on their trail, seized the Brenta bridge and broke into the town, menacing the left and rear of the Austrian main position, which was being simultaneously attacked in front by Augereau. Wurmser was driven back in disorder to the south, losing 3,000 prisoners and 35 guns, and, his line of retreat to Trieste being cut, had no other recourse but to recross the lower Brenta and throw himself, with the remnant of his army, into Mantua. Here he was at once attacked and shut in, only a few thousand men, who had succeeded in escaping eastward from the battlefield, remaining in the open field. The addition of Wurmser's forces to the garrison of Mantua merely increased the drain on the limited supplies in the fortress, and the Austrians were compelled to collect a new army for its relief. (*See* further FRENCH REVOLUTIONARY WARS.)

BASSARAB or **BASSARABA,** the name of a dynasty in Rumania which ruled Walachia from the dawn of its history until 1658. The origin of the name and family has not yet been explained. It undoubtedly stands in close connection with the name of the province of Bessarabia, which oriental chroniclers gave in olden times to the whole of Walachia. The heraldic sign, three heads of negroes in the Bassarab shield, seems to be of late western origin and to rest on a popular etymology connecting the second half of the word with Arabs, who were taken to signify Moors (blacks). The other heraldic signs, the crescent and the star, have evidently been added on the same supposition of an oriental origin of the family. The Serbian chroniclers connect its origin with their own nationality, basing this view upon the identification of Sarab with *Sorb* or *Serbia.* All this is mere conjecture. It is, however, a fact that the first appearance of the Bassarabs as rulers (*knyaz, ban* or *voivod*) is in the western part of Rumania (originally called Little Walachia), and also in the southern parts of Transylvania—the old dukedoms of Fogarash and Almash, which are situated on the right bank of the Olt (Aluta) and extend south to Severin and Craiova. Whatever the

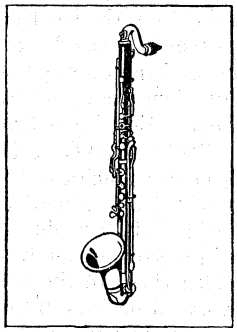
origin of the Bassarabs may be, the foundation of the Walachian principality is undoubtedly connected with a member of that family who, according to tradition, came from Transylvania and settled first in Câmpulung and Tîrgovishtea. It is equally certain that almost every one of the long line of princes and voivods bore a Slavonic surname, perhaps due to the influence of the Slavonic Church, to which the Rumanians belonged. Starting from the 13th century, the Bassarabs soon split into two rival factions, known in history as the descendants of the two brothers Dan and Dragul. The form Drakul—devil—by which this line is known in history is no doubt a nickname given by the rival line. It has fastened on the family on account of the cruelties perpetrated by Vlad Drakul (1433–46) and Vlad Tsepesh (1456–76), who figure in popular legend as representatives of the most fiendish cruelty. The feud between the rival dynasties lasted from the beginning of the 15th century to the beginning of the 17th.

The most prominent members of the family were Mircea (1386–1418), who accepted Turkish suzerainty; Neagoe, the founder of the famous cathedral at Curtea de Argeș (*q.v.*); Michael, surnamed the Brave (1592–1601); and Petru Cercel, famous for his profound learning, who spoke 12 languages and carried on friendly correspondence with the greater scholars and poets of Italy. He was drowned by the Turks in Constantinople in 1590 through the intrigues of Mihnea, who succeeded him on the throne of Walachia. The British Museum possesses the oldest mss. of the Rumanian Gospels, once owned by this Petru Cercel, and containing his autograph signature. The text was published by Dr. M. Gaster at the expense of the Rumanian government. Mateiu Bassarab (1633–54) established the first printing-press in Rumania, and under his influence the first code of laws was compiled and published in Bucharest in 1654. The Bassarab dynasty became extinct with Constantine Sherban in 1658. (*See* RUMANIAN LANGUAGE AND LITERATURE.) (M. G.)

BASSARI, a west African tribe, well-set-up, prognathous, patrilineal, animistic people of medium stature, living in the Bassari district, northern Togoland. Their language is related to Losso. They have head chiefs and village chiefs taken from among the notables. The extended family group embraces several households living together. Land is held in common with individual ownership of personal property. They are cultivators and cattle-raisers, and employ neighbouring Fulani families as herdsmen.

See Klose, *Togo unter deutscher Flagge* (1899).

BASS CLARINET is practically the A, B♭, or C clarinet speaking an octave lower; what therefore has been said concerning the fingering, transposition, acoustic properties, and general history of the clarinet (*q.v.*) also applies to the bass clarinet. Owing to its greater length the form of the bass clarinet differs from that of the other clarinets in that the bell joint is bent up in front of the instrument, terminating in a large gloxinia-shaped bell, and that the mouthpiece is attached by means of a strong ligature and screws to a serpent-shaped crook of brass or silver.



BY COURTESY OF MESSRS. BOOSEY AND CO. LTD., LONDON
THE BASS CLARINET, USED IN ORCHESTRATION SINCE THE YEAR 1838

The quality of tone is less reedy in the bass clarinet than in the higher instruments. It resembles the bourdon stop on the organ, and in the lowest register, more especially, the tone is somewhat hollow and wanting in power, although it is, curiously enough, mellower than that of the bassoon.

The low pitch of the bass clarinet (8ft. tone) contrasted with the moderate length of the instrument—the bore of which measures only some 42 to 43in. from mouthpiece to bell, whereas that of the bassoon, an instrument of the same pitch, is twice that length—is a puzzle to many. An explanation of the fact is to be found in the peculiar acoustic properties of the cylindrical tube played by means of a reed mouthpiece characterizing the clarinet family, which acts as a closed pipe, speaking an octave lower than an open pipe of the same length, and overblowing a twelfth instead of an octave.

The origin of the bass clarinet must be sought in Germany where Heinrich Grenser of Dresden, one of the most famous instrument-makers of his day, made the first bass clarinet in 1793, which was subsequently developed by Adolphe Sax and others into the instrument as we know it to-day.

The bass clarinet made its first appearance in opera in 1836 in Meyerbeer's *Huguenots,* act v, where in a fine passage the lower register of the instrument is displayed to advantage, and later in *Dinorah.* Two years later (1838), at the theatre of Modena, a bass clarinet, by P. Maino of Milan, differing in construction from the Sax model, was independently introduced into the orchestra. Wagner employed the bass clarinet in *Tristan und Isolde,* where, at the end of act ii, it is used with great effect to characterize the reproachful utterances of King Mark.

BASSEIN, a district and town in the Irrawaddy division of Lower Burma, India. The district was reduced to 4,145 sq.mi., from 8,954 sq.mi. in 1871, having given up a large tract to the district of Myaungmya formed in 1896. The eastern half of the district lies in the Irrawaddy delta but the western half is formed by the southern portion of the Arakan Yomas and extends to the western or Arakan coast. The principal river is the Bassein, the westernmost distributary of the Irrawaddy. In 1941 the population of the district was 664,724, and of the town about 50,000.

Bassein, the chief town and port, is the administrative centre of the district and division, and is situated on the eastern bank of the Bassein river. It fell before the British arms in May 1852, during the 2nd Burmese War, and now forms an important seat of the rice trade with several steam rice mills and has great capabilities from a mercantile point of view. Though there are several dangerous bends in the river, it is navigable up to Bassein by liners up to 10,000 tons. The vessels of the Irrawaddy Flotilla company ply between Rangoon and Bassein, etc., by inland waters, and a railway opened in 1903 runs north-eastward through the centre of the district to Henzada and Letpadan.

BASSELIN, OLIVIER (*c.* 1400–*c.* 1450), traditionally regarded as the author of a number of French drinking songs, was born in the Val-de-Vire in Normandy. He was by occupation a fuller. His drinking songs became famous under the name of Vaux-de-Vire, corrupted in modern times into "vaudeville." Basselin appears to have been killed in the English wars about the middle of the century, possibly at the battle of Formigny (1450). Early in the 17th century a collection of songs was published by a Norman lawyer, Jean le Houx, purporting to be the work of Olivier Basselin, but probably his own work.

It has been suggested that Basselin's name may be safely connected with some songs preserved in the *Bibliothèque Nationale* at Paris, and published at Caen in 1866 by M. Armand Gaste. The question is discussed in M. V. Patard's *La Vérité dans la question Olivier Basselin et Jean le Houx à propos du Vau-de-Vire* (1897). A. Gasté's edition (1875) of the *Vaux-de-Vire* was translated (1885) by J. P. Muirhead.

BASSERMANN, ERNST (1854–1917), German politician and leader of the National Liberal party, was born on June 26, 1854 at Wolsag in the Black Forest. He began his career in 1880 as a lawyer at Mannheim. From 1886 to 1892 he was deputy in the Baden Diet, and from 1893, with brief interruptions, a member of the *Reichstag.* In 1905 he became president of the National Liberal party. He died on July 17, 1917 at Mannheim.

BASSES-ALPES, a department of south-eastern France, formed in 1790 out of the northern portion of Provence. It is bounded on the north by the department of Hautes Alpes, east by Italy and Alpes Maritimes, south by Var and west by Vaucluse and Drôme. Area, about 2,698 sq.mi.; pop. (1936) 85,090. It is a poor and hilly region, the highest summits (*e.g.,* the Aiguille de Chambeyron, 11,155 ft.) rising round the upper Ubaye in the extreme north. Only a small portion of the Durance valley, which crosses the west of the department, is under 1,000 ft. Its chief tributaries are the Ubaye, Bléone, Asse and Verdon. The system of folds west of the Durance has an east-to-west trend, and is older than the true Alpine ridges which run north-to-south until they reach the extreme south of the department towards Moustiers, where they bend sharply eastwards between the old crystalline

massifs of Mercantour and Estérel. From near the head of the Ubaye valley, the Col de l'Argentière (6,545 ft.) gives access from Barcelonnette to Cuneo, in Italy. There are three arrondissements (Digne, Barcelonnette and Forcalquier), 30 cantons and 246 communes. The department forms the bishopric of Digne in the ecclesiastical province of Aix-en-Provence. Communications are severely limited by natural conditions; the main railway line from Grenoble to Avignon runs through the west of the department along the Durance from Sisteron to Manosque and has branch lines westward to Forcalquier and eastward to the valley of the Var through Digne. The mountain pastures have been much damaged by the Provençal shepherds to whom they are let out, while the forests have been greatly thinned, though extensive reafforestation is now being carried out. Population has seriously declined in recent years, but industries are reviving with the application of hydroelectric power to industry; and the tourist trade is an additional source of income to the local population.

BASSES-PYRÉNÉES, the extreme southwest department of France, bounded on the north by Landes and Gers, east by Hautes-Pyrénées, south by Spain and west by the sea. Area 2,977 sq.mi. Pop. (1936) 413,411. The Pyrenean crestline as elsewhere generally bounds Spain but there are important fortified passes, notably that of Somport and the historic one of Roncevaux (*see* RONCESVALLES) control of which was the strength of the mediaeval kingdom of Navarre. The peaks rise from Rhune (2,950 ft.) eastward to Mourrons (9,760 ft.). The whole of the Nive, Bidouze and the lower part of Gave de Pau, southern feeders of the Adour river, are in the department, with deep valleys among the mountains broadening out toward the northwest. The Adour below its junction with the large glacier-fed Gave de Pau is tidal and navigable and forms the boundary of the department. To the north of the complex rock systems of the Pyrenean axis the department is largely floored in the west by calcareous rock, but from the outlet of the great Gave de Pau from the mountains (at Lourdes, Hautes-Pyrénées), as well as from the similar outlet of the Adour farther east, a huge mass of mud and boulders has spread fanwise and is drained by radial streams. Beyond this fan is a sandy area.

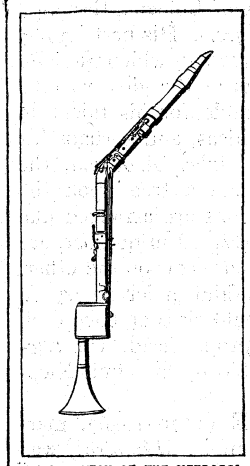
The ancient Basque tongue still survives west of Oloron and Tardets with distribution determined by the passes of Roncevaux and the Bidassoa, and this region is also marked by its farmhouses with windows and frontage under the gable which has one side of the roof very long to cover the barn and stable, small because the animals can remain out. In Béarn on the other hand we have the courtyard-farm near the Gaves, and poorer cottages, transitional to the Basque type, on the hills. Mild rainy weather specially marks the Basque country, the rain continuing in spring. The climate promotes stock raising, but maize, wheat, potatoes and flax are grown, also apples, pears, chestnuts and vegetables and some vines in the less moist east, in shelter near Pau. Woods are numerous. Besides determining the agricultural interests the climate has created a tourist interest. Pau is a famous health resort and many visitors winter at St. Jean-de-Luz or Biarritz on the coast. There are also mineral springs at Eaux-Bonnes, Eaux-Chaudes, Cambo-les-Bains, St. Christau and Salies.

The department has three arrondissements, Pau with capital at Pau (*q.v.*) which is also the departmental capital; Bayonne with capital of that name (*q.v.*), the diocesan centre and chief port; and Oloron with capital at Oloron-Sainte-Marie (*q.v.*). Biarritz, Orthez, Eaux-Bonnes and St. Jean-de-Luz (*q.q.v.*) are other towns. St. Jean-Pied-de-Port (pop. 1,284), the historic fortress at the foot of the pass or "port" de Roncevaux, founded in the 11th century, was the capital of French Navarre until the Revolution. It is on the *Route des Pyrénées*. The department belongs to the educational region of Bordeaux and is part of the region of the 18th army corps.

Fisheries have some importance and Bayonne exports pit-props and timber products from the Landes, etc., and minerals such as salt from the hills, and it imports coal, fertilizers, etc. Le Boucau near Bayonne has chemical and metallurgical works whose output is increasing.

BASSET or **BASSETTE,** a French game of cards now obsolete, played by five persons with a pack of 52 cards. It resembles lansquenet, in that it is played between a banker and several punters, the players winning or losing according as cards turned up match those already exposed or not.

BASSET HORN, a wood-wind instrument, which is not really a horn but a member of the clarinet family, of which it is the tenor. It consists of a nearly cylindrical tube of wood (generally cocus or box-wood), having a cylindrical bore and terminating in a metal bell wider than that of the clarinet. The basset horn has the same fingering as the clarinet, and corresponds to the tenor of that instrument, being pitched a fifth below the clarinet in C.



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

AN EARLY MODEL OF THE BASSET HORN

This instrument is not a horn but a member of the clarinet family. It derives its misleading name from a clarinet maker named Horn, its inventor

Among the great masters, Mozart seems to have been particularly appreciative of this beautiful instrument which he employed in his *Requiem,* in the opera *La Clemenza di Tito,* in *Zauberflöte,* and elsewhere. Beethoven used it in his *Prometheus* overture and Richard Strauss employs it in *Die Frau ohne Schatten.*

The invention of the basset horn in 1770 is ascribed to a clarinet maker of Passau, named Horn—whence the instrument derived its misleading name.

BASSETT, JOHN SPENCER (1867–1928), American historian, was born in Tarboro, N.C., on Sept. 10, 1867. He graduated at Trinity college, now Duke university, in 1888 and received the degree of doctor of philosophy at Johns Hopkins in 1894. In 1893 he began teaching history in Trinity college, continuing there until 1906. He then became professor of history in Smith college, and served in that chair until his death, which occurred in Washington, D.C., on Jan. 27, 1928. An active student of American history, he edited many historical documents including correspondence, and wrote numerous books on historical and biographical subjects. His earlier writings deal chiefly with the history of North Carolina. Among his works are *The Federalist System* (1905), *Life of Andrew Jackson* (1911), *The Plain Story of American History* (1915), *The Middle Group of American Historians* (1917), *The Lost Fruits of Waterloo* (1918), *Our War With Germany* (1919), *Expansion and Reform* (1926), *The Writing of History,* with J. J. Jusserand, W. C. Abbott and C. W. Colby (1926) and *The League of Nations* (1928).

BASSI, LAURA MARIA CATERINA (1711–1778), Italian scholar, was born at Bologna, married in 1738 Giuseppe Verrati, and left several children. She lectured on experimental philosophy at Bologna for many years, and corresponded with learned men in many countries.

BASSI, UGO (1800–1849), Italian patriot, was born in Cento, and received his early education at Bologna. An unhappy love affair induced him to become a novice in the Barnabite order when 18 years old. He entered on his ministry in 1833 and became famous as a preacher, his sermons attracting large crowds. In 1848, when Pope Pius IX. still appeared to be a Liberal and an Italian patriot, Bassi joined General Durando's papal force to protect the frontiers as army chaplain. After the pope's flight from Rome and the proclamation of the Roman republic, Bassi took part with Garibaldi's forces against the French troops sent to re-establish the temporal power. He exposed his life many times while tending the wounded under fire, and when Garibaldi was forced to leave Rome the faithful monk followed him. When the legion broke up, Bassi and a fellow-Garibaldian, Count Livraghi, after endless hardships were captured near Comacchio. On being brought before the papal governor, Bassi said: "I am guilty of no crime save that of being an Italian like yourself. I have risked my life for Italy, and your duty is to do good to those who have suffered for her." The governor gave them over

to an Austrian officer; they were falsely charged before a court-martial with having been found with arms in their hands, and shot on Aug. 8, 1849. Bassi is one of the most beautiful figures of the Italian revolution, a gentle unselfish soul, who, although unusually gifted and accomplished, had an almost childlike nature.

Countess Martinengo, *Italian Characters* (2nd ed., 1901); Zironi, *Vita del Padre Ugo Bassi* (Bologna, 1879).

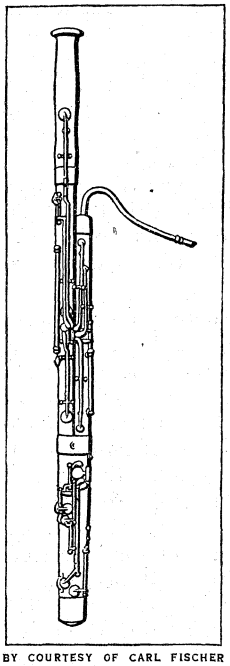
BASSIANUS, JOANNES, Italian jurist of the 12th century, is said by Corolus de Tocco to have been a native of Cremona. He was a professor in the law school of Bologna, the pupil of Bulgarus (*q.v.*) and the master of Azo (*q.v.*). His best known extant treatise is the *Summary on the Authentica,* which Savigny regarded as one of the most precious works of the gloss-writers. Joannes, generally so termed, was remarkable for his talent in inventing ingenious forms to set forth his ideas, and perhaps his most celebrated work is his "Law-Tree," *Arbor Arborum,* the subject of many commentaries. It presents a tree upon the branches of which the various kinds of actions are arranged like fruit. The civil actions, or *actiones stricti juris,* 48 in number, are on one side, the equitable or *praetorian* actions, 121, on the other. A further division of actions was made by him under 12 heads, and by a system of notation the student could class at once each of the civil or praetorian actions under its proper head. His *Lectures on the Pandects* and the *Code,* collected by his pupil Nicolaus Furiosus, have perished.

BASSOMPIERRE, FRANÇOIS DE (1579–1646), marshal of France and the author of some famous *Mémoires,* was born at the Castle of Harrouel in Lorraine on April 12 1579. He was introduced at the court of Henry IV. in 1598, and became a great favourite with the king. He fought in the campaign in Savoy (1600) with the emperor against the Turks (1603), with Louis XIII. against the supporters of Marie de' Medici at Ponts-de-Cé (1620), and against the Huguenots at La Rochelle (1628), and in Languedoc (1629). In 1629 he was made a marshal of France, and fought his last campaigns in Savoy (1629) and in Piedmont (1630). In the intervals of fighting he was engaged on various diplomatic missions: to Madrid in 1621 over the difficult question of the Valtelline fortresses, and to England in 1626 to secure the retention of Henrietta Maria's Catholic attendants. The personal influence of Henry IV. had deterred Bassompierre from a marriage with Charlotte de Montmorency, daughter of the constable Montmorency, afterwards princesse de Condé, and between 1614 and 1630 he was secretly married to Louise Marguerite, widow of François, prince de Conti, and through her became implicated in the plot to overthrow Richelieu on the "Day of Dupes," 1630. His share was only a slight one, but his wife was an intimate friend of Marie de' Medici, and her hostility to the cardinal aroused his suspicions. By Richelieu's orders, Bassompierre was arrested at Senlis Feb. 25, 1631 and put into the Bastille, where he remained until Richelieu's death in 1643. After his release he passed most of his time at the castle of Tillières in Normandy, until his death on Oct. 12, 1646. He left a son, François de la Tour, by the princesse de Conti, and an illegitimate son, Louis de Bassompierre, afterwards bishop of Saintes. His *Mémoires* were first published at Cologne in 1665. He also left an incomplete account of his embassies to Spain, Switzerland and England (Cologne, 1668), and a number of discourses upon various subjects.

The best edition of the *Mémoires* is that issued by the *Société de l'Histoire de France* (1877); *see* also G. Tallemant des Reaux, *Historiettes de la princesse de Conti, et du Maréchal de Bassompierre* (1854–1860).

BASSOON, a wood-wind instrument with double reed mouthpiece, a member of the oboe (*q.v.*) family, of which it is the bass. The German and Italian names of the instrument (*Fagott* and *fagotto*) were bestowed from a fancied resemblance to a bundle of sticks, the bassoon being the first instrument of the kind to be doubled back upon itself; its direct ancestor, the bass pommer, 6ft. in length, was quite straight. The English and French names refer to the pitch of the instrument as the bass of the wood-wind.

The bassoon is composed of five pieces, which, when fitted together, form a wooden tube about 8ft. long (93in.) with a conical bore tapering from a diameter of 1¾in. at the bell, to $\frac{3}{16}$ in. at the reed. The tube is doubled back upon itself, the shorter joint extending to about two-thirds of the length of the longer, whereby the height of the instrument is reduced to about 4ft. The holes are brought into a convenient position for the fingers by the device of boring them obliquely through the thickness of the wood of which the instrument is made.



BY COURTESY OF CARL FISCHER INC.

THE BASSOON, LONG FAVOURED BY COMPOSERS BECAUSE OF ITS WIDE RANGE AND CHARACTERISTIC TONE COLOUR

The performer holds the instrument in a diagonal position; the lower part of the tube played by the right hand resting against his right thigh, and the little bell, turned upwards, pointing over his left shoulder; a strap round the neck affords additional support. The notes are produced by means of seven holes and 16, 17 or 19 keys. The mechanism and fingering are very intricate. Theoretically the whole construction of the bassoon is imperfect and arbitrary, important acoustic principles being disregarded, but these mechanical defects only enhance its value as an artistic musical instrument. The player is obliged to rely very much on his ear in order to obtain a correct intonation, as next to the strings no instrument gives greater scope to the artist. The bassoon has an eight foot tone, the compass extending from B flat below the bass stave to F flat (second space) in the treble or by means of an additional mechanism to even F.

The bassoon has been a favourite with nearly all the great masters. Beethoven uses it largely in his symphonies, with everywhere for it independent parts of great originality. Bach, in his mass in B minor, has parts for two bassoons and both Mozart and Weber wrote concertos for the instrument, which on account of its very characteristic quality of tone has often been employed for comic effects and has been called on this account the humorist of the orchestra.

BASSO-RILIEVO, the term applied to sculpture in which the design projects but slightly from the plane of the background. The relief may not project at all from the original surface of the material, as in the sunken reliefs of the Egyptians, and may be nearly flat, as in the Panathenaic procession of the Parthenon. In the early 19th century the term *basso-rilievo,* or "low relief," came to be employed loosely for all forms of relief, the term *mezzo-rilievo* having already dropped out of general use. (*See* SCULPTURE TECHNIQUE: *Modelling, Practice.*)

BASS ROCK, THE, a small island in the Firth of Forth, about 1½m. from Canty bay, Haddingtonshire, Scotland, circular in shape, a mile in circumference, and 350 ft. high. Pop. (1931) 6.

On three sides the cliffs are precipitous, but they shelve towards the south-west landing. The Bass Rock is an intrusive volcanic mass of phonolitic trachyte or orthophyre like the eruptive masses of North Berwick Law and Traprain Law, but non-porphyritic. Sea-birds, chiefly gannets or solan geese haunt the rock in vast numbers. A lighthouse with a six-flash lantern of 39,000 candle-power was opened in 1902. For a considerable distance east and west there runs through the rock a tunnel, about 15ft. high, accessible at low water. St. Baldred, whose name has been given to several of the cliffs on the shore of the mainland, occupied a hermitage on the Bass, where he died in 756. In the 14th century the island became the property of the Lauders, called afterwards the Lauders of the Bass, from whom it was purchased in 1671 by the Government, and a castle erected in which many Covenanters were imprisoned. At the Revolution four young Jacobites captured the Rock, and having been reinforced by a few others, held it for King James from June 1691 to April 1694, only surrendering when threatened by starvation. Thus the island was the last place in Great Britain to submit to William III. Dismantled in

1701, the Bass passed into the ownership of Sir Hew Dalrymple, to whose family it belongs.

BASSUS, AUFIDIUS, a Roman historian (d. probably A.D. 60). His work, which began with the civil wars or the death of Caesar, was continued by the elder Pliny. The *Bellum Germanicum* of Bassus may have been either a separate work or a section of his general history. Some fragments on the death of Cicero are preserved in the *Suasoriae* of the elder Seneca (vi. 23), but hardly justify Seneca's praise of him.

See Pliny, *Nat. hist.*, praefatio, 20; Tacitus, *Dialogus de Oratoribus*, 23; Quintilian, *Instit.* x. i. 103.

BASSUS, CAESIUS, a Roman lyric poet, who lived in the reign of Nero. He was the friend of Persius, who dedicated his sixth satire to him, and whose works he edited (Schol. on Persius, vi. i.). He is said to have lost his life in the eruption of Vesuvius (79). He had a great reputation as a poet (Quintilian, *Instit.*, x. i. 96). He is also identified with the author of a treatise *De Metris*, of which considerable fragments are extant (ed. Keil, 1885). The work was probably originally in verse, and afterwards epitomized in prose form. A worthless account of some of the metres of Horace (in Keil, *Grammatici Latini*, vi. 305), entitled *Ars Caesii Bassi de Metris* is not by him, but borrowed from his treatise.

BASSUS, CASSIANUS, called SCHOLASTICUS, one of the *geoponici* or writers on agriculture, lived at the end of the 6th or beginning of the 7th century A.D. He compiled a collection of agricultural literature (*Geoponica*) afterwards revised by an unknown hand, and published about 950, in the reign of Constantine Porphyrogenitus, to whom the work has been ascribed. It contains a list of the authorities drawn upon, and the subjects treated are agriculture, birds, bees, horses, cattle, sheep, dogs, etc.

BIBLIOGRAPHY.—Needham (1704), Niclas (1781), Beckh (1895); *see* also Gemoll in *Berliner Studien*, i. (1884); Oder in *Rheinisches Museum*, xlv. (1890), xlviii. (1893) and De Raynal in *Annuaire de l'Assoc. pour l'Encouragement des Études grecques*, viii. (1874).

BASSUS, SALEIUS, Roman epic poet, in the reign of Vespasian. He is praised by Quintilian (*Instit.* x. 1. 90) and by one of the speakers in Tacitus' *Dialogus de Oratoribus* (5, 9). Vespasian relieved his poverty by a present of 500,000 sesterces. Nothing from his works has been preserved; the *Laus Pisonis*, which has been attributed to him, is probably by Titus Calpurnius Siculus (J. Held, *De Saleio Basso*, 1834).

BASSVILLE or **BASSEVILLE, NICOLAS JEAN HUGON DE** (1753–1793), French journalist and diplomatist, was born at Abbeville Feb. 7, 1753. At the outbreak of the Revolution he became editor of the *Mercure international*. Then, through the Girondist minister Lebrun-Tondu, he entered the diplomatic service, went in May, 1792, as secretary of legation to Naples and was shortly afterwards sent, without official status, to Rome. His conduct in Rome, reflecting as it did his extreme revolutionary views, enraged the Roman populace; a riot broke out on Jan. 13, 1793, and Bassville, who was driving with his family to the Corso, was dragged from his carriage and so roughly handled that he died. The responsibility for the murder was laid by the Convention on the pope. In 1797 by an article of the treaty of Tolentino the papal government agreed to pay 300 million francs to the French government as compensation. The poet Vincenzo Monti, in his epic *Bassvilliani*, described the soul of Bassville looking down on the revolutionary scene as a penance before entering Paradise.

Bassville wrote *Mémoires historiques, critiques et politiques sur la Révolution de France* (Paris 1790; English trans. London, 1790).

See F. Masson, *Les Diplomates de la Révolution* (1882); Silvagni, *La Corte e la Società romana nei secoli XVIII. e XIX.* (1881).

BASSWOOD, the name given to North American trees belonging to the genus *Tilia* (the limes of Europe); also called linden, linn and whitewood.

Tilia americana (*T. glabra*) is the most important American species and extends from New Brunswick to Lake Winnipeg and southward to Virginia and Missouri. It is very abundant in the Great Lakes region and furnishes about half of all the basswood lumber produced in the United States.

White basswood (*T. heterophylla*) and Georgia basswood (*T. georgiana*), two trees of southeastern United States, are also productive of valuable timber.

In 1940 the total cut of basswood lumber in the U.S.A. amounted to 116,980,000 ft. B.M.

(*See* LIME or LINDEN.) (E. S. HR.)

BASTAR, the 12th largest state of India, is in the Chhattisgarh subagency of the Eastern States agency. It has an area of 13,701 square miles and a population (1941) of 633,888, and is the southernmost tract of the province. Its boundaries on the east and south-east are the Jeypore Zamindari of the Vizagatam agency in Madras, on the west and south-west the Chanda district and the Nizam's territory, and, on the north, the Kanker state which divides it from the Chhattisgarh plain. Only 7% of the whole area is under cultivation, the villages being divided by large tracts of forest. The inhabitants are almost entirely aboriginals, Halbas, Gonds of various sections such as Marias, Murias and Parjas.

The state has many potentialities in respect of timber, forest produce, and probably minerals. A large portion on the east is elevated plateau with a fairly temperate climate, and near the eastern border is the capital, Jagdalpur (pop., 1941, 11,304). A good road connects this town with the railway at Dhamtari in the Raipur district.

The forests contain both *sal* and teak according to the nature of the country and climatic conditions. The chief crops are rice and small millets, and there has been much shifting cultivation to the great damage of forest areas, but there are still about 5,000 square miles of good forest.

The largest river of the state is the Indravati, which, entering the Eastern plateau from Jeypore crosses the whole of the state and becomes its western boundary for several miles before it joins the Godavari.

There are famous falls at Chitrakat (94 feet high) where the river leaves the plateau, which, if they were not so remote, would give promise of a fine water-power scheme.

There are roads connecting the plateau with Sironcha in the Chanda district and towards Jeypore on the east. Proposals have frequently been made for opening up the state by light railway, but with so sparse a population as 46 to the square mile, and with so little cultivation, the traffic, with the possible exception of timber, would be very small for many years to come. The state is divided by a high range running north to south known as the *Bailadila* (bullock's hump), and west of this range the country falls away into the Godavari valley. It is a wonderful country for big game.

BASTARD, a person born out of legal wedlock. Among the Romans, bastards were classified as *nothi*, children born in concubinage, and *spurii*, those not so born. Both classes had a right of succession to their mother, and the *nothi* were entitled to support from their father, but had no rights of inheritance from him. Both, however, had in other respects most of the rights of citizenship. The Germanic law was based upon an entirely different principle. It recognized as legitimate only those whose parents were of the same social rank. All others were regarded as bastards, and took the status of the parent of inferior rank.

The aim of all the Germanic codes was to preserve purity of race, not to improve morals, for incestuous unions are not censured. The influence of the Germanic law lasted throughout the early feudal period, and bastards were debarred rights of inheritance.

In the 13th century the influence of Roman law tended again to modify this severity. An exception was probably made in the case of those whose fathers were of royal blood, in which case it even seems that no stigma was attached to the accident of their birth, nor did they suffer from the usual disabilities as to inheritance which attended those of illegitimate birth (Gregory of Tours, v. 25). Among the Franks we find Theodoric I, a natural son of Clovis, sharing the kingdom with the legitimate sons; Zwentibold, natural son of Arnulf, was created king of

Lorraine by his father in 895; and even William the Conqueror actually assumed the appellation of bastard.

In English law a bastard still retains certain disabilities. His rights are only such as he can acquire; for civilly he can inherit nothing, being looked upon as the son of nobody, and sometimes called *filius nullius,* sometimes *filius populi.* This, however, does not hold as to moral purposes, *e.g.,* he cannot marry his mother or bastard sister. Yet he may gain a surname by reputation though he has none by inheritance. He has no right of succession to realty or personalty, and only legitimate descendants can succeed him on intestacy. Escheat being abolished by s. 45 of the Administration of Estates Act 1925, on intestacy the property would pass to the Crown as *bona vacantia* under s. 46.

For poor-law purposes, all legitimate children take the settlement of their father, but a bastard takes the settlement of its mother. The mother of an illegitimate child is entitled to its custody in preference to the father and under the guardianship of the Infants Act 1925, it is the consent of the mother that is required for the marriage of such a child. Consequently the responsibility of its support falls primarily on her. But the English law has always recognized the principle that to a certain extent the father must share in that responsibility. This, however, was imposed not with the idea of furnishing the woman with a civil remedy, nor to have a penal effect against the ma[illegible]ly to prevent the cost of maintenance of the b[illegible]ard child from falling upon the parish. Indeed, the legislation upon the subject, which dates back to 1576, was until 1845 an [illegible]timate part of the poor law. But by the Bastardy Act of 184[illegible] the mother was given an independent civil remedy against th[illegible] putative father, dissociating the parish altogether from the [illegible]roceedings. Subsequently, legislation gave the parish the righ[illegible] of attaching, and in some cases suing for, money due from t[illegible] putative father for the maintenance of the child. The existi[illegible] law is set out under AFFILIATION. Originally a bastard was [illegible]emed incapable of holy orders, and disqualified by the fact of [illegible]s birth from holding any dignity in the Church; but this d[illegible]rine is now obsolete, and in all other respects there is no [illegible]stinction between a bastard and another man.

According to the common law, which is the law of England, a bastard cannot be divested of his state of illegitimacy, unless by the supreme power of an act of parliament. And this has been indirectly done by statutes of which the Colonial Marriages (Deceased Wife's Sister) Act 1906 and the Deceased Wife's Sister's Act 1907 are examples. Again marriages, celebrated in buildings not duly authorized, have been declared valid by act of parliament; thus any children would be made legitimate by statute. In 1926, however, by the Legitimacy Act of that year, legitimation by subsequent marriage was first recognized in England. The statutory legitimation is, however, limited both as regards persons and property. (*See* LEGITIMACY AND LEGITIMATION; and, for statistics, ILLEGITIMACY.)

United States.—The general rule in the United States is that legitimacy is presumed upon the establishment of the birth of a child in wedlock, but this presumption may be overcome by proof of the husband's impotency, or his absence during the entire and natural course of pregnancy and birth, or satisfactory proof of the non-existence of sexual intercourse although present. The weight of authority in the United States holds that the non-existence of actual intercourse, and not the opportunity for intercourse, controls in rebutting the presumption favouring legitimacy. In the United States the severity of the common law rule that the issue of an illegal or void marriage was illegitimate has been abated by statute in certain cases, such as where one having a former wife or husband living remarried in good faith, being in ignorance of the existing impediment to his or her lawful marriage with any one, the statute declaring that the court may decree the issue to be the legitimate issue of the party capable of contracting the marriage.

BASTARNAE, the easternmost people of the Germanic race who were the first to come into contact with the ancient world and the Slavs. Originally settled in Galicia and the Bukovina, they appeared on the lower Danube about 200 B.C., and were used by Philip V. of Macedon against his Thracian neighbours. Defeated by these the Bastarnae returned north, leaving some of their number (hence called Peucini) settled on Peuce, an island in the Danube, and occupied the country between the eastern Carpathians and the Danube. As allies of Perseus and of Mithridates the Great, and lastly on their own account, they had hostile relations with the Romans who in the time of Augustus defeated them, and made a peace, which was disturbed by a series of incursions. In these, the Bastarnae after a time gave place to the Goths, with whom they seem to have amalgamated, and we last hear of them as transferred by the emperor Probus to the right bank of the Danube. Tacitus expressly declares their German origin, but says that the race was degraded by intermarriage with Sarmatians. No doubt they were an outpost of the Germans, and so had absorbed into themselves strong Getic, Celtic, and Sarmatian elements.

BASTI, a town and district of British India, in the Gorakhpur division of the United Provinces. The town, a collection of villages, is on the river Kuana, 40 mi. from Gorakhpur by railway. The population in 1941 was 23,893. The district, area 2,822 sq.mi., is one vast level plain, draining towards the south-east, and traversed by the Rapti, Kuana, Banganga, Masdih, Jamwar, Ami and Katneihia rivers. The rich alluvial tract between these streams, more or less subject to inundations, produces good crops of rice, wheat and barley; and there are some fine *jhils,* attaining almost the size of inland lakes. In 1941 the population was 2,185,641. A large transit trade is conducted with Nepal. The district exports rice, sugar and other agricultural produce.

BASTIA, largest city in Corsica, on the E. coast, 22 mi. S. of Cape Corse, northernmost point of the island. Pop. (1936) 44,329. Its prominence results from its nearness to mainland Italy and from its convenience as an outlet for the productive northern valleys of the island. The centre, *Terra Vecchia,* is the original fishing village, while the *Terra Nuova* lies to the south, and the modern town to the north. The settlement was renamed *Bastia* when the Genoese fortress was built by Lionello Lomellino in 1383. Under the Genoese it was the principal stronghold in the north, and the residence of the governor; and in 1553 it was attacked by the French. On the division of the island in 1797 into the departments of Golo and Liamone, Bastia remained the capital of the former; but at the reunion Ajaccio became capital. The city was taken by the English in 1745 and again in 1794. The densely populated commercial quarter of the old port has steep and narrow streets, and the modern quarter to the north lies round the new port. Its churches, of which the largest is San Giovanni Battista, are florid in decoration, as are the law-court, the theatre and the *hôtel-de-ville.* The citadel, which dominates the old port, has a 14th-century keep.

The chief exports are chestnut-extract for tanning, cedrates, citrons, oranges, early vegetables, fish, copper ore and antimony ore. Imports include coal, grain, flour and wine. Industry includes fishing (anchovies and coral), the manufacture of tobacco, oil-distilling, tanning, and the preparation of preserved citrons and of macaroni.

Not only is Bastia the main commercial centre of Corsica, it is also the seat of the law courts and of the military.

BASTIAN, ADOLF (1826–1905), German ethnologist. Educated as a physician, he early devoted himself to travel. From 1861 he travelled in the Far East for five years. Upon his return he commenced the publication of his great work on *The Peoples of Eastern Asia,* an immense storehouse of facts owing little to arrangement or style. He was later made professor of ethnology at the university of Berlin and keeper of the ethnological museum. He was president of the Berlin Anthropological Society and part founder of the German Africa Society of Berlin.

Later he undertook further scientific travels in Africa, South America and India, and the results of these explorations were published in a long series of separate papers comprising several on Buddhism and on the psychological problems presented by native superstitions. Bastian also edited the *Zeitschrift für Ethnologie* from 1869, in conjunction with Virchow and Robert von Hartmann.

His more important works are: *Der Mensch in der Geschichte* (1860); *Die Völker des östlichen Asien* (Jena, 1866–71); *Ethnologische Forschungen* (1871–73); *Die Kulturländer des alten Amerika* (1878); *Der Buddhismus in seiner Psychologie* (1881); *Indonesien* (1884); *Der Fetisch an der Küste Guineas* (1885); *Die mikronesischen Kolonien* (1899–1900); *Die wechselnden Phasen im geschichtlichen Sehkreis und ihre Rückwirkung auf die Völkerkunde* (1900).

BASTIAT, FRÉDÉRIC (1801–1850), French economist, was born June 29, 1801, at Mugron, near Bayonne, where he led the life of a country gentleman, becoming a *juge de paix* of his canton in 1831, and in 1832 a member of the *conseil général* of the Landes. Becoming interested in the English Anti-Corn-Law League against protection, he contributed to the *Journal des Économistes* in 1844 a number of articles on the subject, including the first series of his brilliant *Sophismes Économiques* and in 1845 visited Paris to superintend the publication of his *Cobden et la Ligue*. In 1846 he assisted in organizing at Bordeaux the first French Association pour la Liberté des Échanges and was made secretary of a similar association formed in Paris, where he carried on a vigorous propaganda for Free Trade.

The agitation was brought to an abrupt end by the Revolution of Feb. 1848, which made the socialistic and communistic principles, which had been gathering and spreading during the previous 30 years, temporarily supreme.

Bastiat was returned by the Landes to the constituent assembly of 1849 and the legislative assembly of 1849, but rarely spoke. His real work was done with his pen. He wrote in rapid succession a series of brilliant and effective pamphlets and essays, showing how socialism was connected with protection. Within the space of two years there appeared *Propriété et Loi, Justice et Fraternité, Propriété et Spoliation, L'État, Baccalauréat et Socialisme, Protectionisme et Communisme, Capital et Rente, Maudit Argent, Spoliation et Loi, Gratuité du Crédit,* and *Ce qu'on voit et ce qu'on ne voit pas.* He was meditating the composition of a work on economics. The first volume of this work, *Les Harmonies économiques* was published in the beginning of 1850. In the autumn ill-health drove him to Italy, and he died at Rome on Christmas Eve, 1850.

Bastiat was unrivalled in his exposure of economic fallacies, for he had extraordinary wit and logical power. Professor Edgeworth says (Palgrave's *Dictionary of Political Economy*) that "the opinion that Bastiat did not make any considerable contribution to abstract theory is not inconsistent with gratitude to him for having popularized (in the best sense of the term) the discoveries of his predecessors."

The first volume of his *Oeuvres complètes* (1881) contains an interesting *Memoir* by M. Paillottet; *see* also *Lettres d'un Habitant des Landes* (ed. Cheuvreux, 1870).

BASTIDE, JULES (1800–1879), French publicist and Carbonaro, took part in the revolution of 1830, and throughout the reign of Louis Philippe conducted a Republican agitation in the Press. In 1847 he founded the *Revue nationale* with the collaboration of P. J. Buchez (*q.v.*), whose supporter he had become. He was foreign minister of the Republic for a few months in 1848.

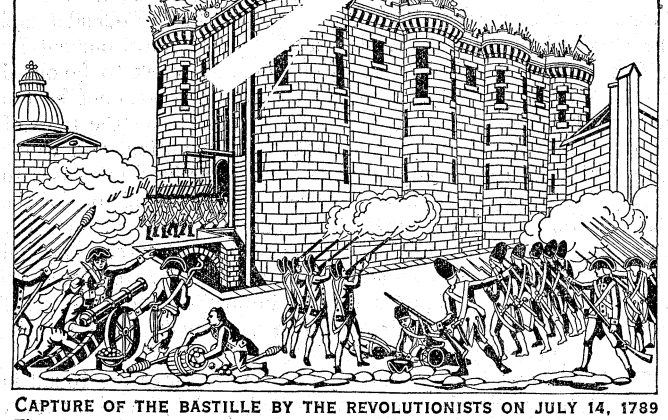
BASTIDE [Provençal *bastida,* building], an old military word for the fortified towns founded in south-western France in the middle ages, and corresponding to the *villes neuves* of northern France. They were established by the abbeys, the nobles and the crown, and were intended to serve as defensive posts for sparsely inhabited districts. They were built on a rectangular plan, with a large central square and with streets running at right angles or parallel to one another. A good example is the existing *bastide* of Monpazier (Dordogne) founded by the English in 1284. Mont-de-Marsan, the oldest of the bastides, was founded in 1141, and the movement for founding them lasted during the 12th, 13th and 14th centuries.

Bibliography.—*See* E. Ménault, *Les Villes Neuves, leur origine et leur influence dans le mouvement communal* (Paris, 1868); Curie-Seimbres, *Essai sur les villes fondées dans le sud-ouest de la France sous le nom de bastides* (Toulouse, 1880).

BASTIEN-LEPAGE, JULES (1848–1884), French painter of portraits and rustic subjects, was born in Damvillers, Meuse, France, of good peasant stock on Nov. 1, 1848, and died in Paris on Dec. 10, 1884. He went in 1867 to Paris to study under Cabanel, served in the campaign of 1870, and then returned to his Lorraine home, to paint in the open air. He was not the pioneer of the "plein air" school, but his brilliant work gave a great impetus to the movement. The fine portrait of his grandfather seated in the orchard of Damvillers, exhibited at the salon of 1874, made him famous. His "Annunciation to the Shepherds" (1878) failed to take the first place in the competition for the Prix de Rome, but one day a wreath of laurel was laid on it by Sarah Bernhardt. His small portrait of Sarah is one of the most famous of his pieces of characterization. The "Hayfield," now in the Luxembourg, exhibited in 1878, created a sensation as great as Millet's "Gleaners" had done. With it may be ranked his "Jeanne d'Arc" (Metropolitan Museum, New York), in which the Maid is represented as a true Lorraine peasant woman in the setting of a Lorraine farm. Among his more famous portraits are those of his friend and biographer A. Theuriet, and of Henry Irving (National Portrait Gallery, London). His studio in Paris was crowded with pupils, among them Marie Bashkirtseff. Between the young painter and the enthusiastic girl a great friendship sprang up. Both were stricken with disease, and both died in the autumn of 1884.

See A. Theuriet, *Bastien-Lepage* (1885; Eng. trans., 1892); Marie Bashkirtseff, *Journal intime* (1890); and Richard Muther, *The History of Modern Painting* (vol. iii.).

BASTILLE, originally any fortified building forming part of a system of defence or attack. The name, which is derived from the old French *bastir,* to build, was especially applied to several of the principal points in the ancient fortifications of Paris. In the reign of King John, or even earlier, the gate of Saint Antoine was flanked by two towers; and about 1369 Hugues Aubriot, at the command of Charles V., changed it into a regular bastille or fort by the addition of six others, the whole united by thick walls and surrounded by a ditch 25ft. wide. Extensions and alterations were afterwards effected; but the building remained substantially what it was made by the provost, a four-square gloomy structure, with eight towers. The ancient fortifications of the city were superseded, the use of the word bastille as a general designation died out, and it became restricted to the castle of St. Antoine. The building had originally a military purpose, and it appears as a fortress on several occasions in French history. When Charles VII. retook Paris from the English in 1436, his opponents in the city took refuge in the Bastille, but the want of provisions obliged them to capitulate. In 1588 the duke of Guise took possession of it, and soon afterwards shut up the whole *parlement* within its walls, for having refused their adherence to the League. When Henry IV. became master of Paris he committed the command of the Bastille to Sully, and there he deposited his treasures. On Jan. 13, 1649, the Bastille



CAPTURE OF THE BASTILLE BY THE REVOLUTIONISTS ON JULY 14, 1789
The above picture, reduced from a contemporary engraving, gives a highly idealized representation of the fall of the Bastille. The attacking forces were neither orderly nor for the most part uniformed

capitulated to the forces of the Fronde which, by the terms of the treaty made with the court in March, remained in possession of it till Oct. 21, 1651.

Very early, however, the Bastille was used for the custody of state prisoners, and it was ultimately more of a prison than a fortress. According to popular tradition the first who was incarcerated within its walls was the builder himself, Hugues Aubriot. It was not till the reign of Louis XIII. that it became recognized as a regular place of confinement; but from that time till its destruction it was frequently filled with men and women of every condition. Prisoners were detained without trial on *lettres de cachet* (*q.v.*)—often to satisfy personal animosities. But the most notorious use of the Bastille was to imprison those who criticized the government or persons in power. It was this which made it so hated and caused its capture by the revolutionary forces on July 14, 1789, to be regarded as symbolizing the downfall of despotism.

The treatment of prisoners in the Bastille varied greatly in different cases. The prisoners were divided into two main classes, those detained on grounds of precaution or by way of admonitory correction, and those who lay under presumption or proof of guilt. The former were subject to no investigation or judgment, and the length of their imprisonment depended on the will of the king; the latter were brought to trial in the ordinary courts or before special tribunals—though even in such cases as these it was possible for a man to grow old in the prison without being tried at all. Until convicted, the prisoner was registered in the king's name, and—except in the case of state prisoners of importance, who were often kept in absolute isolation—he enjoyed a certain degree of comfort and freedom. Visitors were admitted under restrictions; games were allowed, and, for a long time at least, exercise in open parts of the interior. Food was abundant and good, at least for the better class of prisoners. When the prisoner was convicted his name was transferred to the register of the "commission," and he became exposed to numerous hardships, and even barbarities, which, however, belonged not so much to the special organization of the Bastille as to the general system of criminal justice then in force.

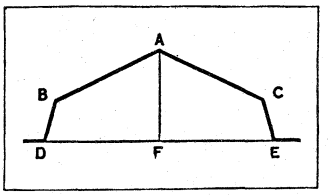
Among the more distinguished personages who were confined in this fortress during the reigns of Louis XIV., XV. and XVI., were the famous *Man of the Iron Mask* (*see* IRON MASK), Foucquet, the marshal Richelieu, Voltaire, Lally-Tollendal and the Cardinal de Rohan. While the system of imprisonment by *lettres de cachet*—which were often given in blank to favoured courtiers and sometimes even sold by Ministers—cannot be too strongly condemned, it is unnecessary to believe all the tales of horror which found currency during the Revolution, and which historical evidence tends to modify, and even in many cases to refute altogether. Much light has been shed on the history of the Bastille from its own records. These documents were flung out into the courts of the building by the revolutionary captors, and after suffering grievous diminution and damage were stored up and forgotten in the vaults of the library of the (so-called) Arsenal. Here they were discovered in 1840 by François Ravaisson, who edited them for publication.

At the time of its capture only seven prisoners were found in the Bastille, which, soon after, was razed to the ground by order of the new municipality of Paris. The site of the building is now marked by a column of bronze, dedicated to the memory of the patriots of July 1789 and 1830.

See the *Memoirs* of Linguet (1783), and Latude (ed. by Thierry, tome iii. 18mo, 1791–93); Delort, *Histoire de la détention des philosophes à la Bastille* (1829); François Ravaisson, *Les Archives de la Bastille* (1866–86); G. Lecocq, *La Prise de la Bastille* (1881); F. Bournon, *La Bastille* (1893); Fr. Funck-Brentano, *Les Lettres de cachet à Paris, étude suivie d'une liste des prisonniers de la Bastille* (1904).

BASTINADO, the European name for a form of punishment common in the East, especially in Turkey (formerly), Persia and China. It consists in blows with a light stick or lath of bamboo upon the soles of the feet or on the buttocks (*see* FLOGGING).

BASTION, a projecting work forming a part of a line of fortifications (through the Fr. from late Lat. *bastire,* to build), designed so as to bring flanking fire in front of the neighbouring bastions and along the curtain connecting them. In the following figure, A is the "salient" angle, AB and AC the "faces" of the bastion, BD and CE the "flanks." A "flat bastion" is one with a very obtuse salient angle. A "tower bastion" is a casemated tower built in bastion form. A "demi-bastion" is formed of half a bastion with a parapet from A-F.



BASIC PLAN OF A BASTION
The Bastion was an important feature of mediaeval fortifications. An explanation of the diagram is given above

BASTWICK, JOHN (1593–1654), English religious zealot, was born at Writtle, Essex, and after a brief education at Cambridge, wandered on the Continent and graduated in medicine at Padua. On his return he settled in Colchester. His celebrity rests on his strong opposition to the Roman Catholic ceremonial. About 1633 he printed in Holland two Latin treatises, entitled *Elenchus Religionis Papisticae,* and *Flagellum Pontificis et Episcoporum Latialium;* and as Laud and other English prelates thought themselves aimed at, he was fined £1,000 in the court of high commission, excommunicated and prohibited from practising physic; his books were burnt and the author consigned to prison. His counterblast was *Apologeticus ad Praesules Anglicanos,* and another book called *The Litany,* in which he exclaimed vehemently against the proceedings of the court, and charged the bishops with being the enemies of God and "the tail of the beast." William Prynne and Henry Burton coming under the lash of the Star-Chamber court at the same time, they were all censured as turbulent and seditious persons, and condemned to pay a fine of £5,000 each, to be set in the pillory, to lose their ears, and to undergo imprisonment for life in remote parts of the kingdom, Bastwick being sent to Scilly. The parliament in 1640 reversed these proceedings, and ordered Bastwick a reparation of £5,000 out of the estates of the commissioners and lords who had sentenced him. He joined the parliamentary army, but in later years showed bitter opposition to the Independents. He died in the latter part of 1654.

BASUTO: *see* SOTHO.

BASUTOLAND or **LESUTO,** a territory in southern Africa, under British protection, bounded by Natal, the Cape Province and the Orange Free State. It extends from 28° 35′ N. to 30° 30′ S. and from 27° E. to 29° 25′ E. The area is 11,716 sq.mi. About one-fifth lies at an altitude of about 5,000 ft.

Structure and Topography.—The country consists of horizontal beds of the Stormberg, or highest, series of the Karroo system. These are divided again into Molteno beds, the Red beds, the Cave Sandstone and the Drakenberg Volcanics, the first mentioned being the oldest and therefore the lowest. The volcanic beds attain a maximum thickness of about 4,500 ft. Some of them are amygdaloidal and contain chalcedony and agates, which, when weathered out, often strew the surface of the ground, and were largely used by the Bushmen for making arrow points, etc. The base of the lavas lies at about 6,500 ft., and may be regarded as a boundary line between two sharply contrasted parts of Basutoland. These beds form a higher, much dissected plateau, which attains its highest point in Mont aux Sources, over 11,000 ft. high, and which covers probably more than half the total area. This high plateau consists of long, grass-covered slopes, but it is limited on the east and west by very abrupt falls to the lower level of the sandstone and mudstone country below, that is, to Natal on the east, and to the lowland tract in the west. These two great escarpments are known as the Drakenberg and the Malutis. They do not form straight walls, but have been attacked by erosion, with the result that they consist of a series of mountain peaks (*see* DRAKENBERG), and great spurs and ridges, alternating with numerous deep and rugged valleys.

Where erosion has removed the volcanic beds the underlying sandstones and mudstones crop out, and give rise to an entirely different type of scenery. They are exposed in the main valleys of the high plateau—in the Sinqu (or Orange) and the Sinqunyane

valleys—but their main outcrop coincides with a strip of comparatively low-lying country in the west, which ranges from about 5,000 to 6,500 ft. above sea level. The most prominent member of these geological formations is the Cave Sandstone, an ancient loess, which immediately underlies the lavas. It often caps tablelands, which are bounded by precipitous cliffs, and which vary greatly in size from the extensive Berea plateau, through isolated flat-topped hills, like Thaba Bosigo, the stronghold of Moshesh, to sharp, needle-shaped pinnacles. Whenever it outcrops on a hillside it forms craggy, precipitous slopes, which generally rule out the possibility of wheeled transport. Along the outcrops occur many caves and shelters which were used by the Bushmen and are still decorated with their paintings. Basutoland is also traversed by a large number of sills and dikes of dolerite.

From the upper plateau radiate a number of drainage systems. At Mont aux Sources rises the Tugela, which, after a short course of a mile or so, falls 5,000 ft. out of Basutoland down into Natal, and subsequently finds its way to the Indian ocean. The Sinqu, or Orange, rises near the same place, as also does the Wilge. The latter flows northward to the Vaal river, while the former, with its tributaries, the Semena, the Sinqunyane and Caledon, drains practically the whole of Basutoland, and eventually empties itself into the Atlantic.

Climate.—The climate is bracing. The annual temperature varies from 93° F. to 11° F. In summer the heat is often tempered by the rain-bearing winds from the southwest. The annual rainfall is variable but averages approximately 30 in. About 70% falls during the five months, November–March, often in heavy thunder showers. The annual average number of rainy days is probably a little over 80; this increases to about 100 at Qacha's Nek on the Drakenberg escarpment, along which clouds and cool drizzles are more frequent than elsewhere. Hailstorms are of frequent occurrence. In the mountains snow may fall in summer.

Vegetation.—With the exception of willows, which grow along the streams, timber is practically nonexistent. Formerly, patches of bush grew on the hillsides and in the kloof but they have been practically all destroyed as a result of overpopulation. Some of the best sheep pasture in southern Africa is provided by types of grass on the middle levels, where wild flowers also abound in spring and early summer. Wheat, of an excellent type, is improved by the introduction of Canadian varieties.

Soil erosion, which has greatly reduced returns from the land, has resulted from deforestation, unchecked heavy rains, overstocking, the practice of veld-burning and the kraaling of stock. Practical steps, including a loan of £160,233 in 1936 to deal with erosion in the lowlands followed Sir Alan Pim's report on his commission of enquiry (cmd. 4907, 1935), in which he had proposed, among other recommendations, the checking of soil erosion, the thorough study of the highlands by ecologists and the construction of small irrigation works. By the end of 1938, 49 dams had been built, 27,000 acres contour-terraced, 170,000 fruit and forest trees planted and an ecological survey undertaken. The problem in 1945 was believed to be partially under control.

Fauna.—A few eland, hartebeest, smaller antelopes and hares manage to survive in the more secluded parts. Partridge and quail may be shot in season, and numbers of storks, like the swallows, migrate to Basutoland to escape the European winter.

Population.—The Bantu population numbered 127,707 in 1875, 347,731 in 1904 and 559,273 in 1936. The great majority consists of Basuto, a branch of the Bechuana family, but there are also several thousand Barolong, a few Matabele, and, in the south, considerable numbers of Xosa peoples. In 1936 there were in Basutoland 1,434 Europeans (169 fewer than in 1921); 1,263 coloured half-breeds and 341 Asiatics. The average density of population had increased to 48 in 1936. The population, however, is not evenly distributed, being restricted almost entirely to the lowland strip in the west. The result is overpopulation. Owing to pressure of population and a shortage of land in the lowlands, permanent villages have been formed in the mountains. Basutoland, like Bechuanaland and Swaziland (*qq.v.*) serves to a very considerable extent as a reservoir of labour for South Africa. It has been estimated that about 100,000 Basuto, both men and women, find employment in various occupations in the union. It is only by the earnings of these migrants that a balance between imports and exports is maintained. Maseru is the chief city of Basutoland. It is the administrative capital and had a population in 1936 of 583 Europeans, 1,890 natives and 331 coloured and Asiatics. Other centres are at Leribe (Hlotse), Teyateyaneng, Mafeteng, Mohale's Hoek, Moyeni and Qacha's Nek.

Transport and Communications.—Sixteen miles of railway link Maseru with the South African system at Marseilles station. A good road runs from north to south in the western lowlands and connects all the government stations, with the exception of Qacha's Nek, which can only be reached by wheeled traffic from East Griqualand. Motor services of the South African railways operate between the government stations of Butha Buthe, Mohale's Hoek, and Quthing and the railroad in the Orange Free State. Wagon roads have been made to most of the trading stations in the lowlands, and up the Orange river valley as far as Mount Morosi. In the volcanic uplands all transport is done by pack animals, or, to some extent, by means of human porterage.

Land.—Land is the common property of the nation, held in trust by the chiefs, who assign arable land to married men and widows. The average holding is about eight acres. Pastures in the mountains are set aside for communal use. There are no European farmers. The white population consists solely of government officials, missionaries, traders and a few labour agents.

Agriculture.—Large quantities of corn (maize) and Kafir corn (mabele) are grown, over 1,000,000 bags of maize being produced in 1941. The early frosts in the mountains practically restrict their serious cultivation to below the 6,000 ft. contour. In the mountains the chief crop is wheat, which thrives on the rich, black soil. Here it is sown in spring. Its cultivation is also undertaken to a considerable extent in the lowlands, where it is sown in autumn. Half of the country's production of 395,000 bags in 1941 was exported. Wherever possible it is sold to the traders, or exchanged for maize or Kafir corn.

Stock.—The stock census of 1940 showed the following animals: cattle 470,040; sheep 1,597,887; goats 565,554; horses 88,272; mules and donkeys 30,940. Cattle are taken to the mountains in spring and are brought back to the lowlands in autumn. The chief movements of the sheep and goats occur in connection with the shearing. The horses are mostly stunted and undergrown, owing largely to lack of proper feeding when young.

Trade.—There are about 200 licensed traders in Basutoland. Their stores meet the native demand for blankets, clothing, saddlery, foodstuffs, cooking utensils, etc. Most of the native productions are sold to the traders, and are then exported. The chief exports are wool, mohair, wheat, hides and skins. The total value of exports in 1940 was £461,666, and of imports, £938,280. Most of this trade passes through the Orange Free State, though a considerable quantity of wool is taken on pack animals down the Drakenberg passes into Natal and East Griqualand.

Government.—Authority is exercised by a resident commissioner, under the high commissioner for Basutoland, Bechuanaland and Swaziland, and aided by seven assistant commissioners and other officers. For fiscal and administrative purposes the country is divided into seven districts—Maseru, Leribe, Teyateyaneng, Mafeteng, Mohale's Hoek, Quthing and Qacha's Nek. Each of these is subdivided into wards, presided over by hereditary chiefs at the head of whom is the paramount chief. The chiefs adjudicate in cases affecting natives, according to native law, so far as it is not repugnant to European law. A native has, however, a right of appeal to the court of an assistant commissioner, or of the resident commissioner, where all cases involving a European are tried. The Basutoland council, established in 1903, with advisory powers, meets annually at Maseru, and discusses the domestic affairs of the nation. It is presided over by the resident commissioner, and consists of 95 members nominated by the chiefs and five nominated by the government.

The European administration, according to Sir Alan Pim's report to the British secretary of state for dominion affairs (1935), virtually amounts to a duplication of the tribal government. It was estimated that of the revenue collected for the gov-

ernment, less than 40% has gone for agricultural, medical and educational services. The total revenue for the year 1939–40 (including £28,169 from the Colonial Development fund) was £421,034, of which £121,234 was yielded by a native tax of 28*s.* per adult male plus 25*s.* for each additional wife, and £120,828 by customs. Among the chief items of expenditure were police, £44,543; medical, £33,408; education, £73,114; public works, £27,320; and £19,042 for the leper settlement.

Police.—The Basutoland police establishment in 1944 consisted of 13 European officers and 290 native noncommissioned officers and men. There were nine jails in Basutoland.

Medical Service.—The medical service is directed by the principal medical officer, who resides in Maseru. In each district there is also a government medical officer. There are five well-equipped hospitals, staffed partly with trained European and partly with native nurses, and a few miles from Maseru is a large leper settlement.

Education.—In 1940 there were 598 native schools with 69,405 pupils. Thirteen of the schools are normal, industrial or agricultural schools. The percentage of Basuto attending school is larger than anywhere else in Africa. Most of these schools are conducted by the missionary bodies, but the government makes a contribution to their cost. The amount set aside for education in 1938–39 was £70,312. There are also a few schools for European children. At Morija is a press, belonging to the French Protestant Mission, which publishes books in Sesuto.

Religion.—Several missionary organizations are active. The most important denominations, numerically, are the French Protestant Church and the Paris Evangelical Mission, which, in 1936, claimed 82,946 native adherents. Next came the Roman Catholic Church with 112,446, and the Anglican Church with 36,623. The total number of Christian Basuto was given as 254,511. (P. W. I.)

HISTORY

Until the beginning of the 19th century Basutoland appears to have been uninhabited save by wandering Bushmen, whose rude rock pictures are to be found in several parts of the Drakenberg. About 1800 the country was occupied by various tribes of Bechuana, such as Batau, Basuto, Baputi, who then possessed the greater part of what is now the Orange Free State province. They appear to have recognized the paramount authority of a family descended from a chief named Monaheng. By the wars of the Zulu chiefs Chaka, Matiwana and Mosilikatze, these tribes were largely broken up, and it is recorded that one tribe, living in the Maluti mountains, was reduced to cannibalism. At this period a young man named Moshesh (born about 1790), who was of the family of Monaheng and already noted as hunter and warrior, gathered round him the remnants of several broken clans, out of which he welded the existing Basuto nation. He established himself in 1824 on the rock fortress of Thaba Bosigo, where, in 1831, he successfully defended himself against Mosilikatze. In 1833 Moshesh invited the missionaries of the Société des Missions Evangéliques of Paris to settle in his country, and from that day until his death proved their firm friend. In 1836–37 large parties of emigrant Boers settled north of the Orange, and before long disputes arose between them and Moshesh, who claimed a great part of the land on which the white farmers had settled. The Basuto acquired an unenviable notoriety as a race of bold cattle lifters and raiders, and the emigrant Boers found them extremely troublesome neighbours. If the Basuto were eager for cattle, the Boers were eager for land; and their encroachments on the territories of the Basuto led to a proclamation in 1842 by Sir George Napier, the then governor of Cape Colony, forbidding further encroachments on Basutoland. In 1843 a treaty was signed with Moshesh creating Basutoland a native state under British protection.

Quarrels between Basuto and Boers continued: there were also interminable disputes between the Basuto and other Bechuana tribes. After the proclamation of British sovereignty over the Orange river regions by Sir Harry Smith in 1848, Moshesh was unwillingly induced by Sir Harry to surrender his claims to part of the territory recognized as his by the Napier treaty. Disputes again arose and there was fighting in 1851 between the Basuto and a commando composed of British soldiers, farmers, and a native contingent, in which the Basuto were victorious. Both sides had just grievances and efforts to reach an accommodation were made. They failed, and in 1852 General Sir George Cathcart, who had succeeded Sir Harry Smith as governor of Cape Colony, led a small force against Moshesh. With that peculiar statecraft for which he was famous, Moshesh saw that he could not hope permanently to hold out against the British troops and followed up some successful skirmishes with General Cathcart by writing him a letter, in which he said: "As the object for which you have come is to have a compensation for Boers, I beg you will be satisfied with what you have taken. You have shown your power; you have chastised; I will try all I can to keep my people in order in the future." General Cathcart accepted the offer of Moshesh and peace was proclaimed, the Basuto power being unbroken. Fourteen months later (Feb. 1854) Great Britain renounced sovereignty over the farmers settled beyond the Orange, and Moshesh found himself face to face with the newly constituted Free State. The Boers and the Basuto proved, as hitherto, bad neighbours. During a war which broke out in 1865, Moshesh unavailingly appealed for British protection; the Boers proved victorious in the conflict, conquered a fertile strip of Basuto territory and forced Moshesh to sign a humiliating treaty at Thaba Bosigo. Moshesh again appealed for protection to the British, saying: "Let me and my people rest and live under the large folds of the flag of England before I am no more." On this occasion the British decided to take over Basutoland, and a proclamation of annexation was issued on March 12, 1868. Much against their wishes the Free State Boers were compelled to recognize the British annexation. The Treaty of Aliwal North, concluded (1869) between the Free State and the high commissioner, defined the boundary between the Free State and Basutoland. By it the fertile strip of country west of the Caledon river, known as the "Conquered Territory," was finally transferred to the Free State. The next year (1870) Moshesh died. For nearly 50 years he had led his people skilfully and well. He was one of the rare instances among the Bantu of a leader endowed with intellectual gifts which placed him on a level with highly endowed Europeans, and his life work left a permanent mark on South African history.

In 1871 Basutoland was annexed to Cape Colony, which soon found that it had a hard task in dealing with the turbulent Basuto warriors. In 1879 Moirosi, a chief residing in the southern portion of Basutoland, openly repudiated colonial rule. An expedition was dispatched from Cape Colony and severe fighting followed. Moirosi's stronghold was captured and the chief himself was killed. In 1880 the Cape government felt sufficiently strong to extend to Basutoland the Cape Peace Preservation Act of 1878, which provided for the disarmament of natives. Its execution in Basutoland proved an extremely difficult task, and desultory warfare was carried on between the colonial troops and the Basuto until 1881. Peace was only restored through the intervention of the high commissioner. In April 1883 a form of self government was established, but was once more followed by internal strife among the chieftains.

The subjection of Basutoland to the control of the Cape government had by this time proved unsatisfactory, both to the Basuto and to Cape Colony. The Cape government, therefore, offered no opposition to the transfer of the country, and at a great national *pitso* (representative gathering) held in Nov. 1883, the Basuto agreed to the terms under which the imperial government was willing to take over the country. On March 13, 1884, the territory came therefore under the immediate authority of the crown, that is, the colonial office. The high commissioner became governor of Basutoland, being represented in the territory by a resident commissioner. Native laws and customs were interfered with as little as possible and the authority of the chiefs—all members of the Moshesh family—was maintained. Moshesh had been succeeded as paramount chief by his son, Letsie, and he in turn was succeeded in 1891 by Lerothodi (*c.* 1837–1905). Both these chiefs acted loyally with the resident commissioner, Lerothodi possessing many of the high qualities of Moshesh. The first commissioner was Sir Marshall Clarke, to whose tact and ability the country owed much. Sir Godfrey Lagden (commissioner 1893–1901) and Sir H. C. Sloley (commissioner 1901–17) also did much to help the Basuto and win their full confidence. The period of warfare over, the Basuto turned their attention more and more to agricultural pursuits and also showed themselves very receptive of missionary influence. Throughout the Anglo-Boer War (1899–1902) the Basuto remained passive, and the neutrality of the country was respected by both armies. One chief alone sought to take advantage of the situation by disloyal action, and his offense was met by a year's imprisonment. In pursuance of the policy of encouraging the self-governing powers of the Basuto, a national council (*pitso*) was officially instituted and held its first sitting in July 1903.

British policy has been to exclude foreign penetration as far as

possible. Mineral exploitation and farming by white people are prohibited; and the few European inhabitants consist of officials, missionaries, and traders who have obtained official permits. Basutoland is, in fact, a purely native reserve, in which the natives themselves have a considerable degree of home rule. A national council, consisting mainly of native chiefs, debates domestic affairs, and its advice is usually taken by the commissioner, although he is not bound to do so. Basutoland is entirely surrounded by the territory of the Union of South Africa; and suggestions have from time to time been put forward to transfer the administration to the union government. The Basuto have often shown a desire to remain under direct British control. The position of the British government is that made public June 20, 1935 (cmd. 4948, 1935): no transfer to take place until the inhabitants of the territory, both native and European, had been consulted and until parliament had expressed its opinion. No definite action had been taken up to 1945.

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BAT, a flying mammal (*see* CHIROPTERA). Bats have greatly elongated fore limbs, forming wings. They are more dependent on flight than other animals, for unlike most birds and insects their limbs and feet are not suited to walking. One or two young are born in the spring; the newborn bat clings to the mother's breast with the hooked milk teeth, aided by the claws of thumb and toes. For several weeks the mother carries her baby about on her flights, then she leaves it hanging up in the roost. Young bats fly when about three-quarters grown.

Bats usually rest during the day, hanging upside down in a cave or other dark place, usually many roosting together; the large fruit bats often hang on trees, like fruit, and other bats roost on the trunks of trees. In cold weather they hibernate, often in great masses, like swarming bees. Most bats are insectivorous, feeding chiefly on moths, beetles and other night-flying insects, but one suborder, the Megachiroptera, are fruit eaters and so are many members of a tropical American family. Several bats catch fish, and two groups of large bats are carnivorous, feeding on other bats, rodents and frogs. There are nearly a thousand species of bats, distributed throughout the world, but they are most abundant in the tropics and warmer parts of the temperate zone. In size they vary from bats with head and body about 1½ in. to the great flying fox 12 in. long and with a wingspread of as much as 5 ft. The colour is generally dark brown, but a South American bat is white; a number of bats are handsomely marked with white or orange; and several are bright orange-red.

(J. E. HL.)

BATAAN. A province and peninsula on the island of Luzon in the Philippines, due west of Manila, across the bay. Pop. (1939) 85,538. It is approximately 30 mi. long and averages about 15 mi. in width. Traversing the peninsula from north to south are steep mountains of volcanic origin. There are few roads except the two principal highways, one of which runs north and south, parallel to the east coast on Manila bay; the other cuts across the mountains and connects the north-south road with Bagac and Moron on the west coast. There are no railways. The principal city is Balanga. To the northwest is Subic bay, site of the U.S. naval base of Olongapo. Two miles off the southern point of the peninsula is the island fort of Corregidor.

After the Japanese invasion of the Philippines in Dec. 1941 and the subsequent fall of Manila on Jan. 2, 1942, the defending force of Filipinos and Americans withdrew to Bataan peninsula. The Japanese, advancing in the north from Lingayen, Vigan and Aparri, and in the south from Mauban and Antimonan, had apparently intended to split the forces of the U.S. commanding general, Douglas MacArthur. But MacArthur, before abandoning Manila, consolidated his lines and withdrew into Bataan. Here his troops, vastly outnumbered and without replenished supplies, held out until April 9, 1942. The remnants of the army, then commanded by Gen. Jonathan Wainwright (who succeeded Gen. MacArthur when the latter was ordered to Australia to take command there), escaped to Corregidor, which was forced to surrender a month later.

Almost three years later, U.S. forces under MacArthur fought their way back to the Philippines from Australia, and on Jan. 9, 1945, effected a landing on the southern and southeastern shores of Lingayen gulf, to the north of Manila. They drove southward, entering Manila on Feb. 3. Bataan peninsula was sealed off from the north to prevent the Japanese from withdrawing to that area for a last stand. With resistance softened by repeated aerial bombardment, landings were made at Mariveles harbour on the southern tip of Bataan and on Corregidor, securing for the U.S. navy the use of Manila bay. The Japanese resisted fiercely, especially at Intramuros, the walled city in Manila, until on Feb. 24 MacArthur announced that Manila had been completely liberated. On March 1, he pronounced Corregidor almost completely secured.

BATAC, a municipality of the province of Ilocos Norte, Luzon, Philippine Islands, 12 mi. S. of Laoag, the capital. Pop. (1939), 22,207, of whom 10,076 were males and none was white. Among the principal products are tobacco, palay (rice), corn and coffee. The town was founded about 1587 and was the birthplace of Gregorio Aglipay (born 1860), founder of the Independent Filipino Church. The vernacular is Ilocano. (C. S. L.)

BATAHIN: *see* ARABS.

BATAILLE, HENRI (1872–1922), French dramatist, was born April 4, 1872, at Nîmes. In early youth he thought of becoming a painter and, in 1890, entered the École des Beaux Arts. His first venture into dramatic work, *La belle au bois dormant* given at the Théâtre de l'Oeuvre in 1894, was a failure; but his reputation was definitely established by a book of verse *La chambre blanche* (1895), and when his Breton drama *La lépreuse* was produced in 1896, he stood revealed as a dramatist of real promise. From that time onwards he developed his gift for writing plays in which passion is shown to sway men's lives more than their beliefs, until he reached maturity with *Maman Colibri* (1904), *La marche nuptiale* (1905) and *Poliche* (1907). Among his other works are *La femme nue* (1908), *La vierge folle* (1910), *La divine tragédie*, a book of war poems (1916) and *La chair humaine* (1922). He died at Rueil, near Paris, on March 2, 1922.

BATAK (not to be confused with the Batta [*q.v.*] or Battak of Sumatra), a tribe of apparently pre-Dravidian stock, with possibly a Negrito blend, inhabiting the interior of Palawan in the Philippines. They live by hunting, supplemented by meagre patches of occasional cultivation; one house is occupied by several families whose limits are defined by lines on the floor; government is by chiefs or old men. Breech-clouts and petticoats of bark cloth are the only garments, dancing the only diversion. Bamboo, shells and grasses are used as ornaments, the blowgun and the bow and arrow as weapons. Food is cooked by broiling in embers, cooking utensils being unknown.

See Miller, "Bataks of Palawan," *Ethnologic Survey of the Philippines*, ii, iii (1905).

BATALA, a town in British India, in the Gurdaspur district of the Punjab. Pop. (1941) 44,458. It is an important centre of trade, with manufactures of cotton and silk goods, shawls, brassware, soap and leather.

BATALHA (*i.e.*, battle), a town of Portugal, 8 mi. south of Leiria. Pop. (1940) 506. Batalha is chiefly interesting for its great Dominican monastery of Santa Maria da Victoria ("St. Mary of the Victory"), also known as Batalha. In the battle fought on the plain between Canoeira and Aljubarrota, 9 mi. southwest, John I of Portugal defeated John I of Castile in 1385 and secured the independence of his kingdom. The monastery, probably founded 1388, is built of golden-brown limestone, resembling marble, and richly sculptured. It is roughly a parallelogram, about 500 ft. from north to south, and 445 ft. from east to west; with the circular annex of the royal mausoleum on the east, and the Founder's chapel at the southwestern corner; its southern division

is the Gothic church. The Founder's chapel contains the tomb of John I (d. 1433) and Philippa of Lancaster (d. 1415), his queen, with the tomb of Prince Henry the Navigator (d. 1460). Like the royal mausoleum, where several later monarchs are buried, it has intricate and exquisitely finished carved stonework. Plans and masons were procured from England by Queen Philippa, and the work was entrusted to Affonso Domingues, a native architect, and Huet or Houguet, an Irishman. Only the royal cloister, church and Founder's chapel were included in the original design; and all three show signs of British influence. The Capellas Imperfeitas ("Unfinished Chapels") are one of the most marvellous examples of Manueline architecture. The earthquake of 1755 damaged the monastery and the French sacked it in 1810. It was secularized in 1834, declared a national monument in 1840 and thenceforward gradually restored.

BATANG (re-named BAANFU in 1908) is an important frontier town in the Sino-Tibetan borderland of China (30° 0′ N. and 99° 30′ E.). It is situated in a beautiful and fertile plain at a point on the Upper Yangtze where the great river which above Batang flows through a wide valley begins its tortuous and torrential descent through the wild mountain country of the Szechwanese alps. It is one of the chief depots on the main trade route between Chengtu in the Red Basin and Lhasa (*see* under SZECHUAN). Its inhabitants are mainly Tibetans. When the administrative region of Sikang was first created in 1908, Batang was made its capital, and in 1928 when Sikang was enlarged and given provincial status Batang became the capital of the province.

BATANGAS, a municipality and capital of the province of Batangas, Luzon, Philippine Islands, near the Batangas river, about 65 mi. S. by E. of Manila by land and 91 mi. by sea. Pop. (1939) 49,164, of whom 23,962 were males and 16 whites. The province has long been noted for the fertility of its soil and the industry of its inhabitants. It leads in the production of coffee but also produces sugar, palay (rice), coco-nuts, corn and fruits. Among its important industries are the raising of livestock, especially horses, also fishing and weaving. The town is connected with Manila by rail and also by excellent motor roads.

In 1939, 32.4% of the children of school age attended school. The vernacular is Tagalog. The municipality has an administrative centre and 50 barrios (wards) and is a port of entry for coastwise steamers. In 1938 there were 19,305 parcels of land declared for taxation; there were 10,511 owners and the assessed valuation was 1,965,180 pesos. The total land area was 82.5 sq.mi. (C. S. L.)

BATAVIA, a residency of Java, Netherlands Indies, under the province of West Java, bounded east, south and west by the residencies of Cheribon, Preanger, Buitenzorg and Bantam, and north by the Java sea. It also comprises small islands, including the Thousand Islands group (actually about 80), with a total area of 3,098 sq.mi. Pop. (1930) 2,637,035, composed of 38,561 Europeans and Eurasians, 2,440,128 natives and 158,346 foreign Asiatics, mostly Chinese. The natives are Sundanese, with many Malays and Javanese in the north. Most of the residency lies in the flat coastal plain built up by the Tjiliwung, Tjitarum and other small rivers, but in the southeastern part the land rises to the volcanic ranges, with Sangga Buwana (4,150 ft.) and Tangkuban Prahu (6,820 ft.). The soil is fertile and intensively cultivated. Rice is the dominant crop, but cassava, tobacco and coco-nuts are also grown by the peasants. There are extensive rubber plantations of European concerns. Sugar was cultivated formerly. In the second half of the 17th century the Dutch East India company began selling land to private persons and granting land in reward for good services. A considerable area of land around Batavia was involved. Under the Agrarian law of 1870 all sale of lands to non-natives was forbidden and in later years the government endeavoured to buy back the private estates. In 1939 the area still in private hands in the residency was 1,016 sq.mi. The principal towns are the seaport Batavia (*q.v.*), which is the capital of the residency as well as the seat of government of the whole Netherlands Indies; Meester Cornelis (pop. 97,831), the scene of a battle between the Dutch force under Marshal Daendels and a British force in August 1811; Purwakarta (pop. 15,141); Krawang (18,227); and Subang (10,539).

Batavia is traversed by two lines of railway, one eastward to Cheribon and another southward to Buitenzorg and on through the Preanger country to Bandoeng. The whole residency was occupied by Japan in March 1942 after bitter Allied resistance.

BATAVIA, a city of Kane county, Illinois, U.S.A., 36 mi. W. of Chicago. It is located on state highway 25 and is served by the Chicago, Aurora & Elgin, the Chicago, Burlington & Quincy and the Chicago & North Western railroads. Population (1940 census) 5,101.

The city is built on both sides of the Fox river, which runs through its centre. Among the chief industries are the manufacture of agricultural implements, cosmetics and windmills, and the quarrying of limestone, because of which Batavia is sometimes known as the "Quarry City."

Settlement began in 1832, after the Black Hawk War, and the town was name Batavia after Batavia, New York, from which many of the early settlers had migrated. There is a sanitarium in the city at which Mary Todd Lincoln, wife of President Lincoln, was once a patient.

BATAVIA, a city and seaport, on the northwest coast of Java, the capital of the Netherlands Indies. Pop. (1930) 435,184 excluding Meester Cornelis (97,831), composed of 37,076 Europeans and Eurasians, 409,655 natives, and 86,284 foreign Asiatics, including Chinese. The average mean temperature is 79° and average rainfall 72.31 with 136 rainy days. There are four divisions of the city: the port, Tanjong Priok, situated at the head of a capacious bay on the northern coast of the western end of the island of Java; the old city of Batavia, a little distance inland, on level and swampy ground, on both sides of the river Jacatra, or Chiliwong; and the modern town of Weltevreden, yet further inland, directly south of Batavia and merging into Meester Cornelis, to the south again. Even in the old town, the streets are mostly straight and regular, some quite broad, with the exception of the Chinese quarter, which, with its old quaintly built houses and many canals, is like an eastern Venice. Here are to be seen old buildings of the days when the Dutch built in the east as they built in Holland—very picturesque, with their brown-tiled roofs, diamond-paned windows, generally shuttered, and pleasing style of architecture, quite unsuited, however, to tropical requirements.

Much of this original city has disappeared, but fragments remain, and though the fortifications exist no longer, near the old town hall (a fine building dating from 1710, now the Resident's office) on an open square known as Kasteel Plein, is the ancient Penang gate, with its two grotesque "Gog" and "Magog" figures, once part of the city walls. Other buildings include the grand old house of Governor-General van Riebeeck (1708), with entrance hall of old tiles, depicting stories from the Bible; and the Portuguese church (1693). The extraordinary old cannon, known as "Miriam Besar" (*měriam,* Malay for cannon), lies half-buried in the ground near the Penang gate and is held in great veneration by the native populace as an emblem of fertility.

Old Batavia is inhabited to-day principally by Malays, Arabs, Chinese, Javanese, and some of the poorer Eurasians: it is the busy present in the daytime, the sleepy past at night. Its former shops are warehouses; the town houses of the old merchants are mercantile offices. The shops, residences of Europeans, better-class Eurasians and Orientals, hotels, clubs, theatres, hospitals, government offices, banks and the newer mercantile buildings and churches are in Weltevreden, and in the streets leading to Batavia, of which Molenvliet is the most important. In Weltevreden proper are two large open spaces: one the Waterloo Plein, with its white column commemorating the battle of Waterloo, and the other Koningsplein, containing two sports clubs, a racecourse and Weltevreden station, on the line from Tanjong Priok. From these branch off the principal shopping and business thoroughfares, fine broad streets, such as Rijswijk, Noordwijk, Gunung Sahari and Tanah Abang. In this quarter, too, are the principal government offices, the High Courts of Justice, the leading clubs, the large hotels, and restaurants, the Masonic lodge, the theatre

and various public buildings and churches. The old Prins Hendrik fort stands in pretty grounds nearly surrounded by water, between the Waterloo and Koningsplein. Nearby, at the end of Willemsland, is the monument of General Michiels, killed in Bali in 1849. The newer parts of Weltevreden, south of Koningsplein, extend to Meester Cornelis, and here, on both sides of the river, set in grass and trees, are hundreds of beautiful bungalows with wide, tree-lined roads. At Meester Cornelis the Dutch built barracks and a military school.

The Batavian society of arts and sciences, later the "Royal society," was founded in 1778. Eventually it was compelled to restrict its sphere to archaeology (a government department lent its aid), history, languages and archipelagian researches. In 1850, the "Royal Natural History society" was founded. The former society has a museum and the latter an excellent library. Their *Transactions* have formed a great contribution to the scientific and literary history of the Malay archipelago. The Dutch Indies Astronomical society, which founded the first observatory in the tropics, has an observatory in Weltevreden.

Educational facilities are afforded by medical schools for Europeans and natives, law schools, schools for training native officials, who later enter the civil service college, training schools for teachers and a good high school, the Queen Wilhelmina and Prins-Hendrik school. There is also a museum and a public library. Several daily and weekly papers are published. An official tourist bureau is maintained at Weltevreden.

The so-styled "European" inhabitants, numbering 37,076, include people of mixed blood, *i.e.*, native, or coloured, with European, and full-blooded Japanese. The greater number of pure Europeans are Dutch. The Chinese form a very numerous and industrious section of the population.

Batavia has a very fine up-to-date port in Tanjong Priok. The original harbour (1877–83) has been much improved within recent years. The outer harbour is enclosed by two long stone breakwaters running north and south, converging at the sea end, where the entrance is about 525 ft. wide. The outer harbour channel, which has a depth of 30 ft. at low water, leads to three inner harbours, of which the first is about 3,500 ft. long and 600 ft. wide, the second 3,300 ft. long and 500 ft. wide, and the third 3,300 ft. long and 720 ft. wide. The first inner harbour is suitable for ships drawing up to 27 ft., the second for those of 30 ft. draught and the third has been designed for vessels drawing up to 40 ft. There are ample fully-equipped quays with warehouses belonging to the port authority and to private companies. There are two dry docks, a coal storage wharf and an airport. The port is connected with Batavia by a good road, a double rail track and canals (the Chiliwong is canalized), and lighters can sail thither along the chief shipping canal.

Batavia has good modern transport arrangements. It is connected by rail with every place of importance in Java. One line goes westward to Bantam; two go eastward, one along the north coast and the other via Buitenzorg and Preanger to Banjoemas, where they meet, and then with a branch to Semarang proceed to Surabaya and Banjuwangi, with branches to Pasuruan, Kediri, etc. Tanjong Priok in normal times has abundant communication by sea with all parts of the world and Batavia connects by telephone, cable and wireless with the general world systems and all parts of the archipelago.

Tanjong Priok, Batavia, not only serves the whole hinterland of West Java but also acts as a clearing house for the whole archipelago. It exports, besides the main commodities of the region (rubber, tea, quinine, tapioca), a great variety of other tropical produce; the imports consist mainly of manufactured goods, which are in turn distributed over Java and other islands.

The total value of imports into Tanjong Priok in 1939 was 134,151,000 guilders (28% of the total imports of the Netherlands Indies) and exports, 110,192,000 (15%). In 1939 2,871 motor and steamships (17,000,000 cu. m. net) and 3,585 sailing vessels (148,000 cu. m. net) visited the port. In the 1930s manufacturing increased considerably. Batavia had several construction and repair shops, oleomargarine and soap factories, breweries and printing establishments. An old industry is the distillation of arrack.

The Java bank, in the profit of which the government shares, is the principal bank, but there are at least ten other important banking concerns.

Batavia owes its origin to the Dutch Governor-General Pieter Both, who in 1610 established a factory at Jacatra on the ruins of Sunda Calappa; and to his successor, Jan Pieterszoon Coen, who founded the present city. In 1699, Batavia suffered from a severe earthquake. The rivers about it were choked with mud from the volcano Salak and flooded the surrounding country. As a consequence, Batavia became notorious for its unhealthfulness and was in danger of being abandoned. In 22 years, from 1730 to 1752, 1,100,000 deaths are said to have been recorded: the death rate in 1930 was calculated at 2.46% for the native population. Marshal Daendels (governor 1808–1811) destroyed the ramparts of the old city and began the nucleus of the new one at Weltevreden. In 1811 a British force was sent against the Dutch settlements in Java which had been incorporated by France, and to this force, after an engagement at Meester Cornelis, Batavia surrendered. It was restored to Holland by the treaty of 1814.

(E. E. L.; J. O. M. B.)

From Batavia and Surabaya was directed the Allied campaign of resistance to Japanese invasion of the southwest Pacific in World War II. Batavia was captured by the Japanese March 5, 1942, and soon thereafter the whole of Java was in enemy control.

BATAVIA, a city in northwest New York, U.S.A., midway between Buffalo and Rochester on state highways 5, 33, 63 and 98, at an elevation of 900 ft.; the county seat of Genesee county. It is served by the New York Central, the Erie and the Lehigh Valley railways. The area is 5.8 sq.mi., and the population in 1940 was 17,267.

Batavia is trade centre of a farming region, producing milk, eggs, vegetable products, small grain and alfalfa. Large numbers of western lambs are fattened during the winter months. Manufacturing includes harvesting machinery, die castings, ladies' shoes, paper boxes, embossed seals and labels and shirts. The public school system is noted for a plan of tutorial instruction, supplementing classroom teaching, which was introduced in 1898 by John Kennedy (1846–1927). The United States veterans' hospital of 300 beds and the New York state school for the blind (opened 1868) are there. Thirteen miles N.W. lies the Tonawanda Indian reservation of 7,548 ac.

There had long been an Indian town (Deo-on-go-wa) at this point, and two Indian trails crossed where the courthouse now stands. Batavia was laid out in 1801 by Joseph Ellicott (1760–1826), agent and surveyor general of the Holland Land company, consisting of residents of the city of Amsterdam in the then republic of Batavia (meaning "better land"). He made it, rather than Buffalo, the capital of the Holland purchase. From the beautiful stone "office" which he built in 1815, now preserved as an historical museum, issued the titles to most of the land in New York west of the Genesee river. Several fine old mansions are still standing, one of which is the present city hall. During the War of 1812, Batavia was a rendezvous for soldiers and a haven for refugees and wounded from Buffalo and other frontier towns. Batavia was incorporated as a village in 1823; as a city, 1914.

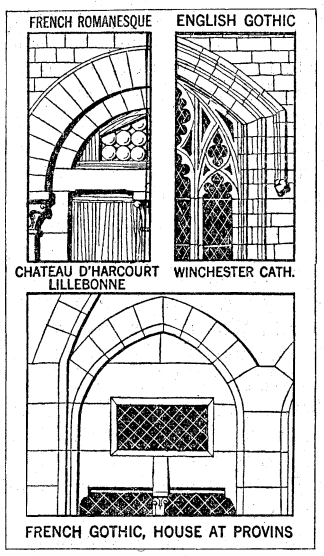
BATEMAN, HEZEKIAH LINTHICUM (1812–1875), American actor and manager, was born in Baltimore, Md., on Dec. 6, 1812. He was intended for an engineer but in 1832 became an actor, playing with Ellen Tree (afterward Mrs. Charles Kean) in juvenile leads. In 1855 he became manager of the St. Louis theatre and in 1859 moved to New York. In 1866 he was manager for his daughter Kate, and in 1871 went to London, where he took the Lyceum theatre. Here he engaged Henry Irving, presenting him first in *The Bells,* with great success. He died on March 22, 1875.

His wife, SIDNEY FRANCES (1823–1881), daughter of Joseph Cowell, an English actor who had settled in America, was an actress and the author of several popular plays, in one of which, *Self* (1857), she and her husband made a great success. After her husband's death Mrs. Bateman continued to manage the Lyceum. She later took the Sadler's Wells theatre, which she managed until her death on Jan. 13, 1881. She was the first to bring

to England an entire American company with an American play, Joaquin Miller's *The Danites*.

Mr. and Mrs. Bateman had eight children, three of the four daughters being specially educated for the stage. The two oldest, Kate Josephine (1842–1917), and Ellen, known as the "Bateman children," began their theatrical career at an early age. In 1862 Kate played in New York as Juliet and Lady Macbeth, and in 1863 had a great success in London as Leah in Mosenthal's *Deborah*. In 1866 she married George Crowe, but returned to the stage in 1868, playing later as Lady Macbeth with Henry Irving, and in various other rôles. After 1892 she conducted a school of acting. Her daughter, Sidney Crowe (b. 1871), also became an actress. Virginia (Mrs. Edward Compton) and Isabel, younger sisters of Kate Bateman, were also well known on the London stage.

BATEMENT LIGHTS, in architecture, the lights in the upper part of a perpendicular window, which are only half the width of those below.



AFTER VIOLLET-LE-DUC, "DICTIONNAIRE DE L'ARCHITECTURE FRANÇAISE"

BATES, EDWARD (1793–1869), American lawyer and statesman, was born in Belmont, Va., on Sept. 4, 1793, of a Quaker family. In 1814 he went to the Territory of Missouri of which his brother, Frederick, was secretary. There he began the practice of law and in 1816 became prosecuting attorney at St. Louis. He was a delegate to the State constitutional convention (1820), attorney-general of the State of Missouri (1820), member of the legislature (1822), States attorney for Missouri (1824) and representative in Congress (1826 Anti-Democrat). After one term in Congress he devoted most of his time to the law, but served in the legislature in 1830 and 1834, in the Chicago convention for internal improvement in 1847, in 1853 was appointed judge of the St. Louis land court and in 1856 led the Whig national convention at Baltimore. He became increasingly prominent as an anti-slavery advocate and in the Republican national convention of 1860 he received on the first ballot 48 votes for presidential candidate. He withdrew, however, in favour of Lincoln, who named him attorney-general in his first cabinet. In 1864 he resigned to resume the practice of law in St. Louis, where he died on March 25, 1869.

BATES, HARRY (1850–1899), British sculptor, was born at Stevenage, Herts, on April 26 1850. He began his career as a carver's assistant. In 1879 he came to London, studied first at the Lambeth School of Art and then at the Royal Academy schools, where in 1883 he won the gold medal and the travelling scholarship of £200 with his relief of "Socrates teaching the People in the Agora." Going to Paris he studied under Rodin. A head and three small bronze panels (the "Odyssey"), executed by Bates in Paris, were exhibited at the Royal Academy. His "Aeneas" (1885), "Homer" (1886), three "Psyche" panels, and "Rhodope" (1887) all showed marked advance in form and dignity; and in 1892, after the exhibition of his vigorously designed "Hounds in Leash," Bates was elected A.R.A. This and his "Pandora," in marble and ivory, which was bought in the same year for the Chantrey Bequest, are in the Tate Gallery, London. Among his portrait busts are the equestrian statue of Lord Roberts (1896) in Calcutta and a statue of Queen Victoria in Dundee. But his masterpiece was an allegorical presentment of "Love and Life." Bates died in London on Jan. 30, 1899.

BATES, HENRY WALTER (1825–1892), English naturalist and explorer, was born in Leicester. In 1844 he met a congenial spirit in Alfred Russel Wallace, and in April 1848 the two friends sailed in a trader for Pará. They had little or no money, but hoped to meet their expenses by the sale of duplicate specimens. After two years Bates and Wallace agreed to collect independently, Wallace taking the Rio Negro and the upper waters of the Orinoco, while Bates continued his route up the great river for 1,400m. He remained in the country 11 years, during which time he collected no fewer than 8,000 species of insects new to science. His long residence in the tropics with the privations which it entailed, undermined his health. Nor had the exile from home the compensation of freeing him from financial cares, which hung heavy on him till he had the good fortune to be appointed in 1864 assistant secretary of the Royal Geographical Society, a post which he retained till his death. Bates is best known as the author of one of the most delightful books of travel in the English language, *The Naturalist on the Amazons* (1863), the writing of which, as the correspondence between the two has shewn, was due to Charles Darwin's persistent urgency. "Bates," wrote Darwin to Sir Charles Lyell, "is second only to Humboldt in describing a tropical forest." His most memorable contribution to biological science was his paper on the "Insect Fauna of the Amazon Valley," read before the Linnaean Society in 1861, in which he clearly stated and solved the problem of "mimicry," or the superficial resemblances between totally different species and the likeness between an animal and its surroundings, whereby it evades its foes or conceals itself from its prey. A man of varied tastes, he devoted the larger part of his leisure to entomology, notably to the classification of coleoptera. Of these he left an extensive and unique collection, which, fortunately for science, was purchased intact by René Oberthur of Rennes.

BATES, JOHN, an English merchant who was tried before the court of Exchequer in Nov. 1606, for refusing to pay an extra duty of 5s. per cwt. on imported currants, levied by the sole authority of the Crown in addition to the 2s. 6d. granted by the Statute of Tonnage and Poundage, on the ground that such an imposition was illegal without the sanction of Parliament. The decision of the case in favour of the Crown threatened to establish a precedent which, in view of the rapidly increasing foreign trade, would have made the king independent of Parliament. The judgments of Chief Baron Fleming and Baron Clark, of considerable importance from the point of view of constitutional history, are preserved.

See *State Trials* (ed. 1779), xi. pp. 30–32; excerpts in G. W. Prothero, *Statutes and Constitutional Documents* (Clarendon Press, 1894); Gardiner, *History of England,* vol. ii.

BATES, KATHARINE LEE (1859–1929), American author and educator, was born at Falmouth, Mass., on Aug. 12, 1859. Following her graduation at Wellesley college in 1880 (M.A., 1881), she engaged in teaching. In 1885 she became instructor and in 1891 professor of English literature in Wellesley college, serving in this post until 1925 when she was made professor *emeritus*. She was the author of numerous works in prose and verse, including stories and plays for children. With Cornelia F. Bates, she translated Becquer's *Romantic Legends of Spain* (1909). Among her writings are: *The College Beautiful and Other Poems* (1887), *Rose and Thorn* (1888), *Hermit Island* (1891), *English Religious Drama* (1893), *American Literature* (1898), *Spanish Highways and By-ways* (1900), *From Gretna Green to Land's End* (1907), *The Story of Chaucer's Canterbury Tales Re-told for Children* (1909), *In Sunny Spain* (1913), *Fairy Gold,* for children (1916), *The Retinue and Other Poems* (1918), *Sigurd* (1919) and *The Pilgrim Ship* (1926). Her national hymn, "America the Beautiful," appeared, with other poems, in 1911. She died in Wellesley, Mass., on March 28, 1929.

BATES, WILLIAM (1625–1699), English Nonconformist divine (one of the ejected ministers in 1662), was born in London. He was rector of St. Dunstan's, London, and was one of the commissioners at the conference in the Savoy, for reviewing the public liturgy, and was concerned in drawing up the exceptions to the Book of Common Prayer. With other moderate churchmen he made efforts in 1668, and again in 1674, towards a comprehensive settlement, but the bishops were uncompromising.

Bates published *Select Lives of Illustrious and Pious Persons* in Latin; his other works, treating of practical theology, were printed after his death; again in 1723; and in 1815.

BATESON, MARY (1865–1906), English historian, was born at Robin Hood's bay, Yorkshire, on Sept. 12, 1865, the daughter of W. H. Bateson, Master of St. John's college, Cambridge. Educated in Germany, at the Perse school for girls and at Newnham college, Cambridge, England, she became an associate of Newnham college and a member of the council. She lectured at Newnham, with intervals, all her life, and furthered the interests of the college in numerous ways. At her death on Nov. 30, 1906, she left her library and her property to Newnham.

Mary Bateson was a pioneer in the study of English mediaeval monastic history, and her first work was the publication of *The Register of Crabhouse Nunnery* (1889) for the Norfolk and Norwich Archaeological Society. She also carried out a considerable amount of research in the municipal history of Leicester and Cambridge. Perhaps her most important contribution to the study of municipal institutions was *Borough Customs,* edited by her with introductions for the Selden Society (2 vols., 1904–06). Her more popular works include *Mediaeval England* (1903) in the "History of the Nations" series, and the chapter on "France in America" (1608–1744) in the *Cambridge Modern History*. She was to have been one of the three editors of the *Cambridge Mediaeval History,* but died on Nov. 30, 1906, shortly after having accepted the appointment.

BATESON, BATSON or **BETSON, THOMAS** (1570–1630), important English madrigal composer. He was organist of Chester cathedral from about 1599 to 1608 and is believed to have been the first musical graduate of Trinity college, Dublin.

BATESON, WILLIAM (1861–1926), British biologist, was born at Whitby, Aug. 8, 1861. He was educated at Rugby school and St. John's college, Cambridge, and became known for his biological investigations, which included important researches on Mendelism and the determination of sex. In 1894 he published *Materials for the Study of Variation.* In 1907 he gave the Silliman lectures at Yale university, from 1908 to 1909 was professor of biology at Cambridge, and in 1910 was appointed director of the John Innes Horticultural Institution at Merton Park, Surrey. From 1912 to 1914 he was Fullerian professor of physiology at the Royal Institution, and in 1914 was president of the British Association. He received the Darwin Medal of the Royal Society, of which he was a fellow and a royal medallist, in 1904, and was also the recipient of other British and foreign awards. His works include *Mendel's Principles of Heredity* (1902) and *Problems of Genetics* (1913). He died at Merton, Surrey, on Feb. 8, 1926.

See B. Bateson, *William Bateson, his Essays and Addresses* (1928).

BATESVILLE, a city of Arkansas, U.S.A., in the foot-hills of the Ozarks, 90 mi. N.N.E. of Little Rock, on the White river and the Missouri Pacific railroad; county seat of Independence county. Pop. (1940) 5,267. There are a large manganese field, black and gray marble quarries and undeveloped beds of phosphate in the county. The principal industrial products are lime, staves, lumber, flour and feed. It is the home of Arkansas college, a co-educational Presbyterian institution founded in 1872.

BATH, THOMAS THYNNE, 1ST MARQUESS OF (1734–1796), English politician, was the elder son of Thomas Thynne, 2nd Viscount Weymouth. Born on Sept. 13 1734, Thomas Thynne succeeded his father as 3rd Viscount Weymouth in January 1751, and was lord-lieutenant of Ireland for a short time during 1765, although he never visited that country. He was appointed secretary of State for the northern department in January 1768; and was a prominent anti-Wilkite, being partially responsible for the "St. George's fields massacre." Before the close of 1768 he was transferred from the northern to the southern department, but he resigned in Dec. 1770. In Nov. 1775 Weymouth returned to his former office of secretary for the southern department, but resigned in 1779. In 1789 he was created marquess of Bath, and he died on Nov. 19 1796. Weymouth was a man of considerable ability especially as a speaker. Horace Walpole refers to his drunkenness, and in early life at least "his great fortune he had damaged by such profuse play, that his house was often full of bailiffs." He is said to have been a close friend and frequent companion of Charles James Fox.

See B. Botfield, *Stemmata Botevilliana* (1858).

BATH, WILLIAM PULTENEY, 1ST EARL OF (1684–1764), English politician, was a member of an old Leicestershire family, and was educated at Westminster School and at Christ Church, Oxford. He obtained, by patronage, a seat in Parliament for Hedon, Yorkshire, which he held continuously from 1705–34; from 1734–42 he sat for Middlesex. During the reign of Queen Anne he was a prominent Whig, and a friend of Robert Walpole. He was secretary for war from 1714–17 in the first ministry of George I., and followed Townshend and Walpole into retirement in the latter year. On Walpole's return to power in 1721 Pulteney found himself neglected, and had to accept the insignificant position of cofferer of the household. He began to oppose Walpole, and in consequence was dismissed from his sinecure in April 1725. From that day he became a violent opponent of Walpole, joining the group of malcontents known as the "patriots." With Bolingbroke he established the *Craftsman,* in the pages of which Walpole was incessantly denounced. For his "Proper reply to a late scurrilous libel" (in the *Craftsman* of 1731), he was challenged to a duel by Lord Hervey; for another, published in July 1731, he was struck off the roll of privy councillors and the commission of the peace. In the House of Commons he was one of the most effective opponents of Walpole. He denounced the appropriation of the sinking fund (1733) and the excise scheme of the same year in brilliant speeches, which had something to do with the withdrawal of the latter measure. On Walpole's defeat in Jan. 1742 Pulteney was entrusted with the formation of the new government, but he contented himself with a peerage and membership of the cabinet, of which Lord Wilmington was the head. Since he had been one of the principal opponents of Walpole's government, his action in declining responsibility cost him his reputation. He was raised to the peerage in 1742, and next year, on the death of Wilmington, asked the king for the post of first lord of the Treasury, only to find that it had been given to Henry Pelham. He was, indeed, for two days, in Feb. 1746, at the head of a ministry, but his political life was over. He died on July 7 1764.

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BATH, city, municipal, and county and parliamentary borough of north-east Somersetshire, England, on the G.W.R., L.M.S., and Somerset and Dorset railways. Pop. (est. 1938) 68,300. Area 8 sq.mi. It lies on the River Avon, 12 miles S.E. of Bristol, and has been called the most nobly placed and best-built city in all England. The crater-like situation of Bath, its sunward aspect, and the surrounding Cotswold hills combine to give it a character of its own. The open oolite hills were centres of population in prehistoric times, and the neighbouring Solsbury Hill bears evidence of pre-Roman occupation, but there is no evidence for the legendary foundation of the city by Bladud, 863 B.C. Solsbury commemorates the native deity, *Sul,* said to have been considered by the Romans the counterpart of Minerva. There are abundant evidences of full civic settlement in Romano-British times.

This ancient city suffered severely from air raids during World War II. Upward of 10 churches, the abbey, the old assembly rooms and part of the Royal crescent were damaged or destroyed.

Roman Bath.—By the Romans, Bath was named Aquae Sulis, the name indicating the dedication to Sul. There were a temple of the goddess and a few houses for priests, officials and visitors, besides the large baths, and the place was apparently walled; but it did not contain a large resident population. Many relics have been disinterred, such as altars, inscriptions, fragments of stone carvings and figures and Samian ware. The chief buildings were apparently grouped near the later abbey churchyard, and included, besides two temples, a magnificent bath, discovered in 1755. Successive excavations have rendered accessible a remarkable series of remains, including several baths, a sudarium and conduits. The main bath still receives its water (now for the purpose of cooling) through the original conduit. The fragmentary colonnade surrounding this magnificent relic still supports the street and buildings beneath which it lies, the Roman foundations having

been left untouched. The remains of the bath and of the temple are among the most striking Roman antiquities in Western Europe.

Bath (*Achemann, Hat Bathum, Bothonea, Batha*) was a place of note in Saxon times, King Edgar being crowned there in 973. The present abbey church occupies the site of Saxon and Norman buildings, founded in connection with a 7th century convent, transferred in the 10th century to Benedictine monks. Bath was then a royal borough. The first charter, granted in 1189, conferred the same privileges as Winchester had. Others followed throughout the 13th, 14th and 15th centuries. The existence of a corporation being assumed in the earliest royal charter, and a common seal having been issued since 1249, there was no formal incorporation of Bath until the charter of 1590. Various fairs were centres of exchange when the cloth trade prospered; but the industry declined long ago. Bath "beaver," however, was known throughout England, and Chaucer makes his "Wife of Bath" excel the cloth-weavers of Ypres and of Gaunt. The golden age of Bath began in the 18th century, and is linked with the work of the two architects Wood (both named John), of Ralph Allen, their patron, and of Richard Nash, master of the ceremonies. Previously the baths had been ill-kept, the lodging poor, the streets beset by footpads. All this was changed by the architectural scheme, including Queen square, the Royal crescent and the North and South parades, which was chiefly designed by the elder Wood, and chiefly executed by his son. Nash provided the assembly rooms which figure largely in the pages of Fielding, Smollett, Burney, and their contemporaries. The genius of Wood, the re-discoverer and re-builder of Bath, and one of the pioneers of town-planning, fused the various traditions of the city, geographical, historical and social, into a grand architectural expression. His response to the *genius loci* is best illustrated in the Royal crescent.

Bath Abbey.—The Abbey church of St. Peter and St. Paul is a singularly pure and ornate example of late Perpendicular work. From the number of its windows it has been called "The Lantern of the West," and especially noteworthy is the great west window. Slight traces of the previous Norman building remain. Of other churches of the city, that of St. Thomas of Canterbury is the oldest while St. Swithin's is one of the most interesting.

Among educational institutions may be mentioned the free grammar school, founded by Edward VI, the Wesleyan college originally established at Kingswood, Bristol, by John Wesley, and the Roman Catholic college. The hospital of St. John was founded in the 12th century. The public buildings include a guild hall, assembly rooms (restored), Jubilee hall, art gallery and library, museum, literary and scientific institute, and theatres. The mineral springs supply several distinct establishments. The temperature varies in the different springs from 117° to 120°F. The waters are very beneficial in cases of rheumatism, gout, neuralgia, sciatica, diseases of the liver, and cutaneous and scrofulous affections. One of the most noteworthy features is the successful treatment of children at the Bath Orthopaedic hospital. The royal baths were rebuilt and enlarged 1916–36 for the special treatment of cripples. The city has successfully retained its position and appearance as an aristocratic health resort and has added to its functions those of a tourist centre, the industries being concentrated outside in such suburbs as Twerton, which has quarries and brickworks. Building activity is restricted by natural causes; but residential suburbs are extending, *e.g.*, at Bathampton to the northeast.

Bath forms, with Wells, an episcopal see of the Church of England. The county borough returns one member to parliament. It sent two members from 1295 to 1918.

BATH, a city of Maine, U.S.A., 30 mi. N.E. of Portland on the west bank of the Kennebec river, 12 mi. from the ocean; a port of entry and the county seat of Sagadahoc county. It is served by the Maine Central railroad and by steamers. The population in 1940 was 10,235. Shipbuilding was exceptionally active during the World War of 1914–18, when the population increased 50% within a few years. Between 1907 and 1922 the Bath district launched 455 craft, including both naval and commercial types; after the war the industry dwindled to practically nothing, but later revived under the stimulus of the national defense program undertaken in 1940. The city has a good harbour and a large domestic commerce, and there are many summer resorts near by. Bath was deeded to R. Gutch, of Salem, Mass., by an Indian sachem in 1660. It was incorporated as a town in 1781, as a city in 1847.

BATH, a village of New York, U.S.A., 40 mi. N.W. of Elmira and 6 mi. S. of Lake Keuka, at an altitude of 1,103 ft.; on the Cohocton river and the Lackawanna and the Erie railways. It is the county seat of Steuben county. Population 1940 was 4,696 federal census. Its industrial plants make knitted underwear, bathing suits and sweaters; sash, doors and ladders; harness and saddles; milking machines and brooms. There is a state fish hatchery. Bath is the seat of the Davenport home for orphan girls and of a state camp for veterans, formerly the state soldiers' and sailors' home, which at one time housed 2,000 veterans of the war of 1914–18. The village, founded in 1793 by Capt. Charles Williamson and named after the English watering place, was incorporated in 1816, and again in 1836.

BATHGATE, a small burgh, West Lothian, Scotland, 19 mi. W. by S. of Edinburgh by the L.N.E. railway. Pop. (est. 1938) 10,401. Limestone, coal, ironstone, shale and fireclay are worked. Silver also was once mined and the old workings have been reopened in recent years. The manufactures include paraffin, paper and whisky, and there are iron and steel works. The burgh is a centre for agricultural produce and has seven annual fairs. It formed the dowry of Marjory, Robert Bruce's daughter, who married Walter, hereditary steward of Scotland, in 1315.

BATHOLITH, in geology, a term applied to a large mass of intrusive igneous rock usually showing transgressive relations to the enclosing country rock (from Gr. *βαθύς*, deep, and *λίθος*, a stone). The name was first used to describe those largest of all intrusions, characteristically developed in great mountain ranges, and thus includes those masses known as "central granites," "intrusive mountain cores," etc. Batholiths are distinguished from stocks only in size, the latter term being applied by many writers to irregular masses of batholithic habit with an area of outcrop not exceeding 100 square kilometres. Some of the best known batholiths reach thousands of square kilometres in area, such as those of Alaska, British Columbia and Patagonia. The discordant relations of these intrusions are shown by the rupture of the bedding or other structural planes of the enclosing wall rock. Great masses of the rocks invaded are often floated off and are found lying in the heart of the consolidated magma much transformed by the heat to which they have been exposed, and traversed themselves by the magma in ramifying threads. There can be little doubt that batholiths have developed during or closely following great orogenic movements; most are elongated parallel to the tectonic axis of the folded belts in which they are, and many show a primary gneissic banding clearly indicative of flow movement during the epoch of crystallization.

Two views are now prevalent as regards their mode of origin. According to the one, batholiths are conical masses rising from great depths and assimilating the strata which lie above and around them. This process is facilitated by the mechanical dislodgement or stoping of great masses of the enclosing rock which sink through the magma and are dissolved at depth. Thus interpreted, batholiths are active agents in making room for themselves by stoping and assimilation. Chemical no less than structural relations with the surrounding rocks preclude acceptance of this view: there is an entire absence of evidence for the existence of the excessive heat required for large scale assimilation processes, also the chemical homogeneity of those portions exposed to view is in itself a strong ground for its rejection.

The opponents of this theory hold that stoping or mechanical dislodgement is merely a subordinate factor in the emplacement of batholiths. Of late years much detailed study has been made of the granite batholiths of Silesia, the principal results of which we owe to Cloos and his co-workers. A field study of these intrusions (such as the massifs of Lausitz, Riesengebirge, Striegau and Strehlen) shows that they are injected *between* the country rocks and are therefore not bottomless. The magma coming from

a deep seated source has risen and spread in different directions, the amount and direction of horizontal spreading being largely determined by folds, faults or other lines of weakness in the surrounding rocks. Space is thus obtained by thrusting aside, lifting or even forcing down the adjacent rocks during the folding movements. Conclusions respecting the shape of batholiths have been obtained from numberless observations on the linear elongation of the component minerals (the "stretching"), disposition of the joints and their variable pitch and dip.

These features within any particular massif exhibit in general a dome-like arrangement, the underlying source of the magma being found beneath the crest of the dome. By these means the Hauzenburg massif, for example, is shown to consist of an elongate arch with roots on the north-east side and a nearly level floor on the south-west; others are shown to possess a sill-like structure, the magma spreading laterally from a source situated along a line of weakness such as an overthrust. A considerable majority of batholiths are constituted of acid igneous rocks, generally of granitic, quartzdioritic or granodioritic composition. Large batholiths of basic composition are rare. Of such, those built up of anorthosite, *e.g.*, in eastern Canada and New York State, are best known.

See H. Cloos, "Das Batholithen problem" (*Fortschritte der Geologie und Palaeontologie*) (Berlin, 1923). (C. E. T.)

BÁTHORY, SIGISMUND (ZSIGMOND) (1572–1613), prince of Transylvania, was the son of Christopher, prince of Transylvania, and Elizabeth Bocskay, and nephew of the great Stephen Báthory. He was elected prince in his father's lifetime, but being quite young at his father's death (1581), the government was entrusted to a regency. In 1588 he joined the league of Christian princes against the Turk, a policy which roused violent opposition which he surmounted in 1595 by executing his opponents. In 1595 he subdued Walachia defeating Sinan Pasha at Giurgevo (Oct. 28). The turning-point of his career was his separation from his wife, the archduchess Christina of Austria, in 1599, an event followed by his own abdication the same year, so that he might take orders. He offered the throne of Transylvania to the emperor Rudolph II., in exchange for the duchy of Oppeln. In 1600, however, at the head of an army of Poles and Cossacks, he attempted to recover his throne, but was routed by Michael, voivode of Moldavia, at Suceava. In Feb. 1601 the diet of Klausenburg reinstated him, but again he was driven out by Michael, never to return. He died at Prague in 1613. Báthory's indisputable genius must have been warped by a strain of madness. His incalculableness, his savage cruelty (like most of the princes of his house he was a fanatical Catholic and persecutor) and his perpetual restlessness point plainly enough to a disordered mind.

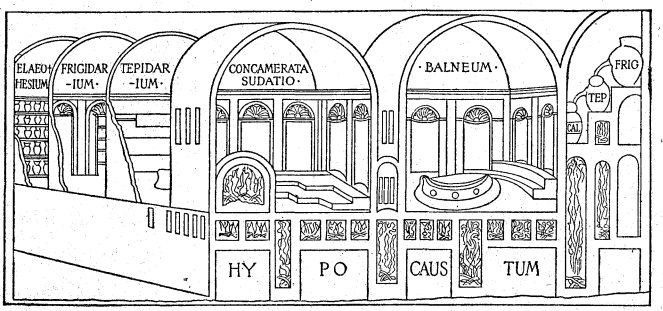
See Ignaz Acsády, *History of the Hungarian State* (Hung.), vol. ii. (Budapest, 1904).

BATHOS, properly depth, the bottom or lowest part of anything. The current usage for a descent "from the sublime to the ridiculous" is due to Pope's satire "Bathos" (*Miscellanies,* 1727–28), "the art of sinking in poetry." The title was a travesty of Longinus' essay, *On the Sublime.*

BATHS. The word bath is used: (1) for the process of immersing the body in some medium other than atmospheric air, for the purpose of cleanliness or as a cure; and (2) for the building or room in which such immersion takes place.

Separate structures for baths existed at a very early date, and probably similar types are still to be found among primitive peoples. Although bathrooms occurred in early Egyptian palaces, remains are too fragmentary to permit complete analysis of Egyptian types. It is the palaces of the Aegean civilization that provide the earliest well preserved examples of bathrooms. They are remarkable both for careful structure and for an advanced system of water supply and drainage. Examples are in the palaces of Cnossus and Phaistos, *c.* 1700–1400 B.C., and also on the mainland as in the palace of Tiryns, *c.* 1200 B.C. Bathing occupied an important place in the life of the Greeks; vase paintings show that there were showers; but even though in the later period there were public baths, they never received important and monumental architectural treatment. Eastern peoples seem to have had luxurious baths which Alexander the Great is reported to have admired.

Roman Baths.—The Romans with their customary organizing genius and love of luxury developed to a degree before unknown not only the technique of bathing but also the planning of bath buildings. Their bathing process seems to have been as follows: The bather undressed and left his clothes in the *apodyterium.* He then was anointed with oil in the *alipterium* or *unctuarium*

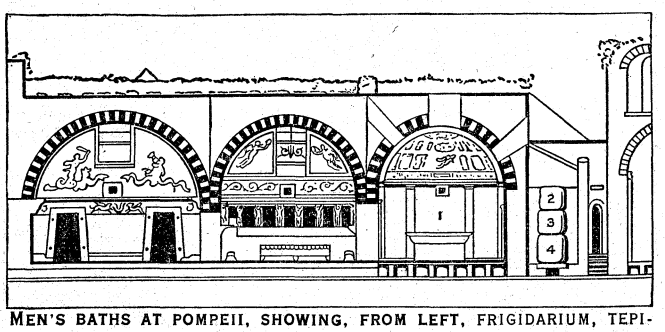


BY PERMISSION OF JOHN MURRAY, FROM SMITH, "DICT. OF GREEK AND ROMAN ANTIQUITIES"
ROMAN BATHS AFTER A DRAWING FOUND IN THE BATHS OF TITUS

and, thus anointed, went to the room or court where he could indulge in violent exercise. After this he proceeded to the *calidarium* or hot room and the *sudatorium* or *laconicum,* a steam room. It was probably at this point that the body was scraped of its accumulation of oil and perspiration with curved metal *strigiles.* The bather then went to the warm room, or *tepidarium* and then into the cold bath or *frigidarium,* in which there was frequently a swimming pool. This completed the process. There is some question as to the exact order in which the hot and cold baths were taken and of the exact relationship of *calidarium* and *laconicum,* which were apparently often combined in one room.

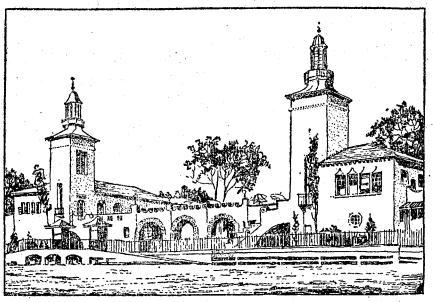
To carry on this complicated process the Romans developed baths varying in size from those in the larger houses, in which each unit was merely a tiny room, to the enormous thermae of Imperial Rome. The essential features that run through all types are: (1) An adequate system of furnishing hot, tepid and cold water; (2) The heating of the hot portions of the bath and sometimes also the *tepidarium* by the circulation of the smoke and heated air from a fire under the floor and through the hollow walls. (3) In the hot bath adequate basins for warm and cold water.

A good example of the private bath exists in the so-called villa of Diomed in Pompeii (*see* Mau, *Pompeii*). Pompeii also furnishes the two oldest Roman public baths extant, the Stabaean baths and those of the Forum, both of which have two com-

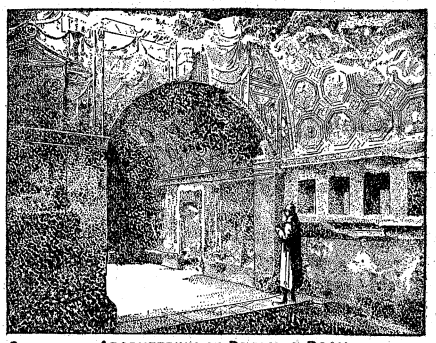


MEN'S BATHS AT POMPEII, SHOWING, FROM LEFT, FRIGIDARIUM, TEPIDARIUM AND CALIDARIUM. 1. FLUES; 2-4. WATER VESSELS

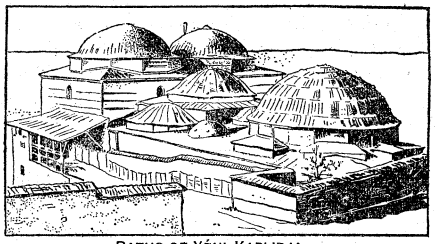
plete sets of bathrooms, one for men and one for women. These are of a type characteristic of all the smaller baths, ruins of which have been found in many provincial towns such as Trier, Germany, and Timgad and Leptis Magna, Africa. The general scheme consists of a range of barrel vaulted apartments flanking an open court. The rooms are of approximately the same size and are usually three in number: the *apodyterium,* usually surrounded by niches to serve as lockers; the *tepidarium;* and the *calidarium,* which has an apse at one end containing the *labrum* and at the other end the hot bath or *alveus.* The cold bath in both the larger Pompeiian establishments takes the form of a small circular room with a large round pool in the centre.



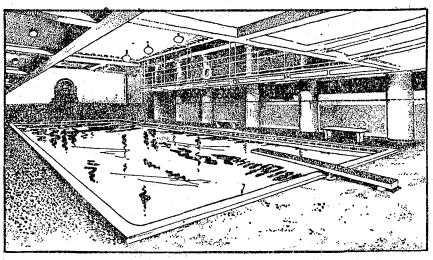
1 BATHING PAVILION, RYE BEACH, N. Y.



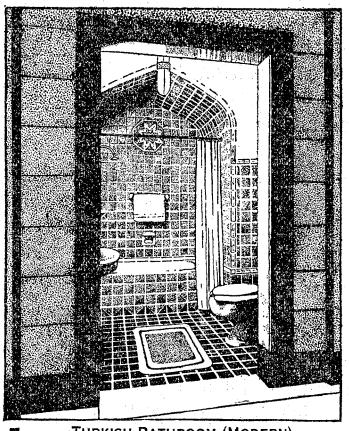
2 APODYTERIUM OR DRESSING-ROOM STABAEAN BATHS, POMPEII



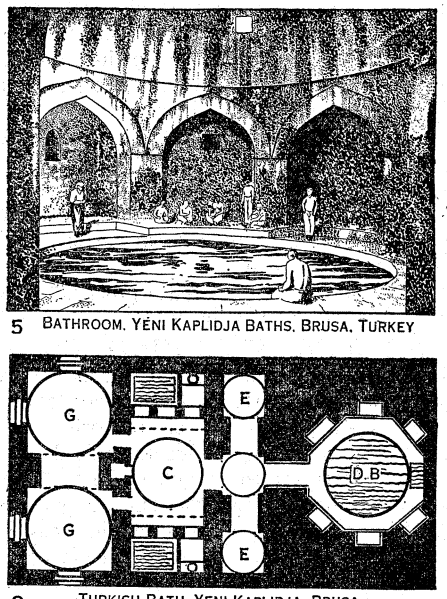
3 BATHS OF YÉNI-KAPLIDJA



4 SHELTON HOTEL SWIMMING POOL

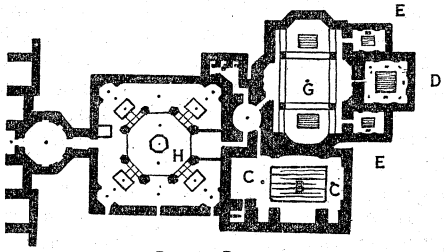


7 TURKISH BATHROOM (MODERN) (KOHLER CO.)

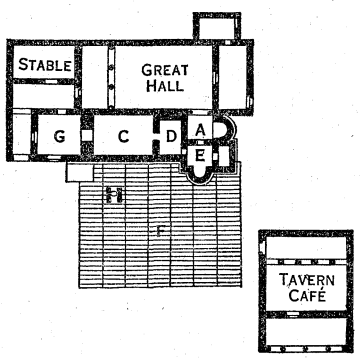


8 TURKISH BATH, YENI KAPLIDJA, BRUSA 16TH CENTURY

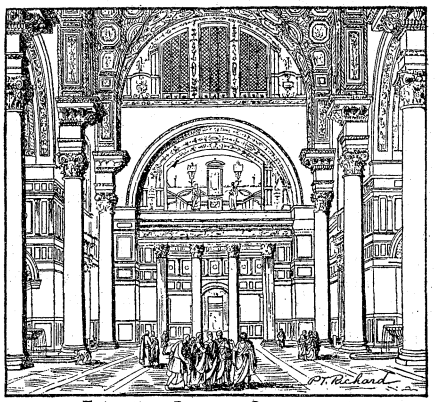
5 BATHROOM, YÉNI KAPLIDJA BATHS, BRUSA, TURKEY



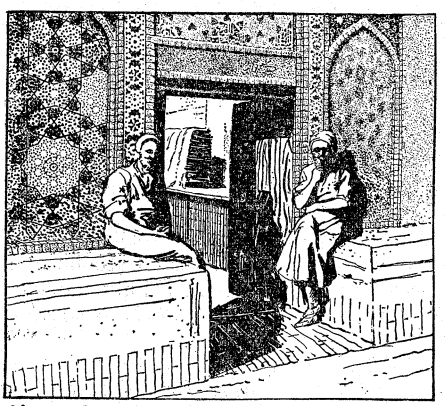
6 PERSIAN BATH AT KASHAN, PERSIA



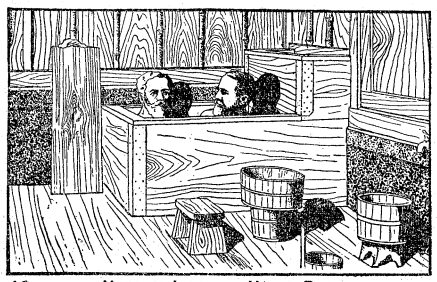
9 BATHS AT SERDJILLA, SYRIA. A. D. 473



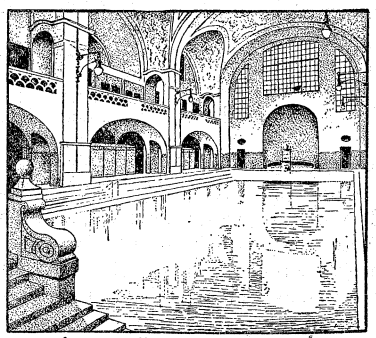
10 TEPIDARIUM, BATHS OF CARACALLA ROME. RESTORED (EARLY 3RD CENTURY)



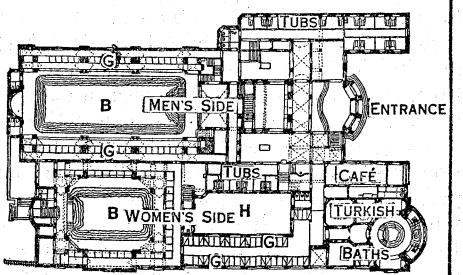
11 DOOR OF PERSIAN BATH ISPAHAN, 19TH CENTURY



12 MODERN JAPANESE HOTEL-BATH



13 INTERIOR, KARL MUELLER BATHS



14 PLAN, KARL MUELLER BATHS MUNICH, GERMANY, EARLY 20TH CENTURY

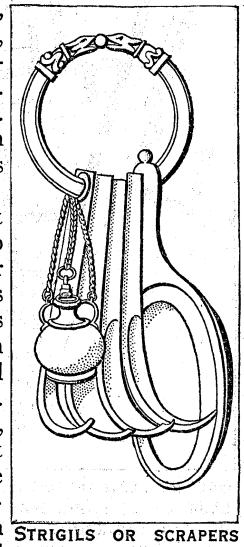
A, Frigidarium B, Swimming-Pool or Plunge C, Tepidarium D, Calidarium E, Laconicum F, Reservoir G, Dressing-Room H, Courts

3, 5, 6, 8, 11. FROM SALADIN, "MANUEL D'ART MUSULMAN," (LIBRAIRIE ALPHONSE PICARD & FILS); 13, 14. REPRINTED BY PERMISSION FROM GERHARD, "MODERN BATHS AND BATH HOUSES" (JOHN WILEY & SONS, INC.)

THE BATHS AT SERDJILLA (9) SHOW A SYRIAN MODIFICATION OF ROMAN PRECEDENT, AND SUCH MODIFICATIONS LED EVENTUALLY TO THE DEVELOPED ORIENTAL TYPE AS IN KASHAN, PERSIA (6), OR BRUSA, TURKEY (5 & 8). THE LUXURIOUS RICHNESS OF THE ROMAN BATHS, AS SHOWN AT POMPEII (2) AND IN THE BATHS OF CARACALLA AT ROME (10), IS MATCHED BY THE MONUMENTAL CHARACTER OF SOME MODERN PUBLIC BATHS, SUCH AS AT MUNICH (14); BY SWIMMING POOLS LIKE THAT OF THE SHELTON HOTEL, NEW YORK (4); BY SHORE BATHING ESTABLISHMENTS LIKE THAT AT RYE (1).

The recently (1928) excavated baths of Leptis Magna have as their main feature a large swimming pool, lavishly cased in marble and bordered by a monumental colonnade.

It was only in Rome, however, in the great imperial thermae that the bath received its most complete architectural form. Here the problem was complicated by the development of the baths as great social centres in addition to their primary purpose. Gardens, a stadium and *exedrae,* where lectures were given and poems read, all became necessary parts. The fully developed examples are those of Titus (A.D. 81), Domitian (A.D. 95), Trajan (*c.* A.D. 100), Caracalla (A.D. 217) and Diocletian (A.D. 302). Extensive remains of the baths of Titus, Caracalla and Diocletian exist.



STRIGILS OR SCRAPERS USED ANCIENTLY AFTER BATHING

The general scheme comprised a great open garden surrounded by subsidiary club rooms, and a block of bath chambers either in the centre of the garden, as in the baths of Caracalla, or at its rear, as in the baths of Titus. The main block contained, in addition to the *frigidarium, calidarium* and *tepidarium,* courts and smaller bath-rooms. Of the three great bath-rooms in this block, the *tepidarium* was made much the most important and was used, apparently, as the great assembly-hall or lounge. The *frigidarium* appears frequently to have been an enormous unroofed swimming bath, and the *calidarium,* on the other side of the *tepidarium,* is, in the baths of Diocletian and Caracalla, treated as a domed, circular hall. Service was furnished by means of underground passage ways; slaves could move swiftly and simply without being seen. In order to light and roof the enormous rooms, the Romans were forced to develop an ingenious system of buttressing, cross vaulting and clerestory windows. Their scheme of groined vaults carried on interior columns and buttressed by cross buttresses, which form the walls of recesses opening from the room, has since been an inspiration to designers of great halls (*e.g.,* St. George's Hall, Liverpool; Pennsylvania Station, New York). The remains of the baths of Diocletian, whose *tepidarium,* slightly altered by Michelangelo, now forms the church of S. Maria Degli Angeli, give an extraordinarily vivid impression of what the thermae must have been. The important pieces of sculpture, found in Roman baths, such as the Laocoön group from the baths of Caracalla, indicate the richness of their furnishings. Floors were universally of marble or mosaic. Walls were apparently sheathed with marble to a considerable height, and decorated above with stucco reliefs, colour and mosaic. Gilt bronze was used freely for doors, capitals and window screens.

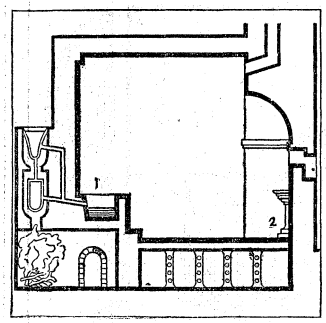
It is significant that in the great imperial thermae there is only one set of public rooms. The usage varied. At times women and men were admitted to the baths at different hours and at times mixed and promiscuous bathing was permitted. Outside of Rome the separation of the sexes into two different sets of rooms in the same establishment was more common. There are many contemporary references to Roman baths and bathing scattered through the works of Pliny the Younger, Seneca, Juvenal, Suetonius and, in the later empire, Ausonius and Statius.

Mediaeval Baths.—The excesses apparently common under the system of mixed bathing in the public baths were bound to produce a reaction and the church fathers generally agreed that bathing should be confined to the purposes of cleanliness and health. Moreover, the destruction of the great aqueducts (*see* AQUEDUCTS) of Rome led to the closing of the baths. The habit, however, of the bath as a luxury, and of public buildings for it, must have continued alive in Europe, for by the 12th century we find indications that public baths were common, and in the 14th and 15th centuries they again became notorious. Late Gothic tapestries and woodcuts indicate the existence not only of much out door bathing in garden pools but also of bath houses with large pools or basins of warmed water. In both cases the bathing was quite promiscuous; the abuse of this custom is indicated by the colloquial use of the Italian word *bagnio* (bath) for a brothel. During the Renaissance there was little additional development of bathing, and the mechanical arrangements were of the crudest, as in the famous bath of Marie Antoinette at Versailles.

Mohammedan Baths.—Bath architecture, however, progressed in the countries under Mohammedan rule. There, either through the development of a primitive eastern bath tradition, or through the adoption of the Roman system, or, as is perhaps more likely, through a merging of the two, the complicated technique of bathing continued and with it the growth of adequate architectural forms. The Alhambra, at Granada, has a beautiful set of bath-rooms, all rectangular, which show the Moorish form at the beginning of the 14th century. Further east Roman or Byzantine forms were the basis of the baths. Constantinople baths, which are typical, and whose form seems to have varied little in five centuries, consist universally of a series of square rooms, carrying domes on pendentives. Each series of rooms is composed of a warm, hot and steam room, corresponding roughly to the *tepidarium, calidarium* and *laconicum.* The place of the *frigidarium* is generally taken by a basin of cold water at one end of the warm room. In addition to these vaulted chambers there are dressing rooms and frequently a luxurious rest room.

Russian Baths.—In Russia, a great love of hot and steam baths has produced a multitude of bath houses. These are usually simple and consist only of a steam room and a cold bath; frequently even the cold bath is lacking and the bather plunges directly from the steam room into a river, or outdoor pool, or even snow.

Modern Baths.—Contemporaneous with the Industrial Revolution a new feeling for personal cleanliness led quickly to the erection of public bath houses to compensate for the universal lack of home plumbing. Three main types have arisen. The mid-19th century baths consisted of a range of small individual bath-rooms and a control office; with the development of athleticism shower baths and swimming pools were added, the original form, without a pool, is less common (1928) than formerly because of the growing custom of having at least one bath-room in each residence. The second type, approximating the Roman, is a large and complex structure containing a swimming bath with adjacent ranges of showers, through which bathers are compelled to pass before entering the pool, steam, massage and rest rooms, and occasionally restaurants. The third type was developed in connection with medicinal springs and is designed to include all units that might add attractiveness; such establishments contain all necessary bath and treatment rooms and also restaurants, card rooms, concert and dance halls and extensive gardens. Modern western architecture has developed no distinctive forms for either Turkish or Russian baths both of which have been very popular since the beginning of the 19th century.



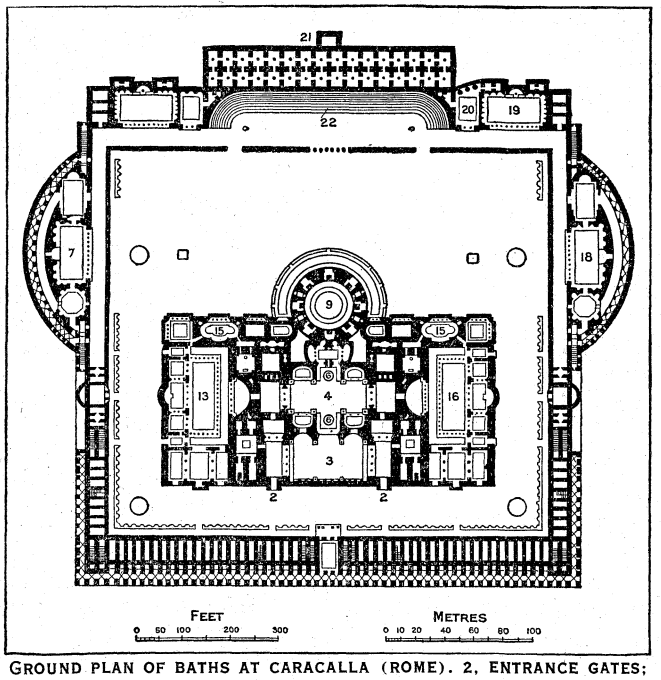
SECTION OF BATH DISCOVERED AT TUSCULUM, SHOWING ARRANGEMENT OF CALIDARIUM. 1.—ALVEUS; 2.—LABRUM

The European municipal swimming baths are, in many cases, works of great architectural interest. On the continent there are usually first and second class establishments under the same roof. The swimming pools are frequently large and often vaulted, and their resemblance to Roman prototypes is strong. Noteworthy among these are the Guentz bath at Dresden, the municipal bath at Hanover and the enormous and monumental Karl Mueller public baths at Munich. The imperial baths and the Bacz baths at Budapest are especially lavish in their appointments, and show, in their use of domed rooms, strong Turkish influence. Medicinal baths exist in all countries; among the best known are those of Baden-Baden, Ger., and Carlsbad, Czech.; Vichy and Aix-les-Bains

in France; Bath and Harrogate in England; White Sulphur Springs, W. Va., and Hot Springs, Ark., in the United States.

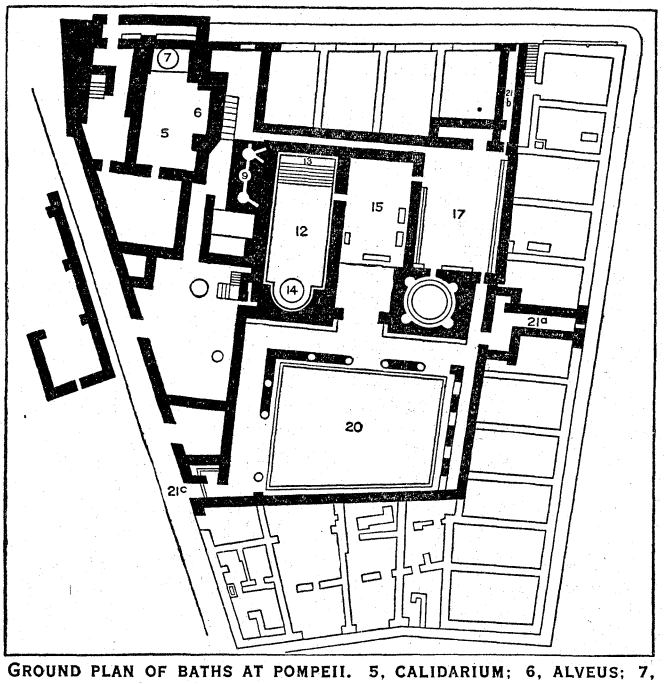
The modern bath-room contains a tile tub and a shower that is often enclosed in glass; its walls and floors are embellished with tiles and mirrors; it is planned for cleanliness and convenience, and in large houses is often lavishly decorated as well. The design of swimming pools has become a science. By means of disinfectants, the same water can safely be used again and again, making a swimming pool possible even when the water supply is limited. Hotels, clubs and steamships maintain pools. The tank is usually of reinforced concrete lined with glazed or ceramic tile and furnished at the water level with a gutter that automatically removes floating scum. Outdoor swimming pools are also built. Another form of the modern bathing establishment is that found at seaside resorts, where the necessary cubicles, showers, suit and towel laundries, and storage space may be combined with terraces, restaurants and club house facilities; the beach clubs of the Florida, U.S.A., winter resorts represent the highest development of this type.

Far Eastern Baths.—Although bathing has always been popular in both China and Japan, it has reached its highest development in the latter. There every house has a bath which usually consists of a circular wooden tub of considerable size. This tub is placed outdoors in the court or garden and all the members of one family are usually served by one filling of exceedingly hot water. In the more luxurious houses and native hotels the system is largely the same, although the tub may be indoors, and the bather is, in these, given a thorough massage at the same time. The Japanese have also built numerous bath establishments of great size near medicinal springs; a famous example is that near Matsuyama, on the island of Shikoku. In these, the bath proper consists of a large, shallow pool with steps on which the bather sits. Surrounding the pool are cubicles for dressing. The main bath-room is frequently of two storeys with tea-rooms, restaurants, etc., above. In all Japanese baths, public and private, there is no attempt to achieve privacy. Public baths, for instance, will frequently have large, unprotected openings through which people in the streets can watch the bathers.



GROUND PLAN OF BATHS AT CARACALLA (ROME). 2, ENTRANCE GATES; 3, FRIGIDARIUM; 4, TEPIDARIUM; 6, LABRA; 9, CALIDARIUM; 13 AND 16, SPHAERISTERIA; 15, BAPTISTERIA; 7 AND 18, THE EXEDRAE; 19 AND 20, RECREATION OR CLUB ROOMS; 21, AQUEDUCT; 22, STADIUM

The medium of the baths hitherto described has been water, vapour or hot dry air. Other substances used are sand, peat, radio-active mud, aromatic herbs in great variety, especially pine oil, scented and coloured soluble salts, ammonia. Electrical baths (*see* ELECTROTHERAPY), sun baths (*see* HELIOTHERAPY AND LIGHT AND RADIATION), and baths of compressed air (*see* AEROTHERAPEUTICS) do not call for special mention here.



GROUND PLAN OF BATHS AT POMPEII. 5, CALIDARIUM; 6, ALVEUS; 7, LABRUM; 9, FURNACES; 12, CALIDARIUM; 13, ALVEUS; 14, LABRUM; 15, WARMING-ROOM; 17, DRESSING-ROOM; 20, ENTRANCE COURT; 21A, 21B, 21C, PUBLIC ENTRANCES

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BATHURST, EARLS. ALLEN BATHURST, 1st Earl Bathurst (1684–1775), was the eldest son of Sir Benjamin Bathurst (d. 1704), by his wife, Frances (d. 1727), daughter of Sir Allen Apsley of Apsley, Sussex, and belonged to a family which is said to have settled in Sussex before the Norman Conquest. He was educated at Trinity college, Oxford, and became member of parliament for Cirencester in May 1705. In 1711, he was created Baron Bathurst of Battlesden, Bedfordshire. He defended Atterbury, bishop of Rochester, and in the House of Lords was an opponent of Sir Robert Walpole. After Walpole left office in 1742 he was made a privy councillor, and in Aug. 1772 was created Earl Bathurst, having previously received a pension of £2,000 a year chargeable upon the Irish revenues. He died on Sept. 16 1775. Pope, Swift, Prior, Sterne and Congreve were among his friends. The letters which passed between him and Pope are published in Pope's *Works,* vol. viii. (London, 1872).

HENRY, 2nd Earl Bathurst (1714–1794), was the eldest surviving son of the 1st earl. Educated at Balliol college, Oxford, he was called to the bar, and became a K.C. in 1745. From 1735 to 1754 he sat in parliament for Cirencester; in the latter year he became a judge of the court of common pleas and in 1771 lord high chancellor, when he was raised to the peerage as Baron Apsley.

Having become Earl Bathurst by his father's death in Sept. 1775, he resigned his office somewhat unwillingly in July 1778 to enable Thurlow to join the cabinet of Lord North. In Nov. 1779, he was appointed lord president of the council, and left office with North in March 1782. He died at Oakley Grove

near Cirencester on Aug. 6 1794. Bathurst was a weak lord chancellor, but appears to have been just and fair in his distribution of patronage.

HENRY, 3RD EARL BATHURST (1762–1834), the elder son of the second earl, was born on May 22, 1762. He was member of parliament for Cirencester from 1783 until he succeeded to the earldom in Aug. 1794. Owing mainly to his friendship with William Pitt, he was a lord of the admiralty (1783–89), a lord of the treasury (1789–91), and commissioner of the board of control (1793–1802). Returning to office with Pitt in May 1804 he became master of the mint, and was president of the board of trade and master of the mint during the ministries of the duke of Portland and Spencer Perceval, only vacating these posts in June 1812 to become secretary for war and the colonies under the earl of Liverpool. For two months during the year 1809 he was in charge of the foreign office. He was secretary for war and the colonies until Liverpool resigned in April 1827 and deserves some credit for improving the conduct of the Peninsular War. Bathurst's official position brings his name frequently into the history of the abolition of slavery. He was lord president of the council in the government of the duke of Wellington from 1828 to 1830, and favoured the removal of the disabilities of Roman Catholics, but was a sturdy opponent of the Reform Bill of 1832. He died on July 27 1834. Bathurst was made a knight of the Garter in 1817, and held several lucrative sinecures.

BATHURST, a city of Bathurst county, New South Wales, Australia. Pop. (1933) 10,413. It is on the south bank of the Macquarie river, at an elevation of 2,153 ft., in a fertile undulating plain to the west of the Blue Mountain plateau. Bathurst is in the east of the chief wheat-growing district of New South Wales, while gold, copper and silver are extensively mined in its vicinity. There are railway works, coach factories, tanneries, breweries, flour-mills and manufactures of boots and shoes. The town was founded in 1815 by Governor Macquarie, taking its name from the 3rd Earl Bathurst, then secretary of state for the colonies, and it has been a municipality since 1862.

BATHVILLITE, a naturally occurring organic substance. It is an amorphous, opaque, and very friable material of fawn-brown colour, filling cavities in the torbanite or Boghead coal of Bathville, Scotland. It has a specific gravity of 1·01, and is insoluble in benzene.

BATHYBIUS, a slimy substance, at one time supposed to exist in great masses in the depths of the ocean, and to consist of undifferentiated protoplasm. Regarding it as an organism which represented the simplest form of life, Huxley, about 1868, named it *Bathybius Haeckelii.* But investigations carried out by the "Challenger" expedition indicated that it was a flocculent precipitate of gypsum thrown down from sea-water by alcohol, and the hypothesis of its organic character was abandoned by most biologists, Huxley included.

BATHYCLES, an Ionian sculptor of Magnesia, was commissioned by the Spartans to make a marble throne for the statue of Apollo at Amyclae, about 550 B.C. Pausanias (iii. 18) gives a detailed description of this monument, which is of the greatest value to us, showing the character of Ionic art at the time. It was adorned with scenes from mythology in relief and supporting figures in the round.

For a reconstruction, *see* Furtwängler, *Meisterwerke der griech. Plastik,* p. 706.

BATIK, a Javanese word meaning wax painting—the application of a wax "resist" to various materials which are afterwards dyed, and certain portions of which are protected by the wax so that they do not absorb the dye, leaving as a result a pattern or design on them. The resist is usually composed of bees-wax, paraffin and sometimes a little resin, which makes it adhere more securely to the material. This resist is applied hot so that it flows easily and sinks into the material, protecting from the dye that part which it covers.

History and Uses in Java.—Little is known of the origin of this art; it is, like many others, lost in antiquity. Some believe that it originated in China, while others claim that it is a natural outgrowth of the methods employed for centuries in India. Probably the latter is more nearly correct. There have been found ruins of temples in Java about 1,200 years old, among which were fragments of stone figures wearing garments similar to those worn to-day by the natives and decorated with similar patterns, and it is likely that these same designs have been handed down for centuries. Batik is used almost entirely throughout Indonesia for



FIG. 1.—NATIVE JAVANESE DANCERS, DRESSED IN COSTUMES OF BATIK, PERFORMING AN ANCIENT DANCE

the decoration of the very simple clothing which the people wear, This clothing consists, in the main, of only four pieces:—

(1) The *Sarong,* a strip of cloth from 9 to 14 ft. long by about 3½ ft. wide, which is worn twisted about the body in various ways. (*See* fig. 4.)

(2) The *Slendang,* a piece of cloth about 9 ft. long and only 18 in. wide, which may be twisted about the head or used by the women for carrying their babies or other burdens on their backs.

(3) The *Kemban,* a narrow girdle or band, worn only on occasion by the women, twisted tightly about their waists or breasts.

(4) The *Sarong Kapala,* a square piece of material not unlike a large bandanna handkerchief, worn by the men, twisted about their heads like a turban in some particular way which designates the locality from which the wearer comes and his station in life. After this piece has been arranged on the head it is removed and starched on the inside so that it will hold its shape.

Each of these pieces is decorated with a design and in colours which indicate the part of the country from which it comes. The



FIGS. 2, 3.—JAVANESE WOMEN IN DRESS COSTUME OF BATIK

designs and colours are all similar, but, on the other hand, they have very definite variations. In all parts of the country, however, there are in use two types of sarong; the usual type, decorated with an all-over pattern, and the dress type, worn on ceremonial occasions. The latter is enhanced by the addition of a wide band, across one end, more ornately decorative than the body of the piece, and also by a surrounding border made up of a number of various-sized smaller borders of different widths, making a beautiful frame similar to that seen on oriental rugs. In all of the

sections the designs are based upon the same origin and consist of conventionalized objects of nature, such as flowers, butterflies, birds, fruits, foliage, cuttlefish and shells and occasionally of a conventionalized Malay kris or knife. These designs are passed from generation to generation and taught by each mother to her daughter, for it is the women who draw them while the men do the dyeing. (*See* figs. 11 and 12.)

Javanese Practice.—In Java batik is done, as a rule, upon cotton cloth or sometimes silk. Whatever the material, it is first carefully prepared by several washings in hot water, alternating with steepings in coconut oil or castor oil (fig. 6). These washings are done in water containing an alkali, such as a weak solution of soda or the ashes of burnt rice stalks, and after each washing, before it is steeped in the oil, it is dried in the sun until it finally assumes the soft creamy tone so beautiful in the finer pieces. After the washing process it is hemmed and then starched or sized in a solution of rice water, again dried in the sun and then rolled up into a loose roll, placed on a board and gently pounded with a hammer or rolled with a wooden roller until it becomes soft and pliable, when it is ready to be suspended upon a frame. Sometimes the artists block in the designs with charcoal (*see* fig. 10), but many of them are so sure in their art that they are capable of drawing the intricately involved patterns without this aid.



FIG. 4.—NATIVE WOMAN SHOWING METHOD OF TWISTING SARONG ABOUT THE BODY

Instruments.—The *tjanting* is the instrument used for applying the wax. It is a small copper cup, from the bottom of one side of which curves outward and downward a delicate spout or capillary tube, and from the opposite side of which projects a bamboo handle, cut in such a way that a spur follows the lower line of the cup. These tjantings are of various forms: some have large spouts and some very slender ones; some, called *penembok,* have wide flat spouts, while others may have as many as two, three, four or even six, all springing from the same cup, so that it is possible to draw with them, simultaneously, a number of parallel lines. Besides the tjanting, there is a primitive instrument called the *djegoel,* which is simply a stick of wood with a wad of cotton attached to the end, forming a sort of crude brush which is used for filling in the large areas with wax. (*See* fig. 5.)

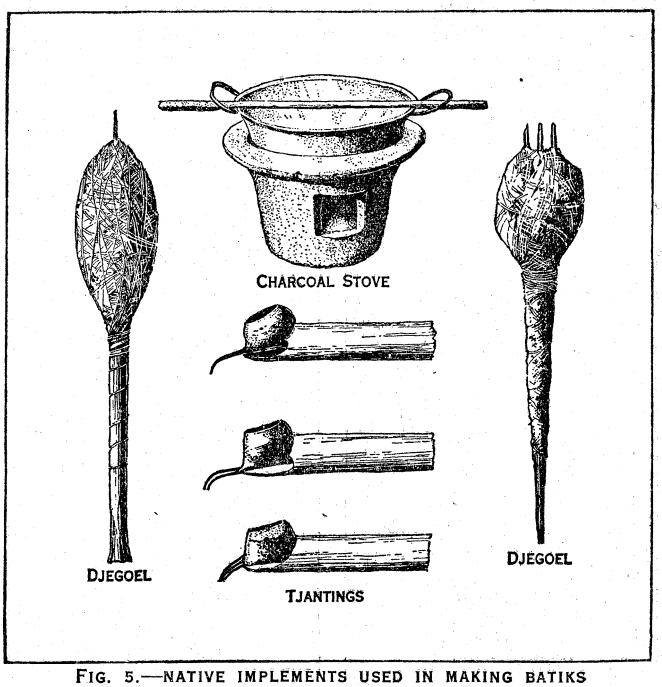


FIG. 5.—NATIVE IMPLEMENTS USED IN MAKING BATIKS
The wax is melted on the charcoal stove and applied to the lines of the design with various types of tjantings, which will be noted as having different kinds of spouts. The larger areas are covered by the use of djegoel, two types of which are shown

Native Practice.—Seated on the ground, the material hanging over a frame before her (fig. 11), the artist covers that part of the design which is to remain the natural colour of the material with a wax consisting of about six parts animal fat to one part resin and to which is sometimes added one part of pure bees-wax and a little of the old wax which, owing to carbonization and former contact with the indigo dye, has become dark, making the whole resist more easily seen upon the fabric. When this first step is finished the piece must be turned over and carefully waxed on the back so that there is no possibility of the dye entering the fabric from that side. It is then immersed in cold water, which thoroughly hardens and solidifies the wax, so that it is ready to enter the dye which has been prepared for it. When it has been satisfactorily dyed, the wax is removed and the piece re-waxed, leaving exposed other parts which are to be dyed a different colour.



FIG 6.—WASHING THE CLOTH AS A PRELIMINARY TO BLEACHING AND DRYING IT IN THE SUN

In sharp contrast to the East Indian, and even more so to modern European methods, stands this "Javanese practice" of carefully waxing the back of the fabric and of removing the wax and replacing it in a different section of the design each time a new colour is to be dyed. In Europe and America the custom is to dye one colour over another, removing the wax only when this becomes impossible. It is, as has been said, the native custom to confine themselves almost entirely to cotton and silk, while in the West batik is also done upon woollens, velvets, ivory, straw or any other material which can be stained with dye. Sometimes batik is employed upon metal or wood, the exposed surface of which is etched away with acid, giving the effect of low relief carving.





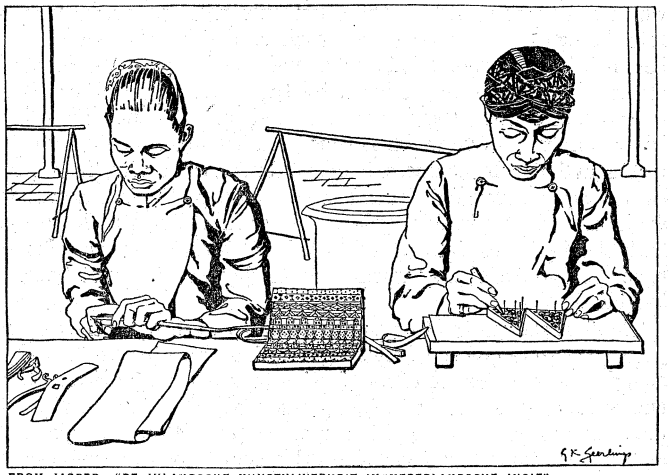
FIGS. 7, 8.—LAYING OUT CLOTH FOR SUN-BLEACHING AND POUNDING THE CLOTH TO SOFTEN IT

The dyes used by the natives were originally, without doubt, vegetable, but nowadays they are making use of some of the anilines brought to them from Holland. Indigo provides blue, and the other colours, such as red from madder and yellow from the bark of mangosteen, are typical. Secondary colours are produced, at times, by dyeing one of these colours over another, and black is produced by the dyeing of brown over the indigo-blue; the range of colours, however, is not very great, and the native is far more interested in the intricacy of the design than in the delicacy of colour.

Tjap Printing.—Although this is not true batik and is looked down upon by the natives themselves, it is a similar process, and one with which beautiful results have been obtained. There is little doubt that the method originated in Madras, where it has at any rate been used extensively since the 15th century.

A *tjap* is a wooden block which has had set into the end of the grain small copper strips, similar to the *cloissons* which divide the different enamel colours in the well known *cloisonné* of China and Japan. These strips are carefully bent with tiny pliers until they

assume the desired curves and are then fastened into the wood block. For the application of the wax, the tjaps are made in pairs, one for each side of the material. They are simple to use, for the process consists of dipping the block into the molten wax (which, in this case, must be somewhat stiffer than that used for true batik, and made of resin, paraffin and varnish gums) touching the block to a pad to remove the excess wax, and then printing the wax



FROM JASPER, "DE INLANDSCHE KUNSTNIJVERHEIT IN NEDERLANDSCHE INDIE"

FIG. 9.—NATIVES MAKING BLOCKS FOR USE IN TJAP PRINTING

on to the material, after which the process is repeated for the back and the dyeing is proceeded with exactly as in the case of real batik.

Tjap printing is not considered equal to batik, but as the tjaps must be made in pairs so as to correspond perfectly in the printing of the front and back of the fabric, and as the making of the tjaps is, in itself, a most exacting and delicate craftsmanship, the work must not be neglected by the student, who should realize that sometimes really good specimens of tjap printing are fully as valuable as batiks.

European History and Uses.—Batik was introduced into Europe by the Dutch, who, returning from Java, described the beautiful costumes of the natives. It was lectured about, and in due time some specimens were brought home by travellers, but very little attention was paid to them as works of art or to the method of execution pursued. Sporadic interest did occur, but when the Dutch acquired the islands, an industry was started in the printing of imitation batiks for sale and trade with the natives. This had an ill effect, as many people did not understand the difference between these printed atrocities and the beautiful creations of the natives, and it was not until the latter part of the 19th century that the great strides made in the production of dyes led artists to experiment with them as a medium and to the revival of this 2,000-year-old art.

Some batik in Europe and America is executed like that in Java, for the purpose of wearing apparel, but the length of time involved in producing these fabrics makes it impossible to compete with the beautifully printed and woven fabrics done by machinery and therefore the art has been driven a step higher. Artists found that they could not spend the time to design and execute a batik gown unless they could first find patrons willing to spend large sums of money for their work; therefore, the application of this art to the more permanent elements of decoration such as wall hangings, lamp shades, table runners or throws, etc., for which comparatively higher prices could be asked, was necessary. The first artists who awoke to the possibilities of this medium of expression were those in Holland; then followed such artists as Arthur Crisp, Pieter Mijer, Bertrand Hartmann and Ethelyn Stewart in America, who developed batik to a higher standard.

These artists, equipped with an almost unlimited range of colour, produced by modern dyes, have created designs of a beauty never before realized. Improved instruments have also aided them in obtaining good results. For instance, they now use heavier cups for the tjantings, so that the heat can be held longer, and tapering spouts which allow the wax to stay hot until it reaches the tip. These spouts extend about half way up into the cups so that the sediment sinks to the bottom and does not clog them. The technique of the brush, which was never properly developed in Java, has been borrowed from Japan and has given its fluent vigour to the lines of these modern artists. The dyes are not only more varied, but infinitely clearer and purer in colour, and the removal of the wax by gasolene has facilitated the cleaning process. Not only is the art itself undergoing improvement; the materials upon which it is executed are becoming, due to modern machinery, more and more beautiful in their varied textures. And so batik has come to be thought of as an art comparable to painting in oils or water colours or to drawing with pastels, with the lithographic crayon or the etching point. In comparison with other arts batik has some limitations, but it has also many well-defined advantages over the other graphic arts and should, without doubt, eventually take its place among them. Swift, vigorous sketches can be executed with it. An utmost delicacy of colour is obtainable, and flat areas of rich tone as well as subtle variations of mottling and "crackling" can be had when required. Besides all these and many similar advantages, there is the possibility of the feel of material, the creation of that texture which not only appeals to the eye but to the sense of touch as well. (*See* TECHNIQUE IN ART.)

Modern Technique and Practice.—Modern technique varies only a little from that which has been practised in Java for centuries, the chief difference being that the Western artist prefers as a rule to do the application of wax on a horizontal or only slightly inclined table rather than on the rack which is preferred in Java. The design is generally sketched in pencil on the material, though some artists trust their ability sufficiently to do it direct with the wax itself. The application of wax is done with an improved type of tjanting or with a brush which may be pointed or wedge-shaped. The brush is usually a good type of water-colour brush made of tapered hairs, because it is necessary constantly to keep a large amount of wax in it, in order to maintain the heat that the wax may flow freely, and yet a fine point is necessary. It has become the practice to dip the brush in wax, touching it very gently to the edge of the pan so as to remove only a little, and then to take a razor blade or sharp knife and carefully trim it to a point. This practice, however, does not always produce a brush capable of the best work, especially where a line of variable width is desired, for when it is allowed to rest a little more heavily while painting in order to produce a broader line, the short trimmed hairs are sure to spread unevenly. A different type of brush, preferred by some artists, is one with a wedge-shaped arrangement of hairs. This brush will, when held properly, produce a very fine line, one that can be made broader by the simple turning of the brush in the fingers. Of course, it has the disadvantage that in drawing a fine sharp curve one must learn how to twist it in the fingers in just the right way to keep the line uniform. When a brush is first put in the hot wax the bristles spread into a great bunch and it takes a few moments' manipulation to slowly press the air and moisture out so that it will resume its natural form. This process should be done slowly and with care, as it determines the form the brush will take in future use. One should always avoid touching a brush to the bottom of the pan, or for any longer than a second to the edge of the pan, as the metal is so hot that it will burn and curl up the hairs.



FIG. 10.—NATIVE DRAWING THE DESIGN WHEN THE BORDER HAS BEEN DYED

Cleaning.—The modern tjanting is so well made that one does not need to exercise the precautions that used to be required

in the care of the more fragile native instruments. When it becomes clogged through impurities in the wax, a fine wire, such as can be obtained on a spool at any hardware store, will quickly remove the dirt, though care should be taken in inserting the wire at the point of the spout as it is likely to cause rough edges, which may catch in the fabric and cause an unpleasant stuttering of line or even an upsetting of the tjanting, which might destroy many days' work.

Use of Tjanting.—In using the tjanting one must, first of all, take the utmost precaution to see that no wax clings to the out-



FIG. 11.—JAVANESE WOMEN, AS A RULE, APPLY THE WAX. IT WILL BE NOTED THAT, CONTRARY TO THE EUROPEAN PRACTICE, THE FABRIC IS HUNG OVER A RACK, AS SHOWN HERE

side of the cup after it has been dipped in the wax pot. The usual method is to keep in the left hand a small bit of cloth or cotton waste with which the cup is gently wiped off over the wax pot each time it is filled. Another method which has worked out satisfactorily is the scraping of the bottom of the cup with a small fragment of cardboard which has been torn or cut into a square form. Some artists use for this purpose old laundry shirt boards, the backing to blocks of paper, etc. This same cardboard may be used to advantage in taking another precaution. It is often well to cover the material between the wax pot and the part of the design being worked on with two or three pieces so that in case of a spill, due to the jogging of one's elbow, they will protect the fabric. In using the tjanting one should hold the hand with the back up and allow it to slide on the nails of the small and third fingers, if such support is necessary. The tjanting should be held delicately and without tension, and the drawing should be done with a free arm movement. It is better not to move the fingers at all, and some artists, whose nerves are not sufficiently well under control, find a wrist rest of help. When it first touches the material it is likely to leave a small globule at the beginning of the line. To avoid this it will be found that if a small piece of cardboard or a piece of paper is held in the left hand with its edge exactly where the line is to begin, and the tjanting is brought down on this paper and carried forward so that it slides off at the proper place on to the fabric, the line will commence with its usual width. It must of course, be understood, that in good work with the tjanting it is possible to make all lines of a uniform width, for any attempt to make the lines narrower or wider is likely to result in a lumpy uneven quality not to be desired. Dots of various sizes, however, can be obtained with the tjanting by the simple process of allowing it to rest a shorter or longer time on the spot and it will not be found difficult to produce these dots in perfectly round form. Under no conditions should the tjanting be held over a flame to reheat the wax, causing clogging and even melting of the solder with which the small spout is attached to the cup, thus ruining the instrument. Fine, even lines can also be obtained with the brush, and the advantage to the skilled artist is that he can make these finer or broader with a sure, even touch. Added to this advantage is that of the technique of the almost dry or cooled brush which deposits the wax in the various textures so often desired. We may say, therefore, that for finer works of art in which the artist wishes to vary the line, the brush is better adapted, while for decorative works of art where an even unbroken line is desired, the tjanting will give a more structural effect.

Wax.—The kind of wax used depends upon the result desired, but it is usually a mixture of one-half bees-wax and one-half paraffin, to which is sometimes added a little resin, for the purpose of making it cling more securely to the fabric, and sometimes a little old wax, which makes the mixture darker. The more paraffin used the more brittle the mixture becomes when cooled, and therefore in producing the sometimes desired "crackle," the proportion of paraffin is increased. "Crackle" is an accidental texture which can be governed by the artist only with difficulty. Therefore, though it is perfectly characteristic of this art, it should not be made use of indiscriminately, and the best artists avoid it almost entirely. It is produced by the cracking up or crushing of the fabric after the wax has cooled and stiffened and then immersing it in a dye which is thus permitted to sink through the cracks and which produces irregular lines, wandering in a haphazard way wherever the wax has been broken. It is not easy to avoid crackle and in dyeing large pieces, a sufficiently large dye bath should be used to avoid crowding. It is advisable also to have the dye sufficiently warm so that the wax does not become too brittle.

The first step in treating the fabric is to wash it, as they do in Java, so as to remove all weighting or sizing, though certain craftsmen do not make use of oil, preferring to leave the fabric as clean and white as possible. It is then pressed, after having been rinsed thoroughly, and stretched either upon a frame, a piece of glass, or an enameled table-top. Sometimes this is done by painting a band of wax at the top which adheres to the surface beneath it when cooled, and then stretching the fabric evenly and painting a band at the bottom following this by the same treatment of both sides. At other times the artist, preferring to move the material into different positions, may stretch it by means of weights placed along the edges. The advantage of the frame is that the wax sinks through and is not broken, as is sometimes the case when the cooled finished piece is removed from glass or enamel. Thus it often saves re-waxing the back.

Methods of Obtaining Colours.—After the first waxing is completed, the dyeing can be proceeded with and in this, again, the western method differs from the eastern, for while the eastern craftsman dyes a colour and then removes the wax, re-waxing other portions of the design to prepare it for the dyeing of another colour, the western craftsman through his knowledge of the mixing of colours need never recommence his waxing more than three times, once for each of the three primary colours whose combinations give all other hues. It may be well to recall at this point that there are three primary colours—red, yellow and blue—and that through the proper mixing of these colours any other colour in the spectrum can be obtained. By mixing these colours secondary colours are obtained, for red and yellow produce orange; yellow and blue, green; red and blue, purple. Making use of this fact, the western craftsman usually begins by reserving (covering with wax) that part of his design which he wishes to keep white and also that part in which no yellow is needed. When this waxing is completed he dyes the fabric a very pale yellow. Should he have use for a yellow red in his design or a yellow blue, that is a green blue, he now blocks out the sections where these colours would occur as well as the sections where he wishes to keep the shade of yellow just applied, and then dips the fabric again in a deeper yellow, reserving with the wax those sections which he intends to have orange and green or deeper yellow, and so on, keeping in mind exactly what hues he wishes to produce in each part of the design and thinking always of their intensity. When he has

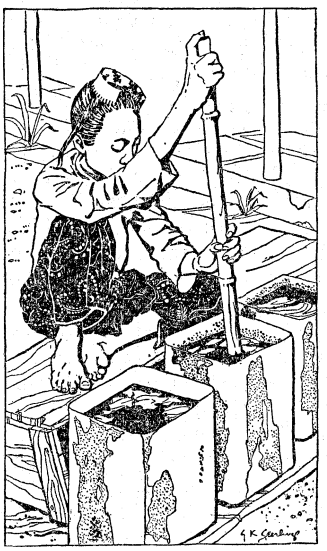


FIG. 12.—THE DYEING OF BATIK IN JAVA IS USUALLY DONE BY THE MEN









BY COURTESY OF (1, 2) RIJKS ETHNOGRAPHISCH MUSEUM, LEYDEN, (4) KOLONIAAL INSTITUUT, AMSTERDAM, (3) ROUFFAER AND JUYNBOLL, FROM "DE BATIKKUNST IN NEDERLANDSCH-INDIE," (N. V. A. OOSTHOEK UITGAVE MIJ)

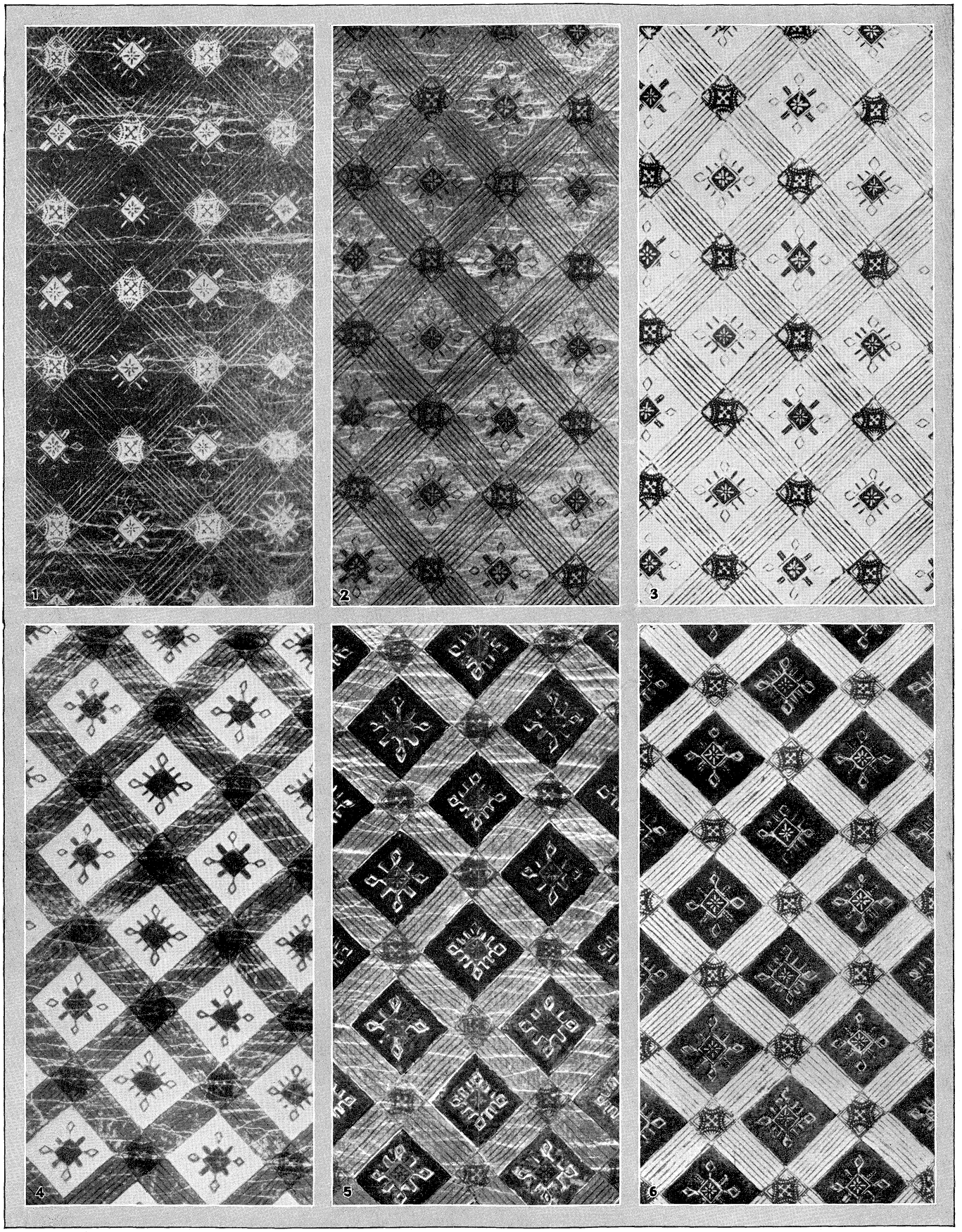
SCULPTURED ORIGINALS OF BATIK DESIGNS

1–2. Figures 1 and 2 show side and front views of the goddess Prajnaparamita, the Buddhist personification of supreme wisdom, with a lotus resting behind her left shoulder. The book containing the quintessence of Buddhist wisdom is in her hands

3. Detail of a design taken from a figure of a stone Ganeśa, showing its similarity to Javanese batik designs

4. The back of a seated Ganeśa, the god of wisdom and justice in Indian mythology

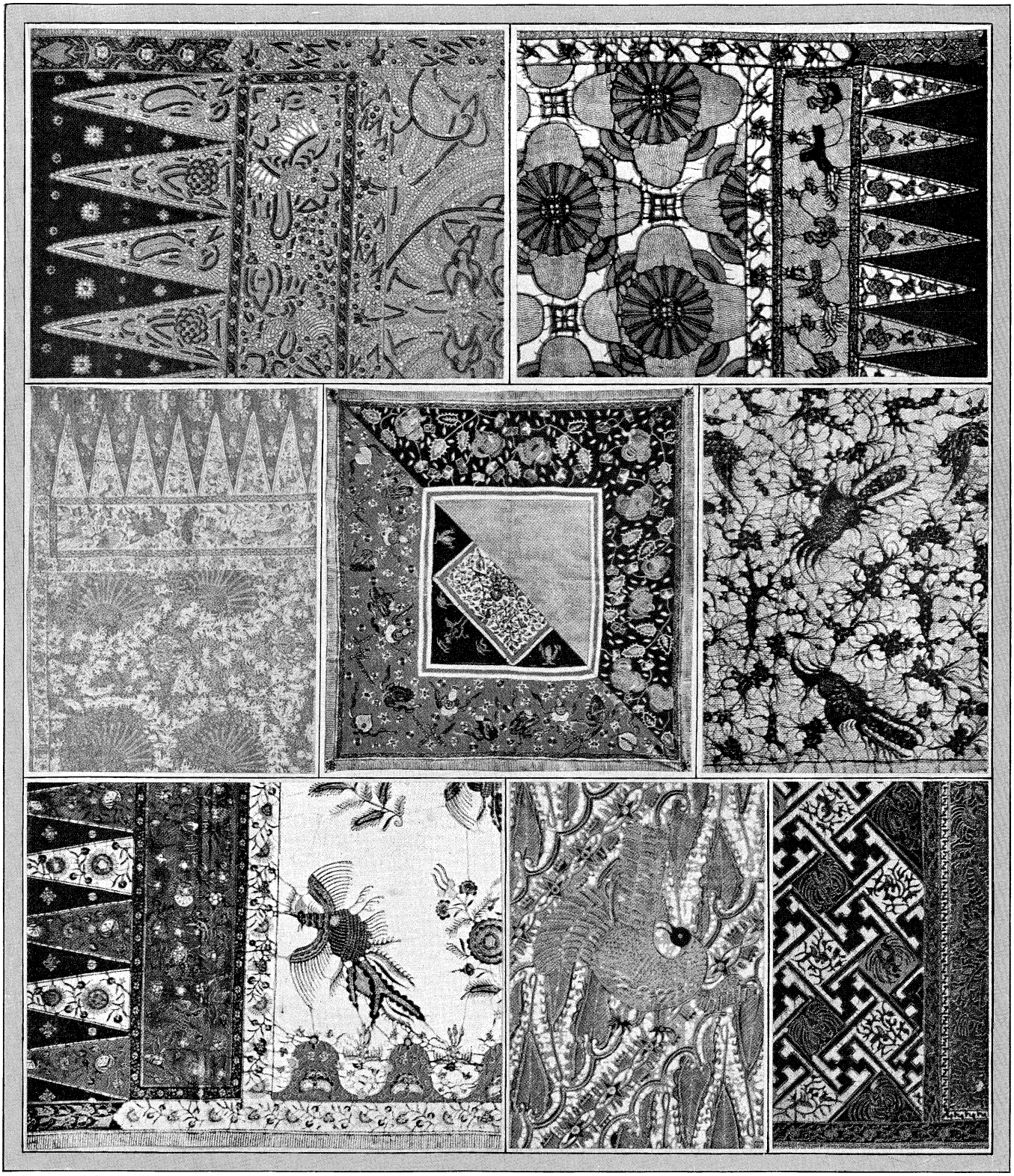
BATIK



FROM ROUFFAER AND JUYNBALL, "DE BATIKKUNST IN NEDERLANDSCH INDIE" (N. V. A. OOSTHOEK UITGAVE MIJ)

THE SIX STAGES IN THE PREPARATION OF BATIK

1. The fabric after the first application of wax, before being dyed
2. The fabric dyed for the first time
3. The wax removed, showing the first stage of the pattern
4. The fabric after the second application of wax
5. The fabric dyed a second time
6. The wax removed and the design completed



FROM ROUFFAER AND JUYNBOLL, "DE BATIKKUNST IN NEDERLANDSCH-INDIE," (N.V.A. OOSTHOEK UITGAVE MIJ)

NATIVE BATIK MOTIFS

Top row: 1 (left). Pattern and colouring of design made in Surakarta, central Java. 2. Colouring and design from Sumenep, Madura

Middle row: 1 (left). Pattern in red from Lasem, on the northern coast of Java. 2. (Centre). Two patterns of Kain Kapala (head cloth) from coast region of Java. 3. Blue batik made in Indramaju, Java

Lower row: Three designs from Surabaya, Djokjakarta and Batavia, Java



BY COURTESY OF ARTHUR CRISP

BATIK HANGING, "THE LAND OF PLENTY"

An example of modern batik executed with the brush by Arthur Crisp on heavy silk. The delicate design, though original, shows traces of Eastern influence

completed the dyeing of the yellows he may take up the reds or blues by first removing all the wax and then again covering those parts, which in the final fabric are to appear white or clear yellow. When this is completed he begins perhaps with a light red, dyeing it over white in certain places where he wishes the exact colour to appear, over a pale yellow where he wishes it to take this tint and over a deeper yellow where he wishes it to be orange. Thus it will be seen that modern batik makes use of colour principles not unlike those employed in the process of four-colour printing, and it may also be seen that the artist must not only be an excellent draughtsman or painter with the wax but must have a perfect knowledge of colour and of the analysis of colour, otherwise his work is sure to be a haphazard jumble of unrelated hues and values.



FIG. 13.—AFTER THE DYEING, THE WAX IS REMOVED BY WASHING THE FABRIC IN HOT WATER

The batik artist must also have a knowledge of the chemistry of modern dyes, which is a separate study (*see* DYES, SYNTHETIC). As to the technique of this side of the art, it is sufficient to state here that for the beginner's use there are no better dyes than those sold by reputable firms in small packages. From these or from the other acid dyes, obtainable in larger quantities wholesale, can be made concentrated solutions by boiling them in the required amount of clear water. When the experienced artist sets out to procure a certain colour he cuts a strip of the same material on which his design is to be worked and tests the colour carefully, adding a little at a time this concentrated solution to a bath of clear water, made properly acid, before immersing his work of art. In making these tests it is necessary that the small fragment of material be kept in the bath for a given length of time, as under certain conditions the longer it stays the deeper the colour. It is also necessary that this test piece of material be rinsed just as carefully and thoroughly as the artist intends to rinse his work of art, and finally, of course, the sample must be dried before it can be determined whether or not the colour is correct. The experienced artist is most careful in his testing and is never satisfied until he has obtained the exact hue desired. It is in this work alone that many amateurs fail, sometimes ruining what might otherwise be a fine piece of craftsmanship. In testing the sample, the temperature of the dye-bath, the length of time it is immersed and all other conditions must be exactly similar to those which the batik itself must undergo. When the sample is ready and seems perfect, the material should be wetted in clear water so that the dye can enter it at once, then immersed and kept moving gently through the dye solution. Some artists do this with sticks, but many prefer using their hands in spite of the discomfort involved, because in order to avoid crackle the motion must be gentle though constant. It is often wise to remove the material in just a little less time than has been given the sample, for it will be found easy, if the colour is slightly pale, to give it one or two more brief dippings, rinsing it each time thoroughly, and thus arriving at the proper result. This system of gentle approach is infinitely more satisfactory than the careless attempt at procuring the desired colour in a single operation, only to find that one has overdone it, and must resort to unsatisfactory bleaching.

Bleaching can be done with soda, ammonia or any of the well-known powders on the market, but it is very likely to attack the wax, and to work upon one colour more than another, giving the result, not of a simple paling of the hue, but of changing it to a distinctly different hue.

Removing Wax.—After the fabric has been properly dyed, the wax must be removed. This can best be accomplished by giving it a preliminary ironing between sheets of newspapers, which absorb a good deal of the wax. Then it is immersed in petrol and left to soak for some time so that a good deal of the remaining wax is dissolved. It is then carefully wrung out and placed in another clean bath of petrol. This work should be done most carefully, away from all flames, and with no quick movements, for even a spark of static electricity, such as may be caused by a shake or flip of the material, has been known to ignite the fumes. It is advisable to have good ventilation where this cleaning is undertaken, for gasolene fumes are poisonous when concentrated and one should breathe as little of them as possible. Often an electric fan, properly placed, will solve this difficulty. When the cleaning by petrol has been accomplished the fabric should be rinsed and washed lightly in warm water and soapsuds, to remove all traces of the acid, and then pressed.

It will be seen that proper technique in batik is quite as difficult as that of etching or painting. It must be realized that this technique involves even surer understanding of line and colour, for it is practically impossible to correct a mistake in drawing once it has been made, and it is also very nearly impossible to correct a mistake in colour. This is no art for those who work with trial and error methods. It must be carried on by those who conceive clearly and completely their finished result before undertaking the first step.

In permanence, batik compares favourably with the weaving of rugs, for modern dyes are sufficiently fast to make it proof against ordinary light conditions and easily cleaned without risk. Used as lamp shades or hangings against windows, it is second only to stained glass in its brilliancy and exceeds stained glass in its delicacy and variety of texture. This is then an art centuries old, little understood, demanding the utmost in technique, lasting and varied in its possibilities. All drawings in this article are from Jasper & Mas Pirngadie, "De Inlandsche Kunstnijverheid in Nederlandsch-Indie" (Boek & Kunstdrukkery).

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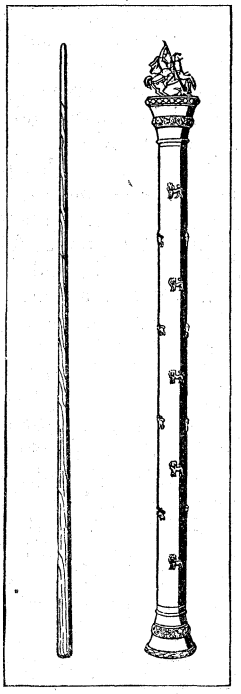
BATLEY, municipal borough, West Riding of Yorkshire, England, 8 mi. S.S.W. of Leeds. Pop. (1938) 39,800. It is at the junction between the E. Pennines and the Yorkshire Plain, and as such became an important market town in the 18th and early 19th century. Its situation on the southwest Yorkshire coalfield led to its rapid development as an industrial town, though it was overshadowed by the more favourably situated Dewsbury and Wakefield. The town became the centre of the heavy woollen trade, manufacturing pilot cloths, druggets, flushings, etc. The working up of old material as "shoddy" is carried on. Modern processes, especially the utilization of synthetic fibres, have centred around Dewsbury, Batley and Wakefield. The secondary industries, such as iron-foundries and manufacture of machinery, suffered during the depression after 1918. The town is included since 1918 in the parliamentary borough of Batley and Morley. It is served by the L.N.E. and L.M.S. Rys. Area 7 sq.mi., including former urban district of Birstall, added in 1937.

BATMAN, from French, *bât,* a kind of pack-saddle, hence *bât-horse* (*cheval de bât*), a horse carrying a bât or pack, the bât-man being the servant in charge of the bât-horse. In course of time the bâtman was given duties to perform more immediately about the person who employed him, *e.g.,* an officer, such as tending his quarters, equipment, etc. The officer's bâtman of the 18th and early 19th centuries was, to some extent, the counterpart of the mediaeval knight's serving man. In the British service the term *batman* strictly denotes the soldier who does the general cleaning work for a Warrant Officer, the term *servant* being reserved for the soldier who performs similar duties for an officer.

BATON, the truncheon carried by a field-marshal as a sign of authority, and by a police constable (Fr. *bâton, baston,* from Late Lat. *basto,* a stick or staff); in heraldry (*q.v.*), the fourth part of a bend; in English coats of arms, only as a mark of illegitimacy, the "baton sinister."

In music, the baton is the name for the light, pointed stick with which a conductor directs the performances of an orchestra or choir. The use of the baton is much older than is generally sup-

posed, though in the first instance it took the form of a roll of paper, which was used for this purpose in the 15th century in Italy and elsewhere. Later, when it became customary to conduct from the harpsichord or pianoforte, the baton fell into disuse; but its employment is now universal. There is great art in the proper manipulation of the baton, which Hans Richter (*q.v.*) once termed the "most difficult instrument in the orchestra."



CONDUCTOR'S BATON BY COURTESY OF MESSRS. BOOSEY AND CO.

TWO TYPES OF BATON
The baton on the left is used by a musical conductor. That on the right is the Field Marshal's baton presented by King Edward VII. to Lord Kitchener

BATONI, POMPEO GIROLAMO (1708–1787), Italian painter, was born at Lucca. In his day, he was regarded in Italy as a great painter. Many of his pictures are in the public buildings in Rome. He had a great vogue as a portrait painter, and is said to have numbered 22 sovereigns among his sitters.

BATON ROUGE, the capital of Louisiana, U.S.A., and of East Baton Rouge parish, on the bank of the Mississippi river, at the head of deepwater navigation 80 mi. N.W. of New Orleans. It is on federal highways 65, 71 and 190; is served by the Illinois Central, the Missouri Pacific, the Louisiana and Arkansas and the Kansas City Southern railways and by the Texas Pacific railway on the west side of the river; has a municipal airport and a well-equipped river port which accommodates ocean-going vessels. The population was 11,269 in 1900, 21,782 in 1920, of whom 39% were Negroes, and was 34,719 in 1940. The city and suburbs were estimated at 70,000.

Baton Rouge is located on the first bluff above the Gulf of Mexico and is free from overflow at all flood stages of the river. A $5,000,000 building houses all state departments in Baton Rouge. Surrounding the city is a fertile agricultural section adapted to stock raising and dairy farming. Across the river from Baton Rouge are the great sugar plantations, this section being known as the "sugar bowl" of America. In addition to sugar, the staple crops are rice, cotton, vegetables and fruits. The Standard Oil company operates one of the largest oil refineries in the world at Baton Rouge, with a daily capacity of 110,000 bbl. of crude oil and manufacturing all the by-products of petroleum. In addition, this company has put in operation a $3,000,000 plant for the manufacture of synthetic rubber.

Other large industries are the manufacture of soda ash, caustic soda, chlorine, and of tetraethyl lead, ethyl fluid, furniture veneer and plywood, sulphuric acid and hydrochloric acid. Many other varied industries are in Baton Rouge.

The state penitentiary and state institutions for the deaf and blind are here. South of the city, 2½ mi. from the capitol, is the state university and agricultural and mechanical college, on a 2,000 ac. tract along the river, bought in 1920, and occupied in 1925, with 34 buildings (including a Greek theatre) at a cost of $5,000,000. The university dates back to grants of land made by the United States to the state in 1806, 1811 and 1827 "for the use of a seminary of learning." The seminary was opened in 1860, near Alexandria, with General W. T. Sherman as superintendent. It was suspended 1863–65, destroyed by fire in 1869 and reopened within a fortnight in Baton Rouge in the building of the school for the deaf. In 1877 it became the Louisiana state university; and in the same year the state agricultural and mechanical college, which had been opened in New Orleans in 1874, was consolidated with it. In 1886 it found quarters in buildings of the United States army post, which are still used for part of the instruction. The total net enrolment in 1940 was 11,000.

A summer forestry camp is maintained at Bogalusa.

The Audubon sugar school of the university was established in 1891 by the sugar planters' association of Louisiana to train managers for sugar plantations. The sugar experiment station is in New Orleans. Special courses are offered in petroleum engineering.

Baton Rouge was one of the earliest French settlements in the State. It was incorporated in 1817; was the State capital from 1849 to 1862; was occupied by U.S. troops from May 1862 until the end of the Civil War, and became the capital again in 1882.

BATRACHIA, a term sometimes used for that class of vertebrates more properly called Amphibia. The living members of the class include the frogs, salamanders and caecilians. The term Batrachia has also been employed as a synonym of Salientia (*see* AMPHIBIA). (K. P. S.)

BATRACHOMYOMACHIA: *see* GREEK LITERATURE.

BATTA (pl. BATTAK, not to be confused with the Batak tribe of Palawan in the Philippines), a Proto-Malayan tribe, probably derived from mixed Mongol and Indonesian stock, of North Sumatra, living in settled communities with hereditary chiefs, popular assemblies and written codes of law. The tribe is literate, using a variety of the Devanagari alphabet, and employing hollow tree-trunks at cross-roads as post-boxes. Maize and rice are cultivated; the latter on terraces which are ploughed with the aid of buffaloes; two-storied houses are built on piles, livestock being kept below the houses; pottery, weaving, jewellery, iron-work, etc., are practised and gunpowder is manufactured. A trinity like that of Brahma, Vishnu and Siva is worshipped, the tribe having been influenced by Hindu civilization. At the same time cannibalism is practised on prisoners of war, criminals and the aged or infirm, the victim being apparently cut up and eaten alive. The eating of captives and criminals appears to be a method of satisfying revenge and conferring ignominy; in the case of the aged, it appears to be a form of pious interment, as the aged invite their own children to eat them. Though the tribe generally is patriarchal the succession to chieftainship is matrilineal, going to the chief's sister's son. Ancestral images are made of soft stone, and are sometimes reinforced by the soul of a fallen warrior inserted by means of a broth made of parts of his body sealed up in a cavity in the image. Carved sticks containing a soul which hums are used as standards in war and to drive away disease. Cannibalism seems to replace head-hunting (*q.v.*). The teeth are filed and blackened.

See Marsden, *History of Sumatra* (1783); Volz, *Archiv für Anthropologie* (Braunschweig), xxvi. p. 717; 1900. (J. H. H.)

BATTA, an Anglo-Indian military term, probably derived from the Canarese *bhatta* (rice in the husk), meaning a special allowance made to officers, soldiers or other public servants in the field.

BATTAGLIA TERME, urban district, Venetia, Italy, province of Padua, 11 mi. S.S.W. from Padua. Pop. (1936), town 2,086; commune 2,712. It is on the eastern edge of the volcanic Euganean hills, and its warm saline springs and natural vapour grotto led the 17th-century owner, Marchese Selvatico-Estense, to build a Palladian palace. Near by is the Cattaio (Ital. for Cathay) palace (1573), of Pio Enea Obizzi, inventor of the shell (Ital. *obice,* Fr. *obus*), after the summer palace of the Chinese court as described by Marco Polo.

BATTAKHIN, African "Arabs" of Semitic stock. They occupy the banks of the Blue Nile near Khartum, and it was against them that General Gordon fought most of his battles near the town. Their sheikh, El Obeid, routed Gordon's troops on the 4th of September 1884, a defeat which led to the close investment of Khartum.

BATTALION, a unit or military organization numbering from 500–1,000 men, the latter figure being usually the standard in modern times. The term is used in nearly every army, and is derived through Fr. from It. *battaglione,* Med. Lat. *battalia* (*see* BATTLE). "Battalion" in the 16th and 17th centuries implied a unit of infantry forming part of the line of battle, but at first meant an unusually large *battalia* or a single large body of men formed of several *battalias.* In the infantry a battalion is gener-

ally three to four companies, frequently three rifle and one machine gun company. In some armies two to three batteries of artillery are called a battalion; in others, a group. The cavalry equivalent in most armies is the squadron. In aviation it is the squadron or esquadrille. In general the term is used to signify the unit commanded by a major, except in the British army where a battalion is commanded by a lieutenant-colonel.

Machine-gun battalions were formed during the World War (1914–18), and although discarded since in the British army, have been revived abroad.

Engineers, train, and more rarely cavalry are also organized in battalions in some countries, and tanks universally.

(H. J. RE.)

BATTAMBANG, a province in southeast Thailand (Siam) bordering the Great lake or Tonlé Sap; it was from 1907 to 1941 the western part of Cambodia, French Indo-China. Area 7,837.8 sq.mi.; pop. (1936) 264,000. Rich rice fields receive 50 inches of monsoon rain. Fisheries of the Great lake, streams and rice fields are very productive. There is a small production of rubber, gold and sulphur. Battambang town was the refuge of King Norodom in 1861. Rice milling, the chief industry, is in Chinese hands, as is most trade. The climate is consistently hot, and relative humidity is always above 80% during the May-October monsoon. The population is predominantly Cambodian, with a strong Thai minority. Part of the powerful Cambodian empire in mediaeval times, Battambang was a battleground for Cambodia (*q.v.*) and Siam. By the end of the 18th century all Cambodia was under Siamese suzerainty. The French took the rest of Cambodia in 1867, but Battambang and neighbouring Angkor were acquired only in 1907, to be re-conquered by Thailand (except for part of Angkor) in 1940–41.

BATTANNI, a small tribe on the Waziri border of the North-West Frontier Province of India from Bannu to the Gomal Valley. There are three sections. In the plains the land is divided into many small divisions, *nálás,* each forming a single plot, owned by a number of families generally closely related.

See H. A. Rose, *Tribes and Castes of the Punjab and North-West Frontier Province* (1911).

BATTEL or **BATTELS,** a word used at Oxford university for the food ordered by members of the college as distinct from the usual "commons"; and hence college accounts for board and provisions supplied from kitchen and buttery, and, generally, the whole of a man's college accounts.

BATTEN, SIR WILLIAM (fl. 1626–1667), British sailor, son of Andrew Batten, master in the royal navy, first appears as taking out letters of marque in 1626, and in 1638 he obtained the post of surveyor to the navy. In March 1642 he was appointed second in command under the earl of Warwick, the parliamentary admiral who took the fleet out of the king's hands. It was Vice-Admiral Batten's squadron which bombarded Scarborough when Henrietta Maria landed there and he was accused by the Royalists of directing his fire particularly on the house occupied by the queen. To the end of the first Civil War, Batten continued to patrol the English seas, and his action in 1647 in bringing into Portsmouth a number of Swedish ships of war and merchantmen, which had refused the customary salute to the flag, was approved by parliament. When the second Civil War began he was distrusted by the Independents and removed from his command. When part of the fleet revolted against the parliament, and joined the prince of Wales in Holland, May 1648, Batten went with them. He was knighted by the prince, but refused to take command of the fleet, and was allowed to return to England. At the Restoration Sir William Batten became once more surveyor of the navy. In this office he was in constant intercourse with Pepys, whose diary frequently mentions him. He died in 1667.

See Penn's *Life of Sir W. Penn,* and Pepys's *Diary.*

BATTEN, in industry a term used in joinery for a board, not more than 4 to 7 in. broad or 3 in. thick, employed for various purposes, such as for strengthening or holding together laths and other wood-work. It is also applied to the strips of wood used in roofing for the fixing of slates or tiles; such battens are usually in sections about 2 by 1 in. On board ship the name batten is applied to a strip of wood nailed to a mast to prevent rubbing, or to fix down a tarpaulin over a hatchway, in rough weather.

BATTENBERG, the name of a family of German counts, which died out about 1314, whose seat was the castle of Kellerburg, near Battenberg, a small place in the Prussian province of Hesse-Nassau. The title was revived in 1851, when Alexander (1823–88), a younger son of Louis II., grand-duke of Hesse, contracted a morganatic marriage with a Polish lady, Countess Julia Theresa von Hauke (1825–95), who was then created countess of Battenberg. From 1858 the countess and her children were raised to the rank of princes and princesses of Battenberg, with the right to use the additional title of *Durchlaucht* or Serene Highness. In 1917 the eldest son of this union, Louis Alexander (1854–1921), who had become an admiral in the British navy, was created Marquess of Milford Haven (*see* MILFORD HAVEN, LOUIS ALEXANDER), and, at the request of King George V., the members of the family who lived in England renounced the German title of prince of Battenberg and adopted the surname of Mountbatten. The second son, Alexander Joseph (1857–93) was elected Prince Alexander I. of Bulgaria in 1879. (*See* ALEXANDER OF BATTENBERG.) Henry Maurice, the third son, married on July 23, 1885, Beatrice, youngest daughter of Victoria, queen of England, became a naturalized Englishman and was appointed captain-general and governor of the Isle of Wight and governor of Carisbrooke. He died at sea, on Jan. 20, 1896, of a fever contracted on active service with the British troops during the Ashanti War. The fourth son, Francis Joseph (1861–1924) married, in 1897, Anna, daughter of Nicholas I., prince of Montenegro, and was the author of *Die volkswirtschaftliche Entwickelung Bulgariens von 1879 bis zur Gegenwart* (Leipzig, 1891). The only daughter of the princess of Battenberg, Marie Caroline (1852–1923), was married in 1871 to Gustavus Ernest, prince of Erbach-Schönberg. (For the descendants, with three exceptions, of princes Louis Alexander and Henry Maurice *see* MOUNTBATTEN.) Princess Alice of Battenberg (born in 1885), daughter of Prince Louis, and Victoria Eugénie (Princess Ena of Battenberg) (b. 1887), only daughter of Prince Henry, were both married before 1917, when the German title was renounced, the former to Prince Andrew of Greece, and the latter to Alphonso XIII., king of Spain. Prince Henry's youngest son, Maurice of Battenberg, was killed in action near Ypres on Oct. 27, 1914, when serving with the King's Royal Fusiliers.

BATTER, an architectural term used of the sloping surface of a wall which is thicker at the base than at the top. Battered walls are commonly used where great strength and weight are necessary in the lower parts of a construction but not in the upper, as in retaining walls and masonry of weak materials, such as sun-dried brick. Frequently the lower portions of monumental buildings are battered to give the impression of great strength, although no batter may be structurally necessary.

BATTERING RAM, a military engine used before the invention of cannon, for breaking down the walls of besieged fortresses. It consisted of a long heavy beam of timber, armed at the extremity with iron fashioned something like the head of a ram. In its simplest form the beam was carried in the hands of the soldiers, who assailed the walls with it by main force. The improved ram was composed of a longer beam, in some cases extending to 120ft., shod with iron at one end, and suspended, either by the middle or from two points, from another beam laid across two posts. This is the kind described by Josephus (*B.J.* iii. 7, 19) as having been used at the siege of Jerusalem. The ram was shielded from the missiles of the besieged by a penthouse (*vinea*) or other overhead protection. It was often mounted on wheels, which greatly facilitated its operations. A hundred soldiers at a time, and sometimes even a greater number, were employed to work it, and the parties were relieved in constant succession. No wall could resist the continued application of the ram, and the greatest efforts were always made to destroy it by various means, such as dropping heavy stones on the head of the ram and on the roof of the penthouse; another method being to seize the ram head with grapnels and then haul it up to a vertical posi-

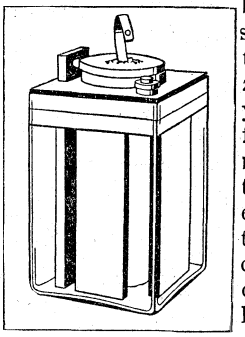
tion by suitable windlasses on the wall of the fortress. Sometimes the besieged ran countermines under the ram penthouse; this if successful would cause the whole engine to fall into the excavation. In mediaeval warfare the low penthouse, called *cat,* was generally employed with some form of ram. (*See* also FORTIFICATION AND SIEGECRAFT; ENGINES OF WAR; CATAPULT.)

BATTERSEA, a south-western metropolitan and parliamentary borough of London, England, bounded north by the Thames, north-east by Lambeth, and south-east, south and west by Wandsworth. Pop. (est. 1938) 141,700. The principal thoroughfares are Wandsworth road and Battersea Park and York roads from east to west, connected north and south with the Victoria or Chelsea, Albert and Battersea bridges over the Thames. The first two of these three are suspension bridges; the third, an iron structure, replaced a wooden bridge. An early form of the name is *Patricsey* or Peter's Island. The manor in Domesday belonged to the abbey of St. Peter, Westminster, passing under Henry VIII to the crown, and subsequently to the family of St. John and to the earls Spencer. York road recalls the existence of a palace of the archbishops of York, occasionally occupied by them between the reigns of Edward IV and Mary. Battersea fields, bordering the river, were formerly a favourite resort. The art of enamelling was introduced, *c.* 1750, at works in Battersea, examples from which are highly valued. There are several large factories by the river. The parish church of St. Mary, Church road (1776), preserves from an earlier building stained glass and monuments. Wandsworth common and Clapham common (220 ac.) lie partly within the borough, but the public recreation ground is Battersea park, bordering the Thames between Albert and Victoria bridges. It was constructed by reclaiming marshy ground in 1858.

Battersea has returned two members to parliament since 1918. Area, 3.6 sq.mi.

BATTERY, the action of beating, especially in law the unlawful wounding of another (*see* ASSAULT). The term is applied to the apparatus used in battering, hence its use in military organization for the unit of mobile artillery of all kinds. (*See* BATTERY MILITARY; ARTILLERY; FORTIFICATION AND SIEGECRAFT). Also used for the "pitcher" and "catcher" in baseball; for a collection of utensils, primarily of hammered copper or brass, especially in the French term *batterie de cuisine*; and for the instruments of percussion in an orchestra.

Electric Battery.—This term was formerly applied to a collection of Leyden jars, but is now used for a device for generating electricity by chemical action, or, more exactly, for a number of such devices joined up together. There are two main classes of electric batteries. In *primary* batteries, composed of a number of galvanic or voltaic "cells," "couples," or "elements," on the completion of the interactions between the substances on which the production of electricity depends the activity of the cells comes to an end, and can only be restored with the aid of a fresh supply of those substances; in *secondary* batteries, also called storage batteries or accumulators (*q.v.*), the substances after the exhaustion of the cells can be brought back to a condition in which they will again yield an electric current, by means of an electric current passed through them in the reverse direction. The first primary battery was constructed about 1799 by Alessandro Volta. In one form, the "voltaic pile," he placed a series of pairs of copper and zinc disks one above the other, separating each pair from the one above it by a piece of cloth moistened with a solution of common salt. In another form, the "couronne de tasses," he took a number of vessels or cells containing brine or dilute acid and placed in each a zinc plate and a copper plate; these plates were not allowed to touch each other within the vessels, but each zinc plate was connected to the copper plate of the adjoining vessel. In both these arrangements an electric current passes through a wire which is connected to the terminal plates at the two ends of the series. The direction of this current is from copper to zinc; the zinc in each cell being the negative and the copper the positive pole. During the time that the external connection is maintained between the two poles and the current passes in the wire, the zinc or positive plates are gradually dissolved and hydrogen gas is liberated at the surface of the copper or negative plates; but when the external connection is broken this action ceases. If the materials used in the cells were perfectly pure, probably the cessation would be complete. In practice, however, even with open circuit a "local action" occurs due to the fact that the impurities in the zinc plate form miniature voltaic couples with the zinc itself, thus causing its corrosion by voltaic action; and an early improvement in the voltaic cell was the discovery, applied by W. Sturgeon in 1830, that the evil was greatly reduced if the surface of the zinc plates was amalgamated, by being rubbed with mercury under dilute sulphuric acid. Another disadvantage of the simple cell composed of copper and zinc in dilute acid is that the current it yields rapidly falls off. The hydrogen formed by the operation of the cell does not all escape, but some adheres as a film to the negative plate, and the result is the establishment of a counter or reverse electromotive force which opposes the main current flowing from the zinc plate and diminishes its force. This phenomenon is known as "polarization," and various remedies have been tried for the evils it introduces in the practical use of primary batteries. The plan usually adopted, is either to prevent the formation of the film or to introduce into the cell some "depolarizer" which will destroy it as it is formed by oxidizing the hydrogen to water (*see* also ELECTROLYSIS).

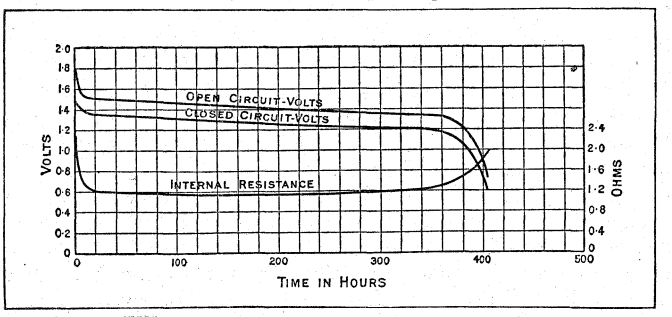


BY COURTESY OF "THE ENGINEER"

FIG. 1.—THE "DARIMONT" CELL

In this cell poles of zinc and carbon are separated by a porous pot. A liquid depolarizer of ferric chloride surrounds the carbon and a neutral emulsion is around the zinc

The former method is exemplified in the cell invented by J. F. Daniell in 1836. Here the zinc stands in dilute sulphuric acid (or in a solution of zinc sulphate), and the copper in a saturated solution of copper sulphate, the two liquids being separated by a porous partition. The hydrogen formed by the action of the cell replaces copper in the copper sulphate, and the displaced copper, instead of the hydrogen, being deposited on the copper plate polarization is avoided. The electromotive force is about one volt. This cell has been constructed in a variety of forms to suit different purposes. In one class of batteries the diaphragm is dispensed with altogether, and the action of gravity alone is relied upon to retard the interdiffusion of the liquids. The cell of J. H Meidinger, invented in 1859, may be taken as a type of this class. The zinc is formed into a ring which fits the upper part of a glass beaker filled with zinc sulphate solution. At the bottom of the beaker is placed a smaller beaker, in which stands a ring of copper with an insulated connecting wire. The mouth of the beaker is closed by a lid with a hole in the centre, through which passes the long tapering neck of a glass balloon filled with crystals of copper sulphate; the narrow end of this neck dips into the smaller beaker, the copper sulphate slowly runs out, and being specifically heavier than the zinc sulphate it collects at the bottom about the copper ring.



FROM "THE ENGINEER"

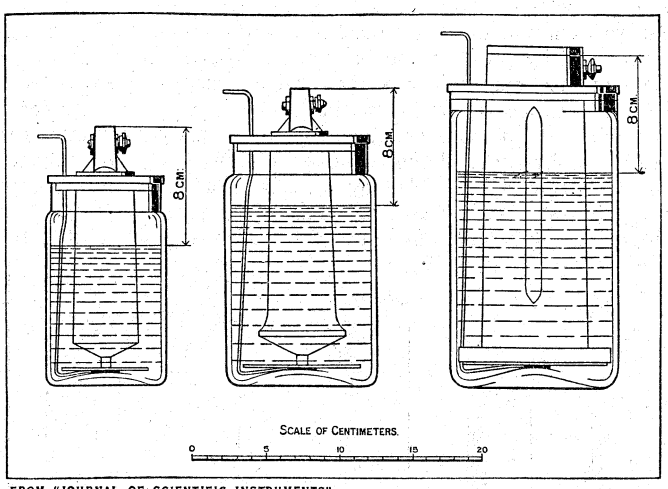
FIG. 2.—GRAPH SHOWING DISCHARGE VOLTAGE CURVE OF T·O "DARIMONT" TYPE CELL

The cell has a nominal capacity of 50 ampere hours, and a zinc consumption per ampere hour of 1.25 grammes

Depolarization by Oxidation.—Sir W. R. Grove in 1839 employed nitric acid as the oxidizing agent, his cell consisting of

a zinc positive plate in dilute sulphuric acid, separated by a porous diaphragm of unglazed earthenware from a platinum negative immersed in concentrated nitric acid. Its electromotive force is nearly two volts, but it has the objection of giving off disagreeable nitrous fumes. R. W. von Bunsen modified Grove's cell by replacing the platinum with the cheaper material, gas carbon.

Chromic acid is much used as a depolarizer, and cells in which it is employed are about as powerful as, and more convenient than, either of the preceding. In its two-fluid form the chromic acid cell consists of a porous pot containing amalgamated zinc in dilute sulphuric acid and a carbon plate surrounded with sulphuric acid and a solution of potassium or sodium bichromate or of chromic acid. But it is commonly used in a one-fluid form, the porous pot being dispensed with and both zinc and carbon immersed in the chromic acid solution. Since the zinc is dissolved even when the circuit is not closed, arrangements are frequently provided by which either the zinc plate alone or both plates can be lifted out of the solution when the cell is not in use. In preparing the solution the sodium salt is preferable to the potassium, and chromic acid to either.



FROM "JOURNAL OF SCIENTIFIC INSTRUMENTS"

FIG. 3.—THREE TYPES OF FÉRY CELLS FOR PRIMARY BATTERIES

The zinc plate rests on the bottom of the jar to prevent corrosion and the carbon plate, in cylinder form, is suspended a few inches above it, a solution of sal ammoniac forming the electrolyte. No porous pot is used

In the cell devised by Georges Leclanché in 1868 a solid depolarizer is employed, consisting of manganese dioxide packed with fragments of carbon into a porous pot round a carbon plate. A zinc rod constitutes the positive plate, and the electrolyte is a solution of sal ammoniac. Sometimes no porous pot is employed, and the manganese dioxide and granulated carbon are agglomerated into a solid block round the carbon plate. The electromotive force is about one and a half volt. The cell is widely used for such purposes as ringing electric bells, where current is required intermittently, and for such service it will remain effective for months or years, only needing water to be added to the outer jar occasionally to replace loss by evaporation. On a closed circuit the current rapidly falls off, because the manganese dioxide is unable to oxidize all the hydrogen formed, but the cell quickly recovers after polarization.

Recent Cells.—In the *Darimont* cell, fig. 1 (cf. *Engineer*, 1924, *137*, 636), which is of the two-fluid type separated by a porous pot, the plates consist of carbon and zinc. The liquid depolarizer around the carbon consists largely of ferric chloride; whilst the electrolyte around the zinc consists of an emulsion formed of sodium chloride, calcium carbonate and other materials, so that the electrolyte is always maintained neutral and local action is consequently negligible. As the internal resistance remains practically constant when a given voltage has to be maintained, the number of cells required is less than usual and the voltage remains very steady during the discharge. The capacity of the cell is high and it is very suitable for use with valves for wireless work in place of accumulators. Results of tests made on a cell of this type of a normal capacity of 50 amp. hrs. are shown in fig. 2.

The cell was discharged through a resistance of 10 ohms down to 6 volts. The total current yielded amounted to 49 amp. hrs. or 62·1 watt hours. The zinc consumed per amp. hr. was 1·25 grm., the theoretical figure being 1·213.

The Féry primary battery (*Journ. Sci. Instr.* 1926, *3*, 313) is a modification of the Leclanché cell. The corrosion of the zinc at the surface of the liquid and the clogging of the porous pot with insoluble crystals which occurs in the Leclanché cell are obviated by removing the zinc from the surface and placing it as a flat plate in the bottom of the cell and by dispensing with the porous pot and the contained manganese dioxide. The carbon is in the form of a long cylinder depending from the top of the cell so that its base is a short distance above the zinc plate, and a solution of sal ammoniac forms the electrolyte. When the battery is in action the zinc dissolves according to the reaction:—

$$Zn + 2NH_4Cl + 2H_2O = ZnCl_2 + 2NH_4OH + H_2$$

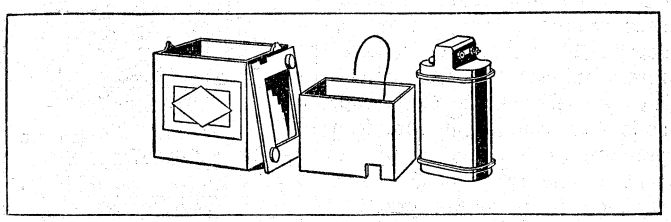
and the hydrogen rises up and is deposited on the carbon and escapes, while the ammoniacal solution, being lighter, also rises to the surface, leaving the heavier zinc chloride solution at the bottom. For low currents the ammonia diffuses into the air, but with heavy currents, when it is produced too fast to escape, it unites with the zinc chloride to form a hydrate as follows:—

$$ZnCl_2 + 2NH_4OH = Zn(OH)_2 + 2NH_4Cl.$$

The hydrated oxide is, however, very soluble both in the zinc chloride solution and in the ammonium hydrate, so that it is only in the neutral zone between the two solutions or at about a quarter or a third of the height of the carbon that the crystals of the double oxychloride of zinc and ammonium are deposited, and as this is well away from the base of the carbon cylinder near to the zinc, the action of the cell is but little interfered with. The hydrogen deposited on the carbon, which would ordinarily cause polarization is oxidized through absorption of atmospheric oxygen by the carbon in the portion above the electrolyte. The carbon thus acts as a catalyst in effecting the oxidation of the hydrogen by the air. Fig. 3 shows sections of three types of these cells.

In tests made during constant discharge the internal resistance of the battery was about 0·25 ohm per cell three months after the commencement, rising to about 1 ohm per cell after nearly two years, and the zinc plates dissolved quite uniformly. Cells 10 cm. square and 22 cm. high with a zinc plate weighing 160 grm. are claimed to yield a total energy, either in continuous or interrupted service, amounting to 125 amp. hours.

In the "A.D." Primary Cell (cf. *Elect. Rev.* [London], 1924, *94*, 433) made by Le Carbone Co. the central carbon plate to which the connecting terminal is fixed is held between extremely porous carbons of special manufacture. The surfaces of the carbons are so prepared that they allow gases to pass through, while they remain impervious to liquids. The carbon blocks are surrounded by wrappings of cloth bound in turn with string and rubber bands. The upper surfaces of the carbon are left well out of the electrolyte and allow depolarization to proceed through contact with air. Owing to the absence of any chemical depolarizing agent, local actions are eliminated and deterioration on standing thereby avoided. The voltage remains constant during discharge, and the ampere-hour capacity is stated to be higher than that of any other primary cell of equal dimensions.



FROM "LE CARBONE"

FIG. 4.—THE "A.D." PRIMARY CELL, WHICH ALLOWS DEPOLARIZATION TO PROCEED THROUGH ELIMINATION OF THE HYDROGEN BY AIR ON THE UPPER PROJECTING SURFACES OF THE CARBON

Dry Cells.—The term "dry" cell is, in this application, used only in a relative sense to denote that the contents of the cell are in a pasty form and not sufficiently fluid to flow if the cell is in-

verted. The first practical primary cell of the type in use at present was produced by Gassner in 1888. This cell consisted of a zinc can serving as anode and also as the container for the cell, a carbon rod surrounded by the depolarizing mixture, which was wrapped in cloth, and the electrolyte in the form of a jelly. The open-circuit voltage of this cell was about 1·3 volts, and its short-circuit current about 6 amperes. At first these were made of a size $2\frac{1}{4}$ in.$\times$6 in. known as the standard dry cell. There soon appeared a miniature type known as the "flashlight" cell. About 1904 the demand for dry cells increased immensely owing to their use in automobile ignition systems, though the starting and lighting systems at present in use finally put an end to that demand. A further extensive application for these cells which still continues is for the operation of telephones, for which a special type of cell has been developed. During the last few years a large demand for dry cells has resulted from their application to the "A" circuits of radio receiving sets, and this in turn has given rise to a special type of cell adapted to the heavy demands imposed upon it in radio service. The application of batteries of miniature cells of this type for operating the "B" circuit also caused a very large expansion in the industry.

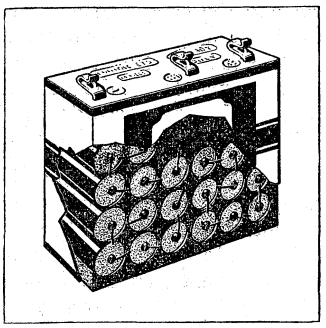


FIG. 5.—DRY CELL "B" BATTERY, SHOWING CELL CONSTRUCTION

In the construction most commonly employed at present the cylindrical container consists of zinc, which serves as the zinc plate. Formerly a layer of paste made of flour, plaster of Paris, ammonium chloride, and zinc chloride was then coated around the inside of the zinc container and allowed to set. In a procedure at present largely followed a double layer of paper board is used in place of the separating paste. A carbon rod is then mounted in the centre of the case and packed around with a depolarizing paste the exact composition of which is held as a trade secret, but is stated to be approximately as follows:—

Manganese peroxide	10
Carbon or graphite	10
Sal ammoniac	2
Zinc chloride	1

Sufficient water is added to make this mixture into a paste, when the zinc chloride prevents the contents becoming too dry.

For the general construction of typical dry cells *see* fig. 5.

Sometimes the electrolyte is made into a jelly with such colloidal material as gum tragacanth, agar agar, gelatin, flour or starch. The electrolyte is therefore unspillable, whether the cell is completely sealed over the top, as is most common in American practice, or is provided with a vent for the escape of gas, as is common in European practice. As the cell is discharged the manganese dioxide is reduced and the effective surface of the electrode travels toward the carbon rod, which is in the centre axially with the cell. This carbon rod only serves to conduct the current out of the mixture to the terminal.

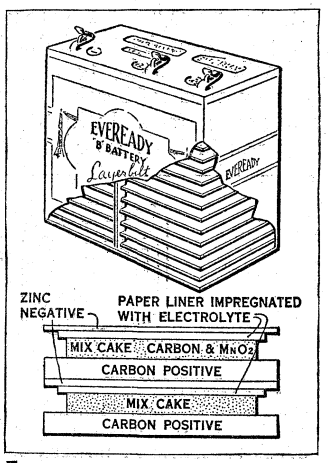
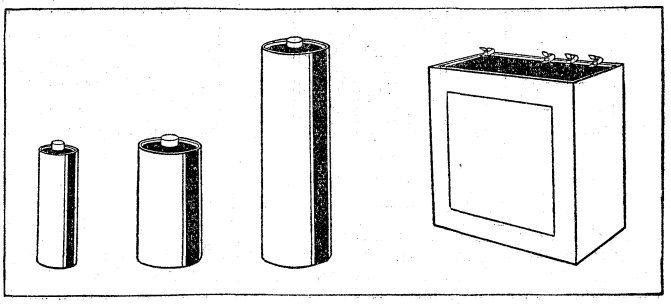


FIG. 6.—DRY CELL "B" BATTERY, SHOWING CROSS-SECTION OF CONSTRUCTION

In the common bag type of dry cell battery the manganese dioxide mixture is contained in a cloth bag or sack. The carbon rod with its surrounding mixture is wrapped in muslin and tied with string, forming a unit which can be placed in the zinc can, leaving sufficient space between the two for the electrolyte in the form of a paste. Spacers to separate the bag from the zinc can are desirable, but are not always used. These are commonly rubber bands in the small cells, such as are used for flashlight batteries, or Manila cord, which is of considerable size in some of the foreign makes of cells. The solution of sal ammoniac and zinc chloride is thickened with flour or other similar materials and may also contain other ingredients, differing with manufacturers and kept secret by them.

In the Siemens dry cell (*Electrical Review* [London], 1927, *100, 3*), which is constructed for radio purposes, the carbon electrodes are made from purified retort carbon, which is agglomerated by pressure and baking, and the second electrode is made of sheet zinc and forms the outside canister. The depolarizing paste which is tamped in the vessel consists of manganese peroxide and carbon together with some graphite, to reduce the internal resistance, and gum. The space between the zinc canister and the depolarizer is filled by pouring in a thin exciting paste consisting of a solution of sal ammoniac, flour and plaster of Paris; the cell is finally filled up with seed husks which allow for expansion, and covered with a paper disc through which two small glass ventilating tubes protrude in the case of large cells and the cell is finally sealed with pitch.



FROM THE "ELECTRICAL REVIEW"

FIG. 7.—THREE SIEMENS DRY CELLS AND A BATTERY OF 36 CELLS

An illustration of three standard sizes of cells is shown in fig. 7. The battery shown in fig. 7 is made of 36 cells, connected in series to give a nominal e.m.f. of 50 volts; its weight is 20 lb. and maximum discharge rate 20 milliamperes.

Chemical Reactions in the Dry Cell.—These are not exactly understood, but the principal changes taking place at the electrodes may be briefly described as follows:—

The zinc in contact with the solution of ammonium chloride becomes negatively charged because of the departure of positive zinc ions $Zn^{\cdot\cdot}$ from its surface. As zinc dissolves in the solution, zinc ions, ammonia and hydrogen ions are produced, according to the ionic equations:—

$$Zn + 2\oplus \rightarrow Zn^{\cdot\cdot}.$$

$$NH_4^{\cdot} \rightarrow NH_3 + H^{\cdot}.$$

The carbon-manganese dioxide electrode in contact with the solution of ammonium chloride becomes positively charged. This fact may be explained in at least two ways. According to the first theory, hydrogen ions ($H^{\cdot}$) are discharged at the surface of the composite electrode and render it positive.

$$2H^{\cdot} \rightarrow H_2 + 2\oplus.$$

The manganese dioxide rapidly oxidizes the hydrogen, which would otherwise accumulate on the surface of the electrode and polarize the cell. The manganese dioxide (MnO_2) is thereby reduced to a lower state of oxidation, probably (Mn_2O_3)

$$2MnO_2 + H_2 = Mn_2O_3 + H_2O.$$

According to the second theory, the manganese dioxide gives tetravalent ions ($Mn^{\cdot\cdot\cdot\cdot}$), which are reduced during the action of the cell to ions of a lower valency and thereby furnish positive charges to the electrode

$$Mn^{\cdot\cdot\cdot\cdot} \rightarrow Mn^{\cdot\cdot\cdot} + \oplus.$$

The manganese dioxide thus diminishes the polarization of the cell, and is at the same time reduced to a lower state of oxidation. If the positively charged electrode (carbon-manganese dioxide) is connected with the negatively charged electrode (zinc) by a wire, a current will flow through the wire from the carbon

to the zinc. Within the cell the current will flow from the zinc through the electrolyte to the carbon-manganese dioxide.

Recent Improvements.—These have been made mainly in the attainment of increase of amperage yield, capacity, the reduction of deterioration and the improvement in dependability. These advances have been secured by care in the selection of raw materials, close control of manufacturing methods and processes, and testing of the products.

Experiments conducted by G. W. Vinal and R. M. Ritchie show that dry cells deteriorate even though they are not in service. The small cell wastes away more rapidly than the larger one. Deterioration, however, can be measurably retarded by storing the cells and battery in a cool, dry place. The user of radio apparatus when employing dry cells should not allow them to freeze. Cells must not be tapped for excessive current requirements. A marked gain in capacity is obtained by making the drain on the current light.

Desiccated cells are manufactured dry and require the addition of water before they are ready for use. Some of them are manufactured as paper-lined cells and others are of the bag type. Each cell is provided with an opening in the seal or centre of the carbon rod, through which the water necessary to make the cell active may be introduced. Some of them are also provided with a vent. Only two kinds of these cells are well known in this country, but others are now being developed. One of these, called a "reserve" cell, closely resembles an ordinary dry cell. The other, called the "add water," is of bag-type construction with an inner zinc for the electrode. When in use it contains rather more electrolyte than the ordinary dry cell.

Action of Heat.—The effect of temperature on the open-circuit voltage of dry cells is small and for most purposes can be neglected entirely. The temperature coefficient is positive within the ordinary range of temperatures; that is, an increase in temperature is accompanied by a rise in voltage.

Between 0° and 25° C (32° and 77° F) the short-circuit current increases by approximately 1 ampere for each 3° C (5·5° F) rise in temperature. At higher temperatures the rate of increase is somewhat less.

Heat produces deterioration of dry cells in two ways. First, it tends to produce leakage, this may be observed when the sticky electrolyte has oozed out around the seal of the cell. Second, it increases the rate of the chemical reactions taking place within the cell. The deterioration of the cells is usually measured by the decrease in the short-circuit current with time when the cells are stored on open circuit.

Testing of Cells.—Service tests, which are applied to gauge the efficiency of cells, include determinations of ampere-hour and watt-hour capacity at both constant current and constant resistance discharge.

Since dry cells are mostly used on circuits of which the resistance is constant or nearly so, the capacity is usually expressed as the number of hours or days that the cell will continue to give service on such a circuit. This period is calculated to the time that the terminal voltage has fallen to some arbitrary value below which the service is not satisfactory. For example, the cut-off voltage of a group of three cells for telephone service is 2·8 volts. Such service is intermittent and extends over a number of months. The capacity of dry cells may also be expressed in terms of ampere hours and watt hours, but to obtain these data it is necessary to integrate carefully measured discharge curves. In any case the capacity, whether expressed as hours, ampere hours, or watt hours, depends on the condition of the cells, the way they are made and the arbitrary choice of the cut-off voltage.

Apart from the voltage on open circuit it is necessary to determine the rate of exhaustion and the power of recuperation of the cell. In a method which has now been adopted practically as standard, the cell is discharged five minutes daily through a 4 ohm resistance until the e.m.f. falls to a value of 0·75 volt per cell.

The Open-Circuit Voltage test is usually made with a voltmeter through which some current necessarily flows. It is, therefore, not strictly an open circuit measurement, but the current which flows through the voltmeter is generally so small that the voltage of the cell is lowered by an amount which is negligible. An accurate voltmeter of at least 100 ohms resistance per volt of the scale and having at least 50 divisions per volt should be used for this purpose. The true open-circuit voltage of cells is most conveniently obtained by measuring them with a potentiometer, but this is possible only in the laboratory.

The voltage of an unused cell is usually from 1·50 to 1·60 volts. Higher voltages are sometimes found, but do not indicate superiority of cell. Lower voltages than 1·45 volts may indicate manufacturing defects, deterioration due to age, or damage. Abnormally low values indicate probably low service capacity. Hence the open-circuit voltage test made with a voltmeter is the best test available for detecting defective cells.

The open-circuit voltage, measured by a potentiometer changes by only a small amount relatively during the life of the cell. In one instance a cell under observation for 20 years still showed 1·36 volts when measured on the potentiometer, although its resistance had increased so that a voltmeter measurement such as is described above showed only 0·215 volt.

In the short-circuit current test a deadbeat ammeter, accurately calibrated, is used. The resistance of the lead wires and shunt of the ammeter should have a value of 0·01 ohm to within 0·002 ohm. The maximum swing of the needle is taken as the short-circuit current of the cell. The lead wires are conveniently tipped with lead to make good contact and should be applied to the brass terminals of the cell. Results of tests vary with the temperature. They should be made only when the cell is at a normal room temperature; that is, about 70° F.

Intermittent tests are made to imitate the use of cells under average conditions. The three standard intermittent tests are (1) Light intermittent tests, which represent telephone and other light services. (2) Heavy intermittent test, which represents ignition service, and (3) Flashlight test, which represents flashlight service.

Besides the tests mentioned above it may be desirable to make other tests, including other physical measurements, chemical examination, noise in radio batteries, and the effect of temperature. For these no definite procedure has been established. A superficial physical examination will occasionally serve to indicate certain defects, such as loose terminals, leaking seals and flaws in the zinc. (J. N. P.)

A recent successful departure from accepted standards of "B" battery construction in the United States involves the substitution of flat cells for the usual cylindrical elements. The electrodes for these cells are made of sheet-zinc, coated on one side with a water-proof conducting plastic, the latter serving as the cathode terminal. Upon the coated side of the metal plate is stamped a mix cake consisting of a suitable mixture of manganese dioxide, carbon and electrolyte, followed by a layer of wet, pasted pulp-board and a second of coated zinc, this one with its metallic surface in contact with the pulp-board. Another mix cake is then added and the building-up process is continued until a block of the requisite number of cells has been produced. Electrical contact between cells is obtained through the coated zinc, no separate connections being provided. The whole battery is finally placed in a box and sealed.

Lalande Cell.—Second only to the Leclanché in commercial importance is the cell devised by Felix Lalande (1881) and Georges Chaperon. This element (*see* Lorenz, *Z. Elektrochem.*, vol. iv., p. 308, 1897) consists of an amalgamated zinc anode, a caustic alkali electrolyte (usually a 15 to 25% solution of sodium hydroxide), and a copper oxide depolarizer-cathode. The copper oxide may be either granular, in which case it is usually tamped into a perforated iron or copper container, or agglomerated and compacted into a cathode block. The use of heavily amalgamated zinc (1·0 to 2·5% mercury) reduces wasteful zinc corrosion to such an extent that cell deterioration with time is very slight. The evaporation of electrolyte, or the access of carbon dioxide which is also deleterious to cell action, is obviated by pouring a layer of paraffin oil over the surface of the electrolyte. The Lalande cell has an open-circuit voltage of 1·0 to 1·1 and an

operating voltage, depending on the current drain, usually ranging from 0·6 to 0·85 volt in ordinary commercial practice. Depolarization is rapid and efficient, hence large currents can be drawn from the cell. During discharge zinc goes into solution, while hydrogen is liberated at the cathode where it is oxidized to water by the copper oxide; the latter is simultaneously reduced in successive stages to metallic copper during the process. Zinc in solution appears to be largely in the form of a zincate complex ($HZnO_2$). Since the zinc ion concentration remains low and the voltage changes during copper oxide reduction (of the order of 0·2 volt) are small, the cell has remarkably well-sustained operating voltage during the period of service life. Cell action proceeds until the active electrodes are used up or, in case the electrolyte is the limiting factor, until zinc hydroxide [$Zn(OH)_2$] or a hydrated sodium zincate of the type ($NaHZnO_2 \cdot 9H_2O$) crystallizes from the saturated solution and prevents further operation by forming non-conducting deposits on the active electrode surfaces. By the addition of small quantities of sulphur to the depolarizer as practised in the Columbia high voltage unit (manufactured in the United States), the operating voltage can be increased by about 0·1 volt.

The Lalande cell is one of the most efficient and satisfactory primary batteries known to-day for the special classes of service to which it is suited. It lends itself readily to rugged construction; it is relatively cheap to make and operate; it is very reliable in its action and has a high current output per unit of volume (about 1 ampere hour per 8 cc. of electrolyte). The cell is made in units as large as 500 to 1,000 ampere hour sizes. Because it requires no attention for long periods of time and because of its excellent continuous discharge and heavy duty characteristics, the Lalande cell is at present much used in railway signal operation. It can be made in dry or non-spillable form either by gelatinizing the caustic soda solution with small quantities of starch or by using such expedients as making a paste out of electrolyte and magnesium oxide.

Air cells of the Lalande type, in which a porous carbon accessible to air is substituted for the usual copper oxide element, are also feasible. These have an even more horizontal discharge curve than the copper oxide cell, since the potential of the cathode remains virtually unchanged during service life. The caustic soda air cell has an open circuit voltage of 1·35 to 1·45 and an operating voltage even on comparatively heavy drains above 1·0 volt—perhaps 0·4 to 0·5 volt higher than that of a standard copper oxide cell. The carbon electrode can be used repeatedly, only zinc and electrolyte requiring renewal each time the cell is completely discharged. (G. W. H.)

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BATTERY, MILITARY, the men, horses, guns and vehicles of the smallest independent artillery unit in most armies (from Fr. *battre*, to beat). The name was first employed in the British army at the time of the Crimean War, and in 1859 all existing artillery units were renamed batteries. The unit consists of 4, 6, 8 or 12 guns with their teams, animals or tractors, and a corresponding number of vehicles for ammunition. Field batteries are horse- or tractor-drawn, and usually form an integral part of infantry divisions. Light, pack or mountain batteries, the guns of which are often carried in pieces on horses or mules, usually act independently, though in the British and Italian armies some are incorporated in the divisional organization. Medium and heavy batteries, which are usually tractor-drawn, and anti-aircraft batteries, the guns of which are mounted on lorries or on travelling platforms, are normally corps or army troops, and are not allotted to divisions.

United States.—The battery is the smallest administrative unit of field artillery in the United States military service and is normally commanded by a captain. One first lieutenant and two second lieutenants complete the officer personnel. The enlisted strength varies with type of equipment. To facilitate technical operation it is organized into a battery headquarters, four gun sections, one caisson section and one maintenance section. Each section contains the necessary personnel, animals and equipment to perform its functions effectively. The battery is a four gun unit. In a division it is armed with the French 75mm. gun or 105mm. or 155mm. howitzers. Each gun and limber, or caisson and limber, is drawn by a six-horse team or a motor truck. (*See* ARTILLERY; FORTIFICATION AND SIEGECRAFT.)

BATTHYÁNY, LOUIS (LAJOS), COUNT (1806–1849), Hungarian statesman, was born at Presburg in 1806. When Széchenyi drew nearer to the court in 1839–40, Batthyány became the leader of the opposition in the upper house. In 1847 he procured the election of Kossuth, took part in the deputation of March 15, and on March 31, 1848, became the first constitutional prime minister of Hungary. His position became extremely difficult when Jellachich and the Croats took up arms. He did his utmost, in his frequent journeys to Innsbruck, to persuade the court to condemn Jellachich and establish a strong national government at Budapest. Unfortunately, however, he was persuaded to consent to the despatch of Magyar troops to quell the Italian rising, before the Croat difficulty had been adjusted, and thenceforth his authority in Hungary declined. When Jellachich invaded Hungary, Batthyány resigned, with the intention of forming a new ministry excluding Kossuth, but this had now become impossible. Then Batthyány attempted to mediate between the two extreme parties, and subsequently raised a regiment from among his peasantry and led them against the Croats. He formed the deputation from the Hungarian diet to Prince Windischgrätz, whom the Austrian commander refused to receive. A few days later (Jan. 8, 1849) he was arrested at Budapest. As a magnate he was only indictable by the grand justiciary, as a minister he was responsible to the diet alone. At Laibach, whither he was taken, he asked that Deák might be his advocate, but this being refused, he wrote his own defence. Sentence of hanging was finally pronounced upon him at Olmütz for violating the Pragmatic Sanction, overthrowing the constitution, and aiding and abetting the rebellion. To escape this fate he stabbed himself with a small concealed dagger, and bled to death in the night of Oct. 5, 1849.

See Bertalan Szemere, *Batthyány, Kossuth, Görgei* (Ger.) (Hamburg, 1853).

BATTIADAE, descendants of Battus of Thera, who in the latter half of the 7th century B.C. led a colony from Thera to Africa, on the instructions of the Delphic oracle. This colony was given the name Cyrene, and was ruled by his descendants for seven generations as kings. On the death of the last (Arcesilaus IV.) about 450, a democracy came into power.

BATTICALOA, the administrative capital of the eastern province of Ceylon, on the east coast 69 mi. S.S.E. of Trincomalee, situated on an island in lat. 7° 44′ N. and long. 81° 52′ E. It is of importance for its haven and the adjacent salt lagoons. The population of the town in 1931 was 11,585; of the province (3,840 sq.mi.) 212,421. The old Dutch fort dates from 1682. Rice and coco-nuts are the two staple products of the district, and steamers trading round the island call regularly at the port. The lagoon is famous for its "singing fish," supposed to be shellfish which give forth musical notes. The survivors of the Veddas, the aboriginal inhabitants of Ceylon, inhabit rock-shelters and huts in this province. The average annual rainfall is 55½ in.; the average temperature, 80.4° F. A railway joins Batticaloa to the Trincomalee-Maho line, which it meets at Galoya; the distance by rail to Colombo is 217 mi.

BATTISHILL, JONATHAN (1738–1801), English composer of church music. Until 1764 he wrote chiefly for the theatre (incidental songs, pantomime music, and an opera in collaboration with Michael Arne, the son of Thomas Arne), but in 1764 he became organist of a city parish, and his later compositions are chiefly glees, part-songs and church music. In 1763 he had married a singer at Covent Garden theatre where he was harpsichordist. She retired from her profession when she married. After her death in 1777 he wrote little more. He died at Islington on Dec. 10, 1801. Batthishill published a collection of his glees in 1776, and some of his anthems and chants were printed in 1804.

BATTLE, a town and parish, Sussex, England, 54½ mi. S.S.E. from London by the Southern railway and 7 mi. from the sea at Hastings. Pop. (1931) 3,491. Its name is derived from the conflict in 1066, which ensured to William the Norman the crown of England (*see* also BATTLE ABBEY ROLL). Before the battle, William vowed to build an abbey on the spot if he should prove victorious, and in 1094 the consecration took place. The place where Harold fell has been identified. The gatehouse at the end of the main street is Decorated; and parts of foundations of the Norman church, Perpendicular cloisters, and Early English refectory remain. A mansion used as a girls' school incorporates some of the ancient building. The church of St. Mary is transitional Norman and later. The interests of the town lie in agricultural trade and tourist traffic.

BATTLE, a general engagement between the armed forces, naval or military, of enemies. The word is derived from the Fr. *bataille,* and this, like the Ital. *battaglia,* and Span. *batalla,* comes from the popular Lat. *battalia. Battalia* was used for the array of troops for battle, and hence was applied to the body of troops so arranged, or to a division of an army, whence the use of the word "battalion" (*q.v.*).

A "pitched battle," loosely used as meaning almost a decisive engagement, is strictly, as the words imply, one that is fought on ground previously selected, French *bataille arrangée,* opposed to *bataille manoeuvrée,* which is intended but may come off on any ground. In modern English usage the two types are distinguished by the titles "deliberate" and "encounter." With "battle," in its usual meaning of a general engagement of hostile armies, are contrasted "skirmish,"[1] a fight between small bodies ("skirmishing" technically means fighting by troops in extended or irregular order), and "action," a more or less similar engagement between larger bodies of troops. (*See* also TACTICS and STRATEGY.)

A "battle" is essentially a climax in which each army brings to bear all its available forces and resources, and which, therefore, by the greatness of the stake is likely to have a vital influence on the fortunes of the campaign. The term "battle" was loosely applied to many of the prolonged trench-warfare operations of World War I, *e.g.,* Battle of the Somme, but the term was not truly justified, both because the offensive effort was punctuated by long pauses during which both sides could redistribute or relieve the forces engaged—so creating a fresh situation—and because only a small proportion of the available forces were engaged in any one episode. Certain of these episodes, *e.g.,* the attacks of July 1 and July 14, 1916, had a better claim to be termed "battles"; but if qualified by the time test they are hardly justified by the scale test, owing to the small fraction of the armies which were actually engaged. On the other hand, their nature accords admirably with the terminology which is historically used of siege operations. The importance of this exact use of language is that it serves to place the Western front campaign in its true form as a gigantic siege.

BATTLE ABBEY ROLL. This is popularly supposed to have been a list of William the Conqueror's companions preserved at Battle Abbey, on the site of his victory over Harold. It is known to us only from 16th century versions of it published by Leland, Holinshed, and Duchesne, all more or less imperfect and corrupt. Holinshed's is much the fullest, but of its 629 names several are duplicates. The versions of Leland and Duchesne each contain many names not found elsewhere. It was so obvious that several names had no right on the roll that Camden held them to have been interpolated by the monks, "not without their own advantage." Modern writers have gone further, Sir Egerton Brydges denouncing the roll as "a disgusting forgery," and E. A. Freeman dismissing it as "a transparent fiction." An attempt to vindicate the roll was made by the last duchess of Cleveland, whose *Battle Abbey Roll* (1889) is the best guide to its contents.

It is probable that the character of the roll has been quite misunderstood. It is not a list of individuals, but only of family surnames, and it seems to have been intended to show which families had "come over with the Conqueror," and to have been compiled about the 14th century. The compiler appears to have been influenced by the French sound of names, and to have included many families of later settlement, such as that of Grandson, which did not come to England from Savoy till two centuries after the Conquest.The roll itself appears to be unheard-of before and after the 16th century, but other lists were current at least as early as the 15th century, as the duchess of Cleveland has shown.

See Leland, *Collectanea;* Holinshed, *Chronicles of England;* Duchesne, *Historia Norm. Scriptores;* Brydges, *Censura Literaria;* Thierry, *Conquête de l'Angleterre,* vol. ii. (1829); Burke, *The Roll of Battle Abbey* (annotated, 1848); Planché, *The Conqueror and His Companions* (1874); duchess of Cleveland, *The Battle Abbey Roll* (1889); Round, "The Companions of the Conqueror" (*Monthly Review,* 1901, iii. pp. 91–111). (J. H. R.)

BATTLE-AXE, a cleaving weapon for hand-fighting. Its use as a weapon of war dates from the bronze age. According to Homer, Agamemnon was attacked by Peisander with such a weapon. In the 11th century the Danish battle-axe was a regular part of the equipment of fighting men in England and under the Statute of Winchester of 1285 certain classes were required to maintain these weapons. In the 14th century the classic example of its effective employment was when Robert the Bruce felled Sir Henry Bohun with a single blow the day before the battle of Bannockburn (June 23, 1314). It was sometimes the custom to secure the axe to the wrist by a chain to ensure its retention. The oldest body-guard of the English sovereigns, the Honourable Corps of Gentlemen-at-Arms, introduced battle-axes into its equipment in 1526 and for centuries all their duties were ordered to be carried out "with their axes" or "with their pole-axes." At the funeral of a sovereign the axe was carried in the left hand, reversed and draped. In 1520 "The Battle-Axe Guard of Ireland" came into existence with duties similar to those of the Yeomen of the Guard. It was disbanded in 1833. There is in the Royal Artillery a battery known as "The Battle-Axe Company" which is the descendant of the Artillery Company which distinguished itself at the capture of Martinique in 1809 and was granted a battle-axe in commemoration of the service. The original axe is now in the possession of the 25th Medium Battery, Royal Artillery, the "Battle-Axe Company."

BATTLE CREEK, a city of Calhoun county, Michigan, U.S.A., 114 mi. west of Detroit, at the confluence of Battle Creek with the Kalamazoo river.

It has an area of 10.2 square miles, with 16 parks and parkways having a total area of 393.25 acres.

Battle Creek is on federal highway 12 and state highways 37, 78 and 96; and is also served by the Michigan Central (division of the New York Central) and the Grand Trunk Western railways and bus lines. It has a municipal airport just outside the city limits. The population was 43,573 in 1930 and 43,453 in 1940. The population is preponderantly native-born white.

The Battle Creek sanitarium is an internationally known health resort. Founded in 1866 as the Western Health Reform Institute, it was taken over in 1876 by Dr. John Harvey Kellogg, and its name was changed to Battle Creek Sanitarium. It pioneered in dietetic and hygienic treatment, and has influenced the industrial development of the city considerably. Four of the largest industries make cereal foods which are shipped to all parts of the world.

The industries, however, are well diversified, including such products as printing presses, steam pumps, boxboard cartons, gas and electric ranges, material-handling equipment, power-farming and threshing machinery, speed-packaging machinery, automotive parts, exercising and therapeutic equipment, electrically welded steel and wire specialties, warm air registers, brass goods and strings for musical instruments. A mile and a quarter south and west of the city limits is Ft. Custer, a permanent army post, normally quartering some 20,000 soldiers, including the permanent post personnel and various units assigned there for training. Battle Creek is the trade centre for a general farming region. Within 15 mi. are 20 lakes and numerous streams providing good fishing. There are three golf courses.

[1]This is the same word as "scrimmage," and is derived from the Ang.-Fr. *eskrimir,* modern *escrimer,* properly to fight behind cover, now to fence. The origin of this is the O.H.G. *scirman,* to fight behind a shield, *scirm,* M.G. *Schirm.*

Battle Creek was settled in 1831, incorporated as a village in 1850 and chartered as a city in 1859. It has a commission form of government

BATTLEDORE AND SHUTTLECOCK, a game played by two persons with small rackets, called battledores, made of parchment or rows of gut stretched across wooden frames, and shuttlecocks, made of a base of some light material, like cork, with trimmed feathers fixed round the top. The object of the players is to bat the shuttlecock from one to the other as many times as possible without allowing it to fall to the ground. There are Greek drawings extant representing a game almost identical with battledore and shuttlecock, and it has been popular in China, Japan, India, and Siam for at least 2,000 years. In Europe it has been played by children for centuries. A further development is Badminton (*q.v.*).

BATTLEMENT, the parapet of a wall consisting of alternating low portions known as "crenels" or "crenelles" (hence "crenellated" walls with battlements) and high portions called "merlons." Battlements were devised in order that warriors might be protected by the merlons and yet be able to discharge arrows or other missiles through the crenels. The battlement is an early development in military architecture; it is found in Chaldea, Egypt and prehistoric Greece as well as commonly in Roman fortifications. It was in the middle ages that the battlement received its highest development, crenels being narrowed, and frequently given splayed sides, the merlons often having in the centre a thin slit sometimes cross-shaped to give the widest possible arc for the discharge of missiles. The developed mediaeval battlement was frequently bracketed out from the face of the wall and holes in its floor were furnished to allow objects to be dropped directly downward upon attacking forces. In actual siege use the battlement was usually covered with a protecting shed of timber and hides.

In the Saracen countries and in Italy, through Eastern influence, the battlement frequently takes decorative shapes, and towards the end of the Gothic period, as the military necessity decreased, the battlement became merely decorative. A similar persistence of the battlement as a purely decorative form occurs in much late Gothic throughout Europe; especially in the perpendicular work in England, when it is richly ornamented with tracery and frequently pierced as well.

For a complete discussion *see* Viollet-le-Duc, *Dictionaire raisonné de l'Architecture française,* especially articles Architecture militaire, Château, Donjon, Hourd, Machicoulis and Siège. (T. F. H.)

BATTLESHIP. The battleship is the ultimate instrument of naval warfare, in that it is provided with the means for inflicting the greatest damage to all other floating craft, and at the same time is so designed to resist all forms of attack. Its supremacy has been temporarily challenged from time to time in the past by the advent of new weapons: gunpowder, torpedoes, mines, submarines and the aeroplane.

With the appearance of each new weapon there has always arisen the familiar cry from the inventors and enthusiasts of the new weapon, and from the misinformed and uninformed amateurs, that the battleship is doomed and that the newly invented and small "Davids" will drive the huge and costly "Goliaths" off the seas. No one doubts the old adage that it is impossible to get something for nothing.

The threat of each new weapon has been met by suitable and adequate measures to increase the offensive and defensive qualities of ships, and from each temporary challenge the battleship has emerged more powerful than ever. The resumption in construction of this type of ship after the building holiday of about 14 years after the Washington Treaty of 1922 practically stopped their construction, was a practical example of the faith all nations have in the type. The holiday gave ample time to weigh deliberately all the factors involved and their decision to resume the building of larger battleships was unanimous.

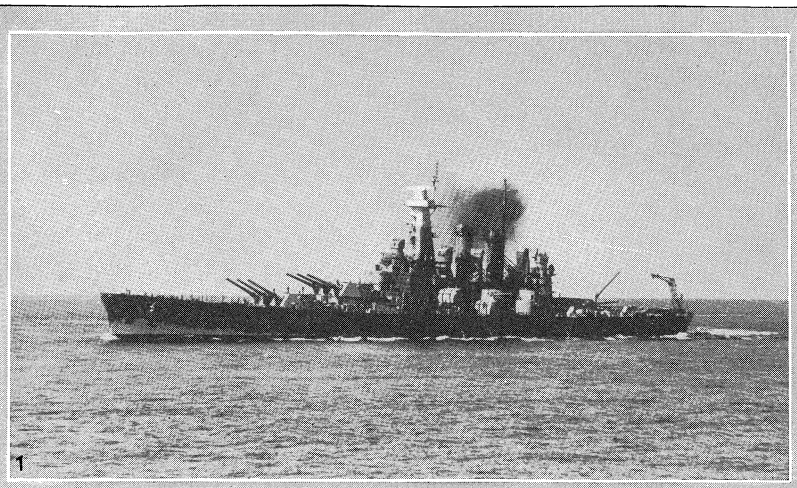
In the 18th century the standard "battleship" was the 74-gun two-decker and the "super-dreadnought" of that era was the 90- to 100-gun three-decker. Steam as an auxiliary form of propulsion was installed in ships of the line about 1850; then the invention of shell, as distinct from solid shot, hastened the advent of the iron-clad. The sailing navy died hard, owing to the conservatism of the times, and it was not until the tragic loss of the turret ship "Captain," which capsized in the Bay of Biscay, had proved the futility of combining the obsolete with the modern, that masts and sails finally disappeared from battleships. Already there had started the duel between guns and armour, a duel which continues to this day and which, in practice, necessitates a compromise with speed in all big warships.

From time to time the battleship has been declared to be useless and obsolete. The invention of the torpedo and the construction of the torpedo-boat were loudly proclaimed to have sounded her death-knell, but with these, as with all new forms of weapons, we see an example of the enduring principle that for every form of attack there is an effective form of defence. At the time, the answer to the torpedo was the crinoline-like net defence with which the battleship surrounded herself, coupled with batteries of quick-firing guns, and better watertight sub-division. With experience, the limitations of the torpedo-boat, just as those of the submarine in later times, became more apparent. The torpedo-boat, like the submarine, had to count for its success mainly on surprise. This it secured by its speed and comparative invisibility, due to the difficulty of seeing so small an object in the dark. But it was severely handicapped by bad weather, and it had no great radius of action; moreover, an antidote was found to this new menace in the destroyer—the predominant type of surface torpedo craft.

The torpedo-boat, for a time, disappeared, and the destroyer became her sea-going successor and, in turn, a yet more formidable challenge to the battleship. This new danger was met by equipping the battle fleet with attendant flotillas of destroyers, carrying a powerful armament of guns, to counter the enemy's flotilla. In addition these flotillas were given the support of fast light cruisers. It was found that, with the greatly increased speed of modern battleships, a net defence at sea was impracticable, while immunity from torpedo attack in harbour was far better secured by local booms, fixed nets and batteries to guard the entrance. On the other hand, the battleships' own defence was improved by better underwater construction, including the system known as the "blister" (*see* further *Technical Aspects*), and by a powerful secondary armament, more efficient fire-control and laying systems for the guns and searchlights, star-shells and a number of other technical appliances. In this connection it is interesting to note that the German battle fleet broke through the massed flotillas of the Grand Fleet the night after the battle of Jutland (*q.v.*) and reached harbour with the loss of only one battleship due to destroyer attack. In the numerous destroyer attacks made during the daylight action, no capital ship was lost on either side. It may fairly be said, therefore, that the torpedo, fired from surface craft, has failed to render the battleship obsolete, but it should be noted that the mobility of a battle fleet is dependent on it being properly equipped with cruiser squadrons and destroyer flotillas.

Two new menaces to the surface ship generally have arisen in the shape of the elusive aeroplane capable of attacking with torpedo or bomb, and the almost invisible submarine. These in their turn have been proclaimed as being so formidable that once again the battleship is doomed, but, as in the case of the torpedo-boat, those who regard such new weapons as irresistible fail to perceive their limitations, nor do they realize that the latest design of battleship is, both in its powers of resistance and in those of offence, as much an advance on the pre-World War I design as that was on the first iron-clad, or the latter on the wooden three-decker. Still less do they realize that, ultimately, an effective answer to both these new perils to sea security rests on the predominant surface warship, the so-called battleship.

In most instances of battleships being sunk by bombers during World War II, the ships lacked adequate air protection of their own (*e.g.,* Pearl Harbor and the sinking of the "Prince of Wales" and "Repulse" off Malaya). The plane has to hit a comparatively small target at high speed and in the teeth of anti-aircraft gunfire. It takes several torpedoes to sink a battleship; a bomb, to be most effective, must be dropped, not on the heavily armoured deck, but close alongside, and timed to explode under water to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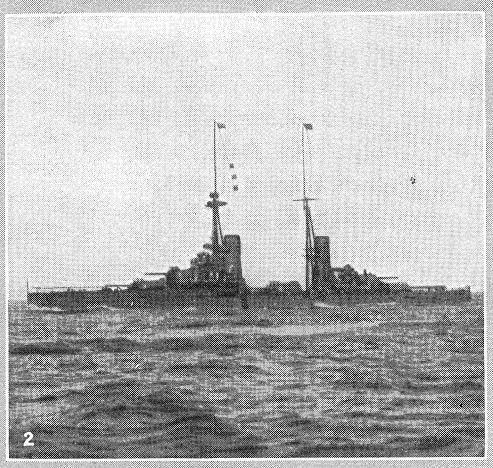
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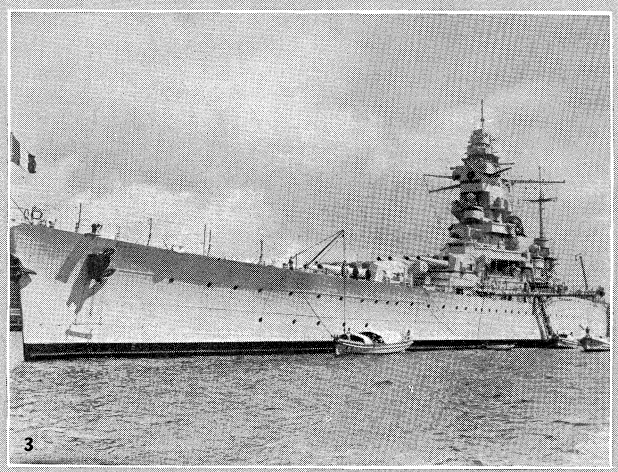
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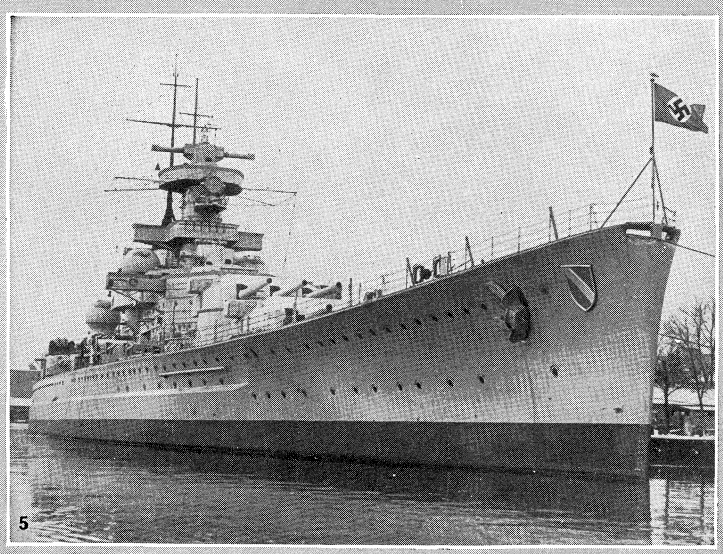
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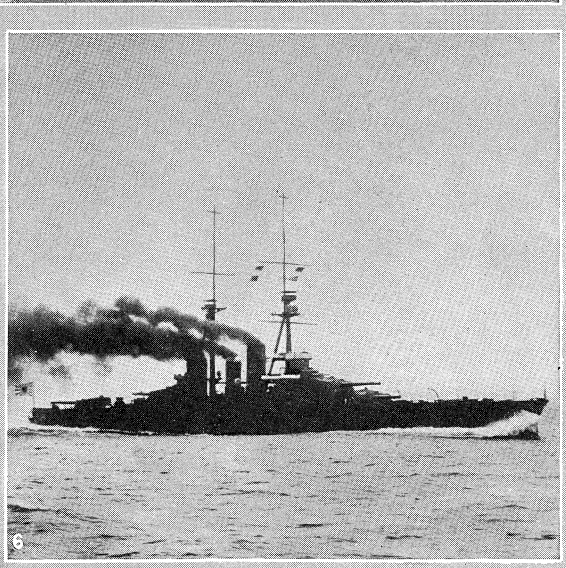
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BY COURTESY OF (2) THE NAVAL ATTACHÉ TO THE ITALIAN EMBASSY; PHOTOGRAPHS, (1, 5) ACME. (3) FROM EUROPEAN, (4, 6) BRITISH COMBINE

BATTLESHIPS OF SIX NATIONS

1. U.S.S. "North Carolina"; 35,000 tons; armour, 16-in. belt; speed, over 27 knots
2. Italian battleship "Duilio"; 22,562 tons; armour, 9¾–8-in.; 22 knots
3. French battleship "Dunkerque"; 26,500 tons; armour, 14-in. (conning tower and turrets), 11-in. side; speed 29.5 knots or more
4. H.M.S. "Rodney"; 33,900 tons; armour, 14-in. belt; speed, 23 knots
5. German battleship "Scharnhorst"; 26,000 tons; armour, 13–12-in. belt; speed, more than 27 knots
6. Japanese battleship "Kirisima"; 29,330 tons; armour, 8-in belt; speed, 26 knots

give the effect of a mine: a most difficult thing to accomplish. In practice, fleet aircraft and the anti-aircraft batteries of adjacent ships will assist in the defence, while the battleship is so well armoured and protected under water that she can withstand such attacks just as well, if not better, than the gunfire which she has always had to endure.

In the war of 1914–18 the submarine signally failed against the battleship. Old battleships, unescorted, or lying stationary in the open, were naturally the victims of under-water attack; but no single battleship of the Grand Fleet was hit, much less sunk, by a submarine, even though they were constantly cruising in the narrow waters of the North Sea. On the other hand, an enemy submarine was rammed and sunk by H.M.S. "Dreadnought."

Since the war of 1914–18, anti-submarine measures and devices have been further developed and, although the submarine, too, has become more formidable, it is no exaggeration to say it is less of a menace to the battleship in World War II than it was during World War I. Even though nations have signed agreements not to attack merchant and passenger ships without warning, agreements which were observed as international law, the conflict which began in Europe in 1939 has seen non-military and neutral shipping attacked by both aircraft and submarines.

Aircraft attack is met by escorting aircraft and by ship's anti-aircraft guns. Outside the range of air escort, working from shore bases, defending aircraft have to be launched from aircraft carriers, although it is not the usual procedure for carriers to accompany convoys. Both the merchantmen and their escorts are fitted with guns capable of being used both against aircraft and submarines.

The experience of the war of 1914–18 showed that the most effective form of defence against submarine attack was to sail shipping in convoys (*q.v.*), with armed escorts, but such passive defence had to be supplemented by active anti-submarine operations on a very large scale. Unlike the aeroplane, the main antidote to the submarine is not the submarine, but the surface craft with detecting gear, depth charges, guns or mines. (*See* SUBMARINE CAMPAIGN, 1914–18.) In the war of 1914–18, the submarine menace, which almost secured a strangle-hold on the Allies, was mainly defeated by an array of small surface craft. These could not have operated effectively and must have been continually driven from their work, but for the covering support of destroyers and cruisers; but the latter, in turn, would have been driven from the sea by the enemy's battle-cruisers and battleships had it not been for the Grand Fleet which effectively contained the German High Sea Fleet and drove it back into harbour whenever it appeared. (*See* JUTLAND, BATTLE OF, and DOGGER BANK.)

It will be seen, therefore, that the answer to the air menace to sea-borne commerce is, under certain conditions, the sea-borne aeroplane and the escort vessel with anti-aircraft guns, and to the submarine menace the convoy system, the armed escort and the array of surface submarine-hunters. It has also been demonstrated that the security against these new foes, as against the older surface raider, depends entirely on the existence of a surface navy, the most important unit of which is the "predominant surface ship"—the battleship. So well was this realized after the war of 1914–18 that there seemed danger that the principal naval powers would embark on a race to produce the most powerful type of warship afloat. This danger, if it can be called a danger in view of the conflagration in Europe beginning in 1939, was temporarily stopped by the Washington and London naval treaties which stated, "No capital ship shall exceed 35,000 tons (35,560 metric tons) standard displacement." After the three-power protocol was signed by Great Britain, France and the United States in 1938, raising the treaty limitations, several countries were reported as having commenced the construction of larger ships, super-battleships of 45,000 tons displacement. This ship might, in peace time, by agreement, become the 10,000 ton or even the 5,000 ton cruiser, but, with each reduction in tonnage, the capabilities, offensive and defensive, of the ship must necessarily decline and with them the sense of sea security. It is for this reason that responsible naval opinion is disinclined to reduce drastically the characteristics of the modern battleship. In fact, the trend in 1940 was to enlarge them, giving more offensive and defensive power and in turn the much-sought sea security. (E. A.; H. W. GN.)

TECHNICAL ASPECTS

The modern battleship is the lineal descendant of the "ships of the line" of Nelson's day of which the "Victory," now jealously preserved in H.M. dockyard at Portsmouth, was the most famous example. Such ships are at the head of the many types of ships forming a navy. They are fitted with the most powerful armament available and form the main striking force in a naval war.

The history of the modern battleship, apart from the adoption of all improvements in materials and methods due to general scientific advance, is one of continuous rivalry between guns and armour, and when we speak of guns we must also include the shells which are fired from the guns, as a shell to do great damage must not only be fired to hit the target but must also be strong enough to penetrate the armour and explode inside the ship with devastating effect.

With the gradual advance in the power of ordnance it has been necessary to provide more and more efficient protection to enable the battleship to withstand the shot and shell of the enemy, and the size of each new ship laid down increases as the power of the gun increases.

The climax of this development is shown on the table of the latest battleships of the five great Naval Powers at the end of this article.

Ships of the British Navy up to the year 1860 were still being built of wood with broadside guns, after the manner of the "Victory." For the next ten years, 4½″ wrought iron plates were used as armour on the sides of these vessels. This armour was proof against shot from the 68 pdr. gun at a range of 100 yards, this being the largest gun in use at this period. In 1859, the "Warrior," an iron armoured ship, was started. She was 380 ft. long, 9,200 tons displacement, and rather more than one half her length was covered with 4½″ wrought iron plates. The armament was all on the broadside and she was armed with the new Armstrong 100 pdr. gun. There was great opposition to building a war vessel of iron, and it is narrated that the First Lord of the Admiralty remarked to the builder: "I often wonder how I mustered sufficient courage to order the construction of such a novel vessel," to which the builder replied: "I often wonder how I mustered sufficient courage to undertake the construction of such a novel vessel." The "Warrior" was, of course, fully rigged; her single screw machinery was of sufficient power to propel her at a speed of 14¼ knots.

The "Warrior" and her sister ship, the "Black Prince," were succeeded by the "Achilles," "Minotaur," "Agincourt" and "Northumberland" of the same general type. The "Minotaur" was a vessel 400 ft. long, and of 10,690 tons displacement, with the armour extending the whole length, thus protecting the vulnerable steering gear, and having a maximum thickness of 5½″. These vessels proved too long to be handy under sail, and the next step was the production of a shorter and handier ship, the "Bellerophon," 300 ft. long, 7,550 tons. Vessels on somewhat similar lines continued until about 1875, and as the series progressed fewer guns of greater size were carried and these were placed in a battery amidships with thick armour on the sides. Thus, "Temeraire" in 1877 had a belt of 11″ armour with 8″ on the midship battery, her armament being 4–11″, 4–10″, and 6–4″ guns.

The revolving armoured turret, mounted in a low freeboard monitor came prominently to notice during the American Civil War, when Ericsson's "Monitor" with a turret containing 2–11″ guns, defeated the Confederate vessel "Merrimac." Revolving armoured turrets were first introduced into the British Navy in the "Royal Sovereign" in 1862; this ship was a 3-deck line-of-battle ship, cut down to a height of about 7 ft. above the water and fitted with armoured turrets and side armour; but the "Monarch," designed in 1866, and the "Captain" were the two first iron turret ships built as such for the Royal Navy; both were full rigged ships. The type-vessel for the turret ship was, however, the "Devastation," laid down in 1869, in which the armament consisted of 4–35 ton guns contained in 2 revolving turrets of 14″ thickness, placed on the middle line. Sails were definitely abandoned and the propelling machinery was duplicated. The armour

belt had a maximum thickness of 12″, tapering to 8″ at the ends. She was 285 ft. in length, 9,320 tons displacement, and had a speed of 14·2 knots. The "Devastation" type continued for the next 20 years, but owing to the rapid increase in the power of the large guns, the protecting armour had to be successively increased in thickness, and a stage was eventually reached, when, owing to limitations of weight, the area of side that could be armoured had to be confined to the most vulnerable portion of the ship amidships, where the machinery and the heavy guns were situated. The wrought-iron armour plates had then become 12″ thick, and even with this thickness two layers had to be provided in some cases to give the necessary protection. Compound armour consisting of a wrought-iron plate with a steel face welded on was introduced about 1873, the steel face being hardened to break up projectiles, while the tough wrought-iron back prevented the cracking and shattering of the plate. With such armour a lesser thickness would give the same protection. Successive improvements in the manufacture of this armour increased its value as compared with wrought iron, from 1·25 to 1·7, and it was used in the British Navy up to 1889. Ships of the "Devastation" type carried a few heavy guns and no secondary armament. They had comparatively low freeboard and were greatly inferior to present-day ships in their power of keeping the sea. The last of the type were the "Admiral" class, of which 6 were built. They were 325 ft. long and 9,500 tons displacement, and had an armour belt 18″ thick at the waterline, only 7′ 6″ broad over rather less than half the length. The armament consisted of 4–12″ guns, arranged in 2 barbettes at the end of the armoured citadels, with a secondary armament of six 6″ guns. Speed was 16½ knots. This class was much criticised, chiefly on account of the extent of the unprotected side abreast the 6″ guns and the insufficiency of the area of the protected side of the citadel. It was rightly contended that a light vessel armed with many comparatively small quick-firing guns could quickly riddle the whole of their upper works and put them out of action. Up to this period the general idea had been to keep the displacement so that it should not exceed 10,000 tons, and to keep the dimensions so small that the ship should be capable of ramming in a fleet action. As a result of the controversies aroused, and the natures of the ships which other nations started to build, a radical departure was made in the "Royal Sovereign" Class of 1889. The length of the ship was substantially increased and the displacement raised to 14,150 tons. A secondary armament of 10–6″ guns in armoured casemates was provided. Above the waterline belt of armour 11″ thick the side to the main deck was plated of 4″ nickel steel armour to give protection against small quick-firing guns. These ships were followed by the "Majestic" Class, in the design of which all the experience gained by trials at sea of the "Admiral" and "Royal Sovereign" Classes was embodied. A new and powerful type of 12″ gun and a new style of mounting was available for them, also for the armour an improved type of manufacture known as the Harvey process was adopted. This armour was of steel, homogeneous and with a hard face obtained by chilling. It was more efficient than the compound armour previously employed, its efficiency compared with wrought iron being 1·8 to 2·2. The vessels were of high freeboard, 390 ft. long and 14,900 tons displacement. The armour protection was arranged on a new principle. The belt was 9 inches in thickness, but it was carried up to the main deck a total depth of 15 feet. The protective deck was level at the middle line and sloped down at the side to the bottom of the armour below water, being 3 inches thick on the flat and 4 inches on the slope. This arrangement reflected the influence of the larger quick-firing guns; although the protection at the waterline was not sufficient to keep out the heaviest projectiles, it was backed up by the deck inside.

These vessels, which carried an armament of 4–12″ guns and 12–6″ guns in armoured casemates, had a speed of 17 knots; they proved to be very satisfactory in every respect and formed the type from which all British battleships and many of other countries were built over the years which elapsed before the "Dreadnought" era started in 1905. Improvements in details were made in the successive classes as technical science progressed, *i.e.*, water-tube boilers in "Canopus" Class (1897), Krupp type of armour instead of Harvey in "Formidable" Class (1900), 4–9·2″ guns in shields in addition to other armament in "King Edward VII." (1902).

The modern Navy starts with the "Dreadnought," which ship was the outcome of an Admiralty Committee appointed in December 1904 to review the types of fighting ships which the Board of Admiralty proposed to adopt for future building. The members of the Committee were naval and civilian officers of large and varied experience, and Admiral Sir John (later Lord) Fisher was appointed Chairman. Experience of earlier vessels in the Channel and Atlantic Fleets and the lessons of the naval actions in the Russo-Japanese War of 1904–5 were taken into account and pointed to the great importance of increasing the number of the heavy long range gun. The advisability of extra speed was recognised and to obtain it propulsion by turbine machinery was adopted, it having been experimented with in several small warships and used in fast passenger vessels. The design as finally adopted was 490ft. long and 17,900 tons displacement, armament 10–12″ guns in 5 turrets, three on the centre line and two at the sides abreast the mast, no secondary armament of 6″ guns, but 24 12pdrs. to deal with torpedo attack. The thickest armour was 11″ and the belt and deck followed the arrangement of previous ships. The turbine machinery developed 23,000 H.P. on 4 shafts, giving a speed of 21 knots. About one-third of her fuel supply consisted of oil fuel. Laid down in October 1905, she was completed and commissioned in December 1906, and immediately proceeded on long-distance trials in the Atlantic to test the turbine machinery for reliability and endurance. From this time onward till the World War, British battleships followed on progressively without departing from the essential principles of the type.

This type was followed in all its main features in the ships laid down up to the year 1908, namely, the "Superb," "Bellerophon" and "Temeraire," "St. Vincent," "Vanguard" and "Collingwood"; but 10 to 12 4in. guns replaced the 12-pounders. In the "Neptune" and "Hercules" laid down in 1909 the five turrets were disposed differently. In the latter ship the length had increased to 510ft. and the displacement to 20,000 tons. In the next group of ships, "Orion," "Monarch," "Conqueror" and "Thunderer," the 12in. gun gives way to the 13·5in. gun, all disposed on the centre line, two pairs forward, two pairs aft, in each case the pair nearer amidships firing over the adjacent pair, and a fifth pair right amidships. "King George V.," "Centurion," "Ajax" and "Audacious" (1910–11) were similar but slightly larger, the standard speed of 21 knots being maintained. These vessels were 555ft. long and 23,000 tons. The next step was the "Iron Duke" Class, four in number, the "Iron Duke" herself being the flagship of Admiral Jellicoe while he was in command of the Grand Fleet. In these ships 10 13·5in. guns were retained, but 12 6in. guns replaced the 4in. as the secondary armament. The armour belt of 12in. maximum thickness is carried to the upper deck with a battery above for 10 of the 6in. guns. The length of ship was increased to 580ft. and the displacement to 25,000 tons, the speed remaining at 21 knots.

The ships of the "Queen Elizabeth" Class were laid down in 1912 and completed in the first year of the World War. This class, five in number, formed a division of fast battleships of 25 knots requiring 75,000 H.P. The length was 600 ft. and displacement 27,500 tons. The calibre of the main armament was increased to 15in. and the number of guns reduced to eight, two pairs at each end. The armour belt had a maximum thickness of 13in., the armour being carried to the upper deck, with a battery above for 12 of the 16 6in. guns carried. The other four 6in. guns were removed later. In this class of ship oil fuel was exclusively employed, with very great advantages especially as regards endurance. An internal bulkhead 2in. in thickness was fitted as a protection against torpedo explosion; "Blisters" are being fitted to increase this protection still further. The ships of the "Royal Sovereign" Class, five in number, were laid down 1913–14 and completed in 1916. These vessels were designed for a speed of 23 knots and had four 15in. guns with 14 6in. guns.

No ship of the battleship class, as distinct from battle-cruisers, was laid down for the British Navy between 1914 and December 1922, when "Nelson" and "Rodney," designed to displacement limit agreed to at the Washington Conference, were commenced.

They were designed to the maximum standard displacement allowed, viz., 35,000 tons, and they carry 9–16″ guns in triple mountings with heavily armoured gun-shields, all of them forward of the machinery, the middle mountings being at a higher level than the others. 12–6″ guns are carried as secondary armament in 6 revolving gunhouses at the after end. The design speed is 23 knots. These ships were completed in 1927 and cost about £6,000,000 each.

The great advance in offensive power of the "Dreadnought," combined with her increased speed, made the type so superior to previous ships that with her a new era was opened in battleship construction, and other nations immediately started to build up a new fleet of vessels of the same type. Germany in particular started on a programme of construction which continued methodically up to 1914, starting with the "Nassau" Class (4 ships), with 12–11″ and 12–5·9″ guns; each succeeding class being of a size and power equal to contemporary British ships. These classes were "Helgoland" (4 ships), "Kaiser" (5 ships), "König" (4 ships), and "Bayern" (3 ships). The speeds were 20–21 knots in the "Nassau," "Helgoland" and "Kaiser" Classes, and 23–24 knots in later ships. The guns were 12 in the "Helgoland," "Kaiser" and "König" Classes, the "Bayern" Class having a main armament of 8–15″; in each class the secondary armament comprised 12 to 16–5·9″ guns.

The United States of America also embarked in 1906 on a building programme of battleships of the type, with the "Delaware" Class (2 ships), with 10–12″ and 14–5″ guns, followed by the "Florida" (2), "Arkansas" (2), "Texas" (2), "Nevada" (2), "Pennsylvania" (2), "New Mexico" (3), "Tennessee" (2), and "Colorado" (3). The speed of all these ships was 21 knots. As in other navies, the power of the guns and the dimensions and displacement of the ships increased in successive classes, the length of "Delaware" being 518 ft. and displacement 20,000 tons, and of "Colorado" 624 ft. and displacement 32,600 tons, the guns being 12″ in "Delaware," increased to 14″ in "Texas" and 16″ in "Colorado," the secondary armament being 12–5″ and 8–5″ A.A. guns.

The ships of "Colorado" Class, completed in 1921–3, embody the lessons of the war of 1914–18. The calibre of the main armament guns was increased to 16″, and two armoured decks are fitted, both thicker than those worked in previous designs. Very extensive underwater protection against torpedo attack is provided in the form of 5 longitudinal bulkheads on each side between the outer bottom and the machinery bulkheads, three of which are of thick plating. These ships, with the "Tennessee" Class and the Japanese "Mutu," are the only battleships which embody full war experience, with the exception of the "Nelson" and "Rodney."

Japan did not start building Dreadnoughts till 1909, when the "Kawachi" Class (2 ships) was started, the armament being 12–12″, 10–6″ and 8–4·7″ guns. This class has been followed by "Yamashiro" (2), "Hyuga" (2) and "Mutu" (2)—speeds, 21 knots in "Kawachi" and 23 knots in the later classes. The guns were also increased to 14″ in "Yamashiro" and 16″ in "Mutu," the displacement increasing from 20,800 to 33,800 tons.

France started in 1911 with "Jean Bart" (4 ships), the armament being 12–12″ and 22–5·5″ guns, followed by the "Bretagne" (3) and "Normandie" (5), but the latter ships were dismantled at the conclusion of the war of 1914–18. The armament of "Bretagne" was 10–13·4″ guns and 18–5·5″. (W. J. B.; X.)

On June 30, 1938, the three-power protocol above mentioned signed by Great Britain, France, and the United States followed Japan's adoption of a policy of secrecy as to its naval program, with unofficial reports that Japan was building three 40,000-ton battleships. As of Nov. 15, 1938, the five larger naval powers (except Japan) had 25 battleships totalling 880,000 tons under construction or appropriated for, according to reports from the intelligence division of the U.S. Navy. These, all of the super-dreadnought type, included six U.S. battleships of 35,000 tons each; seven British totalling 259,000 tons; France five, 33,000 tons each; Italy four, and Germany three of 35,000 tons each. Details of late types of capital ships were in 1937 as follows:

Nation	Ship	Length (over all)	Displacement (tons)	H. P.	Speed (knots)	No. and calibre of main guns	Armour on sides
Great Britain	Rodney	710′	33,900	45,000	23	9–16″ 12–6″	14″
United States	Idaho	624′	33,400	40,000	21	12–14″ 12–5″	14″
Japan	Mutu	700′	32,720	80,000	26	8–16″ 20–5.5″	12″
France . . .	Dunkerque	702′	26,500	100,000	29.5	8–13″ 16–5.1″	14″
Germany . .	Scharnhorst	741.5′	26,000	.....	30	9–11″ 12–5.9″	14″

BATTUE, the beating of game from cover under the sportsmen's fire; by analogy the word is used to describe any slaughter of defenseless crowds.

BATTUS, the legendary founder of the Greek colony of Cyrene in Libya (*c.* 630 B.C.). The Greeks who accompanied him were, like himself, natives of Thera, and descended partly from the race of the Minyae. Various accounts are given both of the founding of Cyrene and of the origin of the founder's name. Four kings named Battus, alternating with four named Arcesilaus, ruled in Cyrene (*q.v.*) till the fall of the dynasty about 450 B.C. *See* R. W. Macan's *Herodotus IV.–VI.* (1895), vol. i., pp. 104 *et seq.* and notes.

BATU or **ROCK ISLANDS** (Dutch *Batoe*), three greater and 48 lesser islands, Netherlands Indies, W. of Sumatra, between 0° 10′ N. to 0° 45′ S. and 97° 50′–98° 35′ E., belonging to the Ayerbangi district of the lowlands of Padang (Sumatra). They are separated by the strait of Sibirut from the Mentawi group. The three chief islands, from N. to S., are Pini or Mintao, Masa, and Bala; land area 445 sq.mi. The islands are generally low and covered with forest, notably coco-nut palm. There is trade in copra, oil and other forest produce. The natives, about 13,000 in number, are of Malayan or pre-Malayan stock, akin to those of the island of Nias, to the N.W. Only about 20 of the smaller islands are inhabited. Japan occupied the islands in 1942.

BATU KHAN, Mongol chief, the grandson of Jenghiz Khan, succeeded his father, Juji, as king of the Kipchaks in 1223, and in 1229 followed the new khan, Ogdai, in his expedition to China. On his return the latter sent Batu to Europe at the head of an invading army which spread over Russia, Poland and Hungary, and in 1236 attacked the Bulgars of the Volga, and advanced westward to Kiev, and Hungary in the following years. Western Europe was saved only by the death of Ogdai in 1241, which necessitated Batu's return to take part in the election of a new khan. After this he settled on the river Akhtuba, and lived in great splendour at his capital, Sarai, in the present gubernia of Astrakhan. At the death of Batu in 1255 his brother Bereke succeeded to his kingdom, which extended from Lake Balkash as far west as the confines of modern Russia. *See* Mongols.

BATUM, chief town of Autonomous Adzharian S.S.R., on the east coast of the Black sea. Lat. 41° 41′ N., long. 41° 38′ E.; alt. 30 ft.; average rainfall per annum 93.3 in., the highest in the Caucasus; average temp., Jan. 43° F., Aug. 73.8° F.; pop. (1939) 70,807. Batum is a port with no docks, but has five berths accommodating 20 tank steamers in the petroleum harbour, which needs constant dredging to maintain a depth of 26–28 ft., for it tends to silt. Oil comes to Batum by pipe and also by rail from Baku. The Standard Oil company established an oil refinery at Batum, and a 10-in. pipeline from Baku to Batum was constructed. The chief exports are naphtha, raw silk, cocoons, oil-cake, walnut and rosewood. Manganese, wool, liquorice and maize are also exported. Its chief imports are machinery, oil-boring appliances, copperas and ironware. Batum has a cathedral (1903) and a park. Malaria is a perpetual scourge.

It is the Bathys of antiquity, Vati of the middle ages, and was known as Bathumi only after the beginning of the 17th century, when it belonged to the Turks. It was transferred to Russia, 1878.

BATWA: *see* BAMBUTE.

BATYPHONE, a contrabass clarinet which was the outcome of F. W. Wieprecht's endeavour to obtain a contrabass for the reed instruments. In practice, however, the instrument was found to be of little use, and it was superseded by the bass tuba. A similar attempt was made in 1843 by Adolphe Sax, and met with a like fate.

BATZ, JEAN, BARON DE (1761–1822), French Royalist, was born in Gascony on Dec. 6, 1761, and died at Chadieu, Jan. 10, 1822. At the time of the French Revolution he was grand seneschal of the duchy of Albret, and in 1789 was nominated deputy at the States General by the nobility of Nérac. In the constituent assembly De Batz was on the committee for finance; on July 3, 1790, he reported on the public debt, and he opposed the issue of assignats. On Jan. 21, 1793, the baron made a futile attempt to rescue Louis XVI., on his way to the guillotine; five months later he organized a conspiracy to help Marie Antoinette to escape from the Temple. On the failure of this plot on June 21, he left Paris for a time. His next step was to join the foreign conspiracy which aimed at the dissolution of the convention and the restoration of the monarchy. Drawing suspicion on himself by his connection with certain members of the convention, Fabre d'Eglantine, Chabot, Bazire, etc., who were accused of speculating in the public funds, De Batz was attacked on June 14, 1794, by Elie Lacoste, who accused him, before the convention, of conspiracy with Jacobins to restore the Bourbons. Of a number of proscribed men who were arrested and guillotined, De Batz was the only one to escape. After this, little is known of his movements; he served, apparently, in Condé's army till 1800, and on the return of Louis XVIII., in 1814, was made a Knight of St. Louis. In 1820 he retired to his estate at Chadieu, where he died in 1822.

BAUAN, a municipality of the province of Batangas, Luzon, Philippine Islands, at the head of Batangas bay, about 54 mi. S. of Manila by land and 91 mi. by sea. Pop. (1939), 37,043, of whom 17,702 were males and 7 were whites. It is connected with Manila by rail, has a fine church and is an established market for sinamay (abacá cloth). Palm-fibre mats, fans, bamboo baskets and cotton fishnets are also manufactured. The bay abounds in excellent fish. Hogs, cattle and horses are raised for the Manila market. Tobacco and coco-nuts are also produced, and oranges, corn, sugar, palay (rice) and other products are grown in the surrounding regions. The municipality has an administrative centre and 44 barrios (wards). The vernacular is Tagalog. The number of parcels of land declared for taxation in 1938 was 15,787, owned by 9,045 individuals. The assessed valuation was 1,470,220 pesos. The total land area was 9,142 hectares. (C. S. L.)

BAUBLE, a word applied to a stick with a weight attached, used in weighing; to a child's toy; and especially to the mock symbol of office carried by a court jester, a baton terminating in a figure of Folly with cap and bells; hence a term for any triviality or childish folly. The word is probably a blend of two different words, an Old French *baubel,* a child's plaything, and an Old English *babyll,* something swinging to and fro.

BAUCHI, name of a town and of three overlapping areas on and near the plateau of northern Nigeria. It signifies "Land of Slaves," referring to the immemorial practice of raiding the populace which took refuge on the rugged and infertile watershed between the Niger-Benue and Lake Chad drainage.

The Bauchi emirate originated as part of the Fulani empire centred at Sokoto (*q.v.*) and is one of half a dozen states along the border of the rival empire of Bornu (*q.v.*). Yakoba (Jacob), a Moslem from the northeastern base of the plateau, though not of Fulani origin, lived 21 years at Sokoto. Supported by Fulani families, he then conquered his homeland and in 1809 built his capital town of Bauchi on the lower slopes of the highland (1,800 ft. elevation). The population of the emirate included both Hausa and Kanuri peoples. Yakoba overran the plateau and extended his suzerainty over the 64 tribes of animists living there. For a century Bauchi town was the collecting point for slaves raided from the highland, and also a principal station for slave traffic skirting the plateau from the Cameroons to Hausaland.

In 1902 a British expedition sent to stop the slave trade took the Bauchi capital and installed a British resident for the Bauchi province then set up. Its core is the Bauchi emirate, but its boundaries have fluctuated. At the outset an emirate to the east and two animist districts to the north were incorporated. After some years other emirates bordering Bornu were added. In 1926 the province was divided into two, the name Bauchi being retained for the larger fraction, chiefly low country inhabited mainly by Moslems. Most of the highland of the animists was set off as the Plateau province. The changes accompanied concurrent decentralization of the entire area into small administrative districts under local headmen.

Bauchi plateau has been the common regional name of the highland of northern Nigeria. It is being superseded by Nigerian plateau, now that "Bauchi" legally applies to a district largely lowland. The plateau is one of the most distinctive regions in West Africa. It covers 2,000 sq.mi. and averages 4,000 ft. elevation, the highest ground and the most abrupt face being at the south. Its indigenous population subsists on an inferior grain, *acha,* eked out by animal food taken with crude weapons. Living in the coldest climate of West Africa, the people wear no clothing except when visiting a market town. These tribes were never really conquered by their lowland neighbours, and some held out against the British three to five years.

Near the west side of the plateau lies a belt of tin placers, originally mined by Africans. The British expedition of 1902 located the deposits, and prospecting followed. Improvements in transportation were mainly to facilitate tin export: a road to the navigable Benue, 1905; a 2 ft. 6 in. gauge railway to the Lagos line, 1914; a standard 3 ft. 6 in. railway to the Port Harcourt line, 1927. Nigeria ranks third among tin-producing areas, in peak years producing more than 10,000 long tons (tin content of ore).

Jos (9° 52′ N., 9° E.) is the rail terminal, and on an all-weather road between Bauchi and the capital of northern Nigeria. It is the market centre of the plateau and seat of provincial administration. The population of the town of Jos, together with the surrounding mining districts, 132,297 (1931), is more than twice as dense as the average for the entire plateau. (D. WH.)

BAUDELAIRE, CHARLES PIERRE (1821–1867), French poet, was born in Paris on April 9, 1821. Baudelaire's father died in 1827, and his mother married Lieut.-Col. Aupick, who was afterwards ambassador of France at various courts. Baudelaire was educated at Lyons and at the Collège Louis-le-Grand in Paris. The irregularities of his life after he left college induced his guardians, in 1841, to send him on a voyage to India. Mr. Arthur Symons declares that there is "something oriental in Baudelaire's genius, a nostalgia that never left him after he had seen the East." When he returned to Paris in 1843 he was of age; but in a year or two his extravagance threatened to exhaust his small patrimony, and his family obtained a decree to place his property in trust. He wandered from one address to another in Paris, spending much of his time in the studios of Delacroix, Manet, and Daumier, and the first books he published, *Le Salon de 1845* and the *Salon de 1846,* showed his real critical genius. He took part with the revolutionaries in 1848, and for some years interested himself in Republican politics, but his permanent convictions were aristocratic and catholic. Baudelaire was a slow and fastidious worker, and it was not until 1857 that he produced his first and famous volume of poems, *Fleurs du mal.* Some of these had already appeared in the *Revue des deux mondes* when they were published by Baudelaire's friend Auguste Poulet-Malassis, who had inherited a printing business at Alençon. The consummate art displayed in these verses was appreciated by a limited public, but general attention was caught by the perverse selection of morbid subjects, and the book became a by-word for unwholesomeness among conventional critics. Victor Hugo, writing to the poet, said, "Vous dotez le ciel de l'Art d'un rayon macabre, vous créez un frisson nouveau." Baudelaire, the publisher, and the printer were successfully prosecuted for offending against public morals. The obnoxious pieces were suppressed but printed later as *Les Épaves* (Brussels, 1866). Another edition of the *Fleurs du mal,* without these poems, but with considerable additions, appeared in 1861.

Baudelaire had learnt English in his childhood, and had found some of his favourite reading in the English "Satanic" romances, such as Lewis's *Monk.* In 1846–47 he became acquainted with the

works of Edgar Allan Poe, in which he discovered romances and poems which had, he said, long existed in his own brain, but had never taken shape. Poe was to him "the master of the horrible, the prince of mystery." From this time till 1865 he was largely occupied with his version of Poe's works, producing masterpieces of the art of translation in *Histoires extraordinaires* (1856), *Nouvelles Histoires extraordinaires* (1857), *Aventures d'Arthur Gordon Pym* (1858), *Eureka* (1864), and *Histoires grotesques et sérieuses* (1865). Two essays on Poe are to be found in his *Oeuvres complètes* (vols. v. and vi.). Meanwhile his financial difficulties grew upon him. He was involved in the failure of Poulet-Malassis in 1861, and in April 1864 he left Paris for Belgium, partly in the vain hope of disposing of his copyrights. He had for many years a *liaison* with a coloured woman, whom he helped to the end of his life, in spite of her gross conduct. He had recourse to opium, and in Brussels he began to drink to excess. Paralysis followed, and the last two years of his life were spent in *maisons de santé* in Brussels, and also in Paris, where he died on Aug. 31, 1867.

His other works include: *Petits Poèmes en prose;* a series of art criticisms published in the *Pays, Exposition universelle;* studies on Gustave Flaubert (in *L'artiste,* Oct. 18, 1857); on Théophile Gautier (*Revue contemporaine,* Sept. 1858); valuable notices contributed to Eugène Crépet's *Poètes français; Les Paradis artificiels, opium et haschisch* (1860); *Richard Wagner et Tannhäuser à Paris* (1861); *Un Dernier Chapitre de l'histoire des oeuvres de Balzac* (1880), originally an article entitled "Comment on paye ses dettes quand on a du génie," in which his criticism is turned against his friends H. de Balzac, Théophile Gautier, and Gérard de Nerval.

BIBLIOGRAPHY.—An edition of his *Lettres* (1841–66) was issued by the Soc. du Mercure de France in 1906. His *Oeuvres complètes* were edited (1868–70) by his friend Charles Asselineau, with a preface by Theophile Gautier. Asselineau also undertook a vindication of his character from the attacks made upon it, in his *Charles Baudelaire, sa vie, son oeuvre* (1869). He left some material of more private interest in a ms. entitled *Baudelaire.* See *Charles Baudelaire, souvenirs, correspondance, bibliographie* (1872), by Charles Cousin and Spoelberch de Lovenjoul; *Charles Baudelaire, oeuvres posthumes et correspondances inédites* (1887), containing a journal entitled *Mon coeur mis à nu,* and a biographical study by Eugène Crépet; also *Le Tombeau de Charles Baudelaire* (1896), a collection of pieces unpublished or prohibited during the author's lifetime, edited by S. Mallarmé and others, with a study of the text of the *Fleurs du mal* by Prince A. Ourousof; Féli Gautier, *Charles Baudelaire* (1904), with facsimiles of drawings by Baudelaire himself; A. de la Fitzelière and G. Decaux, *Charles Baudelaire* (1868) in the series of *Essais de bibliographie contemporaine;* essays by Paul Bourget, *Essais de Psychologie contemporaine* (1883), and Maurice Spronck, *Les Artistes littéraires* (1889). Among English translations from Baudelaire are *Poems in Prose,* by A. Symons (1905), who also wrote an admirable study of the poet in *Charles Baudelaire* (1920) and translated *The Letters of Charles Baudelaire to his Mother 1833–66* (1928), with bibliography. *See* also F. Porché, *Ch. Baudelaire* trans. J. Mavin (1928); L. P. Sharles, *Baudelaire* (1930).

BAUDIER, MICHEL (*c.* 1589–1645), French historian, wrote, in addition to many works on French history, an *Histoire de la cour du roi de Chine* (Paris, 1626; English trans. in vol. viii. of the *Collection of Voyages and Travels* of A. and J. Churchill, London, 1707–47), derived from the narrative of a Jesuit missionary. He also wrote *Vie du cardinal Ximénès* (Paris, 1635), reprinted with a notice of the author by E. Baudier (Paris, 1851), and a curious romance entitled *Histoire de l'incomparable administration de Romieu, grand ministre d'état de Raymond Bérenger, comte de Provence* (Paris, 1635).

See J. Lelong, *Bibliothèque historique de La France* (1768–78); L. Moréri, *Le Grand Dictionnaire historique* (Amsterdam, 1740).

BAUDISSIN, WOLF HEINRICH, COUNT (1789–1878), German man of letters, was born in Rantzau on Jan. 30, 1789, and died at Dresden on April 4, 1878. As secretary to the legation, he was employed by the Danish diplomatic service, between 1810–14, on missions to Stockholm, Vienna and Paris. In 1827, after travelling in Italy, France and Greece, Baudissin settled at Dresden and began to write. In collaboration with Schlegel and Tieck he translated many of Shakespeare's plays into German. *Ben Jonson und seine Schule,* 2 vols. (Leipzig, 1836), contains translations of old English drama. He translated plays from *Politik, Kultur und Aufklärung des 18ten Jahrhunderts* (4 vols.) (Leipzig, 1865–67) and two plays by Coppée, *Zwei dramatische Dichtungen* (Leipzig, 1874).

BAUDRILLART, HENRI JOSEPH LÉON (1821–1892), French political economist, was born in Paris. His father, Jacques Joseph (1774–1832), was a distinguished writer on forestry. Henri was professor of economic history at the University of Paris from 1866 onwards, and from 1881 professor of political economy at the École des Ponts et Chaussées. His first work was an *Éloge de Turgot* (1846), which at once won him notice among the economists. In 1853 he published an erudite work on *Jean Bodin et son temps;* then in 1857 a *Manuel d'économie politique;* in 1860, *Des rapports de la morale et de l'économie politique;* in 1865, *La Liberté du travail;* and from 1878 to 1880, *L'Histoire du luxe . . . depuis l'antiquité jusqu'à nos jours,* in four volumes. At the instance of the Académie des Sciences Morales et Politiques he investigated the condition of the farming classes of France, and published the results in four volumes (1885, *et seq.*). He was editor of the *Constitutionnel,* and later, 1855–64, of the *Journal des économistes.*

BAUDRILLART, HENRI MARIE ALFRED (1859–1942), French ecclesiastic, born in Paris Jan. 6, first undertook an academic career. Subsequently he was ordained priest in 1893, and occupied the chair of history at the Catholic Institute of Paris, of which he became rector in 1907. In 1908 he became vicar-general of Paris, and in 1915 founded the Catholic committee of French propaganda abroad. In 1918 he was made a member of the Académie française, and in 1921 was consecrated titular Bishop of Himeria. In Nov. 1925 he was made a papal count and bishop assistant at the pontifical throne.

Baudrillart's works include: *La politique de Henri IV. en Allemagne* (1885); *Philippe V. et la cour de France* (1889–99) (Grand Prix Gobert); *L'église catholique* (1905); *Quatre cents ans de Concordat* (1905); *La vie catholique dans la France contemporaine* (1918), etc.

BAUDRY, or **BALDERICH, OF BOURGUEIL** (1046 or 1047–1130), archbishop of Dol, historian and poet, was born at Meung-sur-Loire. He became abbot of Bourgueil in 1079, and archbishop of Dol in 1107.

The most important of his Latin poems, from the historical point of view, have been published in the *Historiae Francorum Scriptores,* tome iv., edited by A. Duchesne (Paris 1639–49).

His *Historiae Hierosolymitanae,* a history of the first crusade from 1095 to 1099, is drawn mainly from the anonymous *Gesta Francorum,* but some valuable information has been added by Baudry. It was very popular during the middle ages, and was used by Ordericus Vitalis for his *Historiae ecclesiasticae;* by William, archbishop of Tyre, for his *Belli sacri historia;* and by Vincent of Beauvais for his *Speculum historiale.* The best edition is that by C. Thurot, which appears in the *Recueil des historiens des croisades,* tome iv. (Paris, 1841–87). Many other works attributed to Baudry are published by J. P. Migne in the *Patrologia Latina,* tomes 160, 162, and 166 (Paris, 1844).

See *Histoire littéraire de la France,* tome xi. (1865–69); H. von Sybel, *Geschichte des ersten Kreuzzuges* (Leipzig, 1881); C. Thurot, "Études critiques sur les historiens de la première croisade; Baudri de Bourgueil" in the *Revue historique* (1876).

BAUDRY, PAUL JACQUES AIMÉ (1828–1886), French painter, was born at La Roche-sur-Yonne (Vendée) on Nov. 7 1828, and died in Paris on Jan. 17 1886. He studied under Drolling, and carried off the Prix de Rome in 1850 by his picture of "Zenobia found on the banks of the Araxes." Baudry derived strong inspiration from Italian art with the mannerism of Coreggio, as was very evident in the two works he exhibited in the Salon of 1857, which were purchased for the Luxembourg. The works that crowned Baudry's reputation were his mural decorations, which show much imagination and a strong sense for colour, as may be seen in the frescoes in the Paris Cour de Cassation, at the château of Chantilly, and some private residences—the hôtel Fould and hôtel Paiva—but, above all, in the decorations of the Paris opera house.

See H. Delaborde, *Notice sur la vie et les ouvrages de Baudry* (1886); Ch. Ephrussi, *Baudry, sa vie et son oeuvre* (1887).

BAUER, BRUNO (1809–1882), German theologian and historian, was born on Sept. 6, 1809, at Eisenberg in Saxe-Altenburg. He studied at Berlin, where he attached himself to the "Right" of the Hegelian school under P. Marheineke. In 1834 he began to teach in Berlin as a licentiate of theology, and in 1839 was transferred to Bonn. After the publication of his *Kritik der evangelischen Geschichte des Johannes* (1840) and *Kritik der evangelischen Geschichte der Synoptiker* (1841), with their destructive criticism, his licence was revoked, and he retired for the rest of his life to Rixdorf, near Berlin, where he died on April 13, 1882. The most important of his historical works is *Geschichte der Politik, Kultur und Aufklärung des 18ten Jahrhunderts* (4 vols. 1843–45).

BAUER, GUSTAV (1870–1944), German politician, was born at Darkehmen, East Prussia, Jan. 6, 1870. He became connected at an early age with the German trade union movement, and in 1908 was elected president of the general committee of the trade unions of Germany. In 1912 he entered the Reichstag as a Social Democrat, being appointed, in Oct. 1918, secretary of State for labour in the Government of Prince Max of Baden. Appointed minister of labour under the republic in Feb. 1919, on June 21 of the same year he became president of the ministry formed to accept the Peace Treaty of Versailles, resuming shortly afterwards the former title of chancellor. In 1920 he became minister of the treasury in Müller's cabinet and shortly afterwards minister of commerce. From May 1921 until Nov. 1923 he held the offices of vice-chancellor and minister of the treasury in Wirth's cabinet. It was reported that he died Sept. 27, 1944.

BAUER, HAROLD (1873–), Anglo-American pianist, born at New Malden, near London, April 28, 1873. He began with the violin, which he studied with his father and under Adolph Pollitzer, making his début at the age of ten and playing in concerts thereafter for nine years. He was then introduced to Paderewski, who was so impressed by his talents as a pianist that he advised him to take up the piano instead of the violin and undertook to give him lessons himself. The suggestion was adopted; he made his début as a concert pianist in 1893 and quickly obtained general recognition as one of the first virtuosi of the day. He made his first appearance in the United States in 1900 with the Boston Symphony Orchestra and has divided his time since between Europe and America. He became an American citizen in 1925. In 1919, with Kreisler and Pablo Casals, he founded the Beethoven Association, of New York, of which he became president. The function of this organization is to bring together artists of established reputation in a fraternity of service at annual concerts. The proceeds are devoted to musical objects.

BAUER, OTTO (1881–1938), Austrian politician, was born at Vienna. Bauer was one of the founders of the Socialist educational movement, "Die Zukunft." He founded with F. Adler the theoretical Socialist periodical *Der Kampf* and collaborated on Kautsky's journal *Die Neue Zeit*. He became secretary to the parliamentary fraction of the Social Democrat party in 1904 and at once proved himself the party's most brilliant theoretician. His first work, *Die Nationalitätenfrage und die oesterreichische Sozialdemokratie,* treated the problem of nationality in the Dual Monarchy with deep historical insight and on lines entirely borne out by later developments.

As a prisoner of war in Russia he studied Bolshevism at first hand, and on his return to Austria in 1917 became leader of the left wing of his party, which worked for a republic and self-determination for all nationalities. He was appointed under-secretary of state for foreign affairs by Victor Adler and became minister a few days later, on the latter's death (Nov. 12, 1918). He retained this post under the Austrian Republic until July 1919. After 1918 it was Bauer's brain which really guided the international and internal policy of his party which he preserved as a non-Bolshevist but advanced Socialist organization.

Bauer was a member of the Austrian national council from 1929 to 1934. Following the uprising of Vienna Socialists and workers in 1934 he went into exile, but continued to direct the program of the Austrian Socialist party from Czechoslovakia and France. He died in Paris, July 4, 1938.

He wrote an important account of his own and his party's activities. *Die oesterreichische Revolution* (1923; English translation, 1925). His other chief works are *Bolshevismus oder Sozialdemokratie* (1920); *Der neue Kurs in Sovietrussland* (1921); *Das Weltbild des Kapitalismus* (in *Der lebendige Marxismus,* Jena, 1925).

BAUERNFELD, EDUARD VON (1802–1890), Austrian dramatist, was born at Vienna on Jan. 13, 1802, and died there on Aug. 9, 1890. He entered the Austrian civil service, and remained a civil servant until after the revolution of 1848, when he retired in order to devote his whole energies to the drama. His earliest essays, the comedies *Leichtsinn aus Liebe* (1831); *Das Liebes-Protokoll* (1831) and *Die ewige Liebe* (1834); *Bürgerlich und Romantisch* (1835), were very popular. Later he turned his attention to so-called *Salonstücke* (drawing-room pieces), notably *Aus der Gesellschaft* (1866); *Moderne Jugend* (1869), and *Der Landfrieden* (1869), in which he gave a gay and witty picture of Viennese social life.

A complete edition of Bauernfeld's works, *Gesammelte Schriften,* appeared in 1871–73; *Dramatischer Nachlass,* ed. by F. von Saar (1893); selected works, ed. by E. Horner (1905). *See* A. Stern, *Bauernfeld, Ein Dichterporträt* (1890), R. von Gottschall, "E. von Bauernfeld" (in *Unsere Zeit,* 1890), and E. Horner, *Bauernfeld* (1900).

BAUHIN, GASPARD (1550–1624), Swiss botanist and anatomist, was the son of a French physician, Jean Bauhin (1511–1582), a Protestant exile in Switzerland. He was born at Basle on Jan. 17, 1550, and studied medicine at Padua, Montpelier and some of the celebrated schools in Germany. In 1582 he was appointed to the Greek professorship at Basle, and in 1588 to the chair of anatomy and botany. He was afterwards made city physician, professor of the practice of medicine, rector of the university, and dean of his faculty. He died at Basle on Dec. 5, 1624.

Bauhin's most important botanical work was his *Pinax Theatri Botanici* (1596). He planned a *Theatrum Botanicum,* meant to be comprised in 12 parts folio, of which he finished three; only one, however, was published (1658).

His son JEAN GASPARD BAUHIN (1606–1685) was professor of botany at Basle for 30 years. His elder brother, JEAN BAUHIN (1541–1613), after studying botany at Tübingen under Leonard Fuchs (1501–1566), and travelling with Conrad Gesner, began to practise medicine at Basle, where he was elected professor of rhetoric in 1566. His great work, *Historia plantarum nova et absolutissima,* a compilation of all that was then known about botany, was not complete at his death, but was published at Yverdon in 1650–51, the *Prodromus* having appeared at the same place in 1619. He also wrote a book, *De aquis medicatis,* which was published in 1605.

See W. Hess, *Kaspar Bauhinus Leben und Charakter* (1860).

BAULK or **BALK,** a word of Teutonic origin meaning a ridge or beam. The ridge left unploughed between furrows or ploughed fields; also the uncultivated strip of land used as a boundary in the "open-field" system of agriculture. From the meaning of something left untouched comes that of a hindrance or check, so of a horse stopping short of an obstacle, of the "baulk-line" in billiards, or of the feint of the pitcher in baseball. From the other original meaning, *i.e.,* "beam," comes the use of the word for the cross or tie-beam of a roof, or for a large log of timber sawn to a 1 ft. or a $1\frac{1}{2}$ ft. square section (*see* JOINERY).

BAUMBACH, RUDOLF (1840–1905), German poet, was born at Kranichfeld on the Ilm, in Thuringia, on Sept. 28, 1840, and acted as a private tutor in various Austrian towns. In Trieste he caught the popular taste with an Alpine legend, *Zlatorog* (1877), and songs of a journeyman apprentice, *Lieder eines fahrenden Gesellen* (1878), both of which ran into many editions. In 1885 he returned to Germany and was appointed ducal librarian at Meiningen, where he died on Sept. 14, 1905.

Baumbach was a poet of the vagabond school, and wrote, in imitation of his greater compatriot, Viktor Scheffel, many excellent drinking songs, among which *Die Lindenwirtin* has endeared him to the German student world. But his real strength lay in narrative verse, especially when he had the opportunity of describing the scenery and life of his native Thuringia. Special mention may be made of *Frau Holde* (1881), *Spielmannslieder* (1882), *Von der Landstrasse* (1882), and *Thüringer Lieder* (1891).

BAUMES LAWS, a series of criminal laws enacted in New York State in 1926 upon the recommendation of the crime commission of which Senator Caleb H. Baumes was chairman. The passing of these laws was induced by an unusually active period of wanton crime, involving frequent bloodshed. One of the new laws prohibited sawed-off guns and machine guns equally with pistols, and heavily penalized the possession of any of these in a vehicle as well as on the person. Another, which caused consternation among criminals, provided that in cases where a felon convicted of a first offence was armed with a pistol while committing crime, five to 10 years should be added to the sentence. For the second offence 10 to 15 years, and for the third 15 to 25 years' additional imprisonment was ordered. The fourth conviction entailed life imprisonment.

The crime commission of the State of New York reported in 1927 that these laws had been so effective that many New York criminals had departed to other States. Murders of citizens resulting from robberies decreased 58% in 1927 compared with 1926, and 61% compared with 1925. Murders of police officers had decreased 44% compared with 1925 and 1926. In 1927 Senator Baumes introduced two bills aiming to strengthen the law in punishing "fences" or receivers of stolen property. One provided that a thief's testimony should be considered even if uncorroborated; the other declared that any person not making reasonable inquiry into the right of another to sell him goods should be held responsible if he bought stolen property. Defeated in 1927, these bills were re-introduced in 1928 and passed.

See files of the *New York Times:* March 26, Aug. 8, Oct. 26 and Dec. 15, 1926; Dec. 15 and March 28, 1927. *See* also records of N.Y. State crime commission, 1926.

BAUMGARTEN, ALEXANDER GOTTLIEB (1714–1762), German philosopher, was born in Berlin. He studied at Halle, and became professor of philosophy at Halle and at Frankfurt. He was a disciple of Leibnitz and Wolff, and was distinguished for separating aesthetics from the other philosophic disciplines, and in marking out a definite object for its researches. Baumgarten's first work preceded those of Burke, Diderot, and P. André, and Kant had a great admiration for him. His most important works are: *Disputationes de nonnullis ad poema pertinentibus* (1735); *Aesthetica* (1750); *Metaphysica* (1739); *Ethica philosophica* (1740); *Initia philosophiae practicae primae* (1760). After his death, his pupils published a *Philosophia Generalis* (1770) and a *Jus Naturae* (1765).

See Meier, *Baumgarten's Leben* (1763); Abbt, *Baumgarten's Leben und Charakter* (1765); H. G. Meyer, *Leibnitz und Baumgarten* (1874); J. Schmidt, *Leibnitz und Baumgarten* (Halle, 1875); Zimmermann, *Gesch. der Aesthetik* (Vienna 1858).

His brother, SIEGMUND JACOB BAUMGARTEN (1706–1757), was professor of theology at Halle, and applied the methods of Wolff to theology. His chief pupil, Johann Salomo Semler, is sometimes called the father of German rationalism. Baumgarten, though he did not renounce the Pietistic doctrine, began the process which Semler completed. His works include *Evangelische Glaubenslehre* (1759); *Auszug der Kirchengeschichte* (1743–62).

See Life by Semler (Halle, 1758).

BAUR, ERWIN (1875–1933), German plant geneticist, was born at Ichenheim, Baden on April 16, 1875. He studied medicine in the universities of Strasbourg and Kiel and obtained his M.D. degree in 1900. After practising as physician in mental diseases he entered the University of Freiburg to study botany and was awarded a Ph.D. in 1903. He started his botanical activity in the same year as an assistant in the Institute of Botany of Berlin university and in 1911 became professor of botany in the Agricultural school of Berlin, where he founded the Institut für Vererbungsforschung. After World War I he was instrumental in organizing an institute for the same purpose in Dahlem-Berlin and in 1929 became director of Institut für Züchtungsforschung in Müncheberg. He died in Berlin on Jan. 13, 1933.

Baur started his work in botany as a bacteriologist but later specialized in experimental genetics. He carried through genetical studies of *Antirrhinum,* wild species of which he collected in Spain and other Mediterranean regions, and investigated their behaviour under controlled crossing and under varying laboratory conditions, such as X-rays, ultraviolet light, etc. He studied also infectious chlorosis of the Malvaceae and carried out investigations on cereals, lupins, tobacco and other important economic plants. He founded in 1908 and edited an important journal, *Zeitschrift für inductive Abstammungs—und Vererbungslehre* and still had enough energy to edit two other periodicals *Zeitschrift für Pflanzenzüchtung* and *Der Züchter.*

His publications include *Einführung in die experimentelle Vererbungslehre* (1911, ed. 2, 1914, ed. 3, 1930); *Physiologie und Biologie der Fortpflanzung in Kultur der Gegenwart* (1917) and numerous articles in various periodicals.

See *Ber. Deutsch. Bot. Ges.,* vol. lii (1934–35); *Proc. Linn. Soc. London* (1933–34, pt. 4) and *Kew Bull.* (1934).

BAUR, FERDINAND CHRISTIAN (1792–1860), leader of the Tübingen school of theology, was born in Schmiden, near Cannstatt, on June 21, 1792. After receiving an early training in the theological seminary at Blaubeuren, he went in 1809 to the University of Tübingen. In 1817 Baur returned to the theological seminary at Blaubeuren as professor. He had already, in 1817, written a review of G. Kaiser's *Biblische Theologie* for Bengel's *Archiv für Theologie* (ii. 656); its tone was moderate and conservative. His first important work, *Symbolik und Mythologie oder die Naturreligion des Altertums* (1824–25) showed signs of the influence of Schelling and more particularly of Friedrich Schleiermacher. In 1826 he was appointed professor of theology at Tübingen. It is with Tübingen that his greatest literary achievements are associated. His earlier publications here treated of mythology and the history of dogma. *Das manichäische Religionssystem* appeared in 1831, *Apollonius von Tyana* in 1832, *Die Christliche Gnosis* in 1835, and *Über das Christliche im Platonismus oder Socrates und Christus* in 1837. Meantime Baur had adopted completely the Hegelian philosophy of history. "Without philosophy," he has said, "history is always for me dead and dumb." The change of view is illustrated clearly in the essay, published in the *Tübinger Zeitschrift* for 1831, on the Christ-party in the Corinthian Church. Baur contends that St. Paul was opposed in Corinth by a Jewish-Christian party, and finds traces of a keen conflict of parties in the post-apostolic age. The theory is further developed in a later work (1835, the year in which David Strauss' *Leben Jesu* was published), *Über die sogenannten Pastoralbriefe.* In this Baur attempts to prove that the false teachers mentioned in the Epistles to Timothy and Titus are the Gnostics, particularly the Marcionites, of the second century, and consequently that the Epistles were produced in the middle of this century in opposition to Gnosticism. In *Paulus, der Apostel Jesu Christi, sein Leben und Wirken, seine Briefe und seine Lehre* (1845) he contends that only the Epistles to the Galatians, Corinthians and Romans are genuinely Pauline, and that the Paul of Acts is a different person from the Paul of these genuine Epistles, the author being a Paulinist who is at pains to represent Peter as far as possible as a Paulinist and Paul as far as possible as a Petrinist. Those writings alone he considers genuine in which the conflict between Jewish-Christians and Gentile-Christians is clearly marked. In his *Kritische Untersuchungen über die kanonischen Evangelien, ihr Verhältniss zu einander, ihren Charakter und Ursprung* (1847) he maintains that the authors were conscious of the conflict of parties; the Gospels reveal a mediating or conciliatory tendency (*Tendenz*) on the part of the writers or redactors. The Gospels, in fact, are adaptations or redactions of an older Gospel, such as the Gospel of the Hebrews, of Peter, of the Egyptians, or of the Ebionites. The Petrine Matthew bears the closest relationship to this original Gospel (*Urevangelium*); the Pauline Luke is later and arose independently; Mark represents a still later development; the account in John is idealistic: it "does not possess historical truth, and cannot and does not really lay claim to it." He found in the conflict between Petrinism and Paulinism the key to the literature of the 1st and 2nd centuries.

But Baur was a theologian and historian as well as a Biblical critic. As early as 1834 he published a strictly theological work

Gegensatz des Katholicismus und Protestantismus nach den Prinzipien und Hauptdogmen der beiden Lehrbegriffe, a strong defence of Protestantism on the lines of Schleiermacher's *Glaubenslehre,* and a vigorous reply to J. Möhler's *Symbolik* (1833). This was followed by his larger histories of dogma, *Die Christliche Lehre von der Versöhnung in ihrer geschichtlichen Entwicklung bis auf die neueste Zeit* (1838), *Die Christliche Lehre von der Dreieinigkeit und Menschwerdung Gottes in ihrer geschichtlichen Entwicklung* (1841–43), and the *Lehrbuch der Christlichen Dogmengeschichte* (1847). The value of these works is impaired somewhat by Baur's habit of making the history of dogma conform to the formulae of Hegel's philosophy, a procedure "which only served to obscure the truth and profundity of his conception of history as a true development of the human mind" (Pfleiderer). Baur, however, soon came to attach more importance to personality, and to distinguish more carefully between religion and philosophy. The change is marked in his *Epochen der kirchlichen Geschichtschreibung* (1852), *Das Christenthum und die Christliche Kirche der drei ersten Jahrhunderte* (1853) and *Die Christliche Kirche von Anfang des vierten bis zum Ende des sechsten Jahrhunderts* (1859), works preparatory to his *Kirchengeschichte,* in which the change of view is specially pronounced. The *Kirchengeschichte* was published in five volumes during the years 1853–63, partly by Baur himself, partly by his son, Ferdinand Baur, and his son-in-law, Eduard Zeller, from notes and lectures which the author left behind him. Pfleiderer describes this work, especially the first volume, as "a classic for all time." "Taken as a whole, it is the first thorough and satisfactory attempt to explain the rise of Christianity and the Church on *strictly historical* lines, *i.e.,* as a natural development of the religious spirit of our race under the combined operation of various human causes" (*Development of Theology,* p. 288). Baur's lectures on the history of dogma, *Ausführliche Vorlesungen über die Christliche Dogmengeschichte,* were published later by his son (1865–68).

Baur's views were revolutionary and often extreme; but, whatever may be thought of them, it is admitted that as a critic he rendered a great service to theological science.

BIBLIOGRAPHY.—A full account of F. C. Baur's labours, and a complete list of his writings will be found in the article in Herzog-Hauck, *Realencyklopädie,* in which his work is divided into three periods: (1) "Philosophy of Religion," (2) "Biblical Criticism," (3) "Church History." *See* also H. S. Nash, *The History of the Higher Criticism of the New Testament* (1901); Otto Pfleiderer, *The Development of Theology in Germany since Kant* (trans. 1890); Carl Schwarz, *Zur Geschichte der neuesten Theologie* (Leipzig, 1869); R. W. Mackay, *The Tübingen School and its Antecedents* (1863); A. S. Farrar, *A Critical History of Free Thought in reference to the Christian Religion* (Bampton Lectures, 1862); and *cf.* the article on "The Tübingen Historical School," in *Bibliotheca Sacra,* vol. xix. No. 73, 1862.

BAUTAIN, LOUIS EUGÈNE MARIE (1796–1867), French philosopher and theologian, was professor of philosophy at Strasbourg from 1819 to 1828, when he took holy orders. In 1849 he settled in Paris where he was vicar of the diocese, and in 1853 became professor of moral philosophy in the theological faculty of the university.

Like the Scholastics Bautain distinguished between reason and faith, but, inspired by the Kantian view that reason can never yield knowledge of things in themselves, he so undervalued reason that he was required in 1835, 1840–1844 to sign articles denying that the existence of God, the spirituality and immortality of the soul, the principles of metaphysics, and the credibility of revelation, are beyond the powers of reason.

Many of his theories may well be compared with the arbitrary mysticism of van Helmont and the Gnostics. The most important of his works are: *Philosophie du Christianisme* (1835); *Psychologie expérimentale* (1839), new edition entitled *Esprit humain et ses facultés* (1859); *Philosophie morale* (1842); *Religion et liberté* (1848); *La Morale de l'évangile comparée aux divers systèmes de morale* (Strasbourg, 1827); *De l'éducation publique en France au XIXe siècle* (1876). *See* De Régny: *L'abbé Bautain, sa vie et ses oeuvres* (1884).

BAUTZEN, capital of the eastern division of the *Land* of Saxony, Germany. Pop. (1890) 21,515; (1939) 41,793. It lies on the right bank of the Spree, not far from its source, 680 ft. above sea and 32m. E.N.E. of Dresden. The settlement dates from before the conquest of Lusatia by Henry the Fowler in 928. It became a town and fortress under Otto I., his successor, and the pilgrimages made to the "arm of St. Peter," preserved in one of the churches, caused its growth. It suffered during the Hussite and Thirty Years' Wars, and was burned in 1634. In the following year, at the Peace of Prague, it passed with Lusatia to Saxony as a war indemnity. The cathedral of St. Peter (15th century), with a tower 300ft. in height, has been used by both Protestants and Roman Catholics since 1635, an iron screen separating the two portions. Bautzen has a famous grammar school (*gymnasium*). Metal working (notably in aluminium) is carried on, and the general manufactures include wagons, woollen goods (stockings and cloth), linen and cotton goods, leather and paper.

BATTLE OF BAUTZEN, 1813

The town gives its name to a great battle in which, on May 20 and 21, 1813, Napoleon I. defeated an allied army of Russians and Prussians (*see* NAPOLEONIC CAMPAIGNS). The position chosen by the allies as that in which to receive the attack of Napoleon ran south-west to north-east from Bautzen on the left to the village of Gleina on the right. Bautzen itself was held as an advanced post of the left wing (Russians), the main body of which lay 2m. to the rear (east) near Jenkwitz. On the heights of Burk, 2½m. N.E. of Bautzen, was Kleist's Prussian corps, with Yorck's in support. On Kleist's right at Pliskowitz (3m. N.E. of Burk) lay Blücher's corps, and on Blücher's right, formed at an angle to him, and refused towards Gleina (7m. N.E. by E. of Bautzen), were the Russians of Barclay de Tolly. The country on which the battle was fought abounded in strong defensive positions, some of which were famous as battlegrounds of the Seven Years' War. The whole line was covered by the river Spree, which served as an immediate defence for the left and centre and an obstacle to any force moving to attack the right; moreover the interval between the river and the position on this side was covered with a network of ponds and watercourses. Napoleon's right and centre approached (on a broad front owing to the want of cavalry) from Dresden by Bischofswerda and Kamenz; the left under Ney, which was separated by nearly 40m. from the left of the main body, was ordered to march via Hoyerswerda, Weissig and Klix on to the allies' right rear. At noon on the 20th, Napoleon, after a prolonged reconnaissance, advanced the main army against Bautzen and Burk, leaving the enemy's right to be dealt with by Ney on the morrow. He equally neglected the extreme left of the allies in the mountains, judging it impossible to move his artillery and cavalry in the broken ground there. Oudinot's corps, the extreme right wing, was to work round by the hilly country to Jenkwitz in rear of Bautzen, Macdonald's corps was to assault Bautzen, and Marmont's corps to cross the Spree and attack the Prussians posted about Burk. These three corps were directed by Soult. Farther to the left, Bertrand's corps was held back to connect with Ney, who had then reached Weissig with the head of his column. The Guard and other reserves were in rear of Macdonald and Marmont. Bautzen was taken without difficulty; Oudinot and Marmont easily passed the Spree on either side, and were formed up on the other bank of the river by about 4 P.M. A heavy and indecisive combat took place in the evening between Oudinot and the Russian left, directed by the tsar in person, in which Oudinot's men made a little progress towards Jenkwitz. Marmont's battle was more serious. The Prussians were not experienced troops, but were full of ardour and hatred of the French. Kleist made a stubborn resistance on the Burk ridge, and Bertrand's corps was called up by Napoleon to join in the battle; but part of Blücher's corps fiercely engaged Bertrand, and Burk was not taken till 7 P.M. The French attack was much impeded by the ground and by want of room to deploy between the river and the enemy. But Napoleon's object in thus forcing the fighting in the centre was achieved. The allies, feeling there the weight of the French attack, gradually drew upon the reserves of their left and right to sustain the shock.

Napoleon cared but little that the French centre was almost fought out; it had fulfilled its mission, and on the 21st the decisive

point was to be Barclay's position. Soon after daybreak fighting was renewed along the whole line; but Napoleon lay down to sleep until the time appointed for Ney's attack. To a heavy counter-stroke against Oudinot, which completely drove that marshal from the ground won on the 20th, the emperor paid no more heed than to order Macdonald to support Oudinot. For in this second position of the allies, which was far more formidable than the original line, the decisive result could be brought about only by Ney. That commander had his own corps, the corps of Victor and of Lauriston and the Saxons under Reynier, a total force of 60,000 men. Lauriston, at the head of the column, had been sharply engaged on the 19th, but had spent the 20th in calculated inaction. Early on the 21st the flank attack opened; Ney and Lauriston moving direct upon Gleina, while Reynier and Victor operated by a wide turning movement against Barclay's right rear. The advance was carried out with precision; the Russians were quickly dislodged and Ney was now closing upon the rear of Blücher's corps at the village of Preititz. Napoleon at once ordered Soult's four corps to renew their attacks in order to prevent the allies from reinforcing their right. But at the critical moment Ney punctiliously halted; he had received orders to be in Preititz by 11 A.M. and he reached that place an hour earlier. The respite of an hour enabled the allies to organize a fierce counter-attack; Ney was checked until the flanking columns of Victor and Reynier could come upon the scene. At 1 P.M., when Ney resumed his advance, it was too late to cut off the retreat of the allies. Napoleon now made his final stroke. The Imperial Guard and all other troops in the centre, 80,000 strong and covered by a great mass of artillery, moved forward to the attack; and shortly the allied centre, depleted of its reserves, which had been sent to oppose Ney, was broken through and driven off the field. Blücher, now almost surrounded, called back the troops opposing Ney to make head against Soult, and Ney's four corps then carried all before them. Preparations had been made by the allies, ever since Ney's appearance, to break off the engagement, and now the tsar ordered a general retreat eastwards, himself with the utmost skill and bravery directing the rearguard. Thus the allies drew off unharmed, leaving no trophies in the hands of Napoleon, whose success, tactically unquestionable, was, owing to the want of cavalry, and, above all, to Ney's want of intelligent initiative, a *coup manqué* strategically. The troops engaged were, on the French side 163,000 men, on that of the allies about 100,000; and the losses respectively about 20,000 and 13,500 killed and wounded.

BAUXITE. P. Berthier (1821) discovered that a non-plastic, clay-like substance from Les Baux, near Arles (France) was practically devoid of silica, either free or in combination. His analysis of it indicated 52·0% alumina, 27·6% ferric oxide, and 20·4% combined water. Berthier referred to it as "le mineral des Beaux." A. Dufrenoy (1847) coined the word *Beauxite* "nom donné a l'alumine hydraté de Beaux." H. St. Clair Deville (1861), the father of the aluminium industry, corrected the spelling to *Bauxite* to correspond with that of the type locality Les Baux. Since then material of similar composition to that of Les Baux has been called Bauxite in Europe and America.

F. R. Mallet (1881) compared the iron clays of Ulster (Irish bauxite) with Indian laterite, suggesting a similar origin for both Max Bauer (1899) produced chemical evidence showing that some Seychelles laterite was identical with bauxite in composition. H. and F. J. Warth (1903) conclusively proved that, chemically, the aluminous laterite of India was bauxite. L. L. Fermor (1916) considered that bauxite is not a mineral and should be regarded as a variety of the rock laterite. F. W. Clarke (1920) expressed the opinion that bauxite shades into laterite and there is no dividing line between them. C. S. Fox (1923) stated that the word bauxite implies chemical purity, and that it refers to aluminium ore composed almost entirely of the hydrated oxides of aluminium and ferric iron with the former element present in a commercially extractable amount, whereas the word laterite carries a genetic significance. As all bauxites are not of lateritic origin, a distinction should be recognized in bauxites of various origin. The terms Laterite Type and Terra Rossa Type have been provisionally suggested (1927). The relationship between the *terra rossa* of the Mediterranean seaboard and the bauxites of southern Europe awaits proof. There are some bauxites which evidently do not fit into either of the above types.

The mode of occurrence of bauxite varies with the type to which it belongs; with the primary or detrital character of the deposit; and with the tectonic disturbances to which it has been subjected. In India bauxite is intimately, although irregularly, associated with the primary laterite which caps many of the basaltic plateaux of the peninsula. No Indian plateau of this nature exceeds an elevation of 5,000ft. In Nyassaland bauxite has been located on the Lichenya plateau at an elevation of 6,000ft., where it overlies decomposed syenite. Bauxite on the Gold Coast is found in genetic association with horizontal beds of shale on Mt. Ejuanema, and with steeply inclined phyllites and mica-schists with auriferous quartz reefs on Mt. Supirri. In British Guiana bauxite occurs as the residual weathering product of dolerite and epidiorite. This association is also true of the bauxite in Surinam and French Guiana. In Arkansas (U.S.A.) bauxite overlies kaolinized nepheline-syenite. An inter-trappean bed of bauxite occurs among Tertiary basaltic lavas both in Ireland (Ulster) and Germany (Hesse Nassau). The bauxites of Australia appear to be similar to those of India.

Common characteristics of bauxite are a pisolitic structure and a mottled appearance. This is particularly true of lateritic bauxite. The pisolites may be pea-size and cemented or potato-size and loose. The colour of the mass often varies from cream and grey to pink and yellowish or dark red. In the terra rossa bauxite the texture is frequently granular and impervious, unless a pisolitic structure exists. The exposed surface of lateritic bauxite is rough, often scoriaceous, simulating vesicular lava. In cliff sections lateritic bauxite may have a vermicular structure with variegated colours.

A common property of vermicular lateritic bauxite, which is soft when freshly excavated, is its tendency to harden on exposure. Another peculiarity of lateritic bauxite is the readiness with which its débris re-consolidates. Recognizable minerals are rarely seen in hand-specimens of bauxite. Gibbsite is commonly distinguished in thin slices under the microscope, especially in the matrix of pisolitic bauxite. The specific gravity is variable, from 2·45 to 3·25. The hardness also differs, some bauxites being soft and clay-like, others hard and tough. There is no reliable test for ascertaining the quality of bauxite short of a chemical analysis.

Typical lateritic bauxites average the following composition: Silica 0·25 to 10%, titania 1 to 10%, alumina 50 to 65%, ferric oxide 0·25 to 15% and combined water 20 to 33%. This is true of material from Arkansas, British Guiana, the Gold Coast and India. Terra rossa bauxites are slightly different. Silica 0·25 to 15%, titania 1·25 to 4%, alumina 56 to 75%, ferric oxide 0·5 to 25% and combined water from 8 to 15%. Such is the material from France, the Adriatic seaboard and the Balkans.

Appreciable percentages of titania characterize Indian bauxites formed from the Deccan basaltic lavas. The oxides of manganese, chromium, zirconium and vanadium have been noted in certain bauxites. Cobalt, nickel, tin, gold and diamonds have been found in others. The smaller percentage of combined water in the terra rossa bauxite is usually characteristic. Neither type of bauxite, when heated, gives up its combined water steadily—large emissions occur about 260°C. and 670°C. with complete dehydration near 950°C. The silica in bauxite is usually combined with alumina and should not exceed 10% in ore intended for aluminium reduction. In European practice this limit is about 3% and in America 5 to 6%. All the alumina in bauxite is not soluble in hydrochloric acid. Bauxite with over 50% soluble alumina constitutes fair aluminium ore. Material with more than 4% ferric oxide is not attractive to alum manufacturers.

The mode of formation of lateritic bauxite is the same as laterite (*see* LATERITE). The current opinion is that laterite represents the residual weathering product of rocks containing aluminium and iron silicates. W. A. K. Christie and C. S. Fox (1923) consider that Indian bauxites are indicative of the operation of capillary pressures, dialysis and electrolytic migration

during laterite formation. To electrokinetic phenomena are largely ascribed the removal of the silica and the separation of the colloidal aluminium hydroxides from those of ferric iron in the decomposed rock. Terra rossa bauxites are presumed to have the same genesis as terra rossa.

The world's annual production of bauxite exceeds one million tons. Over 60% of this output is used for the extraction of aluminium. Another 15% of the production is absorbed in the chemical industry, primarily for the preparation of aluminium hydroxide, but also for making sodium aluminate, aluminium chloride, aluminium sulphate and alum. The remainder of the bauxite output (about 15%) is used for the production of abrasives (emery) and refractories; in the manufacture of alumina (fused) cements; and for kerosene purification. (C. S. F.)

Bauxite in the United States.—The manufacture of bauxite elements is becoming an important industry. It was first located by Edward Nichols in 1883 in north-western Georgia. This ore of aluminium is claylike in appearance, some of it being soft and friable and some of it hard and brittle, ranging in colour from white and pink into brown and deep red.

Bauxite is generally formed through the weathering of certain igneous and sedimentary rocks, such as granite, syenite, basalt, limestone and clay. The term "bauxite" is applied to a mixture of hydrates of aluminium with impurities. The monohydrate of aluminium is called diaspore. The tri-hydrate is called gibbsite. Chemically pure diaspore and gibbsite are seldom found in nature and the term "bauxite" is applied to the impure varieties of these minerals, as well as to the mixtures of the two.

Generally speaking the bauxites of North and South America are tri-hydrates with varying amounts of silica, iron oxide and titanium oxide as the chief impurities; while the European ores, for the most part, are mixtures of mono-hydrates and tri-hydrates, also with silica, iron oxide and titanium oxide as the chief impurities. Typical American bauxite will analyze approximately 60% aluminium oxide, called alumina, 5% silica, 3% iron oxide, 3% titanium oxide and 29% chemically combined water. The free moisture in the ores as mined is generally driven off by heating in kilns before marketing.

Bauxite occurs in most countries of the world, with a tendency towards tropical or semi-tropical districts. The mines of southern France and those of southern United States have been longest in operation and have produced the largest amounts of bauxite, although very extensive mining operations have been carried on in British and Dutch Guiana, in western Hungary and in Istria, Dalmatia and other Adriatic countries, where immense deposits of bauxite are found. Large deposits are known to exist also in central and western Africa, Australia, Rumania, India, Greece and Brazil, as well as in many other countries. The known deposits are of sufficient magnitude to supply the world's requirements for a very long period of time. Moreover, new discoveries are being reported at frequent intervals.

Aluminium was a rare and expensive metal, obtained from cryolite, until economical methods for its extraction from bauxite were discovered. In the year 1886 Charles M. Hall, of Oberlin, O., while a student at Oberlin college, discovered an electrolytic process for extracting aluminium from alumina. Bauxite being the most readily available source of alumina, this material became recognized as the natural raw material for the metal aluminium. In the year 1889 patents were issued to Charles M. Hall covering his invention, and about this same time M. Paul Heroult of France invented a similar process, which has formed the basis of European development in aluminium manufacture.

Metallic aluminium is made from bauxite by first removing the impurities from the latter, thus producing alumina, which in turn is treated in an electrolytic bath which separates the metal from the oxygen. Four or five tons of bauxite are required to produce one ton of metallic aluminium.

The abrasive industry uses large quantities of bauxite, which in the process of manufacture is fused in specially designed electric furnaces. Considerable quantities of bauxite are also used for making quick-hardening cement, in the refractory industry, in manufacturing aluminium chloride used in petroleum refining, and for making aluminium sulphate, which is largely used in paper making and water purification. (W. C. N.)

BAVAI, town of north France, department of Nord, 15 mi. E.S.E. of Valenciennes. Pop. (1936) 1,836. It has been a focus of important roads since early times. The capital of the Nervii, it was known to the Romans as Bagacum or Bavacum, and was the meeting place of eight of their roads. It was destroyed in the 5th century and has suffered much in later wars. It was the British advanced headquarters in 1914 but was taken later, and recaptured in Nov. 1918.

BAVARIA (*Ger.* Bayern), the largest of the *Länder* of Germany in area and population, next to Prussia. It consists of two distinct and unequal portions, Bavaria proper, and the Palatinate of the Rhine, which lie from 25 to 40m. apart and are separated by the *Länder* of Baden and Hesse. Bavaria proper is bounded on the south by the Alps, on the north-east, over against Bohemia, by the Böhmerwald; on the north by the Fichtelgebirge and the Frankenwald, and on the west by Württemberg and Baden. Except for the valley of the Main in the north-west, nearly all the surface is over 1,000ft., the ranges seldom exceed 3,000ft.; but the ridges in the south, towards Tirol, frequently attain 9,000 or 10,000 feet. The country mainly belongs to the basin of the Danube, which, entering from Suabia as a navigable stream, traverses the *Land* with a winding course of 200m., receiving the Iller, Lech, Isar and Inn from the south, and the Altmühl and Naab from the north. The Inn is navigable before it enters Bavarian territory, and afterwards receives the Salzach, a large river flowing from Upper Austria. The Main follows a winding course among the broken hills of Upper and Lower Franconia, and greatly facilitates the trade of the provinces. The district watered by the southern tributaries of the Danube consists for the most part of the Subalpine plateau, with a mean elevation of 2,390 feet. The smaller or western portion, the Palatinate, is bounded on the east by the Rhine, which divides it from Baden; on the south by Alsace, and on the west and north by the Haardtgebirge, which separate it from Lorraine and the Prussian Rhine province.

Area and Population.—Bavaria proper contains an area of 27,210 sq.mi., and the Palatinate or western (without the Saar district) 2,124 sq.mi., making a total of 29,334 sq.mi. Pop. (1939), 8,279,828. About half of the population were living in towns, etc., with 2,000 inhabitants and over. The towns with over 50,000 inhabitants (1939) were: Munich (828,355); Nuernberg (430,851); Augsburg (185,704); Ludwigshafen (143,417); Würzburg (108,617); Regensburg (97,924); Fürth (81,844); Kaiserslautern (70,317) and Bamberg (59,284). Politically the country was divided into eight provinces, as follows:

Province	Capital	Pop. of province in 1933	Area in sq. mi.
Upper Bavaria . . .	Munich	1,776,973	6,437
Lower Bavaria . . .	Landshut	770,792	4,148
Upper Palatinate . .	Regensburg	654,095	3,725
Upper Franconia (including Coburg) . .	Bayreuth	787,200	2,898
Middle Franconia . .	Ansbach	1,037,206	2,935
Lower Franconia . . .	Würzburg	796,075	3,260
Suabia	Augsburg	877,848	3,807
The Palatinate (excluding the Saar district) . .	Speyer	984,456	2,124
Total		7,684,645	29,334

Religion.—The majority of the inhabitants (about 70%) are Roman Catholics. Protestants number over 2,000,000. The districts of Lower Bavaria, Upper Bavaria, and the Upper Palatinate are almost wholly Roman Catholic, while in the Rhine Palatinate, Upper Franconia, and especially Middle Franconia, Protestants predominate. Of the Roman Catholic Church the heads are the two archbishops of Munich and Bamberg, and the six suffragan bishops of Eichstätt, Speyer, Würzburg, Augsburg, Regensburg and Passau. The Protestant Church is under a superior church council, with three general deaneries for Bavaria proper and one general church council for the Palatinate. The

republic has two Roman Catholic universities, Munich and Würzburg, and a Lutheran, Erlangen; Munich has a famous technical high school and academies of sciences and of art. It is famous as a centre of culture.

Agriculture.—Of the total area, nearly one-half is under cultivation, one-third forest, and the remaining sixth mostly pasture. The level country of Lower Bavaria and parts of Franconia are productive of rye, oats, wheat, barley and vines. The last are grown chiefly in the vicinity of the Lake of Constance on the banks of the lower Main, and in the Palatinate. Hops are extensively grown in central Franconia; tobacco (the best in Germany) is raised round Nürnberg and in the Palatinate, which also produces sugar-beet. Potatoes are cultivated especially in the Palatinate and in the Spessart district, which lies within a curve of the Main. The southern divisions of Suabia and Upper Bavaria, where pastureland predominates, form a cattle-breeding district and the dairy produce is extensive. The extensive forests are principally situated in the provinces of Upper Bavaria, Lower Bavaria and the Palatinate; they have played an important part in moulding the life of these areas.

Minerals.—The chief mineral deposits in Bavaria are coal, iron ore, graphite, lignite, lead ore and salt. The coal mines lie principally in the districts of Amberg, Kissingen, Steben, Munich and the Palatinate. Salt is obtained partly from brine springs and partly from mines, the best centres being Reichenhall, Berchtesgaden, Traunstein and Rosenheim. The ancient government monopoly was abolished in 1867. There are numerous quarries of excellent marble, basalts, granite, alabaster and gypsum; and the porcelain-clay is among the finest in Europe. There are also numerous mineral springs, many of which have long been resorted to for their curative properties, notably Reichenhall.

Manufactures and Trade.—A great stimulus to Bavarian industry was given by the law of 1868, which abolished the remains of the old restrictions of the guilds, and gave the whole country the liberty which had been enjoyed by the Rhine Palatinate alone. The chief centres of industry are Munich, Nürnberg, Augsburg, Fürth, Erlangen, Aschaffenburg, Regensburg, Würzburg, Bayreuth, Ansbach, Bamberg and Hof in Bavaria proper; and, in the Palatinate, Speyer and the Rhine port of Ludwigshafen. The main centres of the hardware industry are Munich, Nürnberg, Augsburg and Fürth; the first two especially for locomotives and automobiles, the last for tinfoil and metal toys. Aschaffenburg manufactures fancy goods, Augsburg and Hof produce cloth, and Munich has a great reputation for scientific instruments. In Franconia are numerous paper-mills, and the manufacture of wooden toys is carried on in the forest districts of Upper Bavaria. The breweries of Munich, Nürnberg, Erlangen and Kulmbach are famous. Other articles of manufacture are leather, tobacco, porcelain, cement, spirits, lead pencils (Nürnberg), glass, sugar, matches, aniline dyes, straw hats and baskets. The exports consist chiefly of corn, potatoes, hops, beer, wine, cloth, cotton goods, glass, fancy wares, toys, cattle, pigs and vegetables. The seat of the hop-trade is Nürnberg; of wool, Augsburg. The imports comprise sugar, tobacco, cocoa, coffee, oils, silk and pig iron.

There are steamboat services on the navigable rivers to the east by way of Passau on the Danube, and to the west by Ludwigshafen. The Ludwigskanal connects the Rhine with the Danube, extending from Bamberg on the Regnitz to Dietfurt on the Altmühl. In 1921 work was begun on the Rhine-Main-Danube waterway; and the portion as far as Aschaffenburg was opened to through traffic in 1924.

South Bavarian industries and manufacturing were greatly stimulated in the 20th century by the use of Alpine streams for the generating of cheap hydro-electric power. A large part of the railway system was changed from steam to electric power. The mountain streams also afforded an easy means of floating logs down to the sawmills.

These streams and the numerous lakes (Chiemsee, Starnbergersee, Tegernsee) added a picturesque charm to the country as a summer resort for thousands of German and foreign tourists. Other thousands were attracted in cold weather by the skiing and other winter sports.

HISTORY

The earliest known inhabitants of the district afterwards called Bavaria were a people; probably Celtic, who were subdued by the Romans just before the opening of the Christian era, their land being included in the province of Raetia. The cities of Augsburg, Regensburg, and Passau were originally Roman colonies. During the 5th century it was ravaged by the troops of Odoacer and, after being almost depopulated, was occupied by tribes who, pushing along the valley of the Danube, settled there between A.D. 488 and 520. They were, like the Franks, composed of a mixture of Teutonic tribes, and were known as *Bawarii* or *Baiuwarii,* words derived most probably from *Baya* and given to them because they came from *Baya-Hemum* or *Bohemia.* They are first mentioned in a Frankish document of 520. Their country was bounded by the Enns, the Danube, the Lech, and the Alps.

The Bavarians soon came under the dominion of the Franks, and were ruled from 555 to 788 by dukes of the Agilolfing family, possibly of Frankish descent. For a century and a half these dukes resisted the inroads of the Slavs, and by the time of Duke Theodo I. (d. 717) were independent of the feeble Frankish kings. When Charles Martel became the virtual ruler of the Frankish realm he brought the Bavarians into strict dependence, and Pippin the Short was equally successful in maintaining his authority.

Christianity was introduced into Bavaria by Rupert, bishop of Worms who came at the invitation of Duke Theodo I. in 696. He founded several monasteries, and a similar work was also performed by St. Emmeran, bishop of Poitiers. The 8th century witnessed indeed a heathen reaction; but it was checked by the arrival in Bavaria about 734 of St. Boniface, who organized the Bavarian church and founded or restored bishoprics at Salzburg, Freising, Regensburg, and Passau.

Union with Carolingian Empire.—Tassilo III., who became duke of the Bavarians in 749, recognized the supremacy of the Frankish king, Pippin the Short, in 757, but soon showed signs of insubordination, and, during the early years of the reign of Charlemagne, acted as an independent ruler. His position as possessor of the Alpine passes, as an ally of the Avars, and as son-in-law of the Lombard king Desiderius, was so serious a menace to the Frankish kingdom that Charlemagne determined to crush him. The details of this contest are obscure. The outcome, however, was that Tassilo had to surrender his duchy in 794. The country was ruled by Gerold, a brother-in-law of Charlemagne, till his death in a battle with the Avars in 799, when its administration was entrusted to Frankish counts and assimilated with that of the rest of the Carolingian empire.

When the empire was partitioned in 817, Bavaria was assigned to Louis the German, king of the East Franks, and thus formed part of the larger territories which were confirmed to him in 843 by the treaty of Verdun. Louis made Regensburg his capital and was active in improving the condition of Bavaria. When he divided his possessions in 865 it passed to his eldest son Carloman, and after his death in 880 formed part of the territories of the emperor Charles the Fat. Its defence was left by this incompetent emperor to Arnulf, an illegitimate son of Carloman, and it was mainly owing to the support of the Bavarians that Arnulf was able to take the field against Charles in 887, and to secure his own election as German king. Bavaria, which was the centre of the East Frankish kingdom, passed in 899 to Louis the Child, during whose reign it was constantly ravaged and all but depopulated by the Hungarians. For the defence of Bavaria the mark of Carinthia had been erected on the south-eastern frontier, which during the reign of Louis the Child was ruled by Liutpold, count of Scheyern, who fell in the disastrous defeat of the Bavarians by the Hungarians on July 5, 907. His son Arnulf I., surnamed the Bad, rallied the remnants of the race, drove back the Hungarians, and was chosen duke of the Bavarians in 911, when Bavaria and Carinthia were united under his rule. Refusing to acknowledge the supremacy of the German king Conrad I., he was unsuccessfully attacked by the latter, and in 920 was recognized as duke by Conrad's successor, Henry I., the Fowler, who admitted his right to appoint the bishops, coin money, and issue laws. A similar conflict took place between Arnulf's son Eber-

hard and Otto the Great; but Eberhard was less successful than his father, for in 938 he was driven from Bavaria, which was given by Otto, with reduced privileges, to the duke's uncle, Bertold. When Bertold died in 947 Otto conferred the duchy upon his own brother Henry, who had married Judith, a daughter of Duke Arnulf; Henry's short reign was spent mainly in disputes with his people. The ravages of the Hungarians ceased after their defeat by the emperor Otto on the Lechfeld in 955. In that year Henry I. was succeeded by his young son Henry, surnamed the Quarrelsome, who in 974 was implicated in a rising against King Otto II. The revolt was soon suppressed; and in 976 Henry was formally deposed, Bavaria being given to Otto, duke of Swabia. At the same time Carinthia was made into a separate duchy. Restored in 985, Duke Henry II. proved himself a capable ruler by establishing internal order, issuing important laws and reforming the monasteries. His son, who was chosen German king as Henry II. in 1002, gave Bavaria to his brother-in-law, Henry of Luxemburg, after whose death in 1026 it passed successively to Henry, afterwards the emperor Henry III., and to another member of the family of Luxemburg, as Duke Henry VII. In 1061 the empress Agnes, mother of and regent for the German king Henry IV., entrusted the duchy to Otto of Nordheim, who was deposed by the king in 1070, when the duchy was granted to his son-in-law Count Welf, son of Azzo II., of Este. In consequence of his support of Pope Gregory VII., in his quarrel with Henry, Welf lost but subsequently regained Bavaria; and was followed successively by his sons, Welf II. in 1101, and Henry IX. in 1120. Henry was succeeded in 1126 by his son Henry X., the Proud, who obtained the duchy of Saxony in 1137. King Conrad III., however, refused to allow two duchies to remain in the same hands, declared Henry deposed, and bestowed Bavaria upon Leopold IV., margrave of Austria. When Leopold died in 1141 the king retained the duchy himself; but it continued to be the scene of considerable disorder, and in 1143 he entrusted it to Henry II., surnamed Jasomirgott, margrave of Austria. The struggle for its possession continued until 1156, when King Frederick I. persuaded Henry to give up Bavaria to Henry the Lion, a son of Duke Henry the Proud.

Rule of the Wittelsbachs.—A new era set in when in 1180 Henry was placed under the imperial ban, and the duchy was given by Frederick I. to Otto, a member of the old Bavarian family of Wittelsbach (*q.v.*), and a descendant of the counts of Scheyern. After the destruction of the Carolingian empire the borders of Bavaria were continually changing and for a long period after 955 this process was one of expansion. To the west the Lech still divided Bavaria from Swabia, but on three other sides the duchy had been extended and embraced a large area north of the Danube. During the later years of the rule of the Welfs, however, the extent of Bavaria had been reduced. The energies of Duke Henry the Lion had been devoted to his northern rather than his southern duchy, and when the dispute over the Bavarian succession was settled in 1156 the district between the Enns and the Inn had been transferred to Austria. The increasing importance of the mark of Styria, erected into a duchy in 1180, and the county of Tirol, had diminished the strength of Bavaria, which now had few opportunities for expansion.

When Otto of Wittelsbach was invested with Bavaria in Sept. 1180 the duchy was bounded by the Böhmerwald, the Inn, the Alps, and the Lech; and the power of the duke was practically confined to his extensive private domains around Wittelsbach, Kelheim, and Straubing. Otto was succeeded in 1183 by his son Louis I., who took a leading part in German affairs during the earlier years of the reign of the emperor Frederick II., and was assassinated at Kelheim in Sept. 1231. His son Otto II., called the Illustrious, increased the area of his lands by purchases; and he had strengthened his hold upon the duchy before he died in Nov. 1253. The efforts of the dukes to consolidate their power over the duchy had been fairly successful; but they were soon vitiated by partitions among different members of the family, which for 250 years made the history of Bavaria little more than a chronicle of territorial divisions, family feuds and petty squabblings.

Division of the Duchy.—The first of these divisions was made in 1255 between Louis II. and Henry I., the sons of Duke Otto II., Louis obtaining the western part of the duchy, afterwards called Upper Bavaria, and Henry the eastern, or Lower Bavaria. In the course of a long reign Louis, "the Stern," became the most powerful prince in southern Germany. He was the uncle and guardian of Conradin of Hohenstaufen, and when this prince was put to death in Italy in 1268, Louis and his brother Henry inherited the domains of the Hohenstaufen in Swabia and elsewhere. He helped Rudolph of Habsburg to secure the German throne in 1273, married the new king's daughter Mechtild, and aided him in his campaigns. For some years after the death of Louis in 1294 his sons Rudolph I. and Louis, afterwards the emperor Louis IV., ruled their duchy in common; but in 1310 a division of Upper Bavaria was made, by which Rudolph received the land east of the Isar, with the town of Munich, and Louis the district between the Isar and the Lech. This arrangement, however, soon led to war between the brothers, and in 1317, three years after he had been chosen German king, Louis compelled Rudolph to abdicate, and for 12 years ruled alone over the whole of Upper Bavaria. But in 1329 a series of events induced him to conclude the treaty of Pavia with Rudolph's sons, Rudolph and Rupert, to whom he transferred the Palatinate of the Rhine, which had been in the possession of the Wittelsbach family since 1214, and also a portion of Upper Bavaria north of the Danube which was afterwards called the Upper Palatinate. At the same time it was decided that the electoral vote should be exercised by the two lines alternately, and that in the event of either branch of the family becoming extinct the surviving branch should inherit its possessions.

When in 1290 Henry I. of Lower Bavaria died, the duchy was ruled by his three sons, Otto III., Louis III. and Stephen I. Louis died childless in 1296; Stephen left two sons at his death in 1310, namely, Henry II. and Otto IV., and Otto, who was king of Hungary from 1305 to 1308, died in 1312, leaving a son, Henry III. Lower Bavaria was ruled by these three princes until 1333, when Henry III. died, followed in 1334 by his cousin Otto; and as both died without sons the whole of Lower Bavaria passed to Henry II. Dying in 1339, Henry left an only son, John I., who died childless in the following year, when the emperor Louis IV. secured Lower Bavaria and united the whole duchy under his sway. The union of Bavaria under Louis lasted seven years, with much benefit to the country. When he died in 1347 he left six sons to share his possessions, who agreed upon a division of Bavaria in 1349. Its history, however, was complicated by its connection with Brandenburg, Holland, and Tirol, all of which had also been left by the emperor to his sons. All six brothers exercised some authority in Bavaria; but three alone left issue, and of these the eldest, Louis, margrave of Brandenburg, died in 1361, his only son Meinhard dying two years later without issue. The two remaining brothers, Stephen II. and Albert I., ruled over Bavaria-Landshut and Bavaria-Straubing respectively, and when Stephen died in 1375 his portion of Bavaria was ruled jointly by his three sons. In 1392, when all the lines except those of Stephen and Albert had died out, an important partition took place, by which the greater part of the duchy was divided among Stephen's three sons, Stephen III., Frederick, and John II., who founded respectively the lines of Ingolstadt, Landshut, and Munich. Albert's duchy of Bavaria-Straubing passed on his death in 1404 to his son William II., and in 1417 to his younger son John, who resigned the bishopric of Liége on becoming duke. When John died in 1425 this family became extinct, and after a contest between various claimants Bavaria-Straubing was divided between the three remaining branches of the family.

The main result of the threefold division of 1392 was the temporary eclipse of Bavaria. Neighbouring states encroached upon its borders and the nobles ignored the authority of the dukes, who for 50 years were mainly occupied with intestine strife. This condition of affairs, however, was not wholly harmful. The government of the country and the control of the finances passed mainly into the hands of an assembly called the *Landtag* or *Landschaft*, organized in 1392. The towns, assuming a certain inde-

pendence, became strong and wealthy as trade increased, and the citizens of Munich and Regensburg were often formidable antagonists to the dukes. Thus a period of disorder saw the growth of representative institutions and of a strong civic spirit. The rule of Stephen III., duke of Bavaria-Ingolstadt, was marked by struggles with various towns and with his brother, John of Bavaria-Munich. Dying in 1413, he was followed by his son Louis, called the Bearded, a restless and quarrelsome prince, who had played an important part in the affairs of France, where his sister Isabella was the queen of King Charles VI. About 1417 he became involved in a violent quarrel with his cousin, Henry of Bavaria-Landshut, fell under both the papal and the imperial ban, and in 1439 was attacked by his son Louis the Lame. This prince, who had married a daughter of Frederick I. of Hohenzollern, margrave of Brandenburg, was incensed at the favour shown by his father to an illegitimate son. Aided by Albert Achilles, afterwards margrave of Brandenburg, he took the elder Louis prisoner and compelled him to abdicate in 1443. When Louis the Lame died in 1445 his father came into the power of his enemy, Henry of Bavaria-Landshut, and died in prison in 1447. The duchy of Bavaria-Ingolstadt passed to Henry, who had succeeded his father Frederick as duke of Bavaria-Landshut in 1393, and whose long reign was almost entirely occupied with family feuds. He died in July 1450, and was followed by his son, Louis IX., "the Rich," and about this time Bavaria began to recover some of its former importance. Louis IX. expelled the Jews from his duchy, took some steps for the security of traders, and improved both the administration of justice and the condition of the finances. In 1472 he founded the university of Ingolstadt, and he made an attempt to reform the monasteries. On his death in 1479 he was succeeded by his son George, also called the Rich, who died without sons in Dec. 1503, whereupon a war broke out for the possession of his duchy.

Bavaria-Munich passed, on the death of John II. in 1397, to his sons Ernest and William III., but they only obtained possession after a struggle with Stephen of Bavaria-Ingolstadt. Both brothers were then engaged in warfare with the other branches of the family and with the citizens of Munich. William, a loyal servant of the emperor Sigismund, died in 1435, leaving an only son, Adolf, who died five years later; and Ernest died in 1438. In 1440 the whole of Bavaria-Munich came to Ernest's son Albert, whose attempts to reform the monasteries earned for him the surname of Pious. He died in 1460, leaving five sons, the two elder of whom, John IV. and Sigismund, reigned in common until the death of John in 1463. The third brother, Albert, who had been educated for the church, joined his brother in 1465, and when Sigismund abdicated two years later became sole ruler, in spite of the claims of his two younger brothers.

Reunion of the Duchy.—In 1504, Albert IV., called the Wise, became involved in the war which broke out for the possession of Bavaria-Landshut on the death of George the Rich. Albert's rival was George's son-in-law, Rupert, formerly bishop of Freising and son of Philip, count palatine of the Rhine; and the emperor Maximilian I., interested as archduke of Austria and count of Tirol, interfered in the dispute. Rupert died in 1504, and in 1505 an arrangement was made at the diet of Cologne by which the emperor and Philip's grandson, Otto Henry, obtained certain outlying districts, while Albert, by securing the bulk of George's possessions, united Bavaria under his rule. In 1506 Albert decreed that the duchy should pass undivided according to the rules of primogeniture. He was partially successful in improving the condition of the country; and in 1500 Bavaria formed one of the six circles into which Germany was divided for the maintenance of peace. He died in March 1508, and was succeeded by his son, William IV., whose mother, Kunigunde, was a daughter of the emperor Frederick III. In spite of the decree of 1506 William was compelled, in 1516, to grant a share in the government to his brother Louis, an arrangement which lasted until the death of Louis in 1545.

William followed the traditional Wittelsbach policy, opposition to the Habsburgs, until in 1534 he made a treaty at Linz with Ferdinand, king of Hungary and Bohemia. This was strengthened in 1546, when the emperor Charles V. obtained the help of the duke during the war of the league of Schmalkalden by promising him the reversion of the Bohemian throne, and the electoral dignity enjoyed by the count palatine of the Rhine. William also did much at a critical period to secure Bavaria for catholicism. The reformed doctrines made great progress in the duchy; but the duke, who had sympathized with Luther's first protests, objected to doctrinal innovations, and while obtaining from the pope powers to reform the morals of the clergy, took measures to repress the reformers. In 1542, at his invitation, Loyola sent some brethren of the new Society of Jesus to Bavaria, and later the university of Ingolstadt became the headquarters of the society in Germany. William, whose death occurred in March 1550, was succeeded by his son Albert V., who had married a daughter of Ferdinand of Habsburg, afterwards the emperor Ferdinand I. Early in his reign, Albert made some concessions to the reformers, who were still strong in Bavaria; but about 1563 he changed his attitude, favoured the decrees of the council of Trent, and pressed forward the work of the counter-reformation. As education passed into the hands of the Jesuits, protestantism was effectually crushed in Bavaria. Albert V. was a great patron of art. His court at Munich was the resort of artists of all kinds, and the city was enriched with splendid buildings. The expenses of a magnificent court led the duke to quarrel with the Landschaft, to oppress his subjects, and to leave a great burden of debt when he died in Oct. 1579. The succeeding duke was Albert's son, William V. (called the Pious) who was a devout pupil of the Jesuits. He secured the archbishopric of Cologne for his brother Ernest in 1583, and this dignity remained in the possession of the family for nearly 200 years. In 1597 he abdicated in favour of his son Maximilian I., and retired into a monastery, where he died in 1626. Maximilian found the duchy encumbered with debt and filled with disorder, but ten years of his vigorous rule effected a remarkable change. The finances and the judicial system were reorganized, a class of civil servants and a national militia founded, and several small districts were brought under the duke's authority. The result was a unity and order in the duchy which enabled Maximilian to play an important part in the Thirty Years' War; during the earlier years of which he was so successful as to acquire the Upper Palatinate and the electoral dignity which had been enjoyed since 1356 by the elder branch of the Wittelsbach family. In spite of subsequent reverses these gains were retained by Maximilian at the peace of Westphalia in 1648. During the later years of this war Bavaria suffered severely. In 1632 it was invaded by the Swedes and, when Maximilian violated the treaty of Ulm in 1647, was ravaged by the French and the Swedes. After repairing this damage to some extent, the elector died at Ingolstadt in Sept. 1651, leaving his duchy much stronger than he had found it. The recovery of the Upper Palatinate made Bavaria compact; the acquisition of the electoral vote made it influential; and the duchy was able to play a part in European politics which intestine strife had rendered impossible for the past 400 years.

Beginning of Modern Period.—For the next two centuries Bavaria was to suffer for the dynastic ambitions of her rulers. Maximilian's son, Ferdinand Maria (1651–79), did much to repair the wounds caused by the Thirty Years' War, encouraging agriculture, industries, and building, and recalling in 1669 the diet, which had been suspended since 1612. But his son, Maximilian II. Emmanuel (1679–1726), went to war with the Turks, and joined France in the war of the Spanish succession. He shared in the defeat at Höchstädt on Aug. 13, 1704, and his dominions were partitioned between Austria and the elector palatine, and only restored to him, harried and exhausted, at the Peace of Baden in 1714. His son, Charles Albert (1726–45), seized the opportunity of the death of the emperor Charles VI. to dispute the validity of the Pragmatic Sanction which secured the Habsburg succession to Maria Theresa, allied himself with France, conquered Upper Austria, was crowned king of Bohemia at Prague and, in 1742, emperor at Frankfurt. The price he had to pay, however, was the occupation of Bavaria itself by Austrian troops. The invasion of Bohemia in 1744 by Frederick II. of Prussia enabled him to return to Munich, and at his death on Jan. 20, 1745, his successor,

by the Peace of Füssen (April 22, 1745) obtained the restitution of his dominions in return for a formal acknowledgment of the Pragmatic Sanction. The reign of Maximilian III. Joseph (1745–77) was peaceful and prosperous.

War of Bavarian Succession.—At his death the Bavarian line of the Wittelsbachs became extinct, and the succession passed to Charles Theodore, the elector palatine. After a separation of four and a half centuries, the Palatinate, to which the duchies of Jülich and Berg had been added, was thus reunited with Bavaria. Joseph II., emperor of Austria, took this opportunity to put forward a claim to about a third of Bavaria, and sent troops across the frontier, with the secret consent of Charles Theodore who, having no legitimate heirs, hoped, in return, for the elevation of his natural children to the status of princes of the empire. The protests of the next heir, Charles, duke of Zweibrücken, supported by Frederick the Great of Prussia, led to the war of the Bavarian succession, and by the Peace of Teschen (May 13, 1779) the Inn quarter was ceded to Austria, and the succession secured to Charles of Zweibrücken. Meanwhile Charles Theodore abandoned the enlightened internal policy of his predecessor, the Government was inspired by the narrowest clericalism and on the eve of the revolution the intellectual and social condition of Bavaria remained that of the middle ages.

The Revolutionary Wars.—In 1792 the revolutionary armies overran the Palatinate; in 1795 the French, under Moreau, invaded Bavaria itself, advanced to Munich—where they were received with joy by the long-suppressed Liberals—and laid siege to Ingolstadt. Charles Theodore fled to Saxony, leaving a regency to sign a convention with Moreau, who granted an armistice in return for a heavy contribution (Sept. 7, 1796). Immediately afterwards he was forced to retire. Between the French and the Austrians, Bavaria was now in an evil case. Before the death of Charles Theodore (Feb. 16, 1799) the Austrians had again occupied the country, preparatory to renewing the war with France. Maximilian IV. Joseph, the new elector, succeeded to a difficult inheritance. Though his own sympathies, and those of his minister, Max Josef von Montgelas, were French rather than Austrian, the state of the Bavarian finances and the disorganization of the troops placed him helpless in the hands of Austria. On Dec. 2, 1800, Bavaria shared in the Austrian defeat at Hohenlinden, and Moreau once more occupied Munich. By the Treaty of Lunéville (Feb. 9, 1801) Bavaria lost the Palatinate and the duchies of Zweibrücken and Jülich.

The influence of Montgelas now gave Bavarian policy a new direction. On Aug. 24 a separate treaty of peace and alliance with France was signed at Paris by which compensation was promised at the expense of Austria, for the territory on the left bank of the Rhine ceded at the Treaty of Lunéville. Accordingly, in the territorial rearrangements of 1803, Bavaria received the bishoprics of Würzburg, Bamberg, Augsburg and Freisingen, part of that of Passau, the territories of 12 abbeys, and 17 cities, the whole forming a compact territory. Pursuing the policy of alliance with France, Bavarian troops fought side by side with the French in the Ulm-Austerlitz campaign of 1805 and by the Treaty of Pressburg, Dec. 26, the principality of Eichstädt, the margraviate of Burgau and the lordship of Vorarlberg, and other territories were to be added to Bavaria. On the other hand Würzburg, obtained in 1803, was to be ceded by Bavaria to the elector of Salzburg in exchange for Tirol; the treaty also acknowledged the assumption by the elector of the title of king, as Maximilian I. The price which Maximilian had reluctantly to pay for this accession of dignity was the marriage of his daughter Augusta with Eugène Beauharnais.

For the internal constitution of Bavaria also the French alliance had noteworthy consequences. Maximilian and Montgelas belonged to the 18th-century school of "enlightened" princes and politicians. But the revolutionary changes introduced by the constitution proclaimed on May 1, 1808, were due to the direct influence of Napoleon. A clean sweep was made of the mediaeval polity surviving in the somnolent local diets and corporations. In place of the old system of privileges and exemptions were set equality before the law, universal liability to taxation, abolition of serfdom, security of person and property, liberty of conscience and of the Press. A representative assembly was created on paper but never summoned.

In 1809 Bavaria was again engaged in war with Austria on the side of France, and by the treaty signed at Schönbrunn on Oct. 15, 1809, ceded southern Tirol to Italy and some small districts to Württemberg, receiving as compensation parts of Salzburg, the quarters of the Inn and Hausruck and the principalities of Bayreuth and Regensburg. So far the policy of Montgelas had been brilliantly successful; but the star of Napoleon had now reached its zenith; already the astute opportunist had noted the signs of the coming change and Oct. 8, 1813, signed the treaty of Ried, by which Bavaria threw in her lot with the Allies.

Tirol and Vorarlberg reverted to Austria at the first Peace of Paris (1814), but at the Congress of Vienna it was decided that Bavaria was to add to these the greater part of Salzburg and the quarters of the Inn and Hausruck, receiving as compensation Würzburg, Aschaffenburg and other territories. But with the collapse of France the old fear and jealousy of Austria had revived in full force, and war was only averted by the authority of the Grand Alliance. At the Congress of Aix (1818) and by the Treaty of Frankfurt, July 20, 1819, the territorial questions at issue between Bavaria and Austria were settled, in spite of the protests of the former, in the general sense of the arrangement made at Vienna.

Constitution of 1818.—Meanwhile on Feb. 1, 1817, Montgelas had been dismissed, and a new era of constitutional reform begun. In the new German confederation Bavaria had assumed the rôle of defender of the smaller States against the ambitions of Austria and Prussia, and to obtain popular support for this policy the crown prince pressed for a liberal constitution, the reluctance of Montgelas to concede it being the cause of his dismissal. On May 26, 1818, the constitution was proclaimed. The parliament was to consist of two houses; the first comprising the great hereditary landowners, government officials and nominees of the Crown; the second, elected on a very narrow franchise, representatives of the small landowners, the towns and the peasants. Religious equality and the rights of Protestants were guaranteed, concessions which were denounced at Rome as a breach of the recently concluded Concordat. The parliament was hardly opened (Feb. 5, 1819) before the doctrinaire radicalism of some of its members so alarmed the king, that he appealed to Austria and Germany, undertaking to carry out any repressive measures they might recommend, but the parliament, chastened by the consciousness that its life depended on the good will of the king, moderated its tone; and Maximilian ruled till his death as a model constitutional monarch.

Ludwig I.—On Oct. 13, 1825, he was succeeded by his son, Ludwig I., the earlier years of whose reign were marked by a liberal spirit and by financial reform; but the revolutions of 1831 and the opposition of the parliament to his expenditure on building and works of art frightened him into reaction. In 1837 the Ultramontanes came into power with Karl von Abel (1788–1859) as prime minister. The Jesuits now gained the upper hand; the Protestants were harried and oppressed; and a rigorous censorship forbade any free discussion of internal politics. The collapse of this régime was brought about by the king's infatuation for an Irish adventuress, Lola Montez. Ultramontanes and radicals, equally incensed at the influence she exercised, joined in riotous demonstrations in 1847. Neither the Protestant Georg Ludwig von Maurer (*q.v.*), who had succeeded Abel as minister, nor his successor, Prince Ludwig von Oettingen-Wallerstein, the head of the cabinet nicknamed the "Lolaministerium," was able to restore order; and on March 20, 1848, unable to deal effectually with the crisis caused by the Paris Revolution the king abdicated in favour of his son, Maximilian II.

Anti-Prussian Policy.—The new sovereign was a zealous supporter of the national effort to achieve German freedom and unity, accepting the authority of the central Government at Frankfurt, and (Dec. 19) sanctioning the official promulgation of the laws passed by the German parliament. But Prussia was henceforth the enemy, not Austria. In refusing to agree to the

offer of the imperial crown to Frederick William IV., Maximilian had the support of his parliament. In withholding his assent to the new German Constitution, by which Austria was excluded from the Confederation, he ran, indeed, counter to the sentiment of his people; but by this time the back of the revolution was broken, and in the events which led to the humiliation of Prussia at Olmütz in 1850, and the restoration of the old diet of the Confederation, Bavaria was safe in casting in her lot with Austria (*see* GERMANY: *History*). The guiding spirit in this anti-Prussian policy was Ludwig Karl Heinrich von der Pfordten (1811–80), who became minister for foreign affairs in April 1849, and who aimed at establishing a *Trias, i.e.,* a league of the Rhenish States as a counterpoise to the preponderance of Austria and Prussia. His reactionary internal policy, less severe than elsewhere in Germany, led none the less from 1854 onward to a struggle with the parliament, which ended in the dismissal of Pfordten's ministry on March 27, 1859. He was succeeded by Karl Freiherr von Schrenk auf Notzing (1806–84), an official of Liberal tendencies who introduced important reforms including the separation of the judicial and executive powers and the drawing up of a new criminal code. In foreign affairs Schrenk followed his predecessor's policy.

Maximilian was succeeded on March 10, 1864, by his son, Ludwig II., a youth of 18. The Government was at first carried on by Schrenk and Pfordten in concert. Schrenk soon retired, when the Bavarian government found it necessary, in order to maintain its position in the Prussian *Zollverein,* to become a party to the Prussian commercial treaty with France, signed in 1862. In the complicated Schleswig-Holstein question (*q.v.*) Bavaria consistently opposed Prussia and finally, in the war of 1866, sided actively with Austria.

Union with the German Empire.—The rapid victory of the Prussians and the wise moderation of Bismarck paved the way for a complete revolution in Bavaria's relation to Prussia and the German question. The South German Confederation, contemplated by the Treaty of Prague, never came into being; and, though Prussia, in order not prematurely to excite the alarm of France, opposed the suggestion that the southern states should join the North German Confederation, an offensive and defensive alliance with Prussia was signed at Berlin on Aug. 22, 1866, as the result of Napoleon's demand for "compensation" in the Palatinate. The separatist ambitions of Bavaria were thus formally given up and in the war of 1870–71, the Bavarian army marched against France under the command of the Prussian crown prince.

On Nov. 23, 1870, a treaty was signed between Bavaria and the North German Confederation, by which, though Bavaria became an integral part of the new German empire, she reserved a larger measure of sovereign independence than any of the other constituent states. Thus she retained a separate diplomatic service, military administration, and postal, telegraph and railway systems. The treaty was ratified by the Bavarian chambers on Jan. 21, 1871, in spite of the opposition of the "patriot" party. Their hostility was increased by the *Kulturkampf,* due to the promulgation in 1870 of the dogma of papal infallibility. Munich university, where Döllinger (*q.v.*) was professor, became the centre of the opposition to the new dogma, and the "old Catholics" (*q.v.*) were protected by the king and the government. The federal law expelling the Jesuits was proclaimed in Bavaria on Sept. 6, 1871, and was extended to the Redemptorists in 1873. On March 31, 1871, moreover, the bonds with the rest of the empire had been drawn closer by the acceptance of a number of laws of the North German Confederation, of which the most important was the new criminal code, which was finally put into force in Bavaria in 1879. The opposition of the "patriot" party, however, reinforced by the strong Catholic sentiment of the country, continued powerful, and the support given by the king to successive Liberal ministries alone prevented its finding disastrous expression in the parliament.

Regency of Prince Luitpold.—Meanwhile, Ludwig II. and his brother, Otto I., both having been declared insane, the heir presumptive, Prince Luitpold, was proclaimed regent on June 7, 1886: six days later Ludwig committed suicide. During Luitpold's long rule Bavaria shared in the common prosperity of Germany: but it was long before she forgot her "particularism," founded on traditional racial and religious antagonism to Prussia.

Towards the end of Luitpold's regency the Catholic-Clerical Party came into power, after prolonged political struggles. On the defeat of the Podewils ministry in the elections of Feb. 1912, Baron von Hertling, a leader of the Centre Party, formed a cabinet consisting mainly of officials. In December of the same year Luitpold died; on Nov. 5, 1913, his son Ludwig III., who had succeeded him as regent, was made king.

Revolution of 1918.—World War I brought a truce to party politics but in its later stages the discontent of the population gradually assumed alarming proportions. Von Dandl, who had succeeded von Hertling as minister-president, was confronted with the revolution, which broke out in Munich on the night of Nov. 7–8, 1918, before the fall of the Imperial Government in Berlin. The Wittelsbach dynasty was deposed, and Kurt Eisner, the Independent Socialist, placed himself at the head of the Revolutionary Government. Pending a re-election of the diet, a provisional constitution of the Socialist Republic of Bavaria was set up. The diet was to meet on Feb. 21, 1919, but on that very day Eisner was shot dead. The result was the outbreak, on April 4, of a new revolution, inspired by the Bolsheviks, which collapsed, after fierce fighting, on May 1. Once more the diet was assembled, and on May 5, 1919, Hoffmann, the minister-president, laid before it the Government's scheme for the new constitution.

The New Constitution.—The new constitution of Aug. 14, 1919, was based on the assumption that Bavaria was still a sovereign state, though, by the Weimar Constitution of Aug. 11, foreign policy, the army and railways had become the concern of the Reich. Bavaria's economic policy also became severely restricted, as the financial legislation of the Reich had requisitioned her principal sources of income. The form of the state was prescribed by the Reich; Bavaria became a democratic republic with parliamentary government, but without a president to act as a check on parliament. The diet had thus no superior authority except the people, which elected its members and could dissolve it by a "popular demand" (*Volksbegehren*), or administer the laws directly by a referendum (*Volksentscheidung*). The diet was elected, as was the Reichstag, by universal suffrage and secret ballot, on the system of proportional representation. It consisted of a single chamber. The minister-president appointed by the diet did not have the standing of a prime minister. The responsibility for administration rested upon individual ministers who might be forced to resign by a vote of non-confidence. Direct legislation by the people, by popular vote, might occur.

The policy of Bavaria after 1919 was governed by (1) the fear of a conflict with the Reich and (2) the risk of a counter-revolution by nationalist and monarchist organizations. The dominating parties in Bavaria held that the Weimar constitution involved excessive centralization, and wished to return to the old federal constitution of the Reich. On the question of the particular rights to be retained by Bavaria there were constant battles between the two governments.

The rise of the nationalist organizations was due, on the one hand, to a reaction against bolshevism and, on the other, to the execution of the Versailles treaty by the Entente. The attempted counter-revolution in Berlin, the so-called "Kapp putsch" (March 1920), many participants in which sought refuge in Bavaria, was the indirect cause of the fall of Hoffmann's Socialist ministry and Kahr's bourgeois (non-Socialist) cabinet took its place. On June 6 the bourgeois parties obtained a two-thirds majority in the elections, and the "law-and-order party" ("*Ordnungsblock*") began its rule. Herr Escherich founded the *Einwohnerwehr* or "Orgesch" (Organization Escherich), a voluntary militia, for protection against possible repetitions of a bolshevik revolution. This organization was, however, dissolved by order of the Entente commission, and von Kahr resigned in consequence on Sept. 12, 1921. His successor, Count Lerchenfeld, had an equally good majority but was also obliged to go out of office in the following year on account of a conflict with the Reich government (Oct. 27, 1922). Von Knilling's new ministry leaned still more to the

right and the Democrats left the government. National feeling found its extreme expression in the views of the National Socialists, a militarist, nationalist and anti-semite body, nominally democratic in tendency, but actually largely used by the rich to break strikes and attack socialism. This body, although gaining strength under the leadership of Hitler, wavered between Bavarian separatism and pan-Germanism in a bewildering fashion. It became dangerous in the autumn of 1923, when Ludendorff joined it and gave it the backing of the secret military leagues. But it aroused opposition in Bavaria by setting itself against a restoration of the Wittelsbach dynasty and against the Catholic Church. Herr von Kahr was appointed general state commissioner with full dictatorial powers.

On Nov. 8, 1923, the counter-revolution broke out in Munich. It was suppressed with bloodshed, the Reich defense force having remained loyal to the constitution. Von Kahr's task was now at an end, and on Feb. 18, 1924, he retired. The elections for the diet gave no party a majority; a coalition ministry was therefore once more formed, consisting of the Bavarian People's party, the German Nationals and the Farmers' League (*Bauernbund*). Held, the leader of the Bavarian People's party, placed himself at the head. The monarchist sentiment was strong and for some years there was effective resistance to the nazis. But in March 1933 Bavaria, sharing the fate of other federated states in the Reich, ceased to enjoy an autonomous existence. Dr. Heinrich Held, the Catholic premier, was thrown out by storm troopers and nazi control was enforced. Thereafter Adolf Hitler ruled Bavaria autocratically through the following district leaders (*Gauleiters*): Julius Streicher in Franconia, Karl Ruckdeschel in the Bavarian Eastmark, Adolf Wagner in Upper Bavaria, Joseph Bürckel in the Rhine Palatinate, Karl Wahl in Swabia, Otto Hellmuth in Lower Franconia (Mainfranken). The "Brown House" in Munich was the headquarters of the National Socialist party organization.

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BAVARIAN SUCCESSION, WAR OF THE (1778–79): *see* BAVARIA and POTATO WAR.

BAVENO, village, Piedmont, Italy, province of Novara 13 mi. N.N.W. of Arona by rail. A resort with fine valleys. Its red granite quarries supplied columns for Milan Cathedral, S. Paolo fuori le Mura at Rome, the Galleria Vittorio Emanuele at Milan, etc. Pop. (1936) 921 (town), 3,028 (commune).

BAWBEE, the Scottish name for a half-penny or other small coin, and hence used of money generally. A writer in 1573, quoted in Tytler's *History of Scotland,* speaks of "a coin called a bawbee, . . . which is in value English one penny and a quarter." The most plausible conjecture is that the word is a corruption from the name of one Sillebawby, master of the mint from which the coin was first issued about 1541.

BAX, SIR ARNOLD EDWARD TREVOR (1883–), English composer, born in London on Nov. 8, 1883, studied at the Royal Academy of Music under Frederick Corder for composition and Tobias Matthay for pianoforte. As a student his exceptional facility, alike in composition and as an executant, excited astonishment and was illustrated further by the tendency to excessive elaboration which distinguished his own earliest creative efforts and a tendency, it may be added which, though better controlled later, has never been entirely overcome. But as to the wealth and distinction of his ideas and the skill and resourcefulness displayed in their handling there was never any question and he has long taken a place among the most interesting and important of contemporary British composers. Especially attractive is the romantic and mystical feeling pervading so much of his work, with which characteristic may be associated his strong affinity for Irish folklore and legend and other aspects of the Celtic spirit. With the exception of opera, practically every branch of composition is represented in Bax's extensive output. For the orchestra his more notable works include three characteristically imaginative symphonic poems "The Garden of Fand" (1916), "Tintagel" (1917) and "November Woods" (1917) together with a fine symphony (1921). Among a number of admirable chamber works may be mentioned two violin sonatas, a string quartet and a fine piano quintet. The beautiful carol "Mater ora Filium," for double choir unaccompanied, should be noted, as well as three ballets and numerous pianoforte pieces and songs. Bax was knighted in 1937.

BAX, ERNEST BELFORT (1854–1926), English writer and economist, was born at Leamington on July 24, 1854, and educated privately. When a young man he escaped from the strict Sabbatarian atmosphere of his home, and went to study music in Germany, where he became interested in the work of the German philosophers. He subsequently returned to England, and associated himself with the early history of the socialist movement. He helped William Morris, in 1883, to found the Socialist League, whose members seceded from the Democratic Federation (a league of London working men's radical clubs), and edited its organ, the *Commonweal.* He left the Socialist League when it became extreme, and joined the Social Democratic Federation, editing *Justice* for it. In 1894 he was called to the Bar, and in the same year wrote *Socialism, its growth and outcome,* in collaboration with Morris. He is, however, known rather for his philosophical and historical works than his writings on socialism. The socialist ideal, as Bax understood it, embraced a much wider field than the re-organization of the material side of life, and he believed that in time such a strong bond of sympathy would be created between nations that racial conflicts would no longer be possible. In 1882 he edited Kant's *Prolegomena* with biography and introduction. His philosophical works include: *Handbook to the History of Philosophy* (1884); *The Problem of Reality* (1893); *The Roots of Reality* (1907); *Problems of Men, Mind and Morals* (1912); *The Real, the Rational and the Alogical* (1920). On the historical side he has written on such varied subjects as Jean Marat, the French revolution, German society at the end of the middle ages, the Peasants' War, the Anabaptists. In 1918 he published a volume of reminiscences which are valuable as a picture of the period in which he lived. Bax died in London on Nov. 26, 1926.

BAXTER, ANDREW (1686–1750), Scottish metaphysician, born in Aberdeen and educated at King's college. From 1741–47 he lived as a tutor with Lord Blantyre and Mr. Hay at Utrecht, and made excursions in Flanders, France and Germany. Returning to Scotland, he lived at Whittingehame, near Edinburgh, till his death in 1750. His chief work, *An Inquiry into the Nature of the Human Soul* (the 1750 edition of which contains an answer to an attack in Maclaurin's *Account of Sir I. Newton's Philosophical Discoveries,* and a dedication to John Wilkes), examines the properties of matter. Since matter is characterized by inactivity, *vis inertiae,* all movement occurring in it must be caused by some immaterial force, namely, God. But in the case of the human body, movement is caused by a special immaterial force, the soul. The soul, being immaterial, is immortal, and possesses a consciousness independent of the body. The argument is supportable by the phenomena of dreams, which are due to direct spiritual influences. Baxter's work is an attack on Toland's *Letters to Serena* (1704), which argued that motion is essential to matter, and on Locke and Berkeley, but his criticism of Berkeley is based on the common misinterpretations (*see* BERKELEY, GEORGE). Sir Leslie Stephen speaks of him as a curious example of "the effects of an exploded metaphysics on a feeble though ingenious intellect."

Beside the *Inquiry,* Baxter wrote *Matho sive Cosmotheoria Puerilis,* a compendium of universal scientific knowledge (editions in English 1740, 1745 and 1765), and *Evidence of Reason in Proof of the Immortality of the Soul* (published posthumously from mss. by Dr. Duncan in 1779).

See life in Kippis's *Biographia Britannica;* McCosh's *Scottish Philosophy.*

BAXTER, RICHARD (1615–1691), English Puritan divine, called by Dean Stanley "the chief of English Protestant Schoolmen," was born at Rowton, in Shropshire, at the house of his maternal grandfather, in November (probably the 12th) 1615. Educated at the free school of Wroxeter and under Richard Wickstead, chaplain at Ludlow Castle, he went to London under the patronage of Sir Henry Herbert, master of the revels, to follow that course, but he soon went home to study divinity. After three months' schoolmastering for Owen at Wroxeter he read theology, and especially the schoolmen, with Francis Garbet, the local clergyman. About this time (1634) he met Joseph Symonds and Walter Cradock, two famous Nonconformists, whose fervour influenced him. In 1638 he was nominated to the mastership of the free grammar school, Dudley, being ordained and licensed by John Thornborough, bishop of Worcester. His success as a preacher was at first not great; but he was soon transferred to Bridgnorth where, as assistant to a Mr. Madstard, he established a reputation.

He remained there nearly two years, studying deeply the controversy relating to Nonconformity and the Church of England. He soon, on some points, especially of discipline, became alienated from the Church; and after the requirement of what is called "the *et cetera* oath," he rejected Episcopacy in its English form. He was, however, a moderate Nonconformist; and such he always continued to be. Classed as a Presbyterian, he had no exclusive attachment to Presbyterianism, and would have accepted a modified Episcopalianism. But all forms of Church government were regarded by him as indifferent. He was unanimously elected minister of Kidderminster in April 1641, when he was but 26 years of age.

His ministry lasted with interruptions about 19 years; he accomplished a work of reformation in Kidderminster and the neighbourhood, as notable as any upon record. Civilized behaviour succeeded to brutality of manners; and, whereas the religious had been but few, the irreligious became in their turn rare. He formed the ministers in the country round about him into an association for the better fulfilment of their duties, uniting them together irrespective of their differences as Presbyterians, Episcopalians and Independents. The spirit in which he acted may be judged of from his *The Reformed Pastor.* During the Civil War he was exposed to annoyance and danger at Kidderminster, and therefore removed for a time to Gloucester and afterwards (1643–45) settled in Coventry, where he preached regularly both to the garrison and the citizens. After the battle of Naseby he became chaplain to Colonel Whalley's regiment, and continued so till Feb. 1647. During these stormy years he wrote his *Aphorisms of Justification* (1649), which excited great controversy.

Baxter's connection with the parliamentary army was characteristic of him; he joined it that he might, if possible, counteract the sectaries, and maintain the cause of constitutional government against republican tendencies. He regretted that he had not accepted an offer of Cromwell to become chaplain to the Ironsides, being confident in his power of persuasion under the most difficult circumstances. His success in converting the soldiery to his views was not great, but he kept his consistency remarkably. By disputation and conference, as well as by preaching, he enforced his doctrines, both ecclesiastical and political, and shrank as little from urging what he conceived to be the truth upon the most powerful officers as from instructing the meanest followers of the camp. Cromwell disliked his loquacity and shunned his society; but Baxter having to preach before him after he had assumed the Protectorship chose for his topic the divisions of the Church, and in interviews not only opposed him about liberty of conscience, but spoke in favour of the monarchy. In 1647 at the home of Lady Rouse of Rouse-Lench, in much physical weakness, he wrote a great part of his famous work, *The Saints' Everlasting Rest* (1650). On his recovery he returned to Kidderminster, where he also became a prominent leader, his sensitive conscience leading him into conflict with almost all the contending parties. His conduct always did "credit to his conscientiousness rather than to his wisdom."

After the Restoration Baxter, who had helped to bring it about, settled in London. He preached there till the Act of Uniformity took effect in 1662, and was employed in seeking for such terms of comprehension as would have permitted the moderate dissenters with whom he acted to remain in the Church of England. In this hope he was disappointed. There was at that time on the part of the rulers of the Church no wish for comprehension, and their aim was to excuse the breach of faith which their rejection of all reasonable methods of concession involved. The chief good that resulted from the Savoy conference was the production of Baxter's *Reformed Liturgy.* He gained in the larger and more important circle of the metropolis the same vogue that he had gained in the country. The power of his preaching was universally felt, and his capacity for business placed him at the head of his party. He had been made a king's chaplain, and was offered the bishopric of Hereford, but he could not accept the offer without sacrifice of principle. After his refusal he was not allowed to be a curate in Kidderminster, though he was willing to serve unpaid. Bishop Morley prohibited him from preaching. Baxter, however, found much consolation in his marriage on Sept. 24, 1662, with Margaret Charlton, a woman like-minded with himself. She died in 1681.

From the ejectment of 1662 to the indulgence of 1687, Baxter's life was disturbed by persecution of one kind or another. He retired to Acton in Middlesex, for quiet study, and was dragged thence to prison for keeping a conventicle. The *mittimus* was pronounced illegal and Baxter procured a *habeas corpus.* He was taken up for preaching in London after the licences granted in 1672 were recalled by the king. He was barred from the meeting-house which he had built for himself in Oxenden Street after he had preached there but once. He was, in 1680, seized in his house, and conveyed away at the risk of his life, and though he was released that he might die at home, his books and goods were distrained. He was, in 1684, carried three times to the sessions house, being scarcely able to stand, and made to enter into a bond of £400 for his good behaviour.

But his worst encounter was with the chief justice, Sir George Jeffreys, in May 1685. He had been committed to the king's bench prison on the ridiculous charge of libelling the Church in his *Paraphrase on the New Testament,* and was tried before Jeffreys on this accusation. The trial is well known as among the most brutal perversions of justice which have occurred in England, though it must be remembered that no authoritative report of the trial exists. (*See* JEFFREYS, GEORGE JEFFREYS.) Baxter was sentenced to pay 500 marks, to lie in prison till the money was paid, and to be bound over for seven years. It was even asserted at the time that Jeffreys proposed he should be whipped at the cart's tail through London. The old man, for he was now 70, remained in prison for 18 months, when the Government, vainly hoping to win him to their side, remitted the fine and released him.

The long time of oppression from 1662 with bodily affliction, was the period of his greatest activity as a writer. He was a most voluminous author, his separate works, it is said, amounting to 168. They are as learned as they are elaborate and varied in their subjects. Such treatises as the *Christian Directory,* the *Methodus Theologiae Christianae,* and the *Catholic Theology,* might each have occupied the principal part of the life of an ordinary man. His *Breviate of the Life of Mrs. Margaret Baxter* records the virtues of his wife, and reveals his tenderness of heart.

The remainder of Baxter's life, from 1687 onwards, was passed in peace and honour. He preached and wrote almost to the end. He was surrounded by attached friends, and reverenced by the religious world. His saintly behaviour, his great talents, and his wide influence, added to his extended age, raised him to a position of unequalled reputation. He helped to bring about the downfall of James II. and complied with the Toleration Act under William and Mary. He died in London on Dec. 8, 1691, and his funeral was attended by churchmen as well as dissenters. A similar tribute of general esteem was paid to him nearly two centuries later, when a statue was erected to his memory at Kidderminster in July 1875.

Baxter was possessed by an unconquerable belief in the power of persuasive argument. He thought everyone was amenable to reason—bishops and levellers included. He was at once a man of fixed belief and large appreciation, so that his dogmatism and his liberality sometimes came into collision. His popularity as a preacher was pre-eminent; but he was a real student and in an age when it was the fashion even with the learned to deride the schoolmen he honoured the *Summa* of St. Thomas Aquinas. He was well equipped for intellectual debate, but his devotional tendency was as strong as his logical aptitude. Some of his writings from their metaphysical subtility, will always puzzle the learned; but he could write to the level of the common heart without loss of dignity or pointedness. His *Reasons for the Christian Religion* is better than most work of its kind. His *Poor Man's Family Book* is a manual that continues to be worthy of its title. His *Saints' Everlasting Rest* will always command the grateful admiration of pious readers. It is also charged with a robust and manly eloquence and a rare and unsought felicity of language that make it a masterpiece of style. Perhaps no thinker has exerted so great an influence upon Nonconformity as Baxter has done, and that not in one direction only, but in every form of development, doctrinal, ecclesiastical and practical. He is the type of a distinct class of the Christian ministry—that class which aspires after scholarly training, prefers a broad to a sectarian theology, and adheres to rational methods of religious investigation and appeal. He hated fanaticism. Even Quakerism he could scarcely endure. Religion was with him all and in all—that by which all besides was measured, and to whose interests all else was subordinated. Isaac Barrow said that "his practical writings were never mended, and his controversial ones seldom confuted," and John Wilkins, bishop of Chester, asserted that "if he had lived in the primitive time he had been one of the fathers of the Church."

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BAXTER, ROBERT DUDLEY (1827–1875), English economist and statistician, was born at Doncaster. He joined his father's firm of Baxter & Co., solicitors, with which he was connected till his death. His principal economic writings were *The Budget and the Income Tax* (1860), *Railway Extension and its Results* (1866), *The National Income* (1868), *The Taxation of the United Kingdom* (1869), *National Debts of the World* (1871), and *Local Government and Taxation* (1874); and his purely political writings included *The Volunteer Movement* (1860), *The Redistribution of Seats and the Counties* (1866), *History of English Parties and Conservatism* (1870), and *The Political Progress of the Working Classes* (1871).

See *In Memoriam R. D. Baxter* (1878), by his widow. This book contains a good analysis of his elaborate works.

BAY, an architectural term for any division of a building, between vertical lines or planes, especially the entire space included between two adjacent supports; thus the space from pier to pier in a church, including that part of the vaulting or ceiling between them, is known as a bay.

A term also applied to a roofed structure projecting from a wall and one storey high, a bay window being such a structure. When a bay window is carried on brackets, or a corbel, it is called an *oriel*. Bay windows came into use during the late Gothic period. Although found throughout Europe, they are peculiarly characteristic of England. They usually occur at the end of the great hall of large Tudor and Jacobean manor houses and castles, reserved for the lord's dais, from which they open. Occasionally there is one on each side of the hall at each end of the dais. Befitting their position, they are often extremely rich, with fan vaults and window seats at the sill. They are also found in similar positions in the great halls of the English colleges.

During the Jacobean period their use was much increased and they are found on the fronts of houses wherever an accent was desired.

BAYAMO, an inland city on the rolling plains north of the Sierra Maestra in Oriente province, Cuba; population (1943 census), 16,161. The city, head of the *municipio* of the same name, is on the right bank of the Bayamo river in the centre of an important agricultural and cattle district, producing sugar cane of excellent quality, tobacco, dairy products and a variety of crops which are consumed locally. Bayamo is served by the Cuba Railroad company, with direct rail services to Manzanillo (33 mi.), Santiago de Cuba (80 mi.), and Martí (80 mi.). The Central highway passes through the city, and a third-class road leads west to the port city of Manzanillo. Improved transportation is encouraging the development of new industries, and important cheese, butter and evaporated milk factories are located in Bayamo.

Founded Nov. 5, 1513, Bayamo was the third settlement made in Cuba by the Spanish colonists under the leadership of Diego Velázquez. Since that time the city has suffered many physical and political catastrophes, the more important being the earthquakes of 1551, 1624 and 1766; the flood of 1616; the drought of 1729–30; and the Ten Years' War with Spain (1868–78). During the latter the city, a stronghold of the insurgents, was subjected to devastating attacks by the opposition. Bayamo was the birthplace and the home of Carlos Manuel de Céspedes (1819–74), "hero of Cuban independence," first president of the *República en Armas*, and father of ex-President Carlos Manuel de Céspedes Quesada. In honour of its historical significance as the centre of some of Cuba's greatest political events, Bayamo has been declared a national monument. (R. W. RD.)

BAYAMON, an interior town in Puerto Rico. The population of the town itself was 12,986 in 1930 and 14,596 in 1940. The population of the municipal district in 1940 was 37,190. The town is situated in a beautiful and fertile valley about 12 mi. from San Juan, the capital of Puerto Rico. It is one of the oldest towns in the island, having its origin in a small community known as Pueblo Viejo, founded in 1509 by Ponce de León. The municipal district claims the distinction of being the one in which the first city in Puerto Rico, originally known as "Villa de Caparra" was founded by the Spanish settlers. It was the capital of the island until 1521, when the present city of San Juan was made the seat of local government. The present town and municipality of Bayamon was founded in 1772.

Bayamon is the centre of one of the most productive fruit regions in Puerto Rico. Oranges, limes, lemons, bananas, grapefruit and pineapples are grown on well managed fruit farms, and canning is one of the principal industries. Sugar, tobacco and coffee are also produced in the municipality. The town is on the line of the American railroad, is connected also with San Juan by a trolley line, and motorbuses make frequent trips to and from the capital.

BAYARD, PIERRE TERRAIL, SEIGNEUR DE (1473–1524), French soldier, the descendant of a noble family, nearly every head of which for two centuries past had fallen in battle, was born at the château Bayard, Dauphiné (near Pontcharra, Isère), about 1473. In 1494 he accompanied Charles VIII. into Italy, and was knighted after the battle of Fornova (1495), where he had captured a standard. Shortly afterwards, entering Milan alone in ardent pursuit of the enemy, he was taken prisoner, but was set free without a ransom by Lodovico Sforza. In 1502 he was wounded at the assault of Canossa. Bayard was the hero of a celebrated combat of 13 French knights against an equal number of Germans, and his restless energy and valour were conspicuous throughout the Italian wars of this period. On one occasion it is

said that, single-handed, he made good the defense of the bridge of the Garigliano against about 200 Spaniards, an exploit that brought him such renown that Pope Julius II. sought to entice him into the papal service, but unsuccessfully. In 1508 he distinguished himself again, at the siege of Genoa by Louis XII., and early in 1509 the king made him captain of a company of horse and foot. At the siege of Padua he won further distinction, not only by his valour, but by his consummate skill. At Brescia in 1512 his valour in first mounting the rampart cost him a severe wound. Before his wound was completely healed, he hurried to join Gaston de Foix, under whom he served in the terrible battle of Ravenna (1512). In 1513, when Henry VIII. of England routed the French at the battle of the Spurs (Guinegate, where Bayard's father had received a lifelong injury in a battle of 1479), Bayard in trying to rally his countrymen found his escape cut off. Unwilling to surrender, he rode suddenly up to an English officer who was resting unarmed, and summoned him to yield; the knight complying, Bayard in turn gave himself up to his prisoner. The king released him without ransom, merely exacting his parole not to serve for six weeks. On the accession of Francis I. in 1515, Bayard was made lieutenant-general of Dauphiné; and after the victory of Marignan, to which his valour largely contributed, he had the honour of conferring knighthood on his youthful sovereign. When war again broke out between Francis I. and Charles V., Bayard, with 1,000 men, held Mézières, which had been declared untenable, against an army of 35,000 and after six weeks compelled the imperial generals to raise the siege. This stubborn resistance saved central France from invasion. All France rang with the achievement, and Francis gained time to collect the royal army which drove out the invaders (1521). After allaying a revolt at Genoa, and striving with the greatest assiduity to check a pestilence in Dauphiné, Bayard was sent, in 1523, into Italy with Admiral Bonnivet, who, being defeated at Robecco and wounded in a combat during his retreat, implored Bayard to assume the command and save the army. He repulsed the foremost pursuers, but in guarding the rear at the passage of the Sesia was mortally wounded by an arquebus ball (April 30, 1524). He died in the midst of the enemy. His body was restored to his friends and interred at Grenoble.

Chivalry, free of fantastic extravagance, is perfectly mirrored in the character of Bayard. As a soldier he was one of the most skilful commanders of the age. He obtained exact and complete information of the enemy's movements by careful reconnaissance and by a well-arranged system of espionage. In the midst of mercenary armies Bayard remained absolutely disinterested, and to his contemporaries and his successors he was, with his romantic heroism, piety and magnanimity, the fearless and faultless knight, *le chevalier sans peur et sans reproche*. His gaiety and kindness won him, even more frequently, another name bestowed by his contemporaries, *le bon chevalier*.

Contemporary lives of Bayard are the following:—*Le loyal serviteur* (? Jacques de Maille); *La très joyeuse, plaisante, et recreative histoire . . . des faiz, gestes, triumphes et prouesses du bon chevalier sans paour et sans reproche, le gentil seigneur de Bayart* (original edition printed at Paris, 1527; the modern editions are very numerous, those of M. J. Roman and of L. Larchey appeared in 1878 and 1882, and that of O. H. Trior in 1927); Symphorien Champier, *Les Gestes, ensemble la vie du preulx chevalier Bayard* (Lyons, 1525); Aymar du Rivail, *Histoire des Allobroges* (edition of de Terrebasse, 1844); see *Bayard* in *Répertoire des sources historiques*, by Ulysse Chevalier, and in particular A. de Terrebasse, *Hist. de Pierre Terrail, seigneur de Bayart* (1st ed., Paris, 1828; 5th ed., Vienna, 1870).

BAYARD, THOMAS FRANCIS (1828–1898), American diplomatist, was born in Wilmington, Del., on Oct. 29, 1828, of a distinguished family. His great-grandfather, Richard Bassett (1745–1815), governor of Delaware; his grandfather, James Asheton Bayard (1767–1815), a prominent Federalist, and one of the United States commissioners who negotiated the treaty of Ghent with Great Britain after the War of 1812; his uncle, Richard Henry Bayard (1796–1868); and his father, James Asheton Bayard (1799–1880), a well-known constitutional lawyer, all represented Delaware in the U.S. Senate. In 1848 he began the study of law in the office of his father, and was admitted to the bar in 1851 and practised chiefly in Wilmington. He was a U.S. senator from Delaware from 1869 to 1885. His abilities made him a leader of the Democrats in the Senate, and his views on financial and legal questions gave him a high reputation for statesmanship. He was a member of the electoral commission of 1877. In the Democratic national conventions of 1872, 1876, 1880 and 1884 he received votes for nomination as the party candidate for the presidency. He was secretary of State, 1885–1889, during the first administration of President Cleveland, and pursued a conservative policy in foreign affairs. As ambassador to Great Britain, 1893–97, he was considered by many Americans to have become too partial to English ways and for the expression of some criticisms regarded as unfavourable to his own countrymen, the House of Representatives went so far as to pass on Nov. 7, 1895, a vote of censure on him. The value of his diplomacy was, however, fully recognized in the United Kingdom, where he worthily upheld the traditions of a famous line of American ministers. He was the first representative of the United States in Great Britain to hold the diplomatic rank of an ambassador. He died in Dedham, Mass., on Sept. 28, 1898.

See Edward Spencer, *Public Life and Services of T. F. Bayard* (1880); George F. Parker, "Thomas Francis Bayard," in *Contemporary Review*, vol. lxxiv., p. 674–680 (1898).

His son THOMAS FRANCIS BAYARD (1868–1942), lawyer and politician, was born in Wilmington, Del., June 4, 1868. He graduated at Yale in 1890, studied law at the Yale law school, 1890–91, and in his father's office in Wilmington until his admission to the Delaware bar in 1893. From 1906 to 1916 he was chairman of the Democratic State committee, and from 1917 to 1919 was city solicitor, Wilmington. In 1922 he was elected to the U.S. Senate; he served until 1929. He was the sixth member of his family to attain that office, his great-great-grandfather, great-grandfather, great-uncle, grandfather and father each having been chosen U.S. senator. This remarkable senatorial record was probably unequalled by any other family in America. Bayard died July 12, 1942.

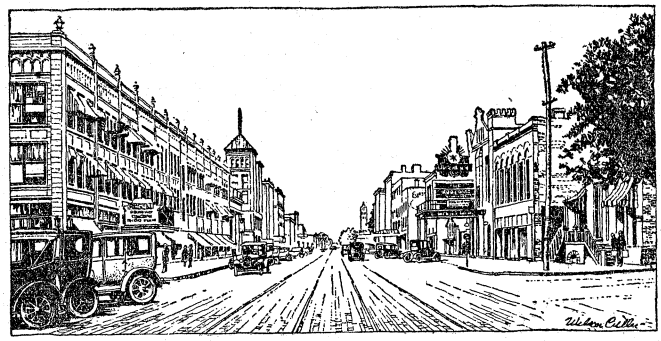
BAYAZID or AĞRI, a border fortress of Turkey, chief town of a vilayet of the same name, close to the frontiers of the U.S.S.R. and Iran, and looking across a marshy plain to the great cone of Ararat, at a general altitude of 6,000 feet. It occupies a site of great antiquity, as the cuneiform inscriptions on the neighbouring rocks testify; the town stands on the site of the old Armenian town of Pakovan. The great trade route from Trebizond by Erzerum into northwest Iran crosses the frontier at Kizil Dize a few miles to the south and does not enter the town. A knoll above the town is occupied by the half-ruined fort or palace of former governors, built for Mahmud Pasha by a Persian architect and considered one of the most beautiful buildings in Turkey. It contains two churches and a monastery, the Kasa Kilissa, famous for its antiquity and architectural grandeur. The cuneiform inscriptions are on the rock pinnacles above the town, with some rock chambers, indicating a town or fortress of the Vannic period. Pop. 20,467.

BAYBAY, a municipality of the province and island of Leyte, Philippine Islands, on the west coast at the mouth of the Pagbañganan river, 45 mi. S.S.W. of Tacloban, the provincial capital. Pop. (1939), 42,526, of whom 21,346 were males and 2 whites. The principal productions are abacá (Manila hemp), palay (rice), corn, copra and sugar. In 1939 the school population numbered 15,046, of whom 30·2% attended school. The vernacular is Cebu-Bisaya. The municipality has an administrative centre and 40 barrios (wards). The number of parcels of land declared for taxation in 1938 was 15,470. There were 11,177 owners, and the assessed valuation was 511,660 pesos. (C. S. L.)

BAY CITY, a city of Michigan, United States, 100 mi. N.N.W. of Detroit, built on both sides of the Saginaw river near its outfall into Saginaw bay (Lake Huron); a port of entry and the county seat of Bay county. It has 17 mi. of river frontage, and the channel has a uniform depth of 20 ft. It is served by the Michigan Central, the Grand Trunk, the Pere Marquette, the Detroit and Mackinac railways and by intercity buses; and has an airport. The population in 1940 was 47,956 by federal census; and in 1930 was 47,355 by federal census.

Bay City is in the midst of Michigan's coal fields, and of a fer-

tile region producing large quantities of sugar beet and diversified crops. It has extensive fisheries; a large produce commission business; large manufactures of beet sugar and chicory, cigars, automobile accessories, automobile parts, cranes, power shovels, steel ships, yachts, castings, transformers, welding machines, hosiery and knitted goods, pickles, cement, fabricated houses, veneer, maple flooring and other wood-working industries. The output of the 93 manufacturing establishments within the city limits in 1937



BY COURTESY OF BAY CITY CHAMBER OF COMMERCE

WASHINGTON AVENUE, THE MAIN BUSINESS STREET OF BAY CITY, MICH., BUILT BY THE LOCAL MANUFACTURING AND LUMBERING INTERESTS

was valued at $34,906,321. The assessed valuation of property in 1940 was $42,693,090. Bay City has a planning commission and a commission-manager form of government.

Fishermen and traders as early as 1837 made settlements here, called Lower Saginaw and Portsmouth. By 1859, when the village of Bay City was incorporated, a number of sawmills were in operation. Salt, discovered under the village in 1859, also became an important factor in its development. At the height of the lumbering industry it shipped more rough lumber than any other place in the country. Gradually industries developed which dressed and manufactured the lumber before shipping, and in recent years great quantities of timber have been imported from Canada and the Upper Peninsula. Coal was discovered in 1895. The city was incorporated in 1865, with a population of 3,359, which grew to 27,628 in 1900. In 1905 West Bay City, which had a population of 13,119 in 1900, was consolidated with it.

BAYEUX, town of France, capital of an arrondissement in the department of Calvados, 18 mi. N.W. of Caen. Pop. (1936) 7,244. It is situated on the Aure, five miles from the English Channel. Bayeux, the Augustodurum of the Romans, afterwards Civitas Baiocassium, had a bishopric from the late 4th century. Taken in 890 by the Scandinavian Rollo, it was soon after peopled by the Normans, one of whom, Duke Richard I., built about 960 a castle which survived till the 18th century. During quarrels between sons of William the Conqueror it was pillaged by Henry I. in 1106, and later it underwent siege and capture on several occasions during the Hundred Years' War and the religious wars of the 16th century. Till 1790 it was the capital of the Bessin, a district of lower Normandy. Its cathedral retains nave-arches and portions of the western towers from the Romanesque (12th century) church. The main structure is 13th century Gothic; the central tower is 15th century, with a modern top-storey. The church is one of the finest in Normandy, its crypt is 11th century, restored in the 15th century. The former bishops' palace (11th–14th centuries) is now the hôtel-de-ville, law courts, etc. Bayeux possesses many quaint timbered houses and stone mansions in its quiet streets. The museum contains the celebrated Bayeux tapestry. Lace-making and the manufacture of porcelain for domestic and laboratory purposes are carried on. The town is the seat of a bishop and of a sub-prefect; it has tribunals of first instance and of commerce, and an ecclesiastical seminary.

BAYEUX TAPESTRY, THE. This venerable relic consists of a band of linen, 231 ft. long and 20 in. wide, now light brown with age, on which have been worked with a needle, in worsteds of eight colours, scenes representing the conquest of England by the Normans. Of these scenes there are 72 beginning with Harold's visit to Bosham on his way to Normandy, and ending with the flight of the English from the battle of Hastings, though the actual end of the strip has perished. Along the top and the bottom run decorative borders with figures of animals, scenes from fables of Aesop and of Phaedrus, from husbandry and the chase, and occasionally from the story of the Conquest itself. Formerly known as the *Toile de St. Jean,* it was used on certain feast days to decorate the nave of Bayeux cathedral. Narrowly escaping the perils of the Revolution, it was exhibited in Paris, by Napoleon's desire, in 1803–04, and has since been in civil custody at Bayeux, where it is now exhibited under glass.

"The noblest monument in the world relating to our old English history," as William Stukeley described it in 1746, it has been repeatedly described, discussed and reproduced, both in France and in England since 1730. The best coloured reproduction is that by C. A. Stothard in 1818, published in the sixth volume of *Vetusta Monumenta;* but in 1871–72 the "tapestry" was photographed for the English education authorities by E. Dossetter.

Local tradition assigned the work to the Conqueror's wife. F. Pluquet, in his *Essai historique sur la ville de Bayeux* (Caen, 1829), was the first to reject this belief, and to connect it with the Conqueror's half-brother Odo, bishop of Bayeux, and this view, which is now accepted, is confirmed by the fact that three of the bishop's followers mentioned in Domesday Book are among the very few named figures on the tapestry. That Odo had it executed for his cathedral seems tolerably certain, but whether it was worked by English fingers or not has been disputed, though some of the words upon it have been held to favour that view. Freeman emphatically pronounced it to be "a contemporary work," and historically "a primary authority . . . in fact the highest authority on the Norman side." As some of its evidence is unique, the question of its authority is important, and Freeman's conclusions have been practically confirmed by subsequent discussion. In 1902 M. Marignan questioned, on archaeological grounds, the date assigned to the tapestry, as the Abbé de la Rue had questioned it 90 years before; but his arguments were refuted by Gaston Paris and M. Lanore, and the authority of the tapestry was vindicated.

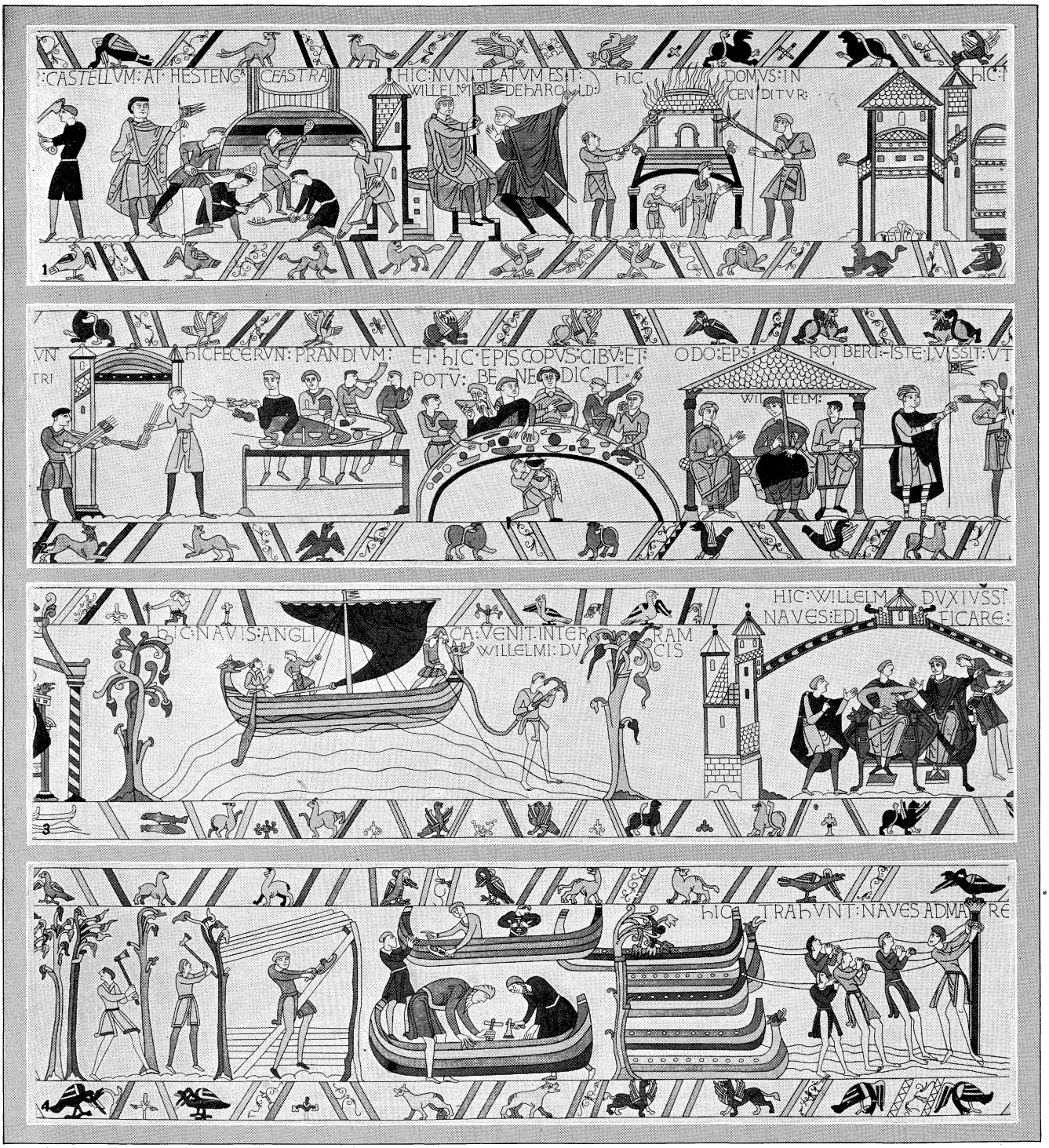
See E. A. Freeman, *Norman Conquest,* Vol. iii. (ed. 1875), with summary of the discussion to date; *Archaeologia,* Vols. xvii.–xix.; Dawson Turner, *Tour in Normandy* (1820); *Gentleman's Magazine* (1837); Bolton Corney, *Researches and Conjectures on the Bayeux Tapestry* (1836–38); A. de Caumont, "Un mot sur . . . la tapisserie de Bayeux," in *Bulletin monumental de l'institut des provinces,* Vol. viii. (1841); J. Laffetay, *Notice historique et descriptive sur la tapisserie . . .* (1874); J. Comte, *Tapisserie de Bayeux;* F. R. Fowke, *The Bayeux Tapestry* (ed. 1898); Marignan, *Tapisserie de Bayeux* (1902); G. Paris, "Tapisserie de Bayeux," in *Romania,* Vol. xxxi.; Lanore, "La Tapisserie de Bayeux," in *Bibliothèque de l'école des chartes,* Vol. lxiv. (1903); and J. H. Round, "The Bayeux Tapestry," in *Monthly Review,* xvii. (1904). (J. H. R.)

BAYEZID I. (1347–1403), Ottoman sultan, surnamed YILDERIM or "LIGHTNING," from the great rapidity of his movements, succeeded his father, Murad I., on the latter's assassination on the field of Kossovo, 1389, and signalized his accession by ordering at once the execution of his brother Yakub, who had distinguished himself in the battle. He was the first Ottoman sovereign to be styled "sultan." After routing the chivalry of Christendom at the battle of Nikopoli in 1396, he attacked Greece, and Constantinople would doubtless have fallen before his attack had not the emperor Manuel Palaeologus bought him off by timely concessions, which reduced him practically to the position of Bayezid's vassal. He met with an overpowering check at the hands of Timur (Tamerlane). Utterly defeated at Angora by the Mongol invader, Bayezid became his prisoner and died in captivity some months later.

Bayezid married Devlet Shah Khatun, a daughter of the prince of Kermian, who brought him in dowry Kutaiah and its dependencies.

BAYEZID II. (1447–1512), sultan of Turkey, was the son of Mohammed II., whom he succeeded in 1481. Before he could establish himself on the throne a long struggle ensued with his brother Prince Jem and he succeeded only after pacifying the janissaries with a large *placebo.* Being routed, Jem fled for

BAYEUX TAPESTRY

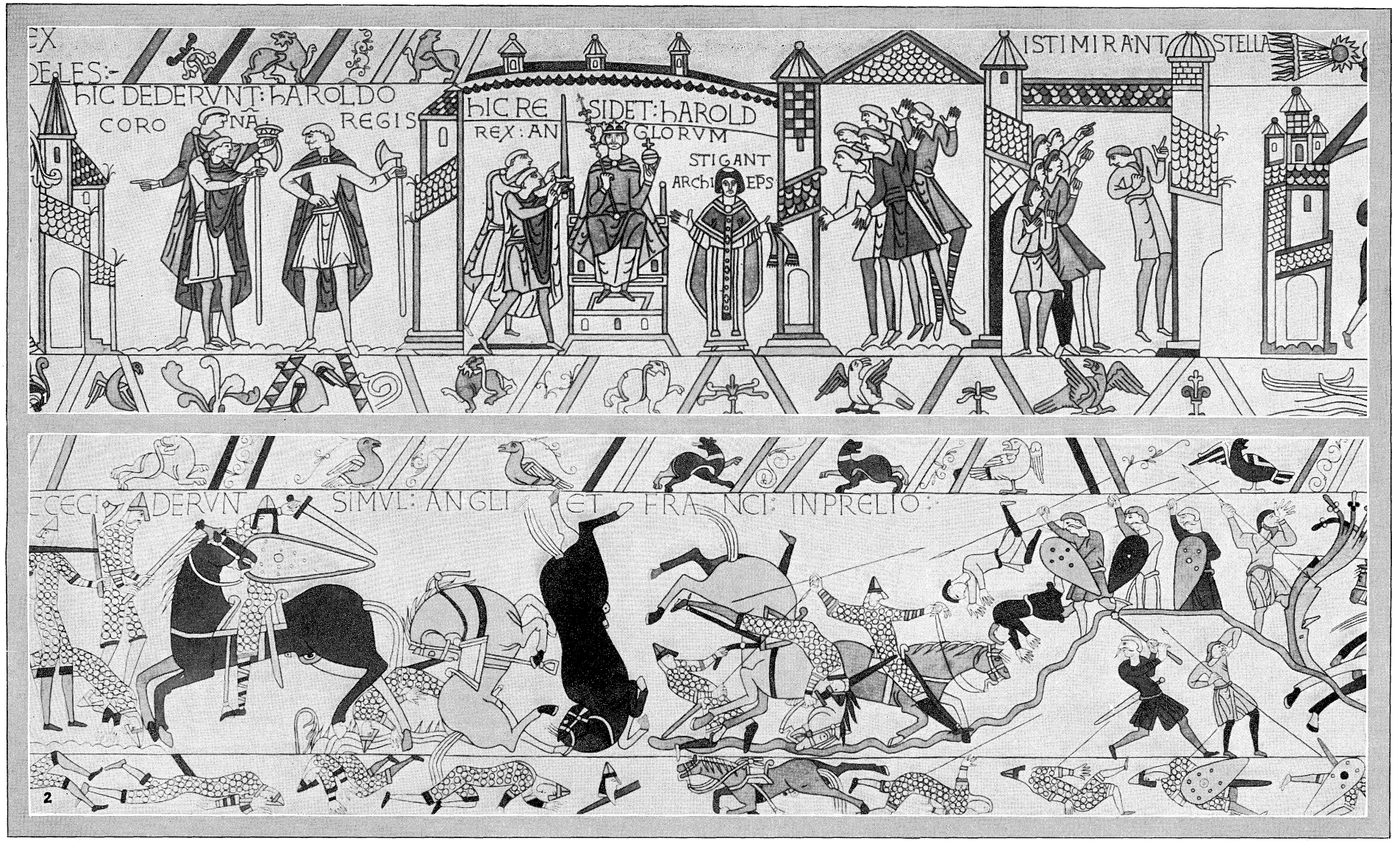


FROM "VETUSTA MONUMENTA" BY COURTESY OF THE SOCIETY OF ANTIQUARIES, LONDON

PANELS FROM THE BAYEUX TAPESTRY

The Bayeux Tapestry, now in the museum at Bayeux, Normandy, was originally composed of 76 panels, of which 72 still exist; 12 are shown in this and the following plates. The tapestry, which is 230 feet long and 20 inches wide, is embroidered in coloured wools on a background of coarse linen. It is believed to have been made at the request of Bishop Odo, a half-brother of William of Normandy, for the cathedral at Bayeux. The panels set forth in great detail the history of the Norman Conquest and form an unequalled record of the customs of the time. From the point of view of design the Bayeux Tapestry holds a place of unique importance in mediaeval art

1. From panels 52 and 53. At the left, building of earthworks for William's camp at Hastings. Centre, a messenger brings to William at Hastings news of Harold. At the right a woman and child escape from a house to which soldiers are setting fire
2. From panels 50 and 51. The serving of a meal, and, in the centre, the bishop blessing the meal at table. At the right William is seen between his two half-brothers, Bishop Odo and Robert of Mortain
3. From panels 35 and 36. An English ship coming to Normandy. At the right Duke William orders the building of a fleet
4. From panels 37, 38 and 39. Details of ship-building. Cutting and planing timber, building the hulls, and launching by means of reeves and blocks



FROM "VETUSTA MONUMENTA," BY COURTESY OF THE SOCIETY OF ANTIQUARIES, LONDON

FURTHER PANELS FROM THE BAYEUX TAPESTRY

1. From panels 33 and 34. Harold is offered the crown, and in the centre is shown crowned; the Archbishop Stigand (Stigant) is at his left. In the right hand panel is shown the appearance of a comet (now known to have been Halley's comet) which appeared at that time and was regarded as an omen of evil

2. From panels 67 and 68. The battle of Hastings, the English defending the ridge against the French. The movement, line and balance of the masses of light and shade make these panels one of the best illustrations of the sense of rhythm and composition found in the Bayeux Tapestry

refuge to the Knights of St. John at Rhodes, who, in spite of a safe-conduct granted to him, accepted a pension from Bayezid as the price for keeping him a close prisoner (*see* AUBUSSON, PIERRE D').

By common consent Prince Jem was ultimately entrusted to Pope Innocent VIII., who used him not only to extract an annual tribute from the sultan, but to prevent the execution of Bayezid's ambitious designs in the Mediterranean. The prince, who had lived on excellent terms with Alexander VI., died at Naples in Feb. 1495, possibly as the result of excesses in which he had been deliberately encouraged by the pope.

Bayezid showed little of the aggressive spirit of his warlike predecessors; and Machiavelli said that another such sultan would cause Turkey to cease being a menace to Europe. He abandoned the attack on Rhodes at the first check, made concessions for the sake of peace to Venice, and reduced the tribute due from Ragusa. His wars were of the nature of raids on the Dalmatian coast and into Croatia, Hungary, Moldavia and Poland. The threat of the growing power of Venice, which had acquired Cyprus in 1489, at last roused him to a more serious effort; and in 1499 the war broke out with the republic, which ended in 1502 by the annexation to Turkey of Lepanto and Modon, Coron and Navarino in the Morea. Bayezid himself conducted the siege of Modon in 1500.

The comparative inactivity of Bayezid as regards Europe was partly due to preoccupation elsewhere. In the south he was threatened by the dangerous rivalry of Sayf ad-Din, the Mameluke sultan of Egypt, who had extended his power northwards as far as Tarsus and Adana. In 1488, the Mamelukes gained a great victory over the Ottomans, but in 1491 a peace was made which was not again broken till after Bayezid's death. From Persia too, where the decisive battle of Shurur (1502) had raised Ismail to power, danger threatened the sultan, and the latter years of his reign were troubled by the spread, under the influence of the new Persian power, of the Shi'ite doctrine in Kurdistan and Asia Minor. The forces destined to maintain his authority in Asia had been entrusted by Bayezid to his three sons, Ahmed, Corcud and Selim; and the sultan's declining years were embittered by their revolts and rivalry. Soon after the great earthquake of 1509, which laid Constantinople in ruins, Selim, the ungovernable pasha of Trebizond, appeared before Adrianople, where Bayezid had sought refuge. The sultan had designated Ahmed as his successor, but Selim, though temporarily defeated, succeeded in winning over the janissaries, and Bayezid abdicated. He was responsible for the erection of several very fine mosques. That specially known by his name was built in 1505 at Constantinople and is still standing.

See J. B. Bury in the *Cambridge Modern History,* vol. i. chap. iii. and bibliography p. 700.

BAY ISLANDS, a group of small islands in the Caribbean sea off the north coast of Honduras, now a part of the national territory of Honduras but for a time (1852–59) under the British flag. Pop. (1940) 7,025, of whom 755 live in the town of Roatán or Coxen Hole, which is the capital of the department of Islas de la Bahía. Area, 144 sq.mi. The chief industries are agricultural, bananas and pineapples being shipped to New Orleans and large quantities of coco-nuts being grown for the preparation of copra. There is still some lumber-cutting, and wild game, including peccaries and deer, abound. The largest of the islands is Roatán, 30 mi. long by 9 mi. wide, the next in size being Guanaja (or Bonacca), 9 mi. long by 5 mi. broad. The other islands in the archipelago are Utila, Barbareta, Santa Elena and Morat. The Puercos or Hog Islands, a part of the group, include several small islands, and there are a number of cays or islets. The soil is fertile, the forests luxuriant and the highest point in the archipelago is about 900 ft. above the sea, in the hills of Roatán. The island of Guanaja was discovered by Columbus in 1502 and the islands were populated in the 17th century by British and the "Carib Indians" brought from the mainland by the British to cut logs. The census of 1940 shows 109 Indians in the department of Islas de la Bahía; slightly more than one-half of the total population is Negro. The inhabitants erected forts in Roatán in 1742, and the islands were formally annexed to Great Britain in 1852, to be ceded to Honduras seven years later.

BAYLE, PIERRE (1647–1706), French philosopher and man of letters, was born on Nov. 18, 1647, at le Carla-le-Comte, near Pamiers (Ariège), the son of a Calvinist minister. He entered the Jesuit college at Toulouse. He adopted the Roman Catholic faith (1669), but reverted to Calvinism, and in order to avoid persecution, fled to Geneva, where he became acquainted with Cartesianism. Returning to France, he acted as tutor for some time, and was then appointed (1675) to the chair of philosophy at the Protestant university of Sedan. On its suppression in 1681, he became professor of philosophy and history at Rotterdam where, in 1682, he published his *Pensées diverses sur la comète de 1680* and his critique of Maimbourg's history of Calvinism. Two years later he began to publish the famous journal, *Nouvelles de la république des lettres,* which was the first thorough-going attempt to popularize literature. He was deprived of his chair in 1693, in consequence of the attribution to him of the tract *Avis important aux refugiés.* He now gave his whole attention to his *Dictionnaire historique et critique,* a work displaying a universal curiosity and considerable erudition, which had great influence on the French *philosophes* of the 18th century, especially on Voltaire. Bayle's dictionary was the source from which the French encyclopaedists drew many of their arguments, and the plan outlined by Diderot for the *Encyclopédie* itself was based on the method of Bayle's book. "Articles dealing with respectable prejudices" wrote Diderot, "must expound them deferentially; the edifice of clay must be shattered by referring the reader to the other articles in which the opposite truths are established on sound principles. This method of enlightening the reader has an immediate influence on those who are quick of apprehension, an indirect and latent influence on all." This is really the principle on which Bayle acted in his criticism of popular beliefs. He was a sceptic, strongly objecting to Spinoza's monism and inclined to manicheism. He regarded the realms of faith and reason as mutually exclusive. He taught that the history of civilization was the history of man's effort to overcome his own nature, but he was nevertheless politically timid and conservative. His writings paved the way for revolution, but he was no revolutionary himself. On one point only was he frankly an advocate of a complete change of front. Three years before Locke wrote his *Letters on Toleration* Bayle published his *Commentaire philosophique sur le Compelle Entrare,* in which he argued that freedom of thought was a natural right, and that even an atheist was not necessarily a bad citizen.

Bayle died in exile at Rotterdam on Dec. 28, 1706. Two centuries later, a statue in his honour was erected in his native place, "la réparation d'un long oubli."

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BAY LEAF, the leaf of the sweet bay tree, a species of laurel (*Laurus nobilis*) which grows in Mediterranean countries. The dried leaves are used as a condiment for flavouring many fish and meat dishes. The peculiar flavour of bay leaves is especially prized for seasoning thin soups and broths. An extract from the leaves is used by barbers.

BAYLEY, WILLIAM SHIRLEY (1861–1943), U.S. geologist, was born in Baltimore, Md., on Nov. 10, 1861. He studied at Johns Hopkins university and received his Ph.D. there in 1886. He taught at Colby college and Lehigh university, and in 1906 joined the faculty of the University of Illinois where in 1928 he became head of the geology department. He was a member of the U.S. geological survey from 1887 to 1931. He retired in 1932, and died Feb. 14, 1943.

Among his works are: *Minerals and Rocks* (1915); *Descriptive Mineralogy* (1916); *Guide to Non-Metallic Products* (1930).

BAYLISS, SIR WILLIAM MADDOCK (1860–1924), English physiologist, only son of Moses Bayliss, iron manufacturer, was born at Wolverhampton, 1860. In 1881 he entered University college, London, as a medical student, but preferring the pursuit of science to the practice of medicine, in 1885 he went to Oxford and continued to study physiology under his former teacher, Burdon Sanderson. In 1888 he returned to London and worked in the physiological laboratories of University college, where he carried on his researches for 35 years. Freed by circumstances from the necessity of earning a livelihood he was able to devote himself entirely to scientific discovery.

Bayliss was one of the most distinguished physiologists of his generation. His researches covered a wide range and resulted in valuable discoveries, the more important being those on the electromotive phenomena associated with the heart's action, the nervous mechanisms controlling the activities of the viscera and of the circulation to the various parts of the body, the application of recently acquired knowledge of surface phenomena to physiology and the discovery, in conjunction with Starling, of "secretin," the hormone which excites the pancreas to secrete its digestive juice when food is passing into the duodenum. During the World War he experimentally investigated the nature of wound-shock and devised methods for treatment which were widely and successfully used and saved many lives. Bayliss' original contributions to science appeared in the scientific journals devoted to physiology and biochemistry between the years 1890–1924. His *Principles of General Physiology,* published in 1914, had a world-wide influence and was regarded as the best exposition of the foundations of modern physiology. Bayliss' pre-eminence as a discoverer was suitably recognized by learned societies at home and abroad. In 1919 he received from the Royal Society the Copley Medal, the highest honour for philosophical researches, last given to a physiologist in 1739. He was knighted in 1922.

BAYLO, in diplomacy, the title borne by the Venetian representative at Constantinople. His functions were originally in the nature of those of a consul-general, but from the 16th century onwards he had also the rank and functions of a diplomatic agent of the first class. (*See* DIPLOMACY.)

BAYLY, THOMAS HAYNES (1797–1839), English popular song-writer and dramatist, was born at Bath on Oct. 13, 1797. He was educated at Winchester and at St. Mary Hall, Oxford. In 1824 he became famous with the popular song "I'd be a butterfly," which he followed up with "We met—'twas in a crowd," "She wore a wreath of roses," "Oh, no, we never mention her," and other ditties. He set some of his songs to music himself; a well-known example is "Gaily the troubadour." Bayly also wrote two novels, *The Aylmers* and *A Legend of Killarney,* and numerous plays. His most successful dramatic piece was *Perfection,* which was produced by Madame Vestris and received high praise from Lord Chesterfield. Bayly died on April 22, 1839. His *Collected Works* (1844) contain a memoir by his wife.

BAYNE, PETER (1830–1896), Scottish journalist and author, was born at Fodderty, Ross-shire, and educated at Marischal college, Aberdeen, and afterwards at Edinburgh university. His works include *The Christian Life, Social and Individual* (1855); *Essays, Bibliographical and Critical* (1859); *Life of Hugh Miller* (1871); *Martin Luther, his Life and Work* (1887); *The Free Church of Scotland . . .* (2nd ed. 1894).

BAYNES, THOMAS SPENCER (1823–1887), English editor and man of letters, the son of a Baptist minister, was born at Wellington, Somerset. At Edinburgh university he was a pupil of Sir William Hamilton, whose assistant he became, and of whose views on logic he became the authorized exponent. This teaching was embodied in his *Essay on the New Analytic of Logical Forms* (1850), which was followed in the next year by a translation of Arnauld's *Port Royal Logic.* He became editor (1850) of the *Edinburgh Guardian,* then (1858) assistant editor of the *Daily News,* and in 1864 professor of logic at St. Andrews. He took over the editorship of the 9th edition of the *Encyclopædia Britannica* in 1873, but in 1881 his health rendered it necessary to give him a coadjutor in the person of Prof. W. Robertson Smith. Baynes worked on the book until his death shortly before its completion. *See* a memoir by Prof. Lewis Campbell prefixed to his *Shakespeare Studies and Other Essays* (1894).

BAYONET, a short thrusting weapon, fixed to the muzzle or fore-end of a rifle or musket and carried by troops armed with the latter weapons. The origin of the word is disputed, but there is some authority for the supposition that the name is derived from the town of Bayonne, where the short dagger called *bayonnette* was first made towards the end of the 15th century. The elder Puységur, a native of Bayonne, says (in his memoirs, published posthumously in Paris, 1747) that when he was commanding the troops at Ypres in 1647 his musketeers used bayonets consisting of a steel dagger fixed in a wooden haft, which fitted into the muzzle of the musket—in fact plug-bayonets. It has been established from the evidence in courts-martial held on some English soldiers—not pikemen—at Tangier in 1663–64, for using their "daggers" on their comrades, that the troops in Tangier used, and that these "daggers" were, plug-bayonets. In 1671 plug-bayonets were issued to the French regiment of fusiliers then raised. They were issued to part of an English dragoon regiment in 1672, although withdrawn in 1674, and to the Royal Fusiliers when raised in 1685. The Foot Guards were armed with them in 1686. The danger incurred by the use of this bayonet (which put a stop to all fire) was felt so early that the younger Puységur saw a ring-bayonet in 1678 which could be fixed without stopping the fire. The English defeat at Killiecrankie in 1689 was due (among other things) to the use of the plug-bayonet; and shortly afterwards the defeated leader, Gen. Mackay, introduced a ring-bayonet of his own invention. A trial with badly fitting socket or zig-zag bayonets was made after the battle of Fleurus, 1690, in the presence of Louis XIV., who refused to adopt them. Shortly after the peace of Ryswick (1697) the English and Germans abolished the pike and introduced these bayonets, and plates of them are given in Surirey de St. Remy's *Mémoires d'Artillerie,* published in Paris in that year; but owing to a military cabal they were not issued to the French infantry until 1703. Henceforward the bayonet became, with the musket or other firearm, the typical weapon of infantry. This bayonet remained in the British service until 1805, when Sir John Moore introduced a bayonet fastened to the musket by a spring clip. The triangular bayonet (so called from the cross-section of its blade) was used in the British army until the introduction of the magazine rifle, when it was replaced by the sword-bayonet or dagger-bayonet. Sword-bayonets—weapons which could be used as sword or dagger apart from the rifle—had long been in use by special troops such as engineers and rifles, and many ingenious attempts have been made to produce a bayonet fitted for several uses. A long curved sword-bayonet with a saw-edged back was formerly used by the Royal Engineers, but all troops came to be supplied with the plain sword-bayonet, which was used during the World War.

Racial psychology plays its part in the choice of design. The British race prefers a club to deal with troublesome neighbors, whereas the Latin races "knife" each other. The effect of these inherent characteristics is reflected in the type of bayonet used. The lessons of the World War indicate that some kind of bayonet may still be necessary in order to frighten one's enemy and to give oneself confidence in close fighting, but the occasions when it will be actually driven home will probably be rare. For this reason the new British (1928) pattern is nothing more than a spike, the blade, cruciform in section, being only 8in. long and no thicker than a lead pencil. Handiness with the rifle is aimed at, a feature easier to attain with a short than with a long bayonet. Its powers of penetration are, however, very great and the length is adequate to deal with an enemy in winter clothing. The U.S.A. pattern is that of 1905, 16in. long; the front edge is sharpened throughout its length and the back edge 5in. from the point. The French army has replaced its long cross-section sword-bayonet for a shorter one of $15\frac{3}{4}$in. blade, which indicates that its utility in war is not considered so great as before the World War. The German pattern is the same as before the World War; viz., sword-bayonet, 37·9cm. in length and 1 lb. 4 oz. in weight. (X.)

In 1940 most European and the Japanese armies used the knife or sword-bayonet, generally similar to the U.S.A. model of 1905

described above, with varying blade lengths between 10 and 20 inches. There is no strict point of demarcation between a long knife and a short sword-bayonet. Italian, Dutch and Swiss infantry, however, use dagger-type bayonets. Efforts to combine the bayonet with some tool or weapon other than a knife, dagger or sword have not been successful. Saw-backed blades for engineer detachments, pointed trowels for trenching, and bolo blades for jungle knives in the Philippines have all been tried and discarded, as when combined for use as a bayonet they were neither effective as a tool or weapon. In all cases they were cumbersome and made the musket muzzle-heavy for either firing or bayonet practice. In the latter part of the 19th century the U.S. Army tried out a combination bayonet and steel ramrod, but it proved too fragile for use in the field.

The bayonet is rapidly losing its value as a weapon and has probably been developed to the extent that future improvement is not likely. (H. N. P.)

BAYONNE, town of France, capital of an arrondissement in the department of Basses-Pyrénées, 66 mi. W.N.W. of Pau on the Southern railway. Pop. (1936) 28,037. A first-class fortified place, it is situated at the confluence of Adour and Nive, about 3½ mi. from the sea. In the 3rd century Bayonne (*Lapurdum*) was a Roman military post and the principal port of Novempopulana. The name survives in the title Pays de Labourd, *i.e.*, the see of Bayonne. The present name of the town, probably Basque in origin, appears first in the 12th century. In the early middle ages it belonged to the dukes of Aquitaine, but passed to the kings of England in 1154. It received communal rights in 1216. In 1451 it strenuously opposed the French, who eventually occupied it. Its maritime commerce had suffered owing to silting and deflection of the Adour. New fortifications were constructed under Louis XII and Francis I, and in 1523 the town held out against a Spanish army. Its position near the Spanish frontier led to its choice for diplomatic interviews, as in 1572 and 1808. In 1814, after a severe siege, Bayonne was occupied by the English (*see* PENINSULAR WAR). The two rivers divide the town into three nearly equal parts. Grand Bayonne, with its old arcaded streets, lies on the left bank of the Nive; Petit Bayonne lies between the right bank of the Nive and the Adour; the new town (Faubourg St. Esprit), with the railway station, occupies the right bank of the Adour. To the northwest of the town are the Allées Marines, bordering the Adour, and the Allées Paulmy, skirting the fortifications. The Gothic cathedral of Ste. Marie in Grand Bayonne, 13th–15th centuries, consists of a choir with deambulatory and apsidal chapels (the oldest part), a transept, nave and aisles. The west towers were completed only in the 19th century when the two conspicuous spires were added. Ste. Marie contains glass windows of the 15th and 16th centuries and other rich decoration. The 13th-century cloister is over-restored but still beautiful. The Château-Vieux nearby (12th–15th centuries) is built on Roman fortifications. The Château Neuf (15th and 16th centuries) serves as barracks and prison. The commerce of Bayonne is much more important than its industries (leather and chocolate). The port consists of an outer harbour, the *rade* (roadstead) and the port proper, and occupies the course of the Adour from its mouth, which is obstructed by a shifting bar, to the Pont St. Esprit, and the course of the Nive as far as the Pont Mayou. Above these bridges there is only river navigation. Vessels drawing from 18 to 25 ft. can make the port, which, however, is tidal. Exports include wine and brandy, linen and silk materials, hams, salt, flour, mine-props, resinous material from the Pyrenees and Landes, and zinc ore. Imports: coal and Spanish minerals supplying the large metallurgical works of Le Boucau at the river mouth, the raw material necessary for the chemical works of the same town, cement, phosphates, wine and the cereals for flour mills at Pau, Peyrehorade and Orthez. The port's tonnage increased greatly after 1900. Bayonne is the seat of a bishopric and of a sub-prefect; it has tribunals of first instance and of commerce, a chamber of commerce, and an art museum with a collection of works of the painter Léon Bonnat. There are ordinarily several consulates, since Bayonne is virtually a port.

BAYONNE, a city of Hudson county, N.J., U.S.A., occupying the long, narrow peninsula (4.4 sq.mi.) between New York and Newark bays, immediately south of Jersey City, and separated from Staten island by the narrow Kill van Kull. It is on the main line of the Central Railroad of New Jersey, and through belt lines is connected (for freight) with the other trunk lines which have their tidewater termini on the western shore of the Hudson river. Nine miles of waterfront offer great potential docking facilities. In 1941 the United States navy was constructing a super-drydock and naval base on the eastern waterfront. In 1927 legislative appropriations were made for the construction by the Port of New York Authority of a vehicular bridge to Staten island, as the final link in a comprehensive highway system. This bridge, the Bayonne bridge, was completed in 1931. The population was 79,198 in 1940 (federal census).

Bayonne is one of the leading centres of the world for the refining of petroleum and the manufacture of its by-products. Its 92 manufacturing establishments employed 8,976 wage earners, maintained pay rolls of $13,308,937 and spent $109,197,440 for materials, fuel and similar operating costs in 1937. Electric cable, insulated copper wire and submarine cable, boilers and steel barrels are other important products. During the war of 1914–18 Bayonne supplied boilers to a total of 1,845,000 h.p.; naval guns for hundreds of ships; 11,000 miles of wire and cable; 723 finished submarine chasers; 7,000 tons of steel castings and 8,000 tons of iron and steel rivets; also refined nickel to meet the needs of several armies and navies, and 25,000,000 bbl. of gasoline, kerosene, fuel and gas oil. After the large national defence program was initiated in 1940, Bayonne began building mosquito torpedo boats and motor submarine chasers. The assessed valuation of property in the city in 1939 was $138,559,919.

Bayonne was settled by the Dutch about 1665–70; was separated from Bergen as a township in 1861, was chartered as a city in 1869. In 1915 a commission form of government was adopted.

BAYOU (bī'o͞o), a marshy offshoot of a river. The term is used chiefly in the southern United States for an "ox-bow" lake left behind by a river that has abandoned its old channel in the lower stages of its course. Good examples are found in the lower Mississippi valley. In the lower reaches of a river where the country is more or less level, and the current slow, a river usually swings from side to side of its valley line in a series of curves, and in flood times there is a tendency for the water to impinge more strongly upon the concave bank. This bank will be eaten away, and the process will be repeated until finally it is cut through, leaving a loop or ox-bow lake filled with dead water, while the stream runs directly past it.

BAYREUTH, a town in the district of Upper Franconia, Bavaria, Germany, 58 mi. by rail N.E. of Nürnberg. Pop. (1939) 44,998. Bayreuth was formerly the capital of an independent principality, annexed in 1791 to the kingdom of Prussia. In 1807 it was ceded to France; and in 1810 transferred to Bavaria. In Richard-Wagner-strasse is Wagner's house, with his grave in the garden. Franz Liszt (1811–1886) is buried here, as well as Jean Paul Friedrich Richter. Most of the buildings are comparatively modern, the city having suffered severely from the Hussites in 1430 and from fire in 1621. The *Stadt-Pfarrkirche* (1439) contains the monuments of the margraves of Bayreuth. The town has an active trade, chiefly in grain and horses. It manufactures woollen, linen and cotton goods, delft and other earthenware. The village of St. Georgen is a suburb to the north-east noted for its marble works.

The Wagner Theatre.—In spite of Wagner's intimacy with King Ludwig II. of Bavaria, the first plan of building a new theatre for the performance of Wagner's operas in Munich was rejected, because Wagner himself disliked the distractions of a large capital. Bayreuth possessed the desired seclusion, and the municipality furthered the scheme. In May 1872, the foundation stone of the Festspielhaus was laid, the event being commemorated by a notable performance of Beethoven's Choral Symphony in the old opera-house. The bulk of the sum for the erection of the theatre was raised by founding "Wagner Societies" from St. Petersburg (Leningrad) to Cairo, from London to New York;

and the theatre was opened in 1876 with the first complete performance of *Der Ring des Nibelungen*. The theatre, standing about a mile above the town, is built from plans of Gustav Semper, based on Wagner's ideas.

The second festival (1882) saw the performance of *Parsifal* under Hermann Levi and Franz Fischer. At later festivals, held about every second year, three works were usually given, *Parsifal* (which, until copyright expired, could be heard only here) being almost invariably one, but in 1896 the *Ring* was given alone. Frau Cosima Wagner and her son Siegfried directed the festivals, but were criticized for too rigid adherence to established traditions. There was a festival in 1914, but thereafter the first was in 1924. After 1930 Adolf Hitler and his satellites frequently attended the festivals.

BAY RUM, a fragrant liquid cosmetic widely used by hairdressers. It is composed of oil of bay, called also oil of myrcia, to which has been added alcohol, water, oil of orange peel and oil of pimenta. Bay rum is one of the chief articles exported from the Virgin islands. (*See* BAY-RUM TREE; ALLSPICE.)

BAY-RUM TREE, a small aromatic tree (*Pimenta racemosa*) of the myrtle family (Myrtaceae), native to the West Indies and closely related to the allspice and the clove. From the leathery leaves, sometimes 5 in. long, is distilled bay oil used in making bay rum (*q.v.*). In Jamaica the tree is called bayberry.

BAZA, a town of southern Spain, in the province of Granada. Pop. (1940) 14,330 (mun., 20,772). The town overlooks a fertile vega belonging to the Hoya de Baza, one of the largest of the structural basins of upper Andalusia. The ancient collegiate church of San Maximo occupies the traditional site of a cathedral founded by the Visigothic king Reccared about 600, and afterwards converted into a mosque. There is a brisk local trade in farm produce, and in the linen, hempen goods and pottery manufactured in Baza. Sulphurous springs exist in the vicinity.

Baza, the Roman *Basti,* was made a bishopric prior to the Council of Elvira, held in 302, at which the attendance of its bishop is recorded. The *Batza* of the Muslim period, it became one of the three leading cities of the kingdom of Granada. Its siege by the Catholic Sovereigns in 1489 was accordingly critical for the continuance of the Muslim power in Spain; the Grand Turk intervened, and both siege and defence were maintained by the sale of the jewels of the ladies on the respective sides. The siege ended with the fall of the city on Dec. 4, 1489.

BAZAAR, a permanent market or street of shops, or a group of short narrow streets of stalls under one roof (Pers. *bazar,* market). The word has spread westward into Arabic, Turkish and European languages, and eastward it has invaded India, where it has been generally adopted. In southern India and Ceylon bazaar means a single shop or stall. The Malayan peoples have adopted the word as *pazar*. The meaning of the word has been much extended in English, where it is now equivalent to any sale, for charitable or mere commercial purposes, of mixed goods and fancy work.

BAZAINE, ACHILLE FRANÇOIS (1811–1888), marshal of France, was born at Versailles on Feb. 13, 1811. He entered the army as a private soldier in 1831, with a view to service in Algeria, and received a commission in 1833. He served with great distinction in Algeria, in the Crimean war, in Lombardy (1859) and in Mexico (1862–67). He was promoted marshal in 1864, and skilfully conducted the retreat of the French troops from Mexico City and their embarkation at Vera Cruz in 1867.

At the outbreak of the Franco-German War (*q.v.*) Marshal Bazaine was placed in command of the III. corps of the Army of the Rhine. How far his inaction was the cause of the disaster of Spicheren is a matter of dispute. Bazaine, indeed, when called upon for help by Frossard, who was in command of the army corps posted at Spicheren, moved part of his corps forward, but only to "take up strong positions," not to strike a blow on the battlefield. A few days later he took up the chief command, and his tenure of it is the central act in the tragedy of 1870. He found the army in retreat, ill-equipped and numerically at a great disadvantage, and the generals and staffs discouraged and distrustful of one another. The question was one of extricating the army and the government from a disastrous adventure, and Bazaine's solution of it was to bring back his army to Metz. For the events which led up to the battles before Metz and the investment of Bazaine's whole army in the fortress, *see* FRANCO-GERMAN WAR and METZ: *Battles*.

It seems clearly established that the charges of treason to which later events gave so strong a colour had, as yet, no foundation in fact. The resolution to stay in the neighbourhood of Metz was based on the knowledge that if the slow-moving French army ventured far out it would infallibly be headed off and brought to battle in the open by superior numbers. In "strong positions" close to his stronghold, however, Bazaine hoped to inflict damaging repulses and heavy slaughter on the Germans, and in the main the result justified the expectation. When, before he had finally decided to stay in Metz, Bazaine attempted half-heartedly to begin a retreat on Verdun, the staff work and organization of the movement over the Moselle was so ineffective that when the German staff calculated that Bazaine was nearing Verdun, the French had in reality barely got their artillery and baggage trains through the town of Metz. After the army had passed through Metz it encountered an isolated corps of the enemy, commanded by Constantin von Alvensleben, which promptly attacked the French. At almost every moment of the day victory was in Bazaine's hands. Two corps of the Germans fought all day for bare existence. But Bazaine contented himself with inflicting severe losses on the most aggressive portions of the German army. Two days later, while the French actually retreated on Metz—taking seven hours to cover 5 to 6m.—the masses of the Germans gathered in front of him, intercepting his communication with the interior of France. Bazaine, feeling certain that the Germans would sooner or later attack him in his chosen position, made no attempt to interfere with their concentration. The great battle was fought, and having inflicted severe punishment on his assailants, Bazaine fell back within the entrenched camp of Metz. But although he made no appeals for help, public opinion, alarmed and excited, condemned the only remaining army of France, Marshal MacMahon's "Army of Châlons," to rescue Bazaine at all costs. The adventure ended at Sedan, and with Sedan the Third Empire collapsed.

In Metz, as commander of the only organized army of France, Bazaine conceived himself to be the ruler of the country's destiny. Accordingly he engaged in a series of diplomatic intrigues. Negotiations passed between the outer world and the besieged commander, the purport of which remains still to some extent obscure, but it is beyond question that he proposed with the permission of the Germans to employ his army in "saving France from herself." The scheme, however, collapsed, and the army of the Rhine became prisoners of war to the number of 140,000. At the moment of the surrender a week's further resistance would have enabled the levies of the National Defence Government to crush the weak forces of the Germans on the Loire and to relieve Paris. But the army of Prince Frederick Charles, set free by the surrender, hurried up in time to check and to defeat the great effort at Orleans (*q.v.*). The responsibility for this crushing blow was naturally enough, and justly enough, placed on Bazaine's shoulders, and although, when he returned from captivity, the marshal enjoyed a brief immunity, he was in 1873 brought to trial before a military court. He was found guilty of negotiating with and capitulating to the enemy before doing all that was prescribed by duty and honour, and sentenced to degradation and death, but very strongly recommended to mercy. His sentence was commuted to 20 years' seclusion, and the humiliating ceremonies attending degradation were dispensed with. He was incarcerated in Île Sainte-Marguérite and treated rather as an exile than as a convict; thence he escaped in 1874 to Italy. He finally took up his abode in Madrid, where he was treated with marked respect by the Government of Alfonso XII. He died there on Sept. 23, 1888. He published *Épisodes de la guerre de 1870* (Madrid, 1883). He also wrote *L'Armée du Rhin* (Paris, 1872).

See the bibliography appended to the article FRANCO-GERMAN WAR; also memoir by C. Pelletan in *La Grande Encyclopédie;* for Bazaine's

conduct see *Bazaine et l'armée du Rhin* (1873); J. Valfrey, *Le Maréchal et l'armée du Rhin* (1873); Count A. de la Guerronière, *L'Homme de Metz* (1871); Rossel, *Les Derniers Jours de Metz* (1871). *See* also the article BOURBAKI for the curious Régnier episode connected with the surrender of Metz.

BAZALGETTE, SIR JOSEPH WILLIAM (1819–1891), English engineer, carried out many important engineering works in London, being concerned with the construction of the main drainage system and the Thames embankment. On the creation of the Metropolitan Board of Works (1855) he was at once appointed its chief engineer. His drainage plans were ready, but the work was delayed by official obstruction until 1858. Once begun, however, it was vigorously pushed on, and in 1865 the system was formally opened. The section of the Thames embankment, constructed on his plans, between Westminster and Vauxhall on the Surrey side was built between 1860 and 1869, and the length between Westminster and Blackfriars was declared open by the prince of Wales in 1870. The Chelsea embankment followed in 1871–74, and in 1876 Northumberland avenue was formed. Bazalgette was also responsible for various other engineering works in the metropolitan area, designing, for example, new bridges at Putney and Battersea, and the steam ferry between north and south Woolwich. He died before his schemes for a tunnel at Blackwall and a bridge at the Tower had taken shape; though these were built later.

BAZARD, AMAND (1791–1832), French socialist, was the founder, about 1820, of a secret society in France corresponding to the Carbonari (*q.v.*), called *Amis de la vérité*. Bazard himself was at the head of the central body, and, while taking a general lead, contributed extensively to the Carbonarist journal, *L'Aristarque*. An unsuccessful outbreak at Belfort ruined the society, and the leaders were compelled to conceal themselves. Bazard later became a follower of Saint-Simon, but quarrelled violently with Enfantin (q.v.) in 1831.

BAZAS, town in the dept. of Gironde, France, 38½m. S.S.E. of Bordeaux. It was the capital of the *Vasates,* and the Romans made it one of the 12 cities of Novempopulana. It had a bishop at least from the 6th century to 1790, and was the chief town of the Bazadais region; it became capital of an arrondissement but lost this dignity in 1926. It has several historic remains and the town is in the white wine and cattle country. Pop. (1936) 2,514.

BAZIGARS, a nomad gipsy-folk of India, found throughout the peninsula, and variously known as Bazigars, Panchpiri, Nats, Bediyas, etc. The Bazigar is usually a Mohammedan, the Nat a Hindu. They make a living as jugglers, dancers, basket-weavers and fortune-tellers; and in true European gipsy fashion each clan has its king.

See H. A. Rose, *Tribes and Castes of the Punjab and North West Frontier* (1911).

BAZIN, RENÉ (1853–1932), French novelist and man of letters, was born at Angers on Dec. 26, 1853. He studied law in Paris and became professor of law in the Catholic university at Angers. His novel, *Une Tache d'encre* (1888), which received a prize from the Academy, was translated into English by Sir Arthur Quiller-Couch and P. M. Francke (1892). Other works of his are: *La Terre qui meurt* (1899, Eng. trans, *Autumn Glory,* 1901); *Les Oberlé* (1901), an Alsatian story, dramatized in 1902; *Le Blé qui lève* (1907, Eng. trans., *By Faith Alone,* 1908); *Charles de Foucauld, etc.* (1921, Eng. trans. by P. Keelan, 1923); a volume of short stories, *Le Conte du Triolet* (1924, Eng. trans. 1924); *Baltus Lorrain* (1926), and *Fils de l'Église* (1927). Bazin was admitted to the Académie Française on April 28, 1904.

BAZIRE, CLAUDE (1764–94), French revolutionist, was deputy for the Côte d'Or in the Legislative Assembly, and supported the Mountain in the Convention. He was implicated in the falsification of a decree relative to the East India Company, and though his share seems to have been simply that he did not reveal the plot, of which he knew but part, he was executed April 5 1794.

"B" BATTERY, a battery connected in the plate or anode circuit of a vacuum tube, for the purpose of supplying power to that circuit.

BDELLIUM, a name applied to several resins derived from species of *Commiphora.* The word *βδέλλιον* is used by Pliny and Dioscorides as the name of a plant exuding a fragrant gum. Bdellium is similar to true myrrh (*q.v.*) and is sometimes found as an adulterant of it.

BEACH, CHESTER (1881–), American sculptor, was born in San Francisco, Calif., May 23, 1881. After his preliminary education in America he went to Paris where he was a pupil of Verdet and of Roland. Returning to the United States, he settled in New York. He works with the stone, cutting from the rough and revealing his originality in ideas and his skill in modelling in powerful figures such as the bronze "Stoker" and delicate ones such as the marble "Beyond" and "Wavehead." His contrasts, "Tears" and "Laughter," two heads of infants, and "Youth and Age," the heads of a girl and of a hag, are unusually effective, as are his medallions and portraits of children. He also designed four special half-dollar coins.

BEACH, a word of unknown origin; probably an old dialect word meaning shingle, hence the place covered by shingle. Beach sometimes denotes material thrown up by waves, sometimes the long resulting ridge—though this generally has the special term of "storm beach"—but usually denotes the area between high and low water, or even the area between land and sea covered with material thrown up by storms.

The actual character of beach material depends upon the rocks inshore or the boulders deposited on the shore as a result of past glaciation, currents and waves. The Isle of Wight ends westward in the well-known "Needles" consisting of chalk with flints. Disintegration of this rock separates the finer chalk, carried seawards in suspension, from the hard flint, piled as rough shingle. Currents sweep constantly eastward up channel, and the rough flint shingle is rolled along toward the Ventnor rampart, and ground finer and finer, until it arrives as a very fine flinty gravel at Ventnor pier. Sandown Bay follows with cliffs composed mainly of greensand, and here the beach at low water is sandy and smooth. The eastern end of the island is again composed of chalk with flints, and here the beach material as at the western end consists of very coarse flint shingle. In this, as in similar cases, the material has been dragged seawards from the land by constant action of the undertow that accompanies each retreating tide and each returning wave. The grading of material is also excellently shown in Chesil bank where the pebbles in various sections are remarkably uniform in size and shape. The resulting accumulated ridge is battered by every storm, and thrown above ordinary high water mark in a ridge; an older example is the long grass-grown mound that has blocked the old channel of the Yar and diverted its waters into Yaverland Bay. Sandown furnishes an instructive example of the power of the eastward currents with their high-storm waves. The groins built to preserve the foreshore are piled to the top with coarse pebble and shingle on the western side, while there is a drop of over 8ft. on to the sands east of the wall. The force of the waves has been estimated on the west coast of Scotland and found to be as much as 3 tons per square foot. Against these forces the preservation of the shore from the advance of the sea becomes an extremely difficult undertaking. The beach advances in front of the encroaching sea, burying former beaches under the sand and mud of the now deeper water, or it retreats when the sea is withdrawn from the land or the land rises locally, leaving the old shingle stranded in a "raised beach."

BEACHCOMBER, a settler on the coast of the Pacific or its islands who haunts the wharves of harbours and makes a livelihood chiefly by pilfering from ships.

BEACH PEA (*Lathyrus japonicus*), a characteristic beach plant of northern regions. It is a perennial herb of the family Leguminosae native to cool sandy shores throughout the Northern Hemisphere and extending northward to the Arctic sea. It is found on the coasts of the British Isles and on those of North America from New Jersey and Oregon northward and also in the interior along the Great Lakes. It is a smooth, stout, trailing or climbing pea-like plant, 1 ft. to 3 ft. high, with tendril-bearing leaves divided into from 6 to 10 oblong, thick leaflets, and with clustered, showy, purple flowers, about 1 in. long.

BEACH WORMWOOD (*Artemisia stelleriana*), a perennial plant of the family *Compositae*, native to north-eastern Asia, now naturalized in North America on sandy sea beaches from Quebec to Delaware and also on the coasts of Sweden. It is a densely white-woolly plant, with foliage very similar to that of the dusty miller (*Cineraria maritima*). It is cultivated as a border plant and enjoys some repute in household medicine. (*See* ARTEMISIA.)

BEACHY HEAD, promontory, Sussex, England, south-west of Eastbourne, about 3m. from centre of the town. It is a perpendicular chalk cliff 532ft. high, and forms the east end of the South Downs. The old Bell Tout lighthouse, 285ft. above high-water mark, erected in 1831 on the second cliff to the westward in 0° 10′ 18″ E., 50° 43′ 30″ N., has been superseded by a new lighthouse built in the sea at the foot of the head itself.

Battle of Beachy Head.—This naval battle, known to the French as Bévisier (a corruption of Pevensey), was fought on June 30, 1690. An allied force of 37 British sail of the line, under command of the earl of Torrington (Arthur Herbert), and of 22 Dutch under C. Evertsen, was at anchor under the headland, while a French fleet of over 70 sail, commanded by the comte de Tourville, was anchored some miles off to the south-west, with orders to co-operate with an expected Jacobite rising in England. Torrington had suggested to the council of Regency that he ought to retire to the mouth of the Thames until he could be reinforced. The council, however, ordered him to remain and rather to fight if he could secure an advantage of position. The admiral elected to treat this as a peremptory order to fight. At day-break on the 30th he bore down on the enemy, but the numerical inferiority of the allies made it inevitable that there should be gaps between the different divisions. The English rear division under Sir Ralph Delaval, fought a close action with the French, but the French ships, ahead of the leading Dutchman, succeeded in turning to windward and putting part of Evertsen's squadron between two fires. The tide turned from flood to ebb during the action, and the surface current began to carry the fleets with it. The Dutch and English dropped anchor, but the French did not and were carried westward. When the tide turned the allies retreated to the Thames, abandoning several of the most damaged ships in Pevensey bay. Torrington was tried for his conduct but acquitted.

A full account of the battle of Beachy Head, written with ample quotation of documents, and for the purpose of vindicating Herbert, will be found in Admiral Colomb's *Naval Warfare* (London, 1899).

BEACON, a city of Dutchess county, N.Y., U.S.A., pleasantly situated on the east bank of the Hudson, opposite Newburgh, about 50m. N. of New York city. It is served by the New York Central and the Central New England railways and by river boats. The population was 11,933 in 1930, of whom 2,300 were foreign-born white, and it was 12,572 in 1940 by the federal census. Its manufactures include bakers' machinery, brick, paint, hats and rubber products.

The Matteawan state hospital for insane criminals is situated there, and at Castle Point, near by, is the U.S. Veterans' bureau hospital 98.

Mt. Beacon, which forms the city's background, was so named from the signal fires which were lighted on its summit in Revolutionary days. There are several historic buildings in and near the city, including the Ver Planck mansion, where the Society of the Cincinnati was organized in 1783. The first house here was built in 1709. The city was created in 1913 by the consolidation of the old villages of Fishkill Landing and Matteawan. A commission form of government (the first in the State) was provided for in its charter.

BEACON, a conspicuous object, either natural or artificial, visible as a mark from a distance by day and, if lighted (*e.g.*, a lighthouse), at night. More particularly it is a fixed mark of distinctive construction provided to assist the mariner, by day, in identifying his position and fixing his course, or to indicate the position of hidden dangers. Beacons are essentially fixed marks as distinguished from floating marks, *e.g.*, a marking buoy, although the superstructure usually carried by a marking buoy—such as a globe or cone—is sometimes referred to as its beacon. They are usually constructed of masonry, concrete, iron, steel or timber, size and form varying widely with the circumstances and position. Simple and primitive forms are a cairn of rough stones, and masts of wood or iron surmounted by a cage or other appropriate top mark. In exposed wave-swept positions beacon structures must be strong and securely founded. Usually they are painted in conspicuous and distinctive colouring to increase their visibility and aid their identification by the mariner. They are erected on headlands and other positions on the coast line, small islands, isolated rocks, reefs and shoals, or to mark the limits of the fairway in harbours, estuaries and rivers. In some instances disused buildings in a conspicuous position on the coast, which otherwise might fall into ruin, have been preserved and maintained as day marks or beacons by a lighthouse authority. Beacons marking fairways are fitted with top marks of the conventional form or colour prescribed by the appropriate lighting or navigation authority in the same way as marking buoys.

A beacon sometimes carries a small light arranged to function automatically and unattended for a considerable period, and thus serves as an aid to navigation at night; such lighted beacons are often employed for fairway marking (*see* LIGHTHOUSES). Two beacons are sometimes so placed, at a suitable distance apart, to indicate, when seen in line, the direction of a submerged danger, or a line of fairway. If, in addition, they are lighted at night, they are described as "leading" or "direction" lights. (N. G. G.)

Beacons in Aviation.—In commercial aviation beacons or aerial lighthouses (*see* LIGHTHOUSES) are in general use for two purposes: (1) the distinctive marking of airports at night; and (2) for marking established airway routes at night.

Beacons: Airport.—Several types of beacons are used for marking airports. Powerful electric arc beacons of 300,000,000 candle power are also used. Incandescent electric rotating beacons using 1,000-watt lamps at the focus of 24in. parabolic reflectors and having a beam candle power of 2,000,000 are most generally used for airport beacons in America. Flashing Neon beacons are being used for airport marking in several of the countries of Europe.

Beacons: Airway.—There are several types of beacons in general use for marking airway routes. The national airways of the U.S. are marked by incandescent beacons of about 2,000,000 beam candlepower spaced at intervals of 15m. along the route. The beacons rotate at six revolutions per minute. Smaller acetylene flashing beacons with Fresnel optical system are occasionally used where shorter spacing is desirable. On the European airways, in addition to the incandescent type and acetylene flashing type described, small Neon beacons are being used, especially in Germany. France, in addition to marker beacons along the air routes, has installed a number of very powerful location beacons on elevated points, not as markers on a route but as definite locations visible from long ranges. The Dijon beacon and the Mt. Valérien beacon are examples of this type. (E. A. Sp.)

BEACONSFIELD, BENJAMIN DISRAELI, EARL OF (1804–1881), British statesman and novelist, eldest son of Isaac D'Israeli (*q.v.*) and Miriam (or Maria) Basevi was born on Dec. 21, 1804, at 6 King's road, Bedford row, now 22 Theobald's road, London. His grandfather, Benjamin D'Israeli (or Israeli) had come to England in 1748 from the Italian Jewish colony of Cento in Ferrara, as a trader; by his death he had risen to be a member of the Stock Exchange committee and left an estate of £35,000. This Benjamin D'Israeli's second wife was Sarah Siprut de Gabay Villareal, descended on the one side from the great Spanish Jewish house of Ibn Xaprut, on the other from the famous Portuguese Jewish family, the Villareals. Their son, Isaac D'Israeli, student of letters and dilettante, remained until 1813 a member of the Portuguese synagogue in Bevis Marks, but in consequence of a quarrel that he had in that year with the officials of the congregation, decided to sever his connection with the religion of his forefathers, and permitted his three surviving sons and his daughter to be baptized. Benjamin's christening took place on July 31, 1817, at St. Andrew's Holborn, and by this indifferent decision of his sceptical father was made possible the political career from which, as a Jew, he would by the laws of the time have been debarred.

Benjamin Disraeli was sent to school first at a Mr. Potticany's at Blackheath and then to Higham hall, near Walthamstow, a prosperous academy kept by a Unitarian minister, the Rev. Eli Cogan. At the age of 17 he was articled to a solicitors' firm in Old Jewry, but three years' experiment convinced a young man of adventurous and romantic temperament, whose dandified dress already attracted notice, that he was not cut out to be a lawyer. His first essays in a wider field were, however, unfortunate. By gambling in South American stock in 1825 he loaded himself with heavy debts, and by attempting, with the aid of a ready tongue and a bold address, to organize, on behalf of Murray the publisher, a new daily paper, the *Representative,* of which Lockhart, Scott's son-in-law was to be editor, he involved himself in a journalistic failure and made enemies of Murray, of John Wilson Croker, the Tory publicist, and other influential persons. His fortunes took a turn for the better, however, when, at the suggestion of his friend, Mrs. Austen, a solicitor's wife, he embodied and embellished some of his experiences in the daring *roman à clef, Vivian Grey*, which was published by Colburn, with strenuous puffing in 1826. In spite of its youthful crudeness, the novel made a stir by its lively plot and witty dialogue, as much as by the audacity with which the chief figures of society were introduced into it under thinly disguised names. On returning to England after a tour in Italy with the Austens, Disraeli published in 1828 a satire on English life and institutions, entitled *The Voyage of Captain Popanilla;* he also entered at Lincoln's inn for the Bar, but, overtaken by illness and depression, largely in consequence of the burden of debt, passed some time in comparative idleness at his father's new country home, Bradenham manor, at the foot of the Chiltern hills. Among the subjects of his meditation at this period appear to have been the history and destiny of the Jewish race, to which he belonged, and he fretted to visit the East and the home of his people. To gain money for the journey he wrote a second society novel, *The Young Duke,* for which in 1830 he was paid £500, and thus enabled to sail from Falmouth in the summer of this year, accompanied by William Meredith, who was engaged to marry his sister Sarah.

This voyage deeply influenced Disraeli's ideas. The itinerary included Spain, Albania, Athens, Constantinople, Palestine and Egypt. Although he indulged his fantasy by wearing a belt full of pistols and daggers, "red cap, red slippers, broad blue striped jacket and trousers," his observation was keenly at work, as is shown in the letters he wrote home to his sister Sarah, the substance of which he later incorporated into his novel *Contarini Fleming.* It was the East that particularly fascinated him, alike in the Alhambra at Granada, at Constantinople, where he was enchanted by the character and life of the Turks, and at Jerusalem, where he had the daring to seek an entry into the mosque of Omar, on the site of the Jewish temple, but was "quickly surrounded by a crowd of turbaned fanatics and escaped with difficulty." In Cairo he had an interview with the great pasha, Mehemet Ali, with whom he discussed parliamentary government. Much of Disraeli's policy in later life may be traced to these experiences. His solicitude for the oriental empire of Britain, his support of Turkey against her enemies, his swift perception of the importance of the Suez canal, above all his unfailing pride in his own Jewish ancestry all owed something to his experiences during this memorable journey. After his return (which was darkened by the death of his companion Meredith from small-pox) he utilized his impressions for two books, *Alroy,* a historical novel based on the exploits of a Jewish national leader in western Asia during the 12th century under the Caliphate, and the "psychological romance" called *Contarini Fleming.* In this latter story, one of the finest of Disraeli's works, his own fiery ambitions are portrayed in the character of the hero, who is the son of a great minister in an imaginary Scandinavian kingdom and on his mother's side of Venetian descent, as Disraeli believed that he was himself. Contarini, like his creator, suffers from the conflict between his poetical and political ambitions, and also from the sense of being half an alien in the country of his birth. In none of his books has Disraeli given a clearer view of his own nature and ambitions.

In fact, the time was now at hand when he himself was to make the choice between letters and politics as the main object of his career. In 1832 he offered himself at a bye-election in High Wycombe, near his home, as a Radical candidate, supported by O'Connell, Hume and Burdett. He was twice defeated in this borough, and then, with an audacious change of front, came forward to contest a county seat as a Tory. His quick wit soon showed him that he was laying himself open to the charge of being an adventurer without principles, and when planning his next candidature in Marylebone (which never actually took shape) he issued a pamphlet "What is He?" in which he sought to show that it was possible honestly to be both a Tory and a democrat. At the moment such a contention might seem the merest opportunism, but in fact it represented one of the deepest and most lasting of Disraeli's political convictions. He was shrewd enough, however, to realize that he must, if he wished to succeed, range himself under one party banner or the other, and accordingly he drew near to the Tories attaching himself particularly to the ex-chancellor, Lord Lyndhurst, a restless and somewhat discredited intriguer. He had still a third and a fourth defeat to suffer, at Wycombe in the general election of 1834 and at Taunton in a bye-election in 1835, but during 1835 and 1836 he laid the basis of a political reputation by three brilliant polemical pamphlets, *The Runnymede Letters* in *The Times,* attacking Melbourne's Whig Government with bitter sarcasm, and two constitutional tracts entitled *A Vindication of the English Constitution* and *The Spirit of Whiggism.* These writings, in spite of their extravagance of phrase and their exotic flavour, expose a coherent philosophy of Conservatism. The theories of abstract rights and the *a priori* systems of the utilitarians are disputed in favour of an organic view of society and of national growth. National character is fashioned by history and institutions and to destroy a nation's institutions is to destroy its life. The House of Commons is not the "house of the people"; it is the house of an "estate" of the realm, that is to say of a particular section of the nation who have the privilege of representation in it. Civil liberty and equality, which make England essentially democratic, are only to be preserved by maintaining the balance of our institutions as a whole, and it is the Whigs who have always been the really anti-popular party by endeavouring to maintain the supremacy of a class on the ruins of those popular bulwarks, the monarchy and the Church. The Tories, in appearance the champions of royal and ecclesiastical absolutism, have really been the champions of national liberty against a veiled oligarchy. Toryism does not proscribe the enlargement of the "third estate" by prudent extensions of the franchise; it only objects to the "sectarian" character of the Reform Act which the Whigs carried in 1832 with a view to consolidating their own political strength. Besides throwing into literary shape these theories which in substance guided the whole of his career as a British statesman, Disraeli in these waiting years published a Lucianic volume of satires including *Ixion in Heaven* and the *Infernal Marriage,* and two more novels, the love story, *Henrietta Temple* (1836) and *Venetia* (1837), which presents some of the chief episodes from the lives of Byron and Shelley in the form of fiction. The year of the publication of *Venetia* was that of the death of William IV. and the accession of Queen Victoria. A new reign then meant a dissolution of Parliament, and Disraeli at last gained a seat as Conservative member for Maidstone.

It is well known that his maiden speech on an Irish topic in the House of Commons on Dec. 7, 1837, was a failure. The extravagance of his attire (more suited to the company of his friends, the dandies, D'Orsay and Bulwer, or to the dining-table of the "gorgeous" Lady Blessington than to Parliament) and the exuberant similes with which his speech was bejewelled made an impression of affected absurdity and he was laughed down, but not before he had warned his interrupters that one day they would have to listen to him. He quickly set himself to learn the style of the House and began to claim attention both by his command of facts and figures and by his independence. This he showed especially in the debates on the Chartist petition and disturbances 1839–40, which proved that his desire to improve the conditions of the working-class was no mere affectation of Radicalism. While he

was thus strengthening his parliamentary position, he had also improved his social status by his marriage in 1839 to Mrs. Wyndham Lewis (born Mary Anne Evans), the widow of his fellow Conservative Member for Maidstone, who had lately died. Mrs. Disraeli brought to her husband, who was 12 years her junior, a house in Park Lane, a considerable fortune and the unceasing devotion of an affectionate, but not particularly intellectual, nature.

Fortified by these advantages, Disraeli considered himself important enough to solicit from Sir Robert Peel, the Conservative leader, a place in the Government that he formed on the fall of Melbourne's Whig administration in 1841. Peel's reply was a curt refusal prompted, it is believed, by a member of his cabinet, Lord Stanley, and the rejected applicant thus entered the new Parliament (where he was returned for Shrewsbury) in a mood of discontent with his leader which gave edge to a divergence of political ideals that must in any case have led to a breach. Peel's Conservatism was of a prudent and conciliatory type, which aimed especially at securing the support of the wealthy manufacturing middle-class that had risen to power by the industrial revolution. Disraeli's Toryism was more romantic and literary, at once more aristocratic and more popular. He believed strongly in the power of the Crown, in the preponderance of the old landed aristocracy, in the influence of the Church (which was at this date being championed with a new fervour by the Oxford Tractarians) and in the need of protecting the labouring class from exploitation by the factory system. These were the ideals that inspired also the small group of youthful Tories (numbering in their ranks George Smythe, later Lord Strangford, Lord John Manners, afterwards Duke of Rutland, and Ambrose Phillips de Lisle, a Roman Catholic gentleman with large estates) who acquired the nickname of "Young England." Under Disraeli's leadership this band of enthusiasts began to harass Peel with criticisms and sarcasms in the House; and to give publicity to their aims Disraeli wrote and published in 1844 *Coningsby, or the Younger Generation,* the first of a projected series of three political novels and one of his most powerful books, which has given to English literature such celebrated characters as Lord Monmouth (based, like Thackeray's Lord Steyne on the actual Lord Hertford), Mr. Rigby, a bitter satire on John Wilson Croker, Taper and Tadpole, the electioneering jackals, and the mysterious Jewish millionaire, Sidonia, embodying many of Disraeli's own characteristics of mind and temper. The next year appeared the second volume of the trilogy, *Sybil or the Two Nations,* which is a moving and carefully documented picture of the Chartist movement and of the distressful condition of the working classes in the "hungry forties." To deliver the lower of the two "nations" (the poor) from the oppression of the upper (the rich), Disraeli looked to the crown without specifying clearly how the young queen could intervene. The book gave added weight to the attacks of the author and his disciples on Peel's factory legislation, for falling short of the drastic reforms of hours and conditions of labour demanded by the Tory reformer, Lord Ashley (afterwards Lord Shaftesbury). It was becoming increasingly clear both to Disraeli and to the landed gentry who formed the bulk of the Tory party that Peel in his regard for the great mill-owners and for the expansion of British industry was approximating more and more to the ideals of the Liberal opposition, that, as Disraeli phrased it, he had "caught the Whigs bathing and walked away with their clothes." The conflict was now to come to a sharp issue on the crucial question of the corn laws.

Ever since the foundation of the Anti-corn-law league in 1838 by Cobden and Bright the protective duties on foreign corn, which had been left in an invidious prominence by Huskisson's reduction of tariffs between 1823 and 1827, had been the object of fierce attack by the manufacturing middle-class. Peel, who had been called to office after defeating the Whigs on a proposal to reduce protective duties, was nominally the champion of this bulwark of the landed interest, but his sympathies and his intellectual convictions were being more and more captivated by the theories of the free traders, a fact which became so obvious that in the beginning of the session of 1845 Disraeli amid applause declared that "a Conservative Government is an organized hypocrisy." In the autumn of the same year a ruinous harvest, coinciding with the outbreak of the potato disease in Ireland hastened Peel's decision. He urged upon his cabinet the necessity of repealing the corn laws, and since they hesitated, Peel, feeling his hand to be forced by Lord John Russell's Edinburgh letter of Nov. 27 announcing his own conversion to complete free trade, handed in his resignation to the queen. Russell failed to form a Liberal Government through dissensions in his own party and Peel returned to office in Jan. 1846 with a reconstructed cabinet, from which the principal seceder was Lord Stanley, the brilliant minister for the colonies, Disraeli's former enemy. Peel at once introduced proposals for abrogating the corn laws, and in the bitter struggle which filled the session between Peel with his followers and the protectionist Tories, Disraeli and a sporting nobleman, Lord George Bentinck, led the opposition. The force of invective with which Disraeli assailed the prime minister during this session made him the leading orator of the House of Commons and an indisputable chief of the old Tory party. A painful incident of the duel between Peel and his revolted follower was Disraeli's denial, in answer to a taunt from the minister, that he had ever solicited office from him, which has been variously interpreted as a lapse of memory or a deliberate falsehood. The protectionists did not succeed in staying the repeal of the corn laws, which was finally carried on June 25, 1846, but they succeeded on the same night in turning out the prime minister by voting against him (with scant consistency) on a proposed measure of coercion for Ireland. The Conservative party was now irretrievably split, and a period of reconstruction in opposition awaited them.

The years of Liberal Government between 1846 and 1852 were spent by Disraeli in attempts to extricate his party from the eclipse into which it had fallen. The death of Peel from a riding accident in 1850, and of Bentinck from heart failure in 1848, cleared the political stage. In spite of the lingering dislike still felt for him by Stanley, the leader of the protectionists in the Lords, Disraeli, who from 1847 to the end of his career in the Commons sat as member for the county of Buckingham, became by degrees the acknowledged leader of the party in the Commons, though he remained unpopular with sections of his following for two main reasons. One was the racial pride with which he emphasized his Jewish descent. This was shown by the support he gave Russell against his own party in 1847 in removing the barriers that excluded professing Jews from Parliament, and even more by the publication in the same year of the third volume of the political trilogy, *Tancred or the New Crusade.* This volume had been planned to deal with the Church, but in fact it implies the impotence of the Church and the emptiness of English politics generally, which leads the hero, a wealthy young noble, to visit Jerusalem and wander in the holy land seeking inspiration from "the angel of Arabia," that is, from the genius of the Semitic stock. The second cause of the distrust felt for Disraeli at this epoch was his determination to bury the issue of protection and to rally the Conservatives round some fresh programme. The completion in 1851 of his vivacious biography of Lord George Bentinck was in effect his final tribute to what he had come to hold an irreparably lost cause. His private life during these waiting years was marked by the purchase in 1848 of the picturesque estate of Hughenden in Buckinghamshire and by his romantic friendship with Mrs. Brydges Willyams, an aged Jewess of Torquay, who left him her considerable fortune on her death in 1863, and was buried in his family grave at Hughenden.

The time of waiting ended in 1852, when the destruction of Russell's Government through his feud with Palmerston placed Stanley (who had in 1851 succeeded to the title of Earl of Derby) for a brief while in office. It was an insecure ministry, since neither Palmerston nor William Ewart Gladstone, the chief figure among the so-called "Peelites," could be persuaded to join it, and in a House overwhelmingly free trade in conviction Disraeli, as chancellor of the exchequer, had an insuperably difficult task. The budget that he brought forward in December, 1852, designed to relieve the agricultural interest by other means than a reversion to protection, was fiercely attacked both by Gladstone and by the Whigs and brought about the fall of the ministry. During Aber-

deen's coalition Government that followed, with the sequel of the Crimean War, Disraeli was principally occupied with organizing and conducting *The Press,* a weekly paper that criticized the hesitations and inefficiency of the ministry with savage irony. Derby would have been the natural person to take office when the coalition split in 1855 amid the disasters of the Crimean expedition, but he shirked the task and it was not until 1858, when Palmerston, the successor of Aberdeen's luckless combination, was overthrown over the Conspiracy bill which he promoted after Orsini's attempt (planned in England) to murder Napoleon III., that the Derbyite party found itself once again in office. Although Disraeli wrote a most magnanimous letter to Gladstone, hinting that he might himself be willing to "be removed from the scene," Gladstone still refused to return to the Conservative fold. The main problem with which the ministry found itself faced was that of parliamentary reform. It was widely felt that the time had come to enlarge the franchise which the Act of 1832 had extended to the middle classes so as to take in the best elements at least of the working class. Disraeli brought forward a tentative Bill in Feb. 1859, which lowered the qualification for the county franchise (an advantage to the Conservatives) and attempted to give some actuality to Disraeli's old dream of "estates of the realm" by what came to be known as the "fancy franchises," votes given to certain professions and standings, as those of the clergy, lawyers, schoolmasters, investors in savings banks and so on. It was too timid to please, and the overthrow of the Government soon followed. Palmerston, resuming in June, 1859, the premiership which he held until his death in 1865, systematically damped down all attempts to fan the flame of reforming zeal. Gladstone, however, who had been a Liberal minister since the overthrow of the Conservatives in 1859, was determined to advance in this direction (after Palmerston's death) and to enfranchise the masses. As leader of the House of Commons under Russell's premiership, he brought forward in 1866 a Reform bill that was hotly opposed not only by the Conservatives but by a revolted section of his own followers headed by Robert Lowe, who saw in it a surrender to pure democracy. The Liberal Government fell with its bill in the summer, and left to the new cabinet formed by Derby the duty of dealing with the reform question, now rendered more pressing than ever by John Bright's inflammatory oratory, the riots in Hyde Park, and the insistence of the queen on the necessity of allaying the agitation. After much cautious feeling of the way the cabinet in Feb. 1867 agreed on a plan of which the main features were household suffrage for all personal ratepayers, a second vote for those who paid also 20s in direct taxation and certain fancy franchises. But the bold advance made by such a scheme in the direction of democracy produced an abrupt crisis in the cabinet. During the week-end of Feb. 23–Feb. 25, Lord Cranborne (Robert Cecil), the Indian secretary, and one of the strongest men in the Government, convinced himself by a fresh study of the statistics that the new Bill would go further than its promoters realized in throwing the balance of power in the constituencies into the hands of the new popular voters. He won over to his view Lord Carnarvon, the colonial secretary, and General Peel, the war minister, and on Monday morning, the very day upon which Disraeli was to unfold the bill to the House, the dissentients announced to Derby that they withdrew their support from the measure. As a result of this unexpected blow Disraeli had to confront the House with some lame suggestions, derisively known as the "ten minutes" bill. But in a few weeks, Derby and Disraeli, rallying from the shock, resolved to return to their original project, at the cost of losing Cranborne and his two sympathizers. Accordingly, Disraeli on March 18, brought in a bill on the lines already mentioned. In its first draft it was not extreme, since the grant of household franchise in the boroughs to ratepayers (which accompanied a reduction on the qualification for the county franchise) was balanced by the dual vote, the fancy franchises and the exclusion of the "compound householder," *i.e.,* the householder, usually poor, who compounded with his landlord for the latter to pay his rates. But in the course of the debates Disraeli with astute parliamentary skill yielded to critics of the measure on all these vital points without forfeiting the prestige of the Government. He agreed to lower the county franchise still further, to a £12 basis, to abandon the dual vote and the two years residence qualification, to include lodgers, and finally to abolish the system of compounding for rates, which made the "fancy franchises" otiose and enormously increased the mass of voters. The bill was finally passed on Aug. 15, after bitter opposition from Gladstone (who was, however, abandoned by his own party), Lowe and Lord Cranborne, who denounced the "Conservative surrender." Undoubtedly Disraeli had departed far from his theory of balanced "estates" and his often repeated hostility to a democracy of numbers, while Derby confessed to "a leap in the dark." They could, however, plead something like a national mandate to settle the reform question on broad lines in order to avert revolution, while the extended electorate of their creation proved by no means unfriendly to Conservative principles.

Its gratitude, however, was not immediate. Disraeli (who became prime minister on Derby's retirement in Feb. 1868) was overthrown, when Gladstone (who had become formal leader of the Liberal Party by old Lord Russell's retirement in 1867) brought forward in 1868 his project for disestablishing the Irish Church. The electorate supported the Liberals and from the autumn of 1868 to 1874 Disraeli was again condemned to hold together a party languishing in the chill of opposition. He had been overthrown on a Church question and religious interests filled a great part of his mind at this period. He had endeavoured, while prime minister, to distribute Church patronage so as to discourage both the Ritualist (Anglo-Catholic) and Broad Church parties, and in a famous speech delivered at Oxford in 1864 he had criticized rationalism and Darwinism, declaring himself "on the side of the angels" against those who (he said) favoured the view that man was rather an ape. He now gathered up the results of his religious thinking in *Lothair,* the most successful of his novels, published in 1870, which depicts the struggle of the revolutionary sects against the papacy, the progress of Roman Catholic proselytizing in England, the conflict between Semitic and Hellenic ideals and other burning topics of the hour in the form of a good-natured satire on English society. His home life was darkened in 1872 by the death of his devoted wife, for whom on leaving office four years earlier he had secured the title of Viscountess Beaconsfield; but he found some solace in his Platonic but ardent, affection for Lady Bradford, for whom, as for her sister, Lady Chesterfield, he unceasingly declared the warmest sentiments in his letters. Politically he had little to do but to watch Gladstone's administration break up under the strain of its own mistakes, though he plied it with keen criticisms, and in especial urged the need of maintaining imperial cohesion against what he considered the "cosmopolitan" indifference of the Liberal rulers to England's colonial heritage. His patience and tenacity were rewarded, when, after the crushing defeat of Gladstone in 1874, he returned to power with a large majority and was able to form an exceptionally strong Government in which Lord Salisbury (formerly Lord Cranborne), now at length reconciled, accepted the India Office again, while Lord Derby (Edward Stanley), the son of Disraeli's old chief, became foreign secretary, Lord Carnarvon, colonial secretary, and a powerful lawyer, Sir Hugh Cairns, lord chancellor.

Yet a further source of strength to the new ministry lay in the special sympathy felt by Queen Victoria for its chief. At the outset of his political career Disraeli had been regarded with some distrust both by the queen and the prince consort; but a better understanding of his ability, his patriotism and his sincere devotion to the monarchical idea had worked a change in the views of the royal couple. After her husband's death, Queen Victoria found great support in the courtly deference and loyal affection with which Disraeli treated her; and though it is difficult to clear him from the charge of gaining certain ends by flattering her self-esteem, there is no reason to doubt either his faith in the principle of monarchy or that his romantic temperament sincerely responded to the ideal of devotion embodied in her whom he called (following Spenser) the "faery." He had not been long in office before he conferred a fresh lustre on her crown by securing the addition of the title "empress of India" to her royal and imperial style. This imaginative measure, carried in 1876, had the

further effect, which Disraeli with his oriental sympathies clearly foresaw, of binding the princes and peoples of India by a closer, more personal tie of loyalty, to the English rule.

Queen Victoria, perhaps, valued almost as highly the support which her prime minister gave her in promoting the passage into law of the Public Worship Regulation Act of 1874. This bill, proposed by the archbishop of Canterbury, Dr. Tait, had for its object to restrain the alleged illegalities of ceremonial practised by the Anglo-Catholic party in the Anglican Church; in Disraeli's picturesque phrases it aimed at "putting down ritualism" and abolishing "the mass in masquerade." An untoward incident of the debates on the measure was a bitter interchange between the prime minister and Lord Salisbury (a moderate High Churchman), who opposed the bill and was described by his chief as "a great master of gibes and flouts and jeers." The remark, however, did not lead to a breach with his powerful lieutenant, and the vehement Protestantism of the queen was gratified by Disraeli's remark that the success of the bill had been wholly due to "the personal will of the sovereign."

That "personal will" was not less strongly felt in the principal matter with which Disraeli's last and greatest administration had to deal, the Eastern question (*q.v.*). Ever since his youthful tour in the East, he had taken a specially keen interest in that department of politics and the concern for Britain's Indian empire which had spurred him on to give the queen her new title made him vigilantly jealous of all possible encroachments on British supremacy in the East. In 1875 a unique opportunity occurred for gaining possession of one of the chief doorways to the orient. The khedive of Egypt found himself compelled by his heavy debts to offer for sale his 177,000 shares in the Suez canal. Disraeli, on receiving early news that the shares were to be disposed of, promptly borrowed the four millions needed from the Rothschilds in the name of the cabinet and waited for parliament to sanction his audacious stroke. It may be reckoned the greatest service that in his long career he rendered to his country.

More complicated was the trouble that arose in 1876 in the Balkan peninsula. Following Palmerston and the great diplomatist Lord Stratford de Redcliffe, who had directed the policy that culminated in the Crimean War, Disraeli was deeply convinced that only by maintaining the Turkish empire with its centre at Constantinople could Russia be prevented from obtaining a position at the Straits from whence ultimately she would threaten British dominion over India and elsewhere in the East. The Bulgarian revolt of 1876, however, suppressed by the Turkish government with hideous barbarity, seemed to give Russia only too plausible an excuse for interfering in the Near East in the interest of humanity. Disraeli made an initial blunder when he dismissed the news of the atrocities committed by the Turkish troops in Bulgaria as "coffee-house babble," and the apparent callousness of his attitude enabled his opponent Gladstone (who had temporarily retired from the leadership but not from the fighting ranks of Liberalism) to mobilize an immense weight of public opinion against him by vigorous pamphlets and by speeches demanding the expulsion of the Turkish government "bag and baggage" from Europe. Disraeli was not shifted from his position by the outcry, and as the situation became more entangled by Montenegro and Serbia declaring war on the Sultan and by Russia peremptorily demanding an armistice, he delivered at the Lord Mayor's banquet in November a defiant speech on England's readiness for war. This seemed doubly unfortunate since shortly before a conference of representatives of the Powers had been convoked at Constantinople, with Lord Salisbury representing England. Although Salisbury reached a friendly agreement with Ignatiev, the Russian representative, and a plan for reorganizing the government of the Sultan's Balkan possessions was accepted by the conference, the upshot was a failure, through the obduracy of the Turkish Government, who considered that the attitude openly displayed by the British Minister and more cautiously shown by the foreign minister, Lord Derby, justified them in believing that the failure of the negotiations would not displease the British Government. In pursuing this line Disraeli (who had in the summer of 1876 gone to the House of Lords with the title earl of Beaconsfield) had the energetic support of the queen, who dreaded the spectre of Russian aggression in the Near East and was revolted by the extravagant agitation of the Liberals and High Churchmen in favour of the Balkan Christian States.

The result of the failure of the conference was the outbreak of war between Russia and Turkey in the summer of 1877, and Disraeli was now faced with the triple task of maintaining a threatening front against a possible Russian advance upon Constantinople, preserving the unity of his cabinet (in which Salisbury and Carnarvon by no means shared his enthusiastically pro-Turkish convictions, while Derby grew progressively more and more alarmed at the possibility of England being involved in the war), and restraining the ardour of the queen, who was passionately desirous of throwing down the gauntlet to Russia. When after sharp vicissitudes of success and failure, the Russian armies in December captured Plevna, which had heroically resisted their advance, and appeared on the outskirts of Constantinople, Disraeli, still hotly pressed by the queen who even spoke of abdication, began to concert measures of warlike preparation and a schism in the Cabinet became inevitable. Carnarvon was the first to go, and when on Feb. 8, 1878, the English fleet was sent up to Constantinople, and on March 27 the cabinet decided to call up the reserves and to seize as military post Cyprus and Alexandretta from which to control the eastern Mediterranean, Derby also resigned his position. Fortunately for Beaconsfield, Salisbury was indisposed to tolerate the demands made upon the Sultan by Russia in the Treaty of San Stefano, dictated, as it were on the field of victory. It provided for an autonomous Bulgaria with far-reaching frontiers, the entire independence of Rumania, Serbia and Montenegro, the cession of Kars and Batum to Russia and the payment of a war indemnity by the vanquished Turks. Salisbury agreed to take Derby's place at the Foreign Office and promptly issued a circular to the Governments of Europe demanding that Russia should submit the Treaty in all its parts to a congress. Russia was in no position to refuse, but before the congress met at Berlin and while Disraeli was summoning Indian troops to Malta a secret agreement between England and herself conceded the division of Bulgaria into two parts, the Southern enjoying less independence than the Northern and the retention by Russia of Kars and Batum subject to England finding compensation in another quarter, which was effected by requiring Turkey to cede Cyprus in return for a guarantee of her Asiatic possessions. This arrangement naturally robbed the congress which opened on June 13 of much of its actuality. Beaconsfield and Salisbury represented Great Britain, and the "old Jew" greatly impressed Bismarck by his firmness. At one moment when the Russian representatives seemed inclined to waver on the new arrangements about Bulgaria, he ordered his special train to be got ready for his departure from Berlin. The influence of Bismarck and of Austria-Hungary, which had been placated by receiving the right to administer Bosnia and Hercegovina, ultimately induced Russia to yield to the chief English demands; a Treaty in that sense was signed on July 13 and Beaconsfield and Salisbury returned to England in triumph, the former claiming to have brought with him "peace with honour."

It was his last triumph. Misfortune gathered round the last months of his Government. Both in South Africa, where the Zulus massacred an English force at Isandhlwana and in Afghanistan, where the British Resident at Cabul was murdered with his staff, it seemed that Conservative policy was rash and ill-judged. The efforts made by the able home secretary, Richard Cross, to improve artisans' dwellings and public health (a legacy of the ideas expressed in *Sybil*) did less to strengthen Conservatism than the acute agricultural depression did to destroy its popularity. A shattering defeat was encountered at the polls in 1880 and Beaconsfield did not tarry in resigning. He took up again a novel he had left unfinished when called to office, and produced in *Endymion,* which was published towards the end of the year, a political novel that was rather a romantic retrospect of the years he had known, than the enunciation of a programme or of a set of principles. In March 1881 Beaconsfield was attacked by a chill, which proved fatal on April 19. He was buried in the family

vault at Hughenden between Lady Beaconsfield and Mrs. Brydges Willyams, and a few days after the interment Queen Victoria came herself to lay a wreath with her own hand upon the grave of her favourite minister.

The character and achievements of Benjamin Disraeli have been variously estimated. As a novelist, for all his wit and his moments of acute realism, he was too individual and fantastic to be classed with a school or to perpetuate a tradition. In considering him as a statesman few would be found to deny that by his courageous seizure of opportunity in the matter of the Suez canal shares he did more to consolidate British power in the east than has fallen to most statesmen to do at a single stroke. Only prejudice again could refuse him the credit of having by tenacity and astuteness reconstructed the Conservative party, shattered by Peel's about-face on the corn law question, and incapable of being restored to its old strength by Derby's dilettante and capricious leadership. Disraeli not only held Conservatism together; he secured for it a new lease of prosperity by making it a popular rather than a restrictive cause. It has on the other side been urged that many or most of his peculiar ideas proved impracticable or sterile. His championship of protection and the preponderance of the landed class, his theory of "estates of the realm" as an alternative to democratic parliamentarism, his faith in the recovery of personal power by the crown, his desire to draw the cords of empire closer by a tariff, a military code and a continuous council representing the Dominions in London, his ecclesiast-policy of warring on both the latitudinarian and Catholic elements of Anglicanism, all proved designs that were either abandoned by their author or failed to commend themselves to posterity. Nor was his Near Eastern policy, on which he especially plumed himself, anything but a grandiose failure. The division of Bulgaria, with the whole scheme of maintaining Turkish rule in the Balkan peninsula, has passed like a dream, while the establishment of the Hapsburg monarchy in Bosnia and Hercegovina paved the way for the conflagration of 1914. In spite of these considerations, however, Conservatives are loth to admit that Disraeli left no legacy beyond the sentimental tradition that founded the "Primrose League" on one of his alleged floral preferences. They feel that they have inherited from him a spirit if not a set of dogmas. The union of Toryism with democracy, the acceptance of the duty of social reform, pride in the empire apart from considerations of material profit, the veneration of the crown as the sacramental symbol of national and imperial unity, are all principles that the modern Conservative finds expressed with incomparable force and felicity in the speeches, novels and epigrams of this undoubtedly mysterious personality.

To solve that fascinating mystery many attempts have been made. Disraeli's personal integrity is no longer doubted. His zeal for his party and his country makes it inappropriate to call him an "adventurer," however adventurous on many occasions his policy. Yet he continues to baffle critics. Few have been more successful in summarizing his character than Frederick Greenwood in the memoir that appeared in earlier editions of this *Encyclopædia*, part of which may fitly be quoted here:—"He was thoroughly and unchangeably a Jew. At but one remove by birth from southern Europe and the East, he was an Englishman in nothing but his devotion to England and his solicitude for her honour and prosperity. It was not wholly by volition and design that his mind was strange to others and worked in absolute detachment. He had 'none of the hereditary prepossessions of the native Englishman.' No such prepossessions disturbed his vision when it was bent upon the rising problems of the time, or rested on the machinery of government and the kind of men who worked it and their ways of working. The advantages of Sidonia's intellect and temperament were largely his, in affairs, but not without their drawbacks. His pride in his knowledge of the English character was the pride of a student; and we may doubt if it ever occurred to him that there would have been less pride but more knowledge had he been an Englishman. It is certain that in shrouding his own character he checked the communication of others to himself, and so could continue to the end of his career the costly mistake of being theatrical in England." (D. L. Mu.)

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BEACONSFIELD, urban district, South Buckinghamshire, England. Pop. (1938) 5,506. Area 8.4 sq.mi. It lies just off the chalk of the Chilterns, above the valley of the small River Wye, giving access to High Wycombe and thus to North Bucks and Oxfordshire. It grew as a posting station of some importance, and has revived its function as a route town with modern road traffic. The Oxford road forms its main street. The improvement of railway communication with London in 1906 led to an influx of resident population. (The population in 1901 was 1,570.)

The Perpendicular church of St. Mary and All Saints is the burial place of Edmund Burke (d. 1797) who lived at Butler's Court, near the town. Benjamin Disraeli chose the title of Earl of Beaconsfield in 1876. There was formerly a considerable manufacture of ribbons.

Since 1918 the town has formed part of the Aylesbury parliamentary county division.

BEACONSFIELD, a town in South Africa. It is at an elevation of 3,790 ft. The town was founded in 1870 near the famous Du Toit's Pan diamond mine. It became practically a suburb of Kimberley, and was officially united to that municipality in 1912.

BEACONSFIELD, a town of Devon county, Tasmania, Australia, on the river Tamar. Pop. (1933) 3,533. It is the centre of the most important goldfield in the island. Dairies and apple orchards are numerous.

BEADLE, also **BEDEL** or **BEDELL,** originally a subordinate officer of a court or deliberative assembly, who summoned persons to appear and answer charges against them (*see* Du Cange, *supra tit. Bedelli*). As such, the beadle goes back to early Teutonic times; he was probably attached to the moot as its messenger or summoner, being under the direction of the reeve or constable of the leet. After the Norman Conquest, the beadle seems to have diminished in importance, becoming merely the crier in the manor and forest courts, and sometimes executing processes. He was also employed as the messenger of the parish, and thus became, to a certain extent, an ecclesiastical officer, but in reality acted more as a constable by keeping order in the church and churchyard during service. He also attended upon the clergy, the churchwardens and the vestry. He was appointed by the parishioners in vestry, and his wages were payable out of the church rate. From the Poor Law Act of 1601 till the Act of 1834 by which poor-law administration was transferred to guardians, the beadle in England was an officer of much importance in his capacity of agent for the overseers. In all mediaeval universities the bedel was an officer who exercised various executive and spectacular functions (H. Rashdall, *Hist. of Universities in the Middle Ages,* i. 193). He still survives in many universities on the continent of Europe and in those of Oxford and Cambridge, but he is now shorn of much of his importance.

BEAD MANUFACTURE. A bead is a small globule or ball used in necklaces, etc., and made of a great variety of materials.

Beads have been made from remote antiquity, and are found in early Egyptian tombs; variegated glass beads, found in the ground in certain parts of Africa, as Ashantiland, and highly prized by the natives as *aggry*-beads, are supposed to be of Egyptian or Phoenician origin. Glass beads have long been used for purposes of barter with savage tribes.

Czechoslovakia produces by far the largest proportion of the world's beads, and though the variety from that country alone is immense, the principal material employed is glass. From Venice come the Venetian beads that are ornamented in bright colours, the colouring matter being blown on by means of a tube. Carved ivory and bone beads come from China and Japan; porcelain beads

from France, Germany and Austria; jug beads from Bavaria. Then there are loofa beads, noteworthy for their extremely light weight, mosaic beads and pound beads, so called because, being so very small, they are sold by the pound weight.

In glass beads there are two distinct methods of colouring. The cheaper kinds are dyed on the outer surface, while the better are coloured on the interior surface. Variegated effects are sometimes introduced by mixing a number of colours while the material of which the bead is made is in a hot and plastic form. Different finishes are identified by the application of trade terms, as, for example, the "satin" bead, which has a dull lustre.

The bead trade is essentially a fashion trade, and therefore fluctuates considerably from year to year, this applying both to beads used for necklaces and for the trimming of dresses. Cylindrical beads for the latter purpose are often known as "bugles."

The Gablonz Industry.—The centre of the Czechoslovak bead industry is in the district of Gablonz, the exports of which amount to about half of the extensive artificial jewellery production of that area. At one time the industry consisted primarily in the production of celluloid beads imitating sea corals in form and colour, but in modern times glass, wood, galalith, horn and tortoiseshell are employed. With the glass beads the raw material, either crystal or black or in various natural colours, such as topaz, aquamarine, amber, ruby, garnet, etc., is produced in the form of glass rods of about a yard in length, this work either being done on factory scale in glass works or at home by members of families. A special kind of the raw material is called "rocail," which is produced from a heavy lead glass. In Gablonz there are about 20 firms manufacturing beads, and production is also carried on in neighbouring places. The industry suffered severely during the World War, but on the cessation of hostilities quickly re-established itself, and in a short space of time the number of exporters rose from about 200 to 700. (G. J. W.)

BEAD-MOULDING, in architecture, a small moulding having a convex profile usually semi-circular. It is differentiated from the *torus,* whose profile is similar, only by its smaller size. It is sometimes decorated by breaking its surface with rhythmic alternations of long, narrow, oval forms and short, reel-shaped or wheel-shaped forms, and is then known as the bead and reel. It is also sometimes decorated by a helical incision forming it into a rope or cable moulding (*q.v.*) or by carving it into a series of adjacent hemispheres. Its most common use is either above or below a larger moulding, or as part of a necking or horizontal division.

BEADS. The word bead is derived from the Saxon verb "biddan," to pray; originally associated with the "beads" on a rosary, it has now been extended to mean almost any pierced object which can be strung. Their great diversity of form, portability and lasting power make beads one of the most valuable articles for tracing the influence of nation upon nation even back to the times of which no written records exist.

Stone Age Beads.—The earliest objects supposed to be beads are certain small fossils, *Coscinopera globularis,* found in numbers in graduated sizes amongst the Acheulian remains. These have natural holes through them, but in some cases the holes appear to have been enlarged by hand, and the ends show signs of wear. By the Aurignacian period there is no doubt that beads were worn in large quantities, and in the carving of the "Femme au Renne" (Laugerie-Basse, Dordogne), the woman, although otherwise nude, wears a bead necklace. Amongst the beads of this period, which are made of teeth, shell, bone and ivory, is a chamois tooth with two perforations (fig. 1, 1) which appears to have been a spacing bead, and suggests that the necklaces with several strings separated by spacing beads, so common in the bronze age, were in use at this period. In the neolithic and later periods the wearing of beads appears to have been universal in all parts of the world. Such trouble was taken to make many of them that they were probably used more as amulets than as ornaments. In Egypt the word for them was "Sha-sha," the syllable "Sha" being the Egyptian word for luck.

Mesopotamia.—(*See* BABYLONIA AND ASSYRIA.) Discoveries at Ur show that about 3500 B.C. the Mesopotamians had a more advanced culture of beads than any other country we know of at that period. Beads were made of pearl, lapis, cornelian, other stones, shell, ostrich shell and occasionally faience. Many of the stones had definite amuletic properties. Very well made bicone

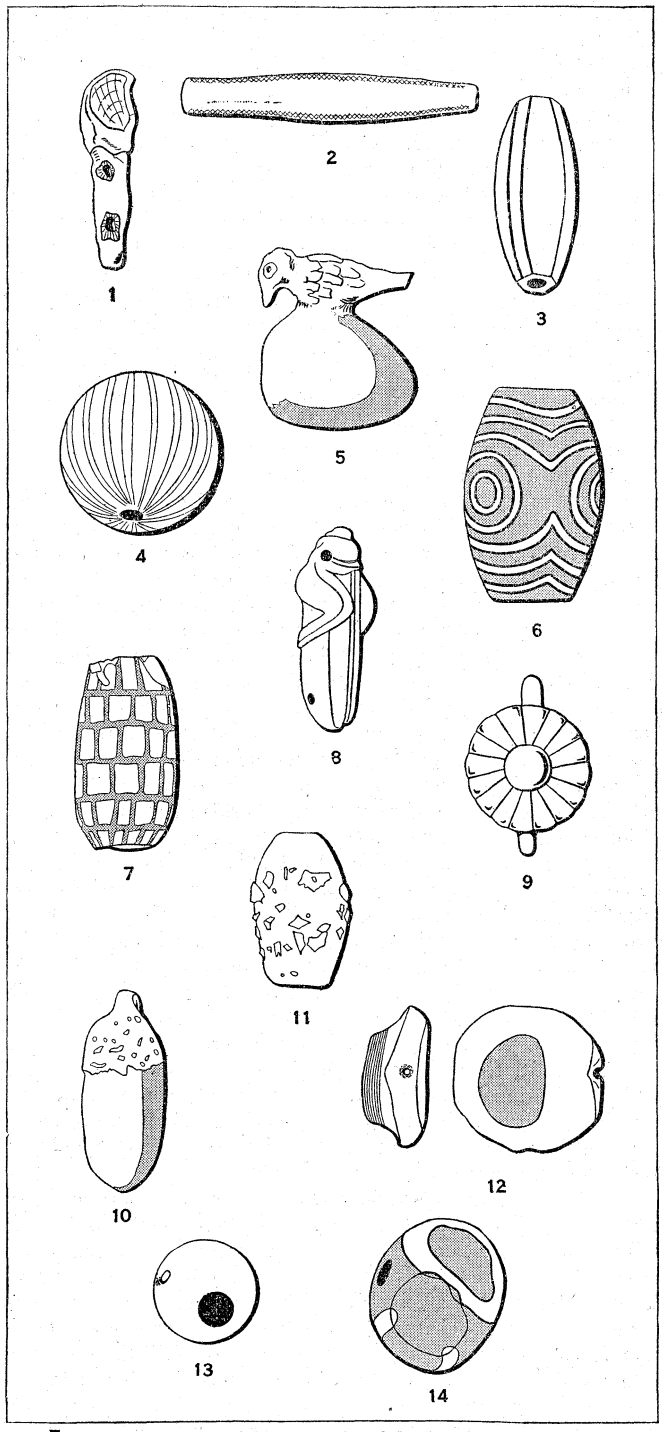

FIG. 1.—TYPES OF BEADS IN USE FROM 3500 B.C. TO 700 B.C.

1. Chamois tooth spacing, Aurignacian period, France. Length, .72 inch
2. Bicone cornelian, Ur, Mesopotamia, 3500 B.C. Length, 2.5 inches
3. Octagonal barrel lapis, Ur, Mesopotamia, 3500 B.C. Length, 1.35 inch
4. Lapis melon, Ur, Mesopotamia, 3500 B.C. Diameter, 1.1 inch
5. Gold bead representing a bird on fruit, Ur, Mesopotamia, 3500 B.C. Length, .38 inches
6. Etched cornelian, Ur, Mesopotamia, 3100 B.C. Length, .44 inch
7. Etched cornelian, Ur, Mesopotamia, date unknown. Length, .52 inch
8. Locust spacing in cornelian, Egypt, XIIth dynasty. Length, .5 inch
9. Daisy spacing Tel el Amarna, Egypt, XVIIIth dynasty. Length, .8 inch
10. Date pendant Tel el Amarna, Egypt, XVIIIth dynasty. Length, .7 inch
11. Faience crumb, Egypt, VIIth dynasty. Length, .5 inch
12. Onyx cats eye, Assyria, before 700 B.C. Length, .76 inch
13. Simple spot glass eye, Tel el Amarna, Egypt, XVIIIth dynasty. Diameter, .55 inch
14. Impressed ring eye, Mediterranean area, *c.* 800 B.C. Diameter, .65 inch

cornelian beads (fig. 1, 2), octagonal barrel beads (fig. 1, 3), and lapis melon beads (fig. 1, 4), were interspersed with elaborate gold beads (fig. 1, 5) and pendants, and mixed with minute carved beads some not much more than 1mm. in diameter with a perforation of ½mm. The etching of cornelian and chalcedony was employed at this period. In one method the pattern was made by etching white lines on a red background (fig. 1, 6). In another the whole surface was first etched white and then dark lines re-etched on that (fig. 1, 7). This process is found in the contemporary Indo-Sumerian beads from Mohenjo-Daro on the Indus, where other beads also suggest a connection between the two countries; it is practically unknown in Egypt, but it has been later used in the Crimea and other parts of Russia.

Many of the Mesopotamian beads of various periods have elliptical, lenticular or planoconvex transverse sections. These shapes are also found to a smaller extent in pre-dynastic Egypt but are rare in dynastic times. Glazed quartz beads are found from an early date up to about 2000 B.C.; they are usually colourless.

Egypt.—(*See* EGYPT: *Archaeology: Detail: Ceramics.*) The earliest Egyptian beads are the Badarian which are mostly of stone. Amongst them is a large number of glazed steatite beads. The glaze used is practically glass, but glass beads are not found until much later.

In the pre-dynastic period "Faience" beads appeared, and were extensively used down to recent times. They have a core consisting of quartz fragments cemented together by heat with a small admixture of lime. This core is covered with glaze. The blue colouring matter was copper, the purple and black was manganese. Special faience beads which appear in early dynasties reach a high state of perfection both in colour and shape during the 12th dynasty, which marked the zenith of Egyptian beads. A typical bead was the ball amethyst, found in great numbers during the 12th dynasty but uncommon at other times. Other favourite materials were gold, green feldspar, lapis and cornelian; the last frequently cut into odd shapes such as a locust etc. (fig. 1, 8).

Glazed quartz beads which commence in the pre-dynastic extend down to the 12th dynasty, but probably not later. They are always coloured blue or green. At Der el Bahri blue beads of the early 18th dynasty reached the finest colour, whilst at Tel el Amarna slightly later factories existed which turned out thousands of beads and pendants representing flowers, fruits, etc. (fig. 1, 9 and 10). For colour and daintiness of design these are unsurpassed. Crumb beads in which small pieces of steatite or faience are cemented on to the surface of a faience bead appear in the 5th dynasty and last to the 18th (fig. 1, 11). Glass came into general use in Egypt in the 18th dynasty, although earlier specimens are recorded both from Egypt and Mesopotamia. From the 19th to 22nd dynasty small oblate and cylindrical beads were made by the million to cover mummies, in some cases woven into complete covers with elaborate designs. During this period and down to the Saite period (about 600 B.C.) amuletic beads and pendants representing various emblems and deities were very common. After this date, although quantities of beads were still made in Egypt those found in the Mediterranean area became more interesting. In the Sudan and West Africa numbers of ancient beads are dug up, which are very highly prized by the natives. In some cases these may date from the Roman period.

Eye Beads.—These were almost invariably talismans. One of the earliest forms is the onyx cat's-eye bead from Mesopotamia (fig. 1, 12), of which a specimen is dated 2200 B.C. The majority of eye beads, however, were made of glass. There were four chief varieties: (1) Spot eye beads, in which simple spots of one coloured glass were stuck on to, or pressed into, a matrix of another colour (fig. 1, 13); (2) impressed eye beads in which a ring of different coloured glass was pressed into the matrix (fig. 1, 14); (3) stratified eye beads, in which a spot was pressed into the matrix, a second spot pressed into the first, and so on (fig. 2, 15); (4) inserted cane eye beads, in which pieces of a glass cane or rod with the required pattern in it were broken off and pressed into the matrix. The first and third methods are the earliest, both being used as early as 1300 B.C. The second commenced in the 9th century B.C. The fourth, though usually much later, is occasionally found in the 6th century B.C. Eye beads continued to be made during Roman and Saxon times and are still manufactured in great quantities at Hebron for protection from the evil eye.

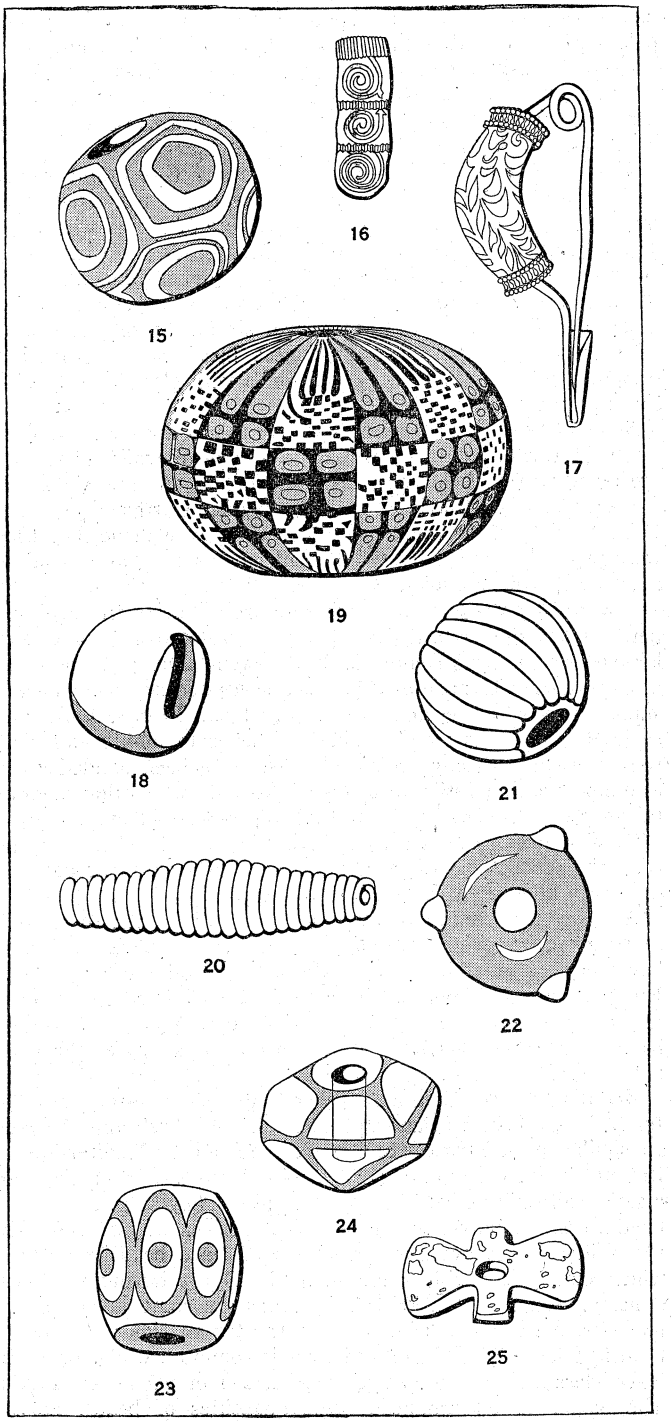

FIG. 2.—TYPES OF BEADS IN USE FROM 1300 B.C. TO A.D. 1500

15. Stratified eye, Italy, c. 1300 B.C. Diameter, .75 inch
16. Glass pendant with spirals, Aegean, 1300 B.C. Length, 1.3 inch
17. Glass leech on gold fibula, Carniola, 900 B.C. Length, 3. inches
18. Amber talisman, Brittany, Roman period. Diameter, .75 inch
19. Viking Chequer, Gotland, 850 A.D. Diameter, .9 inch
20. Spiral gold, Ireland, bronze age. Length, 7.5 inches
21. Faience melon, London, Roman period. Diameter, .6 inch
22. Glass with raised spots, Suffolk, late Roman period. Diameter, .5 inch
23. Double wave and spot glass, Kent, Anglo-Saxon. Length, .56 inch
24. Facetted quartz, Cambridgeshire, Anglo-Saxon. Length, 1.7 inch
25. Carved stone, Peru, c. A.D. 1500. Length, 1.25 inch

Aegean Beads.—The early beads from Crete and the Aegean islands show decided originality. The most striking novelty was the flat glass bead and pendant (fig. 2, 16) dating to about 1300

B.C. These were made of transparent glass, some colourless, some pale blue and some dark blue. The technique of their manufacture was not used in Egypt until several centuries later. The flush glass crumb bead in which pieces of glass of different colours were pressed flush into a matrix, began to appear at this period; a few centuries later it became a common type.

Mediterranean Area.—The Villanovans (*q.v.*) and Etruscans (*q.v.*) from the 9th to the 6th centuries B.C. used great quantities of beads. A large proportion were of amber which was probably imported from the Baltic, glass beads were extremely common, whilst gold and bronze ones were not infrequent. Some of them are very large, scaraboids over four inches long being made of amber, and spiral beads over six inches long of bronze wire. Besides being strung as necklaces, beads were also used to ornament pins and fibulae. A gold fibula with glass leech bead is shown in fig. 2, 17.

Some of these beads found in Italian tombs appear to be definitely Etruscan, but many belong to a type of which quantities are found all round the eastern Mediterranean and the Black sea, in Italy, Sicily, Corsica, Sardinia, Syria, Carthage and the Crimea. There is no evidence where they were made, but they were probably carried by the Phoenicians as they are found so much in Phoenician colonies.

Northern Europe.—In northern Europe during the neolithic period many amber beads and pendants were worn. Some very large ones come from Denmark. In the French Dolmens are found numbers of beads made of callais, a species of turquoise which is supposed to have been imported from China. In pre-Roman and early Roman times large numbers of beads of amber and glass were worn in Brittany. Some of these have been handed down as amulets and are still worn by the peasants who value them as talismans. Such glass beads are said to preserve the eyesight, and the amber ones to be a certain cure for stomach-ache. In some cases the perforations of the beads have almost worn through and then been filled up with metal (fig. 2, 18).

Amongst the beads from Viking graves of the 7th to the 9th century A.D. are several elaborate chequer beads (fig. 2, 19). These have not been found in graves of the same period in other parts of Europe, but a specimen has been found in a Crimean grave over 1,000 years earlier. This suggests that these Viking beads may have been handed down as amulets in the same way as the Brittany beads.

British Beads.—Gold and amber beads of the bronze age are found in southern England and Ireland. The Irish amber beads are similar to the Etruscan and may come from the Mediterranean. But in England elaborate strings with large spacing beads and many small intermediate beads are found. They seem to be confined to this country, where similar necklaces in jet occur. In the Wiltshire barrows segmented blue faience beads are found which closely resemble some made in Egypt during the 18th dynasty. Amongst the Irish gold beads are some bicone beads made from gold wire (fig. 2, 20). In Roman times the melon bead in faience (fig. 2, 21) and glass is common, whilst beads in black glass with coloured eyes (fig. 2, 22) or waves are found. The Saxon period produced great quantities of beads, mostly of glass; these, especially the Kentish ones, show a great similarity to the Merovingian beads of the Rhine district, but there is evidence which suggests that some of them have been made in this country. The double wave and spot bead (fig. 2, 23) occurs in almost all Anglo-Saxon cemeteries. Large faceted crystal beads (fig. 2, 24) and crystal spheres in bronze mounts are typical of this period.

America.—The early civilizations of North and South America produced great numbers of beads. From the Indian grave mounds of North America come beads of stone and shell, both complete shells and shaped beads cut out of large shells. In Peru, beads in turquoise and other stones are found; some of a curious shape which suggests the double axe (fig. 2, 25); whilst from Lake Guatavita in Colombia come quantities of beads and pendants of stone, amber and gold.

Trade Beads.—Since the middle ages the manufacture of beads for sale or barter has been carried on in Europe. Explorers have at all times found them invaluable when dealing with natives and many of the early trade beads are still greatly prized in the countries where they have been sold. During the 17th and 18th centuries this trade in beads, or "conterie" as it was called, was enormous, and warehouses along the Thames were full of them. At the present day great quantities of beads are worn by all semi-civilized races, by whom they are frequently used as money. These beads show immense variety and are of great interest, but it is impossible to discuss them in this article.

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BEADSMAN or **BEDESMAN,** a pensioner whose duty it was to pray for his benefactor (M.E. *bede,* prayer). In Scotland there were public almsmen supported by the king and expected in return to pray for his welfare. They wore long blue gowns with a pewter badge on the right arm, and were nicknamed Blue Gowns. Their number corresponded to the king's years. On the king's birthday each beadsman received a new blue gown, a loaf, a bottle of ale, and a leathern purse containing a penny for every year of the king's life. On the pewter badge were their name and the words "pass and repass," which authorized them to ask alms throughout Scotland. The word had a special sense as the name for those almsmen attached to cathedral and other churches, whose duty it was to pray for the souls of deceased benefactors.

BEAK, the horny bill of a bird, and so used of the horny ends of the mandibles of the octopus, the duck-billed platypus and other animals; hence the rostrum or ornamented prow of ancient war vessels. The term is also applied, in classic architecture, to the pendent fillet on the edge of the *corona* of a cornice, which serves as a drip and prevents the rain from flowing inwards.

The slang use of "beak" for a magistrate or justice of the peace, has not been satisfactorily explained. The earlier meaning, which lasted down to the beginning of the 19th century, was "watchman" or "constable." The word is also used in certain English public schools as a slang name for a schoolmaster.

BEAKER, a large, wide-mouthed drinking-cup, supported on a flaring base or foot; also, a deep vessel of glass, with a projecting lip, used in laboratories. The beaker, used as a drinking-vessel, was perhaps more popular in the 16th century than at any other period. Various designs in metals that lent themselves to decorations were common. The laboratory type is better known at present—a plain, deep, thin vessel of glass, or sometimes copper or porcelain, with a projecting lip. *See* DRINKING VESSELS.

BEAK-HEAD, in architecture, an ornament consisting of the top of a bird's head with its beak, or any similar form, used by the Norman Romanesque builders, especially in England, for the decoration of arch mouldings.

BEALE, DOROTHEA (1831–1906), headmistress of Cheltenham Ladies' college, England, was born on March 21, 1831 and died at Cheltenham, Nov. 9, 1906. In 1848 she attended lectures at the newly opened Queen's college, London, and in 1857 was appointed head teacher of the Clergy Daughters' school at Casterton, Westmorland—the "Lowood" of Charlotte Brontë's *Jane Eyre.* In June 1858 Miss Beale was chosen as principal of the Ladies' college, Cheltenham (opened 1854), and during her time there the numbers rose from 69 girls to some hundreds, the financial arrangements were reorganized, and new buildings were erected from 1873 onwards. In 1869, she published the *Reports*

on the Education of Girls, the result of the Endowed Schools Enquiry Commission before which she had given evidence in 1865. Realizing the necessity for training teachers, Miss Beale helped to establish the first residential training college in this country, St. Hilda's college, at Cheltenham; she also opened St. Hilda's hall, a college for women, in 1893. From 1895–97 she was president of the Headmistresses' Association.

See E. Raikes, *Dorothea Beale of Cheltenham* (1908).

BEAM, a solid piece of timber, as a beam of a house, of a plough, a loom, or a balance (O.E. *béam, cf.* Ger. *Baum,* a tree, to which sense may be referred the use of "beam" as meaning the rood or crucifix, and the survival in certain names of trees, as hornbeam). From meaning simply the cross-bar of the balance, "beam" has come to be used of the whole, as in the expression "the king's beam," or "common beam," which refers to the old English standard balance, formerly in the custody of the Grocers' Company, London. As a nautical term, "beam" was transferred from the main cross-timbers to the side of the ship; thus "on the weather-beam" means "to windward," and a ship is said to be "wide in the beam" when she is wide horizontally. The phrase "to be on one's beam-ends," denoting a position of extreme peril or helplessness, is borrowed from the position of a ship which has heeled over so far as to stand on the ends of her horizontal beams. The meaning of "beam" or rays of light comes by association with the Latin *columna lucis,* a pillar of light.

BEAN, the seed of certain leguminous plants cultivated for food all over the world, and furnished chiefly by the genera *Vicia, Phaseolus, Dolichos,* and *Glycine.* The Windsor or broad bean cultivated in Great Britain and in Europe is the seed of *Vicia faba.* The French bean, kidney bean or haricot, the common bean of the Americas, is the seed or pod of *Phaseolus vulgaris.* In the Orient several other species of *Phaseolus* are raised, and form no small portion of the diet of the inhabitants. Besides these, numerous other legumes, frequently called beans, are grown as the food either of man or of domestic animals. The broad bean (*Vicia faba*) is as nutritious as wheat; it contains about 25% protein, a very high proportion, and has an energy value of 1575 calories per pound. It is, however, a rather coarse food, difficult of digestion, and is chiefly used to feed horses. It is sometimes called horse bean. In England, French beans are used almost exclusively in the green state; the whole pod being eaten as a table vegetable or prepared as a pickle.

The broad bean or common bean of Europe is an annual which has been cultivated from prehistoric times. It will not tolerate hot weather; so it can be grown in the lower latitudes of the temperate zones only as a winter crop. The lake-dwellers of Switzerland and northern Italy, in the bronze age, cultivated a small-fruited variety; and it was grown in ancient Egypt, though, according to Herodotus, regarded by the priests as unclean. Alphonse de Candolle (*Origin of Cultivated Plants,* p. 320) concluded that the broad bean was introduced into Europe probably by the western Aryans at the time of their earliest migrations. He suggested that its wild habitat was two-fold some thousands of years ago, one of the centres being on the south of the Caspian, the other in North Africa.

The broad bean is a plant which will flourish in a mild climate in all ordinary good garden soils. The seeds are sown about 4 in. apart in rows $2\frac{1}{2}$ ft. apart for the smaller and 3 ft. for the larger sorts. The soil should, preferably, be a rather heavy loam, deeply worked and well enriched. An early crop may be obtained (in England) by dibbling in the seeds in November, sheltering by a frame, and in February transplanting them to a warm border. Successional crops are obtained by sowing suitable varieties from January to the end of June. The plants are usually topped when the pods have set. The broad bean is rarely grown in the United States except as a winter or early spring crop in the milder localities of the west and southwest.

The kidney bean, French or haricot bean (*Phaseolus vulgaris*), a tender annual, dwarf and bushy, or vine-like and twining in growth, is widely cultivated in temperate, subtropical and tropical regions, but is nowhere known as a wild plant. It was long supposed to be of Indian origin, an idea which was disproved by Alphonse de Candolle, who concluded that it is probably of South American origin. Seeds, apparently of *Phaseolus vulgaris,* have been found in Peruvian tombs of uncertain date, mixed with seeds of many other species, all American. In the United States the name "kidney bean" refers to a specific group of field varieties of *P. vulgaris* grown for their dry seeds which are definitely kidney-shaped and either red or white in colour. The species, which is the common bean of the Americas, includes the garden sorts which are grown for their edible, succulent pods, and field varieties grown for their dry seeds of a wide diversity of sizes and shapes. Hundreds of varieties have been described. The estimated world production of dry beans, exclusive of the U.S.S.R., in 1937 was about 3,750,000 tons, of which Brazil produced 1,010,000 tons and the United States produced over 600,000 tons of *P. vulgaris* alone. In 1942 the United States produced over 1,000,000 tons of dry edible beans on approximately 2,000,000 ac., including about 800,000 tons of *P. vulgaris.* In the United States the principal dry bean-growing states are Michigan, California, Colorado, New Mexico, New York and Idaho. The United States also produced (1938 to 1941) about 15,000,000 bushels of fresh or "snap" beans for market and about 7,750,000 bushels for canning and freezing. Fresh beans are shipped up to 1,000 mi. or more to market.



BY COURTESY OF THE U.S. DEPARTMENT OF AGRICULTURE

THE SOYBEAN (GLYCINE SOJA), SHOWING STEM, LEAVES AND FLOWER CLUSTERS

In Great Britain and northern Europe early plantings of this bean, made about April 1, are sometimes started in pots, under shelter, and transplanted to the open later. In the United States they are sown only in the open after danger of frost is past. Commercial plantings are almost entirely of the bush type except in the Pacific Northwest where Blue Lake, a pole variety, is grown for canning. The bush varieties, both for fresh and dry beans, are sown 3 to 4 in. apart in rows $2\frac{1}{2}$ to 3 ft. apart, except that in the "dry farming" areas of the west where they are grown without irrigation the rows are 4 ft. or more apart. The seeds are covered $1\frac{1}{2}$ in. deep. Efforts to develop mechanical harvesters for fresh or snap beans have been unsuccessful, so they are all harvested by hand. Dry bean production, however, is on a highly mechanized basis, particularly in the western United States where all growing, harvesting and threshing operations are done by machinery. Plant breeders have developed many varieties resistant to specific diseases.

The scarlet runner (*Phaseolus multiflorus* or *P. coccineus*) is allied to *P. vulgaris* but differs markedly in its flowering habit and fruit characters. It is naturally a perennial and has a thick fleshy root, but is grown as a tender annual in Great Britain, in Europe, and to a minor extent in the United States. Its bright, generally scarlet flowers, in long racemes, and its adaptability to any good garden soil make it a favorite garden plant. A white-flowered, white-seeded type has been grown in the United States for its large, attractive dry seeds, sold under the name of "butternut bean" or the misnomer "Oregon lima." It is also of interest as being one of the few plants that twine from right to left. The seeds should be sown in the open, the first sowing in May, another at the beginning of June, and a third about the middle of June. In the London market gardens they are sown 8 to 12 in. apart in rows 4 ft. apart if the soil is good. The twining tops are pinched or cut off when the plants are from 2 to $2\frac{1}{2}$ ft. high, to save the expense of staking. It is better, however, in home gardens to have the rows standing separately, and to support the plants by stakes 6 to 7 ft. high and about 1 ft. apart. In train-

ing the shoots to their supports, they should be twined from right to left. As grown in the U.S. for dry seed the plants are not supported. By frequently picking the pods the plants are encouraged to produce successive pods which may be picked until the approach of frost.

The lima bean (*Phaseolus lunatus* or *P. limensis*) is a perennial, native to the American tropics. It is typically a tall vining plant, but many bush varieties have arisen, presumably as mutations, and these are of major importance in the U.S. and in Madagascar. The flowers are small, white, and borne profusely on long racemes. The pods are scimitar-shaped or rather spatulate, 3 to 4 in. long, containing three or four seeds. Seeds differ widely in size, thickness, colour and culinary quality. Some varieties, not commonly cultivated, have been known to develop harmful quantities of hydrocyanic acid when grown under certain adverse cultural conditions. The lima bean requires higher temperature than the kidney bean so is confined chiefly to the warmer parts of the world. In 1940–41 about 110,000 tons of dry lima beans were grown annually in California. Elsewhere in the U.S., about 15,000 tons of lima beans in the pod were grown for marketing fresh, and about 32,000 tons for canning and freezing.

Seed of the horse gram (*Dolichos biflorus*) is eaten by the poor classes in India, and the seeds and pods are also fed to horses and cattle.

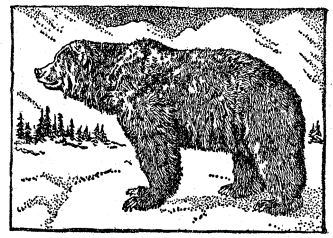
The lablab (*Dolichos lablab*) is a climbing herb, of which the young pods and seeds are widely used in the tropics of the old world. The plant is probably a native of equatorial Africa.

The soybean (*Glycine hispida*) has been a food, oil and forage crop of major importance in the orient, especially in China and Japan, from prehistoric times. Many hundreds of varieties are known. In addition to using the soybean as a vegetable and as a source of oil, the orientals have developed a variety of food products from it including preparations that superficially resemble milk and cheese; a piquant sauce is also made from it. In the U.S., the culture of the plant is recent. Although grown rather widely as a forage and soil improvement crop from about 1910, it became of great importance as a source of oil only after 1925. Phenomenal increases in production for oil and other industrial uses occurred from 1940 to 1943. During this time garden, or edible, varieties began to attract attention in America and gained rapidly in favour as a green vegetable and for use as mature dry beans. Other references to beans will be found under special headings such as CALABAR BEAN; LOCUST-TREE (CAROB-TREE); SOY-BEAN. There are also several nonleguminous seeds popularly called beans. Among these are the sacred Egyptian or Pythagorean bean (*Nelumbium speciosum*) and the Ignatius bean (*Strychnos Ignatii*), a source of strychnine. (V. R. B.)

BEANFEAST, an annual dinner given by an employer to his workpeople, and thus, colloquially, any jollification. The most probable theory connects the phrase with a feast on Twelfth Night, at which a cake with a bean buried in it was a great feature. The bean king was he who had the good fortune to have the slice of cake in which was the bean. This monarch was master of the revels like his congener, the lord of misrule. The king of the bean may have originally reigned for the twelve days from Christmas to Twelfth Night, his chief duty being the performance of magical ceremonies for ensuring good weather during the ensuing 12 months. He is probably the lineal descendant of the old king of the Saturnalia.

See WAYZGOOSE; MISRULE, LORD OF; also Brand, *Popular Antiquities of Great Britain* (Hazlitt's ed., 1905), under "Twelfth Night."

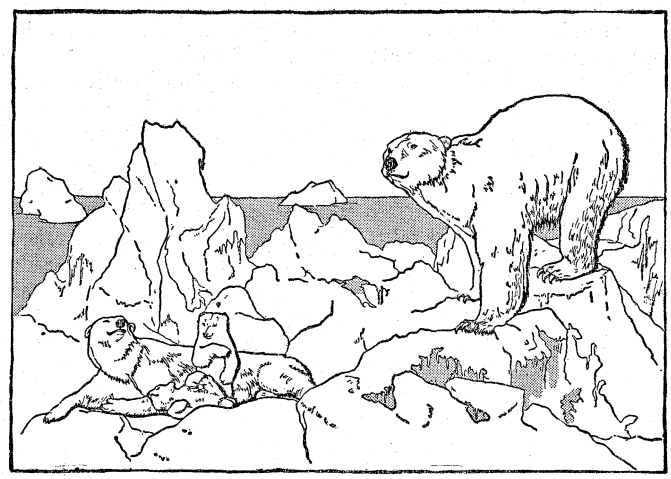
BEAR, originally the European brown bear (*Ursus arctos*), but extended to include all members of the family Ursidae (*see* CARNIVORA). Bears are characterized by their massive bodies, short limbs and very short tails; they are omnivorous and are particularly fond of honey; the grizzly bear (*U. horribilis*) and the polar bear (*Thalarctos maritimus*), however, are largely carnivorous. The five toes are provided with large, nonretractile claws, with which most species can climb well, though slowly. In northern countries the animals hibernate in the winter, having grown very fat during the autumn. The brown bear (*U. arctos*) is found over the temperate regions of the northern hemisphere from Spain to Japan, though extirpated in Britain before the end of the 11th century. It is the commonest species in captivity and can be trained to "dance" to music. A large species inhabits Alaska. The grizzly bear (*U. horribilis*), noted for its ferocity, formerly was found in western North America from Alaska to Mexico. Except in the national parks and in the north, this species is almost extinct. The grizzly received its name from its grizzled fur. The American black bear (*U. americanus*) is a woodland and largely vegetarian animal. Its valuable fur has led to a great reduction in numbers of this beast. The Asiatic black bear (*Selenarctos*) ranges from the Iranian frontier to Amurland, Japan and Formosa. It has a white horseshoe mark on the chest and is more carnivorous. The small bruang or Malay bear (*Helarctos*) lives largely on honey. The spectacled bear (*Tremarctos*) inhabits the Andes of South America. The sloth bear (*Melursus ursinus*) lacks one pair of upper incisors. It is also called the honey bear, but it lives largely on termites.



BY COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY

THE ALASKAN BROWN BEAR

The polar bear (*Th. maritimus*) is distinguished by its white fur and the stiff bristles on its feet. It is a very active animal, feeding on seals, walruses, fish and dead animals. The female brings forth her young in a chamber in the snow. This bear is confined to the Arctic.



BY COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY

A FAMILY OF POLAR BEARS (THALARCTOS MARITIMUS) IN THE ARCTIC

These animals rank among the largest of the bear family

The great cave bear (*U. spelaeus*) of the glacial epoch was bigger than any living species. Its remains have been found in central Europe and Asia. An allied species (*U. priscus*) inhabited Britain. Bears first occur fossilized in the Miocene.

BEAR, in dealing, a term used on the stock exchange, and in other markets in which speculation occurs, to describe a speculator who sells what he does not possess in the hope that before the account day he will be able to buy back at a lower price, and thus make a marginal profit. He sells for the fall, and his risk may be exceedingly great because there is no theoretic limit to the possible rise that may take place in the stock or product dealt in.

Powerful financial interests sometimes sell at declining prices thousands of shares of stocks that they do not own, for the very purpose of creating an unfavourable impression about the value of such stocks, in the hope of inducing others to throw their shares overboard for whatever offers are available. If these bear tactics result in heavy selling by the general public and others, then the original short sellers are able to buy back, or cover, at a considerably lower figure than they received. If one were clever enough to sell short at exactly the right moment, he could make a profit much more rapidly than by holding stocks for the advance in a rising market. This is because stocks are likely to go down in a poor market faster than they rise in a good market. The reason is that a falling market spreads fear, and fear is more suddenly contagious than hope. *See* also STOCK EXCHANGE (BOURSE); BACKWARDATION; BULL.

BEAR-BAITING and **BULL-BAITING,** sports formerly very popular in England but now suppressed on account of their cruelty. They took place in arenas built in the form of theatres which were the common resort even of cultivated people. In the bear-gardens, which are known to have existed since the time of Henry II., the bear was chained to a stake by one hind leg or by the neck and worried by dogs. Erasmus, writing (about 1500) from the house of Sir Thomas More, spoke of "many



AFTER THE LOUTERELL PSALTER

BEAR BAITING IN THE 14TH CENTURY. THIS CRUEL SPORT, POPULAR IN ENGLAND FOR ABOUT 700 YEARS, WAS NOT PROHIBITED UNTIL 1835

herds of bears maintained in the country for the purpose of baiting." Sunday was the favourite day for these sports. Hentzner describes the whipping of a blinded bear, a popular variation. For a baiting attended by Queen Elizabeth in 1575 13 bears were provided. Of it Robert Laneham (*c.* 1575) wrote, "it was a sport very pleasant to see, to see the bear, with his pink eyes, tearing after his enemies' approach; the nimbleness and wait of the dog to take his advantage and the force and experience of the bear again to avoid his assaults; if he were bitten in one place how he would pinch in another to get free; that if he were taken once, then by what shift with biting, with clawing, with roaring, with tossing and tumbling he would work and wind himself from them; and when he was loose to shake his ears twice or thrice with the blood and the slaver hanging about his physiognomy." The famous "Paris Garden" in Southwark was the chief bear-garden in London. A Spanish nobleman of the time, who was taken to see a pony baited that had an ape tied to its back, expressed himself to the effect that "to see the animal kicking amongst the dogs, with the screaming of the ape, beholding the curs hanging from the ears and neck of the pony, is very laughable." Butler describes a bear-baiting at length in the first canto of his *Hudibras.*

The Puritans endeavoured to put an end to animal-baiting, although Macaulay sarcastically suggested that this was "not because it gave pain to the bear, but because it gave pleasure to the spectators." The efforts of the Puritans seem, however, to have had little effect, for we find the sport flourishing at the Restoration; but the conscience of cultivated people seems to have been touched, for Evelyn wrote in his *Diary* under the date of June 16, 1670: "I went with some friends to the bear-garden, where was cock-fighting, dog-fighting, bear and bull-baiting, it being a famous day for all these butcherly sports, or rather barbarous cruelties. The bulls did exceedingly well, but the Irish wolf-dog exceeded, which was a tall greyhound, a stately creature indeed, who beat a cruel mastiff. One of the bulls tossed a dog full into a lady's lap, as she sat in one of the boxes at a considerable height from the arena. Two poor dogs were killed, and so all ended with the ape on horseback, and I most heartily weary of the rude and dirty pastime, which I had not seen, I think, in twenty years before." Steele also attacked these cruel sports in the *Tatler.* Nevertheless, when the Tsar Nicholas I. visited England as Tsarevich, he was taken to see a prize-fight and a bull-baiting. In this latter form of the sport the bull's nose was usually blown full of pepper to render him the more furious. The bull was often allowed a hole in the ground, into which to thrust his nose and lips, his most vulnerable parts. Sometimes the bull was tethered, and dogs, trained for the purpose, set upon him one by one, a successful attack resulting in the dog fastening his teeth firmly in the bull's snout. This was called "pinning the bull." A sport called bull-running was popular in several towns of England, particularly at Tutbury and Stamford. At Stamford the running took place annually on November 13, the bull being provided by the butchers of the town, the townspeople taking part in the chase, which was carried on until both people and beast were exhausted, and ended in the killing of the bull. Certain rules were strictly observed, such as the prohibition of carrying sticks or staves that were shod with iron. The Stamford bull-running survived well into the 19th century. Considering the brutality they involved, it is curious that bear-baiting and bull-baiting were not prohibited in England by act of parliament until 1835.

BEARBERRY (*Arctostaphylos Uva-Ursi*), a small shrub of the heath family, Ericaceae (*q.v.*), native to dry, sandy or rocky soil and very widely distributed in high northern regions. In the British Isles it grows on stony alpine heaths; in North America it is found on rocks and bare hills from Labrador and Alaska south to New Jersey, Colorado and California. The trailing, much branched stems, often somewhat matted on the ground, bear leathery, evergreen, entire leaves, small heath-like white flowers, and smooth, red, insipid, berry-like fruits (drupes) about $\frac{1}{3}$ in. in diameter. The alpine bearberry (*A. alpina*), a smaller depressed-prostrate shrub, with veiny, toothed leaves and black, juicy, edible fruit, grows on high mountain heaths in the British Isles and from Arctic America south in high altitudes to British Columbia, Colorado and northern New England. (*See* MANZANITA.)

BEARD, CHARLES AUSTIN (1874–), American historian and professor of politics, was born in Knightstown, Ind., on Nov. 27, 1874. He graduated from De Pauw university in 1898, and after studying at Oxford, Cornell and Columbia universities received the degree of Ph.D. from the last named institution in 1904. His interest was at first in European, and particularly in English, history; and such works as *The Office of Justice of the Peace in England* (1904), and *The Development of Modern Europe* (1907–08), written in collaboration with J. H. Robinson, represent this phase. But the problems of American history soon gained his attention and it is in this field, and in American politics and government, that he accomplished his most significant work, at first as a member of the faculty of Columbia university (1907–15) and later in independent research. In 1917 he became director of the Training School for Public Service in New York city and gave much attention to municipal problems. He was invited to Japan to give advice for reconstruction after the earthquake and embodied some results of his investigations there in *The Administration and Politics of Tokyo* (1923). In 1927 he was called to Yugoslavia on a similar mission. But throughout he continued his research into the formative elements of the American Constitution and political parties and set forth his conclusions in four notable works: *The Supreme Court and the Constitution* (1912), *The Economic Interpretation of the Constitution* (1913), *The Economic Origins of Jeffersonian Democracy* (1915), and *The Economic Basis of Politics* (1922). These have exerted a profound influence upon opinion concerning the origins of the American State, largely because of their contention that political thought is dictated by the economic self-interest of parties rather than by abstract theories, and that the American Constitution, specifically, was evolved by those whose holdings would increase in value by the creation of the form of government which it prescribes. Later he wrote, in collaboration with his wife, Mary Ritter Beard, a more comprehensive study of the national life under the title, *The Rise of American Civilization* (1927); like his other work, it is characterized by the analysis of cause and effect rather than by an array of outstanding phases in chronological order. Like his other work, too, it shows originality of views founded upon independent investigation of sources.

Among his other works are: *American Government and Politics* (1910), *American City Government* (1912), *Contemporary American History* (1914), *History of the American People* (1918,

in collaboration with W. C. Bagley), *The Idea of National Interest* and *The Open Door at Home* (both in collaboration with G. H. E. Smith, 1934).

BEARD, in modern usage, applies to the hair grown upon a man's chin and cheek. When the chin is shaven, what remains upon the cheeks is called whiskers. "Moustache" or "moustaches" describes the hair upon the upper lip. But the words have in the past had less exact meaning. Beard has stood alone for all these things, and whisker has in its time signified what we now call moustache, as in the case of Robinson Crusoe's great pair of "Turkish whiskers."

The bearded races of mankind have ever held the beard in high honour. It is the sign of full manhood; the lad or the eunuch is beardless, and the bearded woman is reckoned a witch, a loathsome thing to all ages. Also the beard shrinks from the profane hand; the future King John gave deadly offence to the chieftains, when visiting Ireland in 1185, by plucking at their flowing beards. David's ambassadors had their beards despitefully shaven by a bold heathen. Their own king mercifully covered their shame—"Tarry ye at Jericho until your beards be grown"—but the war answered the insult. The oath on the beard is as old as history, and we have an echo of it in the first English political ballad when Sir Simon de Montfort swears "by his chin" revenge on Warenne.

Adam, the primal man, was by tradition created with a beard. Zeus Allfather is bearded, and the old painters and carvers who hardily pictured the first person of the Trinity gave Him the long beard of his fatherhood. The race-fathers have it and the ancient heroes. Abraham and Agamemnon, Woden and King Arthur and Charlemagne, must all be bearded in our pictures. With the Mohammedan peoples the beard as worn by an unshaven prophet has ever been in high renown. But before Mohammed's day, kings of Persia had plaited their sacred beards with golden thread, and the lords of Nineveh had curiously curled and oiled beards such as their winged bull wears. Bohadin tells us that Saladin's little son wept for terror when he saw the crusaders' envoys "with their clean-shaven chins." Selim I. (1512–21) comes down as a Turkish sultan who broke into holy custom and cut off his beard, telling a remonstrating Mufti that his vizier should now have nothing to lead him by. But such tampering with tradition has its dangers, and the absolute rule of Peter the Great is made clear when we know that he taxed Russian beards and shaved his own, and yet died in his bed. Alexander the Great did as much and more with his well-drilled Macedonians, and was obeyed when he bade them shave off the handle by which an enemy could seize them.

With other traditions of their feudal age, the Japanese nation has broken with its ancient custom of the razor, and their emperor has beard and moustache; a short moustache is common amongst Japanese officers and statesmen, and generals and admirals of Nippon follow the imperial example. The Nearer East also is abandoning the full beard, even in Mohammedan lands. Earlier shahs of the Kajar house have glorious beards below their girdles, but Náṣiru'd-Dín and his successor have shaved their chins. The tsar Alexander III.'s beard might have satisfied Ivan the Terrible, whose hands played delightedly with the five-foot beard of Queen Elizabeth's agent George Killingworth. Indeed the royal houses of Europe are for the most part bearded or whiskered. Leopold II., king of the Belgians, however, was in 1909 the only sovereign with the full beard unclipped. The Austrian emperor, Francis Joseph, retained the moustache and whiskers of the '60s, and the German emperor, William II., for a short period commemorated by a few rare photographs, had a beard, although it was never suffered to reach the length of that beard which gave his father an air of Charlemagne or Barbarossa. In France bearded presidents have followed each other, but it may be noted that the waxed moustache and "imperial" beard of the Second Empire is now all but abandoned to the Frenchman of English comedy. The modern English fashion of shaving clean is rare in France save among actors, and during 1907 many Parisian waiters struck against the rule which forbade them to grow the moustache.

For the most part the clergy of the Roman obedience shave clean, as have done the popes for two centuries and more. But missionary bishops cultivate the long beard with some pride, and the orders have varying customs, the Dominican shaving and the Franciscan allowing the hair to grow. The Roman Catholic clergy of Dalmatia, secular and regular, are allowed to wear the moustache without beard or whiskers, a concession to national prejudices.

English Fashions.—Amongst English people, always ready to be swayed by fashion, the hair of the face has been age by age, cherished or shaved away, curled or clipped into a hundred devices. Before the immigration from Sleswick the Briton knew the use of the razor, sometimes shaving his chin, but leaving the moustache long. The old English also wore moustaches and forked beard, but, save for aged men, the beard had passed out of fashion before the Norman Conquest. Matthew Paris had a strange idea that the beard was distinctive of Englishmen; he asserts that those who remained in England were compelled to shave their beards, while the native nobles who went into exile kept their beards and flowing locks "like the Easterns and especially the Trojans."

It was only about the year 1000, according to Rodolf Glaber, that men began in the north of France to wear short hair and shave "like actors"; and even in the Bayeux tapestry the old Norman shipwrights wear the beard. But so rare was hair on the face amongst the Norman invaders that William, the forefather of the Percys, was known in his lifetime and remembered after his death as William "Asgernuns" or "Oht les gernuns," *i.e.*, "William with the moustaches," the epithet revived by one of his descendants making our modern name of Algernon. Fashion swung about after the Conquest, and, in the days of Henry I., Serle the bishop could compare bearded men of the Norman-English court with "filthy goats and bristly Saracens." The crusades, perhaps, were accountable for the beards which were oddly denounced as effeminate in the young courtiers of William Rufus. But for more than four centuries diversity is allowed, beards, moustaches and shaven faces being found side by side. Henry II. is a close-shaven king, and Richard II.'s effigy shows but a little tuft on each side of the chin, tufts which are two curled locks on the chin of Henry IV. But Henry III. is long-bearded, Edward II. curls his beard in three great ringlets, and the third Edward's long forked beard flows down his breast in patriarchal style. The mid-13th century is an age of many full and curled beards, although the region about the lips is sometimes clipped or shaved. The beard is common in the 14th century, the forked pattern being favoured and the long drooping moustache. Henry of Monmouth and his son are shaven, and thereafter beards are rare save with a few old folk until they come slowly back with the 16th century. Henry VIII., always a law to himself, brought back the beard to favour, Stowe's annals giving 1535 as the year in which he caused his beard "to be knotted and no more shaven," his hair being polled at the same time.

The age of Elizabeth saw lawyers, soldiers, courtiers and merchants all bearded. A shaven chin such as that seen in the portrait of Philip Howard, earl of Arundel, is rare, but the beards take a hundred fashions, and satirists and Puritan pamphleteers were busy with them and with the men who wasted hours in perfuming or starching them, in dusting them with orris powder, in curling them with irons and quills. Stubbs gives them a place amongst his abuses. "It is a world to consider how their mowchatowes must be preserved or laid out from one cheek to another and turned up like two horns towards the forehead." The Elizabethan fashions continued under King James, the beard trimmed to a point being common wear; but under King Charles there is a certain reaction, and the royal style of shaving the cheeks and leaving the moustache whose points sweep upward and the chin beard like a downward flame is followed by most of the gentry.

From the Restoration year the razor comes more into use. Young men shave clean. The restored king curls a few dark hairs of a moustache over each cheek, but his brother James is shaven. With the reign of Queen Anne the country enters the beardless age, and beards, moustaches and whiskers are no more seen. In the 18th century the moustache indicated a soldier from beyond sea. A Jew or a Turk was known by the beard, an appendage loathsome as comic. That George III. in his madness should have

been left unshaved was a circumstance of his misery that wrung the hearts of all loyal folk. But we may note that the hair of the face, which disappeared when wigs came in, began to reappear as wigs went out. Early in the 19th century the bucks began to show a patch of whisker beside the ear, and the soldier's moustache became a common sight. Before Waterloo, guardsmen were complaining that officers of humbler regiments imitated their fashion of the moustache, and by the Waterloo year most young cavalry officers were moustached. But for a civilian to grow a moustache was long reckoned a piece of unseemly swagger. Freedom in these matters only came when the troops were home from the Crimea, when officers who had grown beards and acquired the taste for tobacco during the long months in the trenches showed their beards and their cigars in Piccadilly. Then came the Volunteer movement, and every man was a soldier, taking a soldier's licence. The dominant fashion was the moustache, worn with long and drooping whiskers. But the "Piccadilly weepers" of the '60s were out of the mode for the younger men when the '80s began, and by the end of the century whiskers were seen in the army only upon a few veteran officers.

The footman, whose full-dress livery is the court dress of 100 years ago, must show no more than the rudimentary whisker of the early 1800s, and butler, coachman and groom come under the same rule. The jockey and the hunt whip are shaven likewise, but the courier has the whiskers and moustache that once marked him as a foreigner in the English milor's service, and the chauffeur, a servant with no tradition behind him, is often moustached.

Lastly, we may speak of the practice of the royal house since England came out of the beardless century. The regent took the new fashion, and sat "in whiskered state," but his brother and successor shaved clean and disliked even the hussar's moustache. The prince consort wore the moustache as a young man, adding whiskers in later years. King Edward VII. wore moustache and trimmed beard, and his heir also followed the fashion of many fellow admirals. (O. B.)

BEARDSLEY, AUBREY VINCENT (1872–1898), English artist in black and white, was born at Brighton on Aug. 24, 1872. In 1883 his family settled in London, and in the following year he appeared in public as an "infant musical phenomenon." In 1888 he obtained a post in an architect's office. In 1891, under the advice of Sir Edward Burne-Jones and Puvis de Chavannes, he took up art as a profession and attended classes at the Westminster School of Art. From 1893 until his death, at Mentone, on March 16, 1898, his work met with a storm of criticism. Beardsley had an unswerving tendency towards the fantastic; he deliberately ignored proportion and perspective, and the freedom from convention which he displayed caused his work to be judged with harshness. In certain phases of technique he excelled, and his earlier methods of dealing with the single line in conjunction with masses of black are in their way unsurpassed, except in the art of Japan. He was always an ornamentalist rather than an illustrator; and his work must be judged from that point of view. His frontispiece to *Volpone* is held by some to be, from this purely technical standpoint, one of the best pen-drawings of the age. His posters for the Avenue theatre and for Mr. Fisher Unwin were among the first of the modern cult of that art which at that time was by few regarded as such.



BY PERMISSION OF JOHN LANE, FROM BEARDSLEY, "ILLUSTRATIONS FOR SALOME" "THE REWARD OF THE DANCER," A CHARACTERISTIC SPECIMEN OF THE WORK OF AUBREY BEARDSLEY

The following are the chief works which are illustrated with drawings by Beardsley: the *Bon Mot Library*, *The Pall Mall Budget*, and *The Studio* (1893), Sir Thomas Malory's *Morte d'Arthur* (1893–94), *Salomé* (1894), *The Yellow Book* (1894–95), *The Savoy Magazine* (1896), *The Rape of the Lock* (1896).

See also J. Pennell, *The Studio* (1893); Symons, *Aubrey Beardsley* (1898); R. Ross, *Volpone* (1898); H. C. Marillier, *The Early Work of Aubrey Beardsley* (1899); Smithers, *Reproductions of Drawings by Aubrey Beardsley;* John Lane, *The Later Works of Aubrey Beardsley* (1901); R. Ross, *Aubrey Beardsley* (1908).

BEARDSTOWN, a city of Cass county, Illinois, U.S.A., on the east bank of the Illinois river, about 100 miles north of St. Louis. It is served by the Baltimore and Ohio and the Burlington railways and by steamboats. The population in 1940 was 6,505. The leading industries are a glove factory, flour and feed mills and railroad shops. Laid out in 1829 and named after Thomas Beard, who had settled near by in 1820, it was incorporated as a city in 1896. The old court-house, in which Abraham Lincoln won his "Armstrong murder case" in 1854, is now the city hall.

BEARER, strictly "one who carries," a term used in India for a palanquin-bearer, and now especially for a body-servant. The term is also used in connection with military ambulances, and "bearer" companies formed part of the Royal Army Medical Corps until amalgamated with the field hospitals to form field-ambulances (*see* MEDICAL SERVICE, ARMY). In banking and commerce the word is applied to the holder or presenter of a cheque, draft or other negotiable instrument not made payable to a specific person; it has also a technical use, as in printing, of anything that supports pressure in machinery, etc.

BEARER SECURITIES. Stocks and shares can be held in various shapes by the proprietor. The bond to bearer is a document stating upon its face that the bearer of it is entitled to a specified amount of stock in the loan, debenture, share or other security which that bond represents. The instrument may be for a government bond, such as consols in Great Britain or war bonds in the U.S.; for (most popular of all in this shape) foreign government loans; for shares in a rubber, oil, mining or other such company. The interest or dividend payments are met by the provision of coupons, small pieces of paper, numbered and, as a rule, dated, which must be presented to named bankers when the payments become due, and which, after a few days for examination, will be exchanged for cheques in payment of interest or dividend due on the holding.

Risk of Loss.—Bearer securities are regarded as being more liable to loss than are registered or inscribed stocks and shares, for the latter must be dealt with by deed of transfer, involving signatures and witnesses, whereas bearer securities belong, as the name implies, to the bearer, and can be passed from hand to hand like a bank note. A stolen bond may be difficult to trace to the thief if he has succeeded in selling it and in hiding his subsequent tracks after being paid for it.

The British investor greatly prefers registered or inscribed stocks and shares, for reasons of safety, but the French, Belgian and other European Continental capitalist has an equally marked preference for bearer securities.

The prejudice of the continental investor in favour of bearer securities is so pronounced that many companies in whose shares there is an international interest have arrangements for conversion of registered shares into bearer securities, and vice versa.

U.S. Methods.—The American partiality is for a combination of bearer-and-registered security. While the bonds of U.S. railroads are generally bearer securities, the share capital is represented most often by certificates made out in the name of an individual or a firm who, when selling, will sign the certificates on the back and pass them on to buyers who not infrequently treat the certificates as bearer securities, leaving the stock or share in the names of the original holders as stated on the face of the deed. The certificates pass from hand to hand in the same way as a bearer security, although any holder can have the stock registered, if he desires it, into his own or another name. Dividends, as they fall due, are claimed and collected by the holder at the time the payments fall due: if the registered proprietor does not want to be troubled with such claims, he merely gives notice of his desire, and the actual proprietor will then put the shares into his own or some other name. Various companies issue registered bonds, but these securities are not to bearer. The risk of loss entailed by the holding of a bearer security is the reason why many

proprietors deposit such bonds with their bankers, who will detach coupons when these fall due, present them for payment to the proper agents and credit the interest or dividend to the proprietors' banking accounts.

Stamps on Bonds.—Bearer securities in Great Britain require to be stamped with a duty of £2 on every £100 upon their first being negotiated. After this no further charge is made. Therefore it is cheaper to deal with bearer securities than it is with those registered stocks and shares which take a 1% stamp when they are transferred from one holder to another.

BEAR-GRASS (*Xerophyllum tenax*), a North American plant of the lily family (Liliaceae), called also elk-grass, squaw-grass, fire-lily and turkey-beard, native to mountainous districts from northern California to British Columbia and eastward to Montana. It is a very smooth light-green perennial with a stout, unbranched stem, from 2 ft. to 6 ft. high, which rises from a woody, tuber-like rootstock with cord-like roots. At the base the stem bears a dense tuft of very narrow, grass-like, rough-edged leaves, from ½ in. to ¼ in. wide and from 2 ft. to 3 ft. long; the leaves of the upper part of the stem are similar but much smaller. At flowering, which occurs only once in from five to seven years, the top of the stem develops a large showy cluster, 6 in. to 18 in. long, of very numerous small creamy white flowers, each on a slender stock 1 in. to 2 in. long. In many parts of its range the plant is very common on dry hillsides. When in bloom it is a striking feature of the vegetation of mountain slopes. Because of its attractive appearance it is a favourite with tourists who visit alpine resorts within its range, being especially abundant in Mt. Rainier and Glacier national parks. Hupas and other north-western Indians used the fibres of the leaves in making garments and baskets and roasted the bulbous rootstocks for food. The turkey-beard (*X. asphodeloides*) of the southern United States, found in dry pine-barrens from New Jersey to Florida, is similar but with less showy flowers. In the Southern and South-western United States the name bear-grass is given to various kinds of yucca, especially to *Yucca filamentosa* and *Y. glauca;* also to the camas (*Camassia esculenta*) and the aloe-like *Dasylirion texanum,* all of which have grass-like leaves.

BEARINGS, the name given to the supports of a rotating shaft. The shaft imposes a load on each of the bearings supporting it, and it is turned against the frictional resistances caused by this loading.

The main shaft seen in a workshop carries pulleys from which belts transmit power to the machinery. Such a shaft loads its bearings not only with its own weight and the weights of the pulleys, clutches, and couplings keyed to it, but with the tensions from the driving belts on the pulleys and with the dynamical forces caused by the mere rotation of unbalanced masses. The dynamical forces increase as the square of the speed. The dynamical force, f, acting on the shaft at a point where a mass weighing W lb. is unbalanced in the sense that its centre of mass is r feet from the axis of rotation, may be calculated from

$$f = 1{\cdot}2 \text{ W } n^2 r.$$

In this expression n is the speed of the shaft in revolutions per second, r is in feet, and f is in pounds. If, for example, a large pulley on the shaft is out of balance to the extent of 10lb. at 1ft. radius, then when the shaft turns 300 times per minute the force f is 300lb. This force always acts along the radius of the unbalanced mass. If the speed be doubled to 600 turns per minute, the force f is quadrupled to 1,200lb. This force not only increases the friction at the bearings but sets up vibration because it is continually changing in direction. All parts attached to the shaft and rotating with it should therefore be carefully balanced to prevent undue loading of the bearings and to avoid setting up vibration. The rotation of the shaft against the frictional resistances in the bearings caused by the loading, absorbs energy from the prime mover, and this energy is converted into heat. Shafts and bearings assume the temperature of their surroundings when not at work, but immediately the shaft is set in motion, heat is produced at the rubbing surfaces of shaft and bearing and the temperature of the bearing rises, and continues to rise until the heat produced by friction per second is exactly balanced by the heat escaping from the bearing per second by conduction, convection, and radiation to the cooler surroundings. When the balance is struck the temperature of the bearing remains constant. Thus a bearing at work must always be hotter than its surroundings in order to establish a heat flow sufficient to dissipate the heat produced.

The dominating principle of design is therefore so to proportion the parts to the loads and the lubrication to the speed that the heat necessarily produced by the rotation of the shaft is dissipated without undue rise of temperature. If by any chance the frictional resistance is abnormally increased by failure of the lubrication, by dirt getting between the rubbing surfaces, or by unexpected increases of load or speed, the temperature of the bearing rises dangerously until ultimately the rubbing surfaces may seize together, causing perhaps a broken shaft and other troubles.

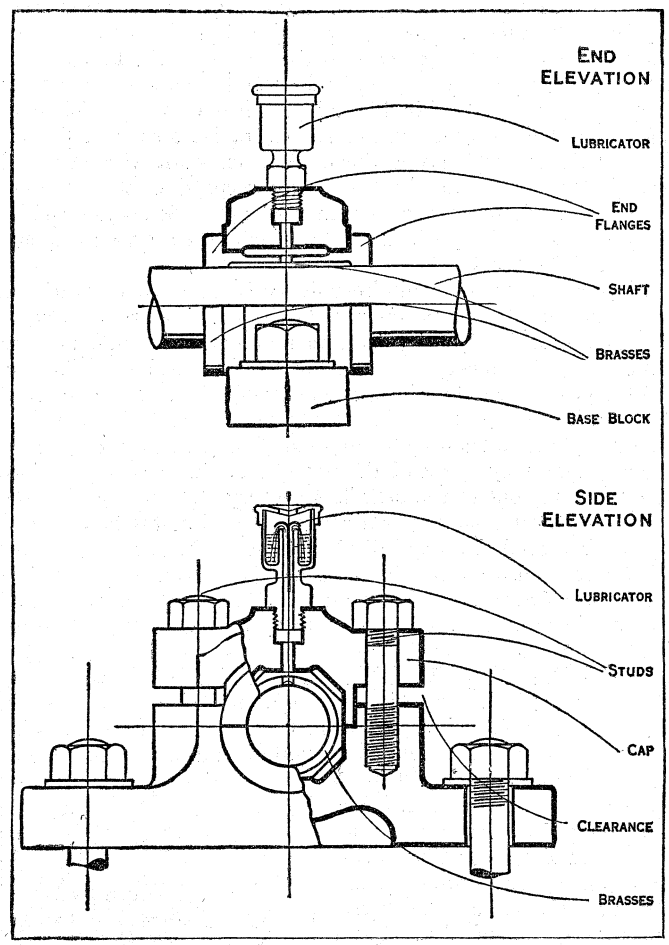
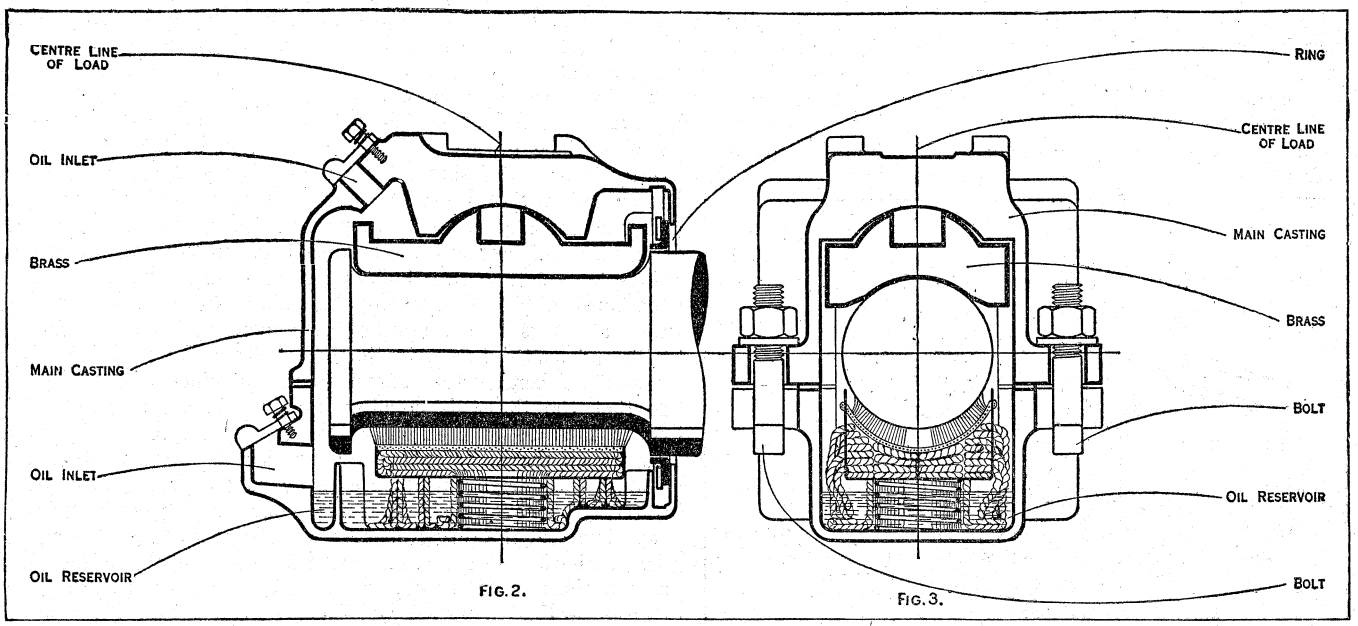


FIG. 1.—DETAILED DRAWING OF A PLUMMER BLOCK

A Plummer Block.—The mechanical details of a bearing in common use for general millwrighting purposes are shown in fig. 1.

The shaft (*see* upper drawing) is encircled by a gun metal or brass cylinder split longitudinally into halves specifically called "brasses" (*see* lower drawing). End flanges prevent endwise movement. The part of the shaft encircled by the brasses is called the journal. Shallow grooves cut in the surface of the brasses distribute oil from the wick lubricator to the rubbing surfaces. The brasses are secured between a base block of cast iron and a cast iron cap by the bolts as shown. The complete unit is called alternatively a pillow block, plummer block, or pedestal. The pillow blocks themselves are supported on brackets secured to the wall, or cross beams or any suitable bearer. When the cap is clamped home the brasses should be in close contact along their longitudinal joint and the cap should stand quite clear of the base block; the clearance is shown in the lower figure. The brasses can be let together to compensate for slight wear by filing away along the longitudinal joint. To facilitate this process, new



FIGS. 2. AND 3.—DIAGRAM OF THE AXLE BOX OF A RAILWAY GOODS WAGON

brasses are sometimes separated along their longitudinal joint by a thin liner or by a few thin steel strips called shims. Thinning the liner, or the removal of a shim, allows of adjustment as wear proceeds without filing the brasses.

The brasses are made of gun metal or brass and are often lined with antifriction metal. The metal is usually an alloy of tin, antimony and lead (the proportions vary), and from its colour is called generally white metal. An antifriction metal must be soft enough to yield to slight inequalities in the shaft but hard enough to resist abrasion on the surface.

An Axle Box.—Figs. 2 and 3 show a bearing in which the load W is imposed on the journal from the brass. It is the axle box of a railway goods wagon. The load acts always vertically downwards so that one brass only is necessary, as shown in diagram. It rests on the journal and engages the axle box crown with a hemispherical central hump. It is thus able to turn slightly and adjust itself to any want of exact alignment between axle box and journal. The bottom part of the axle box is formed into an oil reservoir which has an inlet for replenishment. A pad of cotton wick, woven on a tin frame, is pressed up against the bare underside of the journal by a spring. The upper part of the pad is finished as a sort of brush. The oil is fed to the brush by the capillary action of the streamer in the oil. The bottom part of the box is held in place by strong bolts, and a leather ring, as shown in fig. 2, is fitted to prevent dust from entering the axle box.

The Oil Film.—Given proper conditions of form and relative velocity between the rubbing surfaces of journal and brass, Beauchamp Tower found that with unlimited supply of oil a film insinuates itself between the surfaces, so converting the frictional resistance between greased metal surfaces into the shearing resistance of an oil film under pressure. The oil film automatically builds itself between journal and brass and shoulders the load transmitted from one to the other. Although the pressure in the film varies from point to point of its extension round the journal, yet the sum of these variable pressures is equal to the total load transmitted through the bearing. The condition of form is that the brass shall have a slightly less curvature than the journal. The unoiled brass would therefore touch the journal along a line parallel to the axis of the journal. If a load is applied to the bearing and oil is pumped between the brass and the journal at rest, the brass is separated slightly from the journal and the line of contact becomes a position of closest approach. This position is situated directly under the line of action of the load. A cross section of the bearing (*see* fig. 11) at right angles to the axis of the journal would show the position of closest approach directly under the load, and the brass would be seen receding from the journal both to right and left of this position. The oil film would look like a pair of narrow wedges curving round the journal with the sharp ends joined in the position of closest approach and the blunt ends at the edges of the brass. When the journal is turned at sufficient speed this oil film is formed automatically, providing the supply of oil is sufficient; but when the position of closest approach is ahead of the line of load (*see* fig. 11) in the direction of rotation, the oil wedge in the direction ahead of the position of closest approach becomes shorter, and the other wedge longer and with a blunter end than the leading wedge. Oil is brought into the film, by the rotation of the shaft, at this blunt end. A brass is always bored slightly larger than the journal so that the journal is able to take up a slightly eccentric position in relation to the brass and so accommodate itself to the necessary condition.

The condition of speed cannot be stated precisely because the viscosity of the oils used for lubrication vary with the kind of oil, the pressure in the film, and the temperature. The plummer block illustrated in fig. 1 is an example in which the conditions are not fulfilled because the supply of oil is not copious enough from the wick lubricator to allow the film to form even when a sufficient relative velocity is reached. The axle box is an example in which viscous lubrication is approached. The bottom of the journal is always kept greased by the pad; oil is carried round and a film will form if there is enough oil carried. Beauchamp Tower found that with pad lubrication oil was not carried to the brass in sufficient quantity to form a true film. After the experiments of Beauchamp Tower had been published and the fact had been established that, in suitable conditions, an oil film forms, Prof. Osborne Reynolds showed that its formation could be predicted from the principles of the flow of viscous fluids, and he deduced an expression relating the pressure at any given point in the film to the dimensions of the bearing and the variables of the lubricant. This work was published in the *Phil. Trans.* of 1886. A brief account of this outstanding investigation is given below.

A High Speed Bearing.—The bearing shown in fig. 4 is designed to support one end of the shaft of a turbo alternator which turns at a speed of 1,000 revolutions per minute. The bearing is 12in. in diameter and 48in. long, and carries a load of about 12·8 tons. The brasses, now unsplit longitudinally, are put in from the ends; they are lined with white metal, seen as a thin black cylinder round the journal, and oil is fed to their centre under a head of pressure, due to a tank on a tower, through an inlet pipe. From the middle of the bearing the oil flows right and left between the rubbing surfaces and escapes at each end into the base of the housing from which it flows away to a tank in the base of the tower. Here it is cooled and pumped back to the top tank from which it again flows into the cool oil main sup-

plying a number of bearings in parallel, of which the illustration is one. There is thus an unlimited supply of oil, a sufficient relative speed, and oil films form. The work done against the shearing resistance of the oil film heats the oil to a point which is well within the safe limit. But as an extra precaution the bearing is formed so that water can be circulated round the brasses through the passages as marked. The relative speed of rubbing is in this

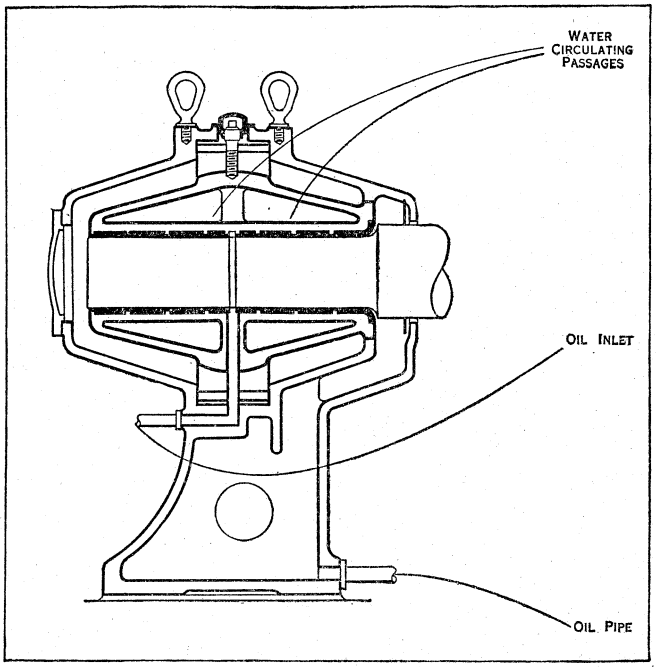


FIG. 4.—A HIGH SPEED BEARING FOR THE SHAFT OF A TURBO ALTERNATOR

bearing about 50ft. per second and in normal conditions the temperature rises about 20°C above its surroundings.

Intensity of Load.—The intensity of the load on a bearing is measured by dividing the total load it carries by the projected area of the journal. The projected area is the product of the diameter of the journal and its length. Thus the projected area of a journal 12in. diameter and 48in. long is 576 sq. in., and assuming the load it carries to be 12·8 tons, the intensity of loading is $12{\cdot}8 \times 2240/576 = 50$ lb. per sq. in. When the shaft is turning under the action of a continuous load the permissible intensity of loading is less than if the load is intermittent. A table of values of intensity of loading used in practice is given in the article LUBRICANTS.

High Speed Engines.—Bearings of different constructional forms are grouped together in an engine. In particular the high speed internal combustion engine for air craft or motor-cars furnishes many examples. In an engine of this type the moving parts are enclosed and the crank shaft is held in a line of bearings with split brasses and caps to allow it to be put in place. The bearings may be formed of white metal directly lining the cap and cylindrical seatings forming part of the framing itself. Thus a shaft with six cranks will usually have seven bearings in line to support it, one between each crank and an outside bearing at each end. Each connecting rod connects a piston to a crank journal by a bearing called a big end bearing and is jointed to the piston by one called a small end bearing. The big end brasses are split to allow connection to the crank journal, but the little end brass may be put in place as a bush. The bearings are in general supplied with oil under pressure from a pump driven by the engine itself. The crank case is formed into a well from which the pump draws oil through a filter. The pump delivers its charge through a spring loaded relief valve, by which the pressure of delivery can be regulated, into pipes and channels leading to the several bearings included in the forced circulation system.

Before the existence of a film was suspected and the advantages of forced lubrication were understood, it was the practice to construct high speed engines single acting only, to avoid the reversal of thrust at the bearings when the connecting rods change their action from push to pull. Since the bearings are always a little larger than the journal, a reversal of thrust in the absence of an oil film causes a knock and high speeds are impossible.

Thrust Bearings.—A shaft which transmits a thrust in a direction along its length is held in a form of bearing called a thrust block. The thrust from the screw propeller is delivered to the hull of a ship through a thrust block of the kind illustrated diagrammatically in fig. 5. A number of collars are formed on the propeller shaft and into the grooves between them are fitted half rings, horseshoe shape, which engage in corresponding grooves in the housing. The thrust from the collars is transmitted through the half rings to the housing. The housing is secured to the hull, and so the hull gets the thrust from the propeller. The method of construction allows individual rings to be adjusted so that the thrust is equally divided between them. If any collar fails to take its share of the thrust, extra thrust is thrown on the other collars and heating may ensue. To guard against this, arrangements are made to cool the bearing with water. The contact area between collars and rings is proportioned so that the thrust does not exceed 50 to 70 lb. per sq. in. The limitation of the thrust intensity to these figures involves a multiplication of the collars to an impossible extent for large thrusts, so that the power which can be transmitted through one shaft is limited. This limitation has been removed by the remarkable inventions of Michell.

The Michell Bearings.—Michell developed Osborne Reynolds' mathematical theory of lubrication and ultimately applied his conclusions to the design of a single collar thrust which has revolutionized the design of marine thrust blocks. Fig. 6 is a diagrammatic sketch of a section through a Michell block. The thrust from the collar is transmitted to the housing fastened to the hull through a ring or segment of pads. A segment of six pads is seen in the end view in fig. 6. Each pad transmits its share of the thrust to the housing through a blunt knife edge, as shown in profile in the lower diagrammatic drawing (fig. 6). The thrust through the pads is delivered immediately to the segments of horse-shoe shape fitted into the housing (shown in outline). This method of construction facilitates assembling and ensures that the load is transmitted from the shaft to the lower part of the housing in the line of thrust. The plan shows a pad of the set for a head running tilted about its blunt knife edge, with a wedge-shaped film of oil between it and the moving surface of the collar. The base of the housing is formed into an oil-bath, and rotation of the shaft ensures a continuous supply of oil to all the pads. Stops (not shown in the sketch) are added to the horseshoe segments to prevent circumferential movement. The pads are made of gun metal or

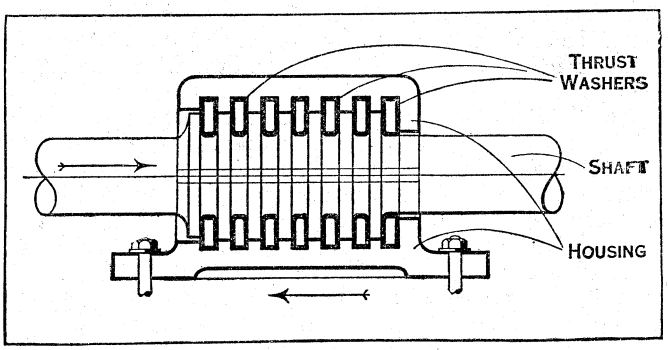


FIG. 5.—DIAGRAM ILLUSTRATING THE THRUST BLOCK

cast-iron faced with white metal. The blunt knife edge is placed to pass nearly through the estimated position of the centre of pressure in the film. The intensity of thrust which may be safely used is 300 lb. per sq. in. A block of this kind fitted to H.M.S. "Hood" transmits through a single collar 36,000 h.p. corresponding to a thrust of about 100 tons.

The Michell principle of pad lubrication has been extended to journals supporting vertical loads. An ordinary high speed bearing may be regarded as a single pad bearing, the conditions for the formation of the oil wedge being realized by slight automatic

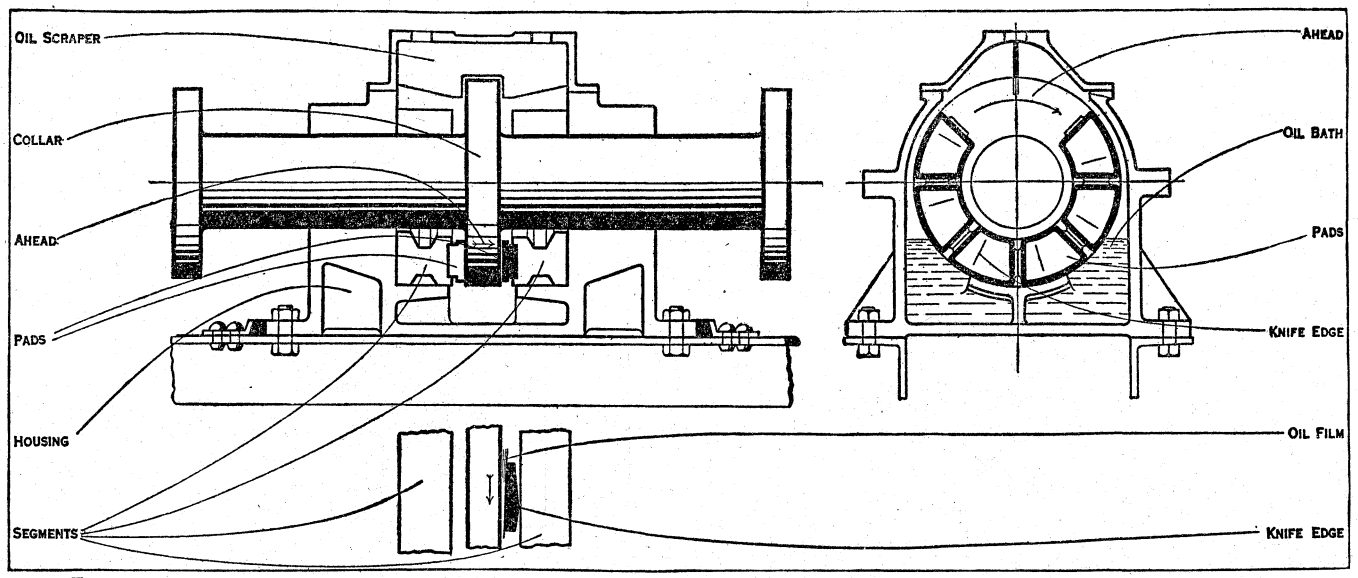
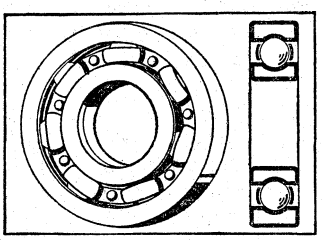


FIG. 6.—DRAWING OF A SECTION THROUGH A MICHELL BEARING, SHOWING THE SINGLE COLLAR THRUST THAT HAS REVOLUTIONIZED THE DESIGNS OF THRUST BLOCKS IN MARINE PROPELLING MACHINERY

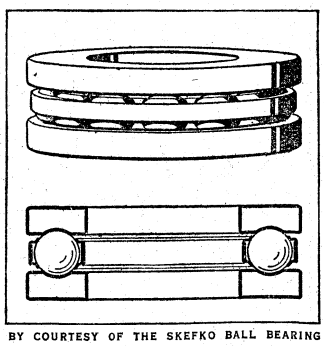
movement of the journal into an eccentric position in relation to the brass. When a number of pads are incorporated in a bearing, then as many oil wedges form as there are pads, and the size of a bearing for a given load is considerably reduced. The twin-screw steamship "Gouverneur-General Chanzy," built by Cammell Laird and Co. Ltd., is stated to be the first ship in which the whole of the main and thrust bearings of the propelling machinery have been constructed on the Michell principle. The details may be studied in *Engineering*, July 28, 1922.

Ball and Roller Bearings.—Ball bearings enable the resistance to rolling to be substituted for sliding resistance and are especially useful for high-speed bearings required to carry moderate loads. The ball elements of a bearing are manufactured as standard units and these units are incorporated in the complete design of a bearing. A typical ball bearing unit with a single row of balls is shown in fig. 7. The inner and the outer race, representing two diameters, enclose completely the ring of balls. A cage is added to prevent adjacent balls from touching because, when rolling in their races, adjacent surfaces are moving in opposite directions. The cage is seen clearly in the perspective sketch to the left of the figure. Units are made with double rows of balls. A single plate thrust bearing is shown in fig. 8. It consists of two flat rings with races formed on their faces for the single ring of balls seen. A cage is added to separate the balls.



BY COURTESY OF THE SKEFKO BALL BEARING CO.

FIG. 7.—A SINGLE ROW OF RADIAL BALL BEARINGS



BY COURTESY OF THE SKEFKO BALL BEARING CO.

FIG. 8.—SINGLE THRUST BEARING FOR FLAT SEATINGS

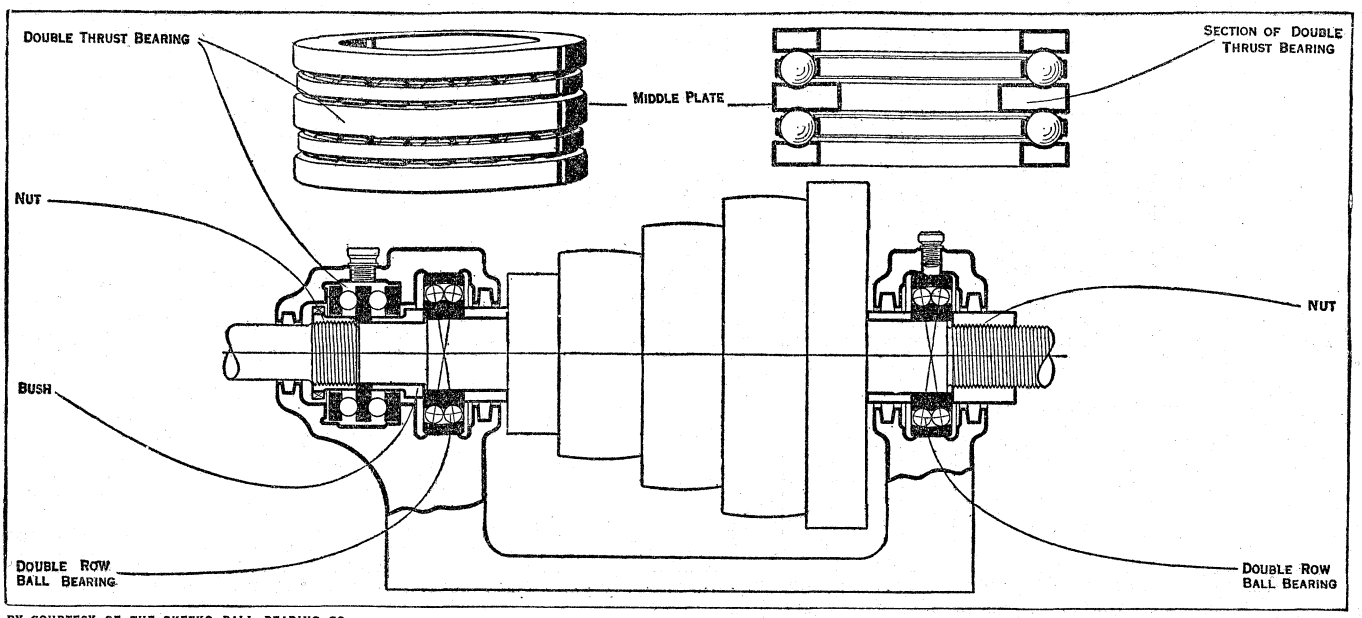
Balls are made of high grade steel hardened and finished to exact dimensions. The ball races and rings are also made of high grade steel hardened and finished by grinding. Rolling resistance is not easily analysed into all the factors involved in the total resistance, but the minute elastic distortions of the hardened balls and races and the slight relative slipping, probably contribute the major part of the resistance when the bearing is properly housed and set up. (*See* Reynolds, *Scientific Papers* Vol. I. for theory of rolling friction.) The manufacturers supply a wide range of sizes in each type together with complete particulars regarding loads and speeds, so that a suitable unit may be selected for the particular problem in hand. The units have then to be incorporated in a suitably designed housing.

A Skefko design of a lathe head incorporating two double row self-aligning bearings and a double row thrust bearing is shown in fig. 9. This illustrates a fundamental principle of design in the use of ball bearing units, namely that the shaft must be located by one unit only. The outer races of the other bearing must be free to take up longitudinal position determined by the balls. The lathe spindle is located by the middle plate of the double thrust bearing. This plate is clamped to the spindle by the bushes of which one is a nut. The outer plates then abut against faces in the housing, but the outer rings of the double thrust bearing supporting the spindle are free to slide longitudinally in the housing. The inner races are however clamped securely to the spindle in the way shown in the sketch.

A Timken design for a front axle bearing for a motor-car is shown in fig. 10. This illustrates the use of a taper roller bearing. Adjustment can be made for any slight wear that may occur.

Ball and roller bearings are used in motor vehicles, and the quietness and smoothness of the motion of a well-made car are due to the frictionless qualities of the ball bearings in which the moving parts are mounted. Experiments on ball and roller bearings are recorded in "Roller and Ball Bearings" by Prof. Goodman, *Proc. Inst. Civil Eng.*, Vol. 189. Much technical information will be found in A. W. Macaulay's *Handbook on Ball and Roller Bearings* (1924).

Bearing Friction.—If W is the total load on a bearing, and if μ is the co-efficient of friction between the rubbing surfaces, the tangential resistance to turning is expressed by the product μW. If v is the relative velocity of the rubbing surfaces, the work done per second against friction is μWv foot pounds. The co-efficient μ is a variable quantity. It varies between values characteristic of solid friction for imperfectly lubricated surfaces and values characteristic of fluid friction for surfaces separated by an oil film. Beauchamp Tower ("Report on Friction Experiments," *Proc. Inst. Mech. Eng.*, Nov. 1883) found that when oil was supplied to a bearing by means of a pad the co-efficient of friction was approximately constant with the value 1/100, thus following the characteristics of solid friction; but when the journal was lubricated by means of an oil-bath the co-efficient of friction varied nearly inversely as the load, thus making $W\mu$ a constant, a characteristic of fluid friction. Tower's experiments were carried out at nearly constant temperature. O. Lasche (*Zeit. Verein deutsche Ingenieure* 1902, 46, pp. 1881 *et seq.*) found that the formula $p\mu t = 2$ expressed the results of his experiments. In this expression p is the load per unit of projected area of the bearing in kilograms per sq. cm., t is the temperature of the bear-

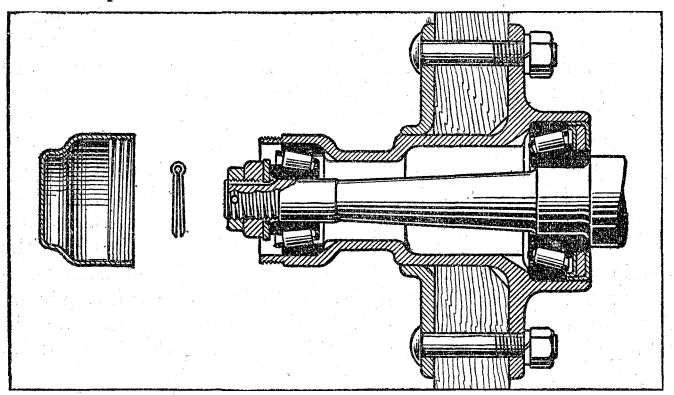


BY COURTESY OF THE SKEFKO BALL BEARING CO.

FIG. 9.—BALL AND THRUST BEARINGS, SHOWING HOW THE WOOD TURNING LATHE SPINDLE IN DOUBLE ROW BALL BEARING IS HELD LONGITUDINALLY BY DOUBLE THRUST BEARING

ing in degrees C. If p is changed to lb. per sq. in., the constant 2 is changed to 30 approximately. The expression is valid between the limits of pressure 14 and 213 lb. per sq. in., between limits of temperature 30°C and 100°C and between limits of relative velocity between the rubbing surfaces of 3 and 50ft. per sec. Experiments bearing on the value of μ are recorded in O. Lasche's *Materials and Design in Turbo-Generator Plant,* trans. by A. L. Mellanby (1927).

With the exception of the work of Michell, nothing of fundamental importance has been done since the researches of Beauchamp Tower carried out for the Institution of Mechanical Engineers (1883–91) and the brilliant work of Osborne Reynolds based upon the results. The Report of the Lubricants and Lubrication Enquiry Committee appointed by the Department of Scientific and Industrial Research in 1917 was published in 1920. The Committee reviewed the knowledge existing at the time of their report and compiled an exhaustive bibliography of the subject. This bibliography is not separately published but may be consulted at the office of the Department, 16, Old Queen street, London. Included in the report are many data derived from experiments initiated by the Committee. The report gives the following approximate values of μ.



BY COURTESY OF THE TIMKEN ROLLER BEARING CO.

FIG. 10.—CROSS SECTION ILLUSTRATING THE USE OF A TIMKEN BEARING ON A MOTOR CAR AXLE

Unlubricated surfaces	0·1 to 0·4
Imperfectly lubricated surfaces called greasy surfaces	0·01 to 0·1
Completely lubricated surfaces with formation of oil film giving what is called viscous friction	0·001 to 0·01

Included in the report are the results of experiments made to find how μ varied with high pressures. Quoting only one comparative result it was found that the co-efficient of viscosity for castor oil at 40°C is about six times as great at a pressure of six tons per sq. in. as at one atmosphere, whilst an animal oil called trotter oil shows a viscosity only 1·16 times as great for the same range of pressure, and yet the tests show that the frictional resistance in the bearing of both oils is about the same. The inference is that the frictional resistance of an oil film does not depend only upon the viscosity of the lubricant. The report contains much experimental work relating to the properties of lubricating oil of value to the engineer. A new committee, The Lubrication Research Committee, was appointed in 1925 to continue research in the subject but it has not yet issued a report.

Theory of Lubrication.—After the publication of Tower's experiments on journal friction Osborne Reynolds showed (*Phil. Trans.*, 1886, p. 157) that the facts observed in connection with a journal lubricated by means of an oil-bath could be explained

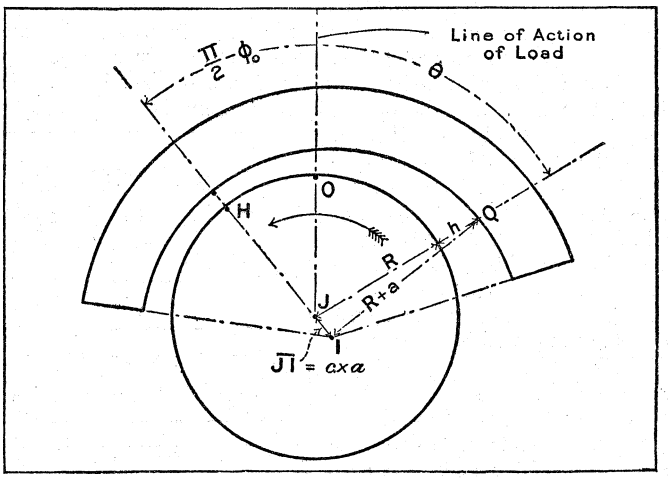


FIG. 11.—DRAWING OF JOURNAL AND BRASS, ILLUSTRATING THE PRINCIPLE THAT THE RADIUS OF THE BRASS MUST BE GREATER THAN THE RADIUS OF THE JOURNAL. I IS THE CENTRE OF THE BRASS AND J THE CENTRE OF THE JOURNAL

by a theory based upon the general principles of the motion of a viscous fluid. It is first established as an essential part of the theory that the radius of the brass must be slightly greater than the radius of the journal as indicated in fig. 11, where J is the centre of the journal and I the centre of the brass. Given this difference of curvature and a sufficient supply of oil, the rotation of the journal produces and maintains an oil film between the

rubbing surfaces, the circumferential extent of which depends upon the rate of the oil supply and the external load. With an unlimited supply of oil, *i.e.*, with oil-bath lubrication, the film extends continuously to the extremities of the brass—unless such extension would lead to negative pressures and therefore to a discontinuity, in which case the film ends where the pressures in the film become negative. The minimum distance between the journal and the brass occurs at the point H (fig. 11), on the off-side of the point O where the line of action of the load cuts the surface of the journal. To the right and left of H the thickness of the film gradually increases, this being the condition that the oil-flow to and from the film may be automatically maintained. With an unlimited supply of oil the point H moves farther from O as the load increases until it reaches a maximum distance, and then it moves back again towards O as the load is further increased until a limiting load is reached at which the pressure in the film becomes negative at the boundaries of the film, when the boundaries recede from the edges of the brass as though the supply of oil were limited.

In the mathematical development of the theory it is first necessary to define the co-efficient of viscosity. This is done as follows: If two parallel surfaces AB, CD are separated by a viscous film, and if whilst CD is fixed AB moves in a tangential direction with velocity U, the surface of the film in contact with CD clings to it and remains at rest, whilst the lower surface of the film clings to and moves with the surface AB. At intermediate points in the film the tangential motion of the fluid will vary uniformly from zero to U, and the tangential resistance will be $F = \mu U/h$, where μ is the co-efficient of viscosity and h is the thickness of the film. With this definition of viscosity and from the general equations representing the stress in a viscous fluid, the following equation is established, giving the relations between p, the pressure at any point in the film, h the thickness of the film at a point x measured round the circumference of the journal in the direction of relative motion, and U the relative tangential velocity of the surfaces,

$$\frac{d}{dx}\left(h^3\frac{dp}{dx}\right) = 6\mu U\frac{dh}{dx} \quad \ldots\ldots\ldots\ldots (1)$$

In this equation all the quantities are independent of the co-ordinate parallel to the axis of the journal, and U is constant. The thickness of the film h is some function of x, and for a journal Reynolds takes the form,

$$h = a\left\{1+c\,sin(\Theta-\phi_0)\right\}$$

in which the various quantities have the significance indicated in fig. 11. Reducing and integrating equation (1) with this value of h it becomes

$$\frac{dp}{d\Theta} = \frac{6R\mu Uc\left\{sin\,(\Theta-\phi_0)-sin\,(\phi_1-\phi_0)\right\}}{a^2\left\{1+c\,sin\,(\Theta-\phi_0)\right\}^3} \quad \ldots\ldots (2)$$

ϕ_1 being the value of Θ for which the pressure is a maximum. In order to integrate this the right-hand side is expanded into a trigonometrical series, the values of the co-efficients are computed, and the integration is effected term by term. If, as suggested by Prof. J. Perry, the value of h is taken to be $h=h_0+ax^2$, where h_0 is the minimum thickness of the film, the equation reduces to the form

$$-\frac{dp}{dx} = \frac{6\mu U}{(h_0+ax^2)^2} + \frac{C}{(h_0+ax^2)^3} \quad \ldots\ldots\ldots (3)$$

and this can be integrated. The process of reduction from the form (1) to the form (3) with the latter value of h, is shewn in full in *The Calculus for Engineers* by Prof. Perry (p. 331), and also the final solution of equation (3), giving the pressure in terms of x.

Reynolds, applying the results of his investigation to one of Tower's experiments, plotted the pressures through the film both circumferentially and longitudinally, and the agreement with the observed pressure of the experiment was exceedingly close. The whole investigation of Reynolds is a remarkable one, and is in fact the first real explanation of the fact that oil is able to insinuate itself between the journal and the brass of a bearing carrying a heavy load. Reynolds assumed the bearing to be of infinite width. In the actual bearing of finite width the oil leaks away from the film at the sides and is not all discharged from the front edge of the brass. Michell developed the theory and solved the problem of a bearing of finite width (see *Zeit. für Math. and Physik*, Vol. 50, pp. 97–155, 1904; and two articles in *Engineering*, "The Theory of the Michell Thrust Bearing," Feb. 20, 1920, p. 233, and "The Michell Thrust Bearing" by Robert Oliphant Boswell, Aug. 7, 1925). Reference may be made to the report of the Lubricants and Lubrication Enquiry Committee, mentioned above, for important references to papers and experimental results, and also to *Lubrication and Lubricants*, by Archbutt and Deeley (1927). (*See* also LUBRICATION.) (W. E. D.)

UNITED STATES PRACTICE

Bearings signify the stationary support which carries a moving element of a machine. The commonest form is the support of a revolving shaft. The quality usually required in a bearing is that it shall allow the supported member perfect freedom for one form of motion, such as rotation, at the same time preventing it from performing any other form of motion. The contacting surfaces between the moving and stationary elements offer more or less resistance to motion, depending on the material used and the smoothness of the surfaces. In nearly all cases the surfaces are separated either by a film of oil or by steel balls or rollers. Bearings may be classified into two distinct types; sliding, and rolling.

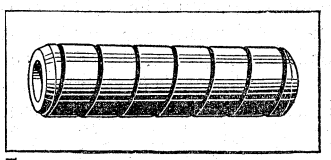


FIG. 12.—THE HYATT ROLLER, A BEARING WHICH IS A SPIRAL CORD AND FLEXIBLE BOTH AS TO DIAMETER AND STRAIGHTNESS

Sliding Bearings, in common use in machinery, are those whose sliding surfaces are separated by a film of oil or other coating having low friction. Sliding bearings are divided into three types; right line, in which the motion is parallel to the elements of the sliding surface; journal bearings, in which two machine parts rotate relatively to each other; thrust bearings, in which the end thrust in bevel and worm gearing, or in general any force acting in the direction of the shaft axis, is taken up.

Rolling Bearings, commonly called anti-friction bearings, are subdivided into two groups, ball and roller. There has been considerable development with the design and application of the rolling bearings in the United States. In this type, rollers or balls are interposed between the moving and stationary element of a machine. The resistance to motion, the rolling friction, is usually found to be very small in comparison to the sliding friction of plain bearings. By the use of anti-friction bearings reduction of frictional resistance has been made possible on all kinds of mechanical contrivances, including bearings for shafts, railway axle boxes, axle boxes for tramcars, automobiles and innumerable industrial machines. In ball bearings the load is concentrated at a few points where the balls touch the race, and in the roller bearing at a few lines of contact between the rollers and the surfaces of the journal and bearing. These points and lines however have an appreciable area due to the flexibility of all material and the consequent indentation of the small contact surface when pressure is applied. Therefore the load, which bearings of this kind carry, must not be great enough to cause indentation deeper than the elastic or fatigue limit of the material in the surface. In practice, these indentations are of microscopic, yet of measurable though negligible depth and area.

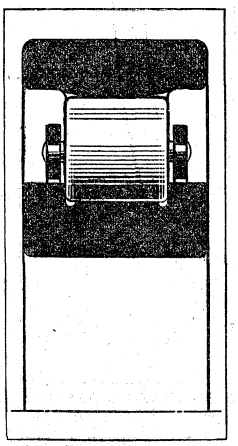


FIG. 13.—THE SHORT ROLL, NORMA-HOFFMAN BEARING
Diagram shows the two ribs, integral with the inner raceway, which guide the roll

Roller Bearings, of the radial classification, having cylindrical rolls are the simplest form of the roller type. The axes of the rolls must be held perfectly parallel with the axis of the shaft,

but as this has not been found possible in a radial roller bearing, various methods have been used to overcome the effect of the skewed position of the rollers. One method is to make the roller flexible both as to diameter and straightness. The flexible roll takes the form of a spiral coil as exemplified in the Hyatt bearing, of which a roll is shown in fig. 12. Another method is to make the roll very short as in the Norma-Hoffman bearing, shown in fig. 13, guiding it between two ribs which are integral with the inner raceway. The outer raceway is rounded so as to make contact only near the centre of the roll. This is to protect the ends of the rollers against slight misalignment of the outer raceway. Radial roller bearings require a cage or retainer which is built of two or more parts. The load must be applied only in a radial direction, as the bearing has no end thrust capacity. A successful method of keeping the rollers in line with the shaft is exemplified in the tapered design of roller as in the Timken bearings. The surfaces of the rolls as well as of both races, when extended, form cones which have their apexes on a common point on the centreline of the shaft. The tapered shape of the roll causes it to press endwise against a rib provided on one of the races, usually the inner race or cone. The rib as well as the ends of the rolls have such contacting surfaces as will prevent skewing of rolls or misalignment.

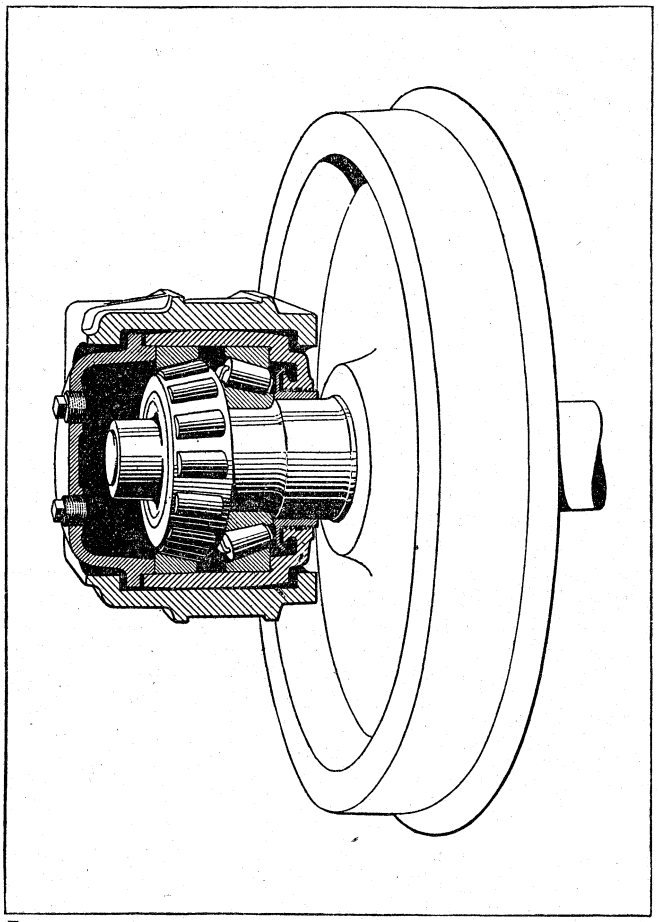


FIG. 14.—CROSS SECTION VIEW OF TIMKEN TAPERED BEARING APPLICATION FOR RAILWAY PASSENGER EQUIPMENT. THIS BEARING CAN TAKE THRUST LOADS IN EITHER DIRECTON AS WELL AS THE VERTICAL AND RADIAL LOADS AND CAN BE ADJUSTED FOR ANY WEAR WHICH MAY OCCUR

There is no possibility of the endwise movement of rolls such as that existing in a straight roller bearing. The angle of the tapered roller bearing can be proportioned to obtain endwise thrust capacity of any desired ratio to its radical capacity. Perfect alignment of the rolls is thus obtained, resulting in a rolling contact along the entire length of the roll. The Timken tapered roller bearing is provided with a one-piece cage which acts as a roll spacer and as a retainer when the bearing is stored or handled. In the mounting of a roller bearing of this type two or more bearings are mounted on the shaft, with the tapers in opposite direction for holding the adjusted running clearance, and for taking thrust load in either direction. The tapered roller bearing is adjustable for proper running clearance with liberal tolerances for dimensions of the finished parts surrounding the bearings. This feature is particularly valuable where tight fits must be used for securing the inner race of the bearing to the shaft. The inner race or cone is expanded because of the tight fit, which would cause pinching of the rolls in bearings of the non-adjustable type. Close adjustment without pinching or cramping is desirable, because if a roller bearing has a large running clearance, the entire load may come on one roll. This applies also to ball bearings. Fig. 14 shows a phantom view of Timken tapered roller bearings as used on a large number of American railway passenger cars (*see* W. C. Sanders, *Journal of the American Society of Mechanical Engineers,* Dec. 1927).

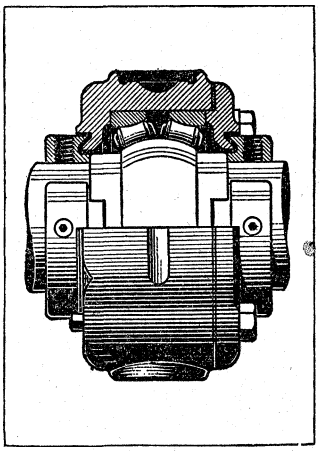


FIG. 15.—SHAFER ROLLER BEARING, SHOWING INNER RACE WITH SPHERICAL FORM FOR PRODUCING A SELF-ALIGNING EFFECT

A modified form of roller bearing employing a barrel shaped roll is being made by the S. K. F. Industries, Inc. The purpose of this form of roll is to permit a spherical surface in the outer race, a self-aligning feature. The cross-section of the inner race has a contour conforming to the shape of the roll, producing a slight slippage near the ends. Tangent lines drawn through the rolling contact points of the roll converge at a common point on the centreline of the shaft, similarly to the tapered roller bearing. This causes the roll to bear firmly against a rib on the inner race. The area of contact on this rib is also spherical and serves to prevent the roll from skewing out of line. A one-piece cage serves to space the rolls. Two sets of rolls opposing each other make up a self-contained bearing unit, each having a separate cage riding on the inner race. The running clearance between the rolls and races is large enough to allow for the expansion of the inner race when properly fitted on a shaft. The bearing is non-adjustable due to the use of one-piece races in a double-row bearing. Another modified form of roller is used in the Shafer roller bearing as shown in fig. 15. The inner race has a spherical form in order to produce a self-aligning effect. The roll makes contact with the inner race over a portion of the roll length. The roll therefore has a smaller diameter at its middle than toward the ends, thus producing considerable slippage. The rolls are held in alignment by means of a one-piece cage. The outer raceway has a convex curvature of cross-section to conform nearly with the shape of the roll. Two sets of rolls opposing each other on the same inner race produce an adjustable self-contained bearing, each set of rolls having a separate cage and separate outer race.

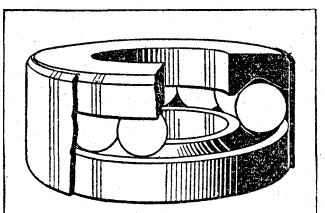


FIG. 16.—AUBURN BALL BEARING, SHOWING DOUBLE CONTACT GROOVES TO OFFSET THE SPINNING EFFECT AT HIGH SPEEDS

Ball Bearings, when subjected to a load between two surfaces, are deformed from their original shape—as is also the surface in contact with the balls—which produces an area of contact instead of point contact. This causes slippage on a portion of the surfaces as the ball rolls along. The nearest approach to a pure rolling motion of a ball is obtained in the single row bearing under radial load. Lines drawn tangent to the ball at the two contacts are parallel with the shaft. The capacity for carrying a load becomes maximum when the cross-sectional curvature of the raceway is made slightly larger in radius than that of the ball. The reason for this is that the area of contact increases as the curvature of ball and race are made more nearly coincident. Each

ball in a bearing of this construction can be loaded only at two points diametrically opposed to each other. When under radial load, the tangent lines through these points are parallel to the shaft, the ball is theoretically free from any spinning effect. This is the condition of minimum slippage. Centrifugal force has the effect of increasing the radial load on the balls and outer race and therefore does not introduce a disturbing force to cause spinning of the ball. When a deep groove ball bearing is subjected to thrust load parallel to the axis of the shaft, the tangent lines through the ball contacts are parallel to each other, but are not parallel to the shaft. The axis of ball rotation is therefore constantly changing position, causing a pivoting or spinning effect about the contact points. This accounts for the reduced capacity or durability of a ball when used in a thrust bearing. In fact, this is the principle used in the manufacture of a steel ball for grinding the finished surface. The ball is ground between two rotating discs, one of which has an abrasive surface. At high speeds,

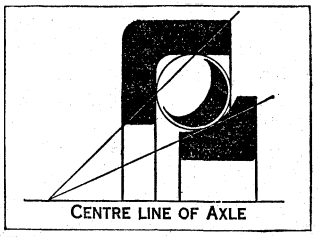


FIG. 17—SECTION SHOWING LINES OF CONTACT IN A THRUST BEARING

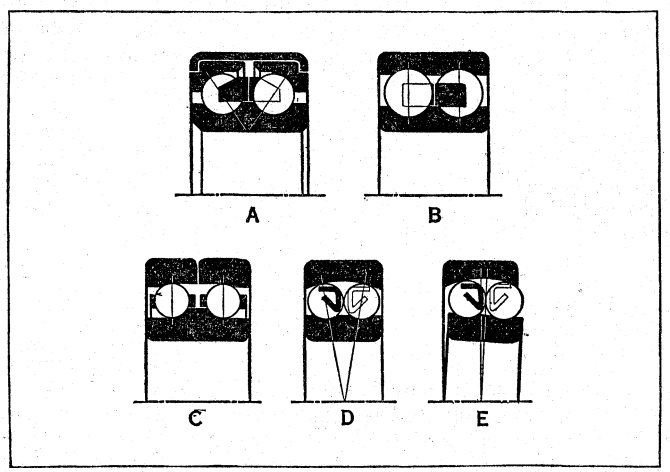


FIG. 18.—DIAGRAMS OF SECTIONS OF DOUBLE ROLL BALL BEARINGS
A. A double row rigid type without filling slot
B. Bearing in which balls are inserted either through a slot or by eccentric race method
C, D and E. Ball bearings that can have a maximum number of balls without the use of a filling slot

centrifugal force in a thrust bearing has the effect of moving the contact points off the diametric line. The spinning effect is therefore greatly increased. Some designers have attempted to overcome the spinning effect of a ball in a thrust bearing by providing double contact grooves as shown in fig. 16 and fig. 17. Lines drawn through the contact points intersect at a point on the bearing. A commercial bearing based on this principle is made by the Auburn Ball Bearing Company. The areas at the contacts of the balls are however at a considerable angle with the axis of ball rotation, therefore, producing a pivoting effect in addition to the rolling motion. The Gurney type of single roll ball bearing permits the full circle to be filled with balls by omitting most of the rib on one side of the outer race. The outer race is sprung into position after heating it in oil. Thrust can be applied only in one direction.

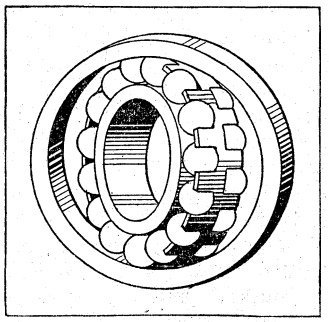


FIG. 19.—SECTION SHOWING RADIAL BALL BEARING. DEFLECTED POSITION

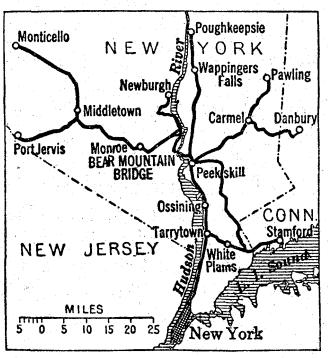
Double Row ball bearing, in which each row of balls is equally loaded by an external radial load, is shown in fig. 19. The bearing is not adjustable. A large number of balls can be used because the outer race swings out of the way during assembly. A one-piece retainer cage is used to hold both rows of balls. Ball bearings of types shown in fig. 18 A, C and D can be given a maximum number of balls without the use of a filling slot. In fig. 18, A shows a double row rigid type without filling slot. The outer race is of two piece construction and held together by an enclosing shell. It is of the cup and cone principle, being partially adjustable. Each row of balls can receive thrust in one direction. In case of design fig. 18 B, thrust is taken in either direction by both sets of balls, but requires great accuracy in its manufacture. The balls in this bearing are inserted either through a slot which is later closed, or by the eccentric race method.

Ball and roller bearings need a small amount of lubrication in spite of the practical absence of friction. The pure rolling motion, as well as the contacts between the balls or rollers and their cages are benefited by the presence of lubricant. The inherent characteristics of a properly designed and produced ball or roller bearing are—durability, long life and continuity of service; simplicity in construction and operating principle; low frictional resistance and absence of any internal condition in the bearing or surrounding parts which is liable to produce rapid wear; and positiveness and cheapness of lubrication. (W. C. S.)

BEAR-LEADER, formerly a man who led bears about the country. In the middle ages and Tudor times these animals were used in the brutal sport of bear-baiting and were led from village to village; performing bears were also common. The phrase "bear-leader" has now come colloquially to mean a tutor or guardian, who escorts any lad of rank or wealth on his travels.

BEAR MOUNTAIN BRIDGE crosses the Hudson river about 44m. above New York city. It is a highway toll bridge, with a deck accommodating four lines of vehicles and two sidewalks. The floor system was designed for 15 ton and 20 ton motor trucks, with impact allowance. Opened to public use in November 1924, 18 months after work on it was started, it had what was at that time the longest suspension span in the world, 1,632ft. from centre to centre of the towers. It was completed early in 1925.

Each of the two cables contains 7,252 annealed steel galvanized wires, giving a diameter of $18\frac{5}{8}$in.; from them stiffening trusses of "silicon" steel carrying the roadway over the main span are suspended by steel ropes passing over castings clamped to the cables. The trusses extend over the main span only, the roadway being carried on independent steel spans supported on concrete piers between the towers and the end of the bridge. The two towers are 355ft. high, built of structural steel with cast bases, and rest on four concrete piers founded on the natural rock on both shores, slightly above the water-level. The roadway and sidewalks are formed of a continuous reinforced concrete slab from railing to railing, with a roadway paving of sheet asphalt. Twelve expansion joints are provided in the main span. The bridge was designed and supervised by Howard C. Baird, with Francis P. Witmer as associate. It is owned by the Bear Mountain Hudson River Bridge Company, but will become the property of the State of New York in 1955. (H. C. B.)



BEAR MOUNTAIN BRIDGE ROUTE connects New England with the West across the Hudson river just below the U.S. Military academy at West Point where the river narrows in passing through deep mountain cuts. The approach along Storm King highway affords magnificent views of the Hudson river.

BÉARN, formerly a small frontier province in the south of France, now included within the department of Basses-Pyrénées. It was bounded on the west by Soule and Lower Navarre, on the north by Chalosse, Tursan and Astarac, east by Bigorre and south by the Pyrenees. Its name can be traced back to the town of Beneharnum (Lescar). It was conquered by the *Vascones* in the 6th century and in 819 became a viscounty dependent on the

dukes of Aquitaine—a feudal link which was broken in the 11th century, when the viscounts ceased to acknowledge any suzerain. They then reigned over the two dioceses of Lescar and Oloron; but their capital was Morlaas, where they had a mint. In the 13th century Gaston VII., of the Catalonian house of Moncade, made Orthez his seat of government. His long reign (1229–90) was a perpetual struggle with the kings of France and England, each anxious to assert his suzerainty over Béarn. As Gaston left only daughters, the viscounty passed at his death to the family of Foix, from whom it was transmitted through the houses of Grailly and Albret to the Bourbons, and they, in the person of Henry IV., king of Navarre, made it an apanage of the crown of France. From the 11th century onward, the Béarnais were governed by their own special customs or *fors*. Moreover, from the 12th century Béarn enjoyed a kind of representative government, with *cours plénières* composed of deputies from the three estates. From 1220 onward, the judiciary powers of these assemblies were exercised by a *cour majour* of 12 *barons jurats* charged with the duty of maintaining the integrity of the *fors*. When Gaston-Phoebus wished to establish a regular annual hearth-tax (fouage) in the viscounty, he convoked the deputies of the three estates in assemblies called *états*. These soon acquired extensive political and financial powers, which continued in operation till 1789.

(C. Bem.)

BEAS or **BIAS,** a river of India. The Beas, which was the Hyphasis of the Greeks, is one of the Five Rivers of the Punjab. It issues in the snowy mountains of Kulu at an altitude of 13,326 ft. above sea level, flows through the Kangra valley and the plains of the Punjab, and finally joins the Sutlej after a course of 290 miles.

BEAT, a blow or stroke; from the many applications of the verb "to beat" come various meanings of the substantive. It is applied to the throbbing of the pulse or heart and to the beating of a drum; in music to the alternating sound produced by the striking together of two notes not exactly of the same pitch (*see* Sound), and to the movement of the baton by which a conductor of an orchestra or chorus indicates the time. In navigation a "beat" is one of the courses taken by a ship in sailing against the wind. The word is also applied to a policeman's or sentry's round.

BEAT FREQUENCY. A term used with respect to wave motions of any sort (*i.e.*, sound, radio, optics, mechanical waves) referring to periodic use and fall of intensity or amplitude of the wave motion when two (or a few) periodic motions of nearly the same frequency are combined. The number of beats per unit time, or the beat frequency, is equal to the difference between the frequencies of the combining waves, if only two frequencies are involved. If several are involved the intensity and amplitude changes are much more complexly related to the frequencies of the several components.

BEATIFICATION, the act of making blessed; in the Roman Catholic Church a stage in the process of canonization (*q.v.*).

BEATON or **BETHUNE, DAVID** (*c.* 1494–1546), Scottish cardinal and archbishop of St. Andrews, was a younger son of John Beaton, of Balfour, in the county of Fife. He was educated at the universities of St. Andrews and Glasgow, and studied civil and canon law in Paris. About this time he was presented to the rectory of Campsie by his uncle James Beaton, then archbishop of Glasgow. When James Beaton was translated to St. Andrews in 1522 he resigned the rich abbacy of Arbroath in his nephew's favour. Beaton was sent by King James V. on various missions to France, and in 1528 was appointed keeper of the privy seal. He took a leading part in the negotiations connected with the king's marriages, first with Madeleine of France, and afterwards with Mary of Guise, and was consecrated bishop of Mirepoix by King Francis I. in Dec. 1537. On Dec. 20, 1538 he was appointed a cardinal priest by Pope Paul III., under the title of St. Stephen in the Coelian Hill, and on the death of Archbishop James Beaton in 1539 he was raised to the primatial see of Scotland.

Beaton used his influence over King James to draw closer the French alliance and refuse Henry VIII.'s overtures to follow him in his religious policy. On the death of James in Dec. 1542 he attempted to assume office as one of the regents for the infant sovereign, Mary, founding his pretensions on an alleged will of the late king; but the earl of Arran was declared regent by the estates. The cardinal was, by order of the regent, committed to the custody of Lord Seaton; but he was soon again at liberty and at the head of the party opposed to the English alliance. Arran, too, was soon won over to his views, dismissed the Protestant preachers by whom he had been surrounded, and joined the cardinal at Stirling, where in Sept. 1543 Beaton crowned the young queen. In the same year he was raised to the office of chancellor of Scotland, and was appointed protonotary apostolic and legate *a latere* by the pope. His strenuous opposition to the plans of Henry VIII. for the subjugation of Scotland would have earned him the lasting gratitude of his countrymen, had not resistance to English influence involved resistance to the reformers in the Church, whose ultimate victory has obscured the cardinal's genuine merits as a statesman. The popular accounts of the persecution for which he was responsible are no doubt exaggerated, and it sometimes ceased for considerable periods. One of his most celebrated victims was George Wishart, an eloquent preacher who was protected by several barons of the English faction. These barons, with Wishart as a willing agent, were engaged in a plot to assassinate the cardinal who, perhaps, suspected Wishart's knowledge of it, and in any case was not sorry to have an excuse for seizing him. For some time he was unsuccessful; but at last, with the aid of the regent, he arrested the preacher and carried him to his castle of St. Andrews. On Feb. 28, 1546, Wishart was brought to trial in the cathedral before the cardinal and other judges, the regent declining to take any active part, and, being found guilty of heresy, was condemned to death and burnt.

The death of Wishart produced a deep effect on the Scottish people, and the cardinal became an object of general dislike, which encouraged his enemies to proceed with the design they had formed against him. Naturally fearless and apparently underestimating his danger, he crossed over to Angus to take part in the wedding of his illegitimate daughter with the heir of the earl of Crawford. On his return to St. Andrews he took up his residence in the castle.

The conspirators, the chief of whom were Norman Leslie, master of Rothes, and William Kirkcaldy, of Grange, contrived to obtain admission into the castle at St. Andrews at daybreak on May 29, 1546, and murdered the cardinal under circumstances of horrible mockery and atrocity.

As a statesman Beaton was able, resolute, and in his general policy, patriotic. As an ecclesiastic he maintained the privileges of the hierarchy and the dominant system of belief conscientiously, but sometimes with cruelty. His immoralities, like his acts of persecution, were exaggerated by his opponents; but his private life was undoubtedly a scandal to religion. The authorship of the writings ascribed to him in several biographical notices rests on no better authority than the apocryphal statements of Thomas Dempster.

Beaton's uncle, James Beaton, or Bethune (d. 1539), archbishop of Glasgow and St. Andrews, was lord treasurer of Scotland before he became archbishop of Glasgow in 1509, was chancellor from 1513–26, and was appointed archbishop of St. Andrews and primate of Scotland in 1522. He was one of the regents during the minority of James V., and was chiefly responsible for this king's action in allying himself with France and not with England. He burned Patrick Hamilton and other heretics.

This prelate must not be confused with another, James Beaton or Bethune (1517–1603), the last Roman Catholic archbishop of Glasgow. A son of John Bethune, of Auchmuty, and nephew of Cardinal Beaton, James was a trusted adviser of the Scottish regent, Mary of Lorraine, widow of James V., and a determined foe of the reformers. In 1552 he was consecrated archbishop of Glasgow, but from 1560 until his death he lived in Paris, acting as ambassador for Scotland at the French court.

See John Knox, *Hist. of the Reformation in Scotland,* ed. D. Laing (1846–64); John Spottiswoode, archbishop of St. Andrews, *Hist. of the Church of Scotland* (Spottiswoode Soc., 1847–51); Art. in *Dict. of Nat. Biog.*, and works there quoted; and A. Lang, *Hist. of Scotland,* vols. i. and ii. (1900–02).

BEATRICE, a city of Nebraska, U.S.A., 40m. S. of Lincoln, in the fertile valley of the Big Blue river, the county seat of Gage

county. It is on federal highway 77, is served by the Burlington, the Rock Island and the Union Pacific railways, and has a municipal airport. The population in 1940 was 10,883.

Its products include silos, showcases, mirrors, cultivators, steel tanks, hardware specialties, windmills, gasoline engines, brick, tile and earthenware. It ranks first in agriculture and second in manufacturing in the state. The state institution for the feeble minded is there. Beatrice was founded in 1857 and was chartered as a city in 1873. It is the site of the first U.S. homestead and the original plot is now the First Homestead national park.

BEATTIE, JAMES (1735–1803), Scottish poet and writer on philosophy, was born at Laurencekirk, Kincardine. He was educated at the parish school and at Marischal college, Aberdeen, where, after some years spent in school teaching, he became professor of moral philosophy. Beattie's first published work was *Original Poems and Translations* (1760). In 1771 and 1774 he published the first and second parts of the *Minstrel,* a descriptive poem written in the Spenserian stanza, which struck a new note of simplicity and made its author famous. The best known of his minor poems are "The Hermit" and "Retirement." In the meantime Beattie wrote the once famous *Essay on the Nature and Immutability of Truth, in Opposition to Sophistry and Scepticism* (1770), which was a direct attack on Hume. Beattie visited London in 1773, and was well received by George III., who gave him a pension of £200 a year. He had many friends in London literary circles, including Johnson, Burke, Garrick and Goldsmith. His domestic life was unhappy. His wife became insane and his two sons died young. The elder, James Hay Beattie, was a poet, and his father published some of his prose and verse with a memoir in 1794.

Beattie's other poetical works include the *Judgment of Paris* (1765), and *Verses on the death of (Charles) Churchill,* a bitter attack which the poet afterwards suppressed. The best edition is the *Poetical Works* (1866) in the *Aldine Edition of the British Poets,* with an admirable memoir by Alexander Dyce. Beattie also wrote *Miscellaneous Dissertations* (1783), *Evidences of Christianity* (1786), and *Elements of Moral Science* (1790).

See Sir William Forbes, *An Account of the Life and Writings of James Beattie* (1807), *Beattie and his Friends* (1904) by the poet's great-grand-niece, Margaret Forbes; and *James Beattie, "The Minstrel." Some Unpublished Letters,* ed. A. Mackie (Aberdeen, 1908).

BEATTY, DAVID, 1ST EARL (1871–1936), British admiral of the fleet, was born on Jan. 17, 1871, second son of Captain David Longfield Beatty of County Wexford, Ireland. He entered the training ship "Britannia" as a naval cadet in 1884. As a young officer, from 1896–98, he saw service with the naval brigade in Egypt and the Sudan, for which he obtained the D.S.O. and early promotion to commander. In that rank he served in China during the Boxer Rebellion in 1900, when he again distinguished himself and was promoted to captain at the early age of 29.

In 1911, as a rear-admiral, he became naval secretary to the first lord of the Admiralty, then Winston Churchill, and, on completing two years in that office, in 1913 he was appointed to command the Battle Cruiser Squadron.

Very soon after the outbreak of the World War in Aug. 1914, his naval force made a raid into the Heligoland bight (*q.v.*) and sank three cruisers and one destroyer without loss. A few months later he intercepted the German squadron under Admiral von Hipper in their third attempt on the English coastal towns. In a running fight, the rear German battle cruiser "Blücher" was sunk by the British gunfire. Further damage to the enemy would probably have been inflicted but for the fact that the flagship "Lion" was disabled just as Beatty had swung his ships away from the reported position of an enemy submarine and that his second in command misunderstood his signal to renew the engagement, which was broken off. This action was known as the fight of the Dogger Bank (*q.v.*).

In the battle of Jutland (*q.v.*) on May 30, 1916, the battle cruiser fleet under Beatty was heavily engaged in a running fight with the German scouting force under von Hipper. Although Beatty's battle cruisers had the advantage of numbers, they were handicapped by conditions of light, and the ships themselves proved unable to sustain the superior gunfire of the German battle cruisers, with the result that the "Indefatigable," "Queen Mary" and "Invincible" were sunk. The Fifth Battle Squadron, which was also part of Beatty's command, having been stationed five miles on the opposite bearing to that on which the enemy was sighted, were unable to render the powerful support which they could have given during the early part of the engagement. Nevertheless, Beatty succeeded in his main object of drawing the combined High Sea Fleet to the northward, from whence Admiral Jellicoe, with the whole British Grand Fleet, was hastening to meet and engage it. In Dec. 1916, on Jellicoe being appointed first sea lord, Beatty became commander-in-chief of the Grand Fleet. In this capacity he received the surrender of the greater part of the German navy after the Peace of Versailles.

From 1919 to 1927 he served with marked distinction and ability as first sea lord, having to deal with the exceptionally difficult problems connected with the reduction of the war fleet and the creation of a much smaller, modernized, but highly efficient peacetime navy. In 1921 he was the British delegate at the Washington Conference on the limitation of armaments.

He received the K.C.B. in 1914. In 1919 he was raised to the Peerage as Earl Beatty, Viscount Borodale of Borodale, Baron Beatty of the North Sea and of Brooksby, and received £100,000 for services during the war. He was also awarded the G.C.B. and the O.M. and was the recipient of numerous other British and foreign honours and decorations. In May 1901 he married Ethel (d. Jan. 13, 1932), daughter of the late Marshall Field of Chicago, and had two sons. He died in London, March 11, 1936. (E. A.)

BEATUS, of Valcavado, Spanish theologian and geographer, was born about 730, and died in 798. He took a prominent part in the Adoptionist controversy, and wrote against the views of Felix of Urgel, and his followers. About 776, he produced his *Commentaria in Apocalypsin* to which was attached one of the oldest Christian world-maps. This original map, which was probably intended to illustrate the distribution of the apostolic missions throughout the world (depicting the head of Peter at Rome, of Andrew in Greece, of Thomas in India, of James in Spain, and so forth) has survived only in 10 copies, varying in date from the 9th to the 13th century, the most valuable being that of "St. Sever" now at Paris, dating from *c.*1030.

There is only one complete edition of the *Commentaria in Apocalypsin,* that by Florez (1770). The text of the Apocalypse used by Beatus has been edited by E. S. Buchanan (1915); *see* also Konrad Miller *Die Weltkarte des Beatus;* Heft I. of *Mappaemundi: die ältesten Weltkarten* (Stuttgart, 1895); d'Avezac in *Annales de . . . géographie* (June, 1870); Beazley, *Dawn of Modern Geography* (1897–1901).

BEAUCAIRE, town in France, department of Gard, 17m. E. by S. of Nîmes on the P.L.M. railway. Pop. (1936), 8,146. Beaucaire is on the right bank of the lower Rhone, opposite Tarascon, with which it is connected by a suspension-bridge 1,476ft. long, and by a railway bridge. A triangular keep, a small late Romanesque chapel and other remains of the castle (13th and 14th centuries) of the counts of Toulouse stand on the rocky pine-clad hill which rises abruptly from the Rhone and is cut off by a deep cleft landward. A great July fair, held here annually since the 12th century, is now of little importance save for leather goods (*see* FAIR). Beaucaire occupies the site of the ancient *Ugernum,* and several Roman remains have been discovered. The present name is derived from the mediaeval term *Bellum Quadrum,* used for the castle or its rock. In 1125 Beaucaire came into the possession of the counts of Toulouse, one of whom established the importance of its fairs by the grant of privileges. In the Wars of the League it suffered severely, and in 1632 its castle was destroyed by Richelieu. The Beaucaire canal communicates with Aigues-Mortes and the Canal du Midi. The town is an important river port, trading in wine and freestone.

BEAUCE (Lat. *Belsia*), a natural region of northern France, comprising portions of the departments of Eure-et-Loir and Loir-et-Cher, and also extending into Loiret and Seine-et-Oise. It has an area of over 2,800 sq.mi., its limits being defined by the course of the Essonne on the E., of the Loire on the S., and of the Brenne, the Loire and the Eure towards the W., though in the lat-

ter direction it extends somewhat beyond these boundaries. The Beauce is a treeless, dry, open plain of limestone formation; windmills and the spires in large nucleated villages at sources of water supply are the only prominent features of the landscape. Apart from the rivers on its borders, it is watered by insignificant streams. Clover and alfalfa (lucerne) are grown and large flocks of sheep kept. It is renowned as a wheat land. Chartres (*q.v.*) is its historic and commercial focus.

BEAUCHAMP, ALPHONSE DE (1767–1832), French historian and writer, was born at Monaco in 1767, and died at Paris on June 3, 1832. In 1784 he entered a Sardinian regiment of marines, but on the outbreak of war with the French Republic he refused to fight in what he considered an unjust cause, and was imprisoned for several months. He then obtained a post in one of the government offices in Paris. On the fall of Robespierre, Beauchamp was transferred to the *bureau* of the minister of police and charged with the superintendence of the press. This situation opened up to him materials of which he made use in his first and most popular historical work, *Histoire de la Vendée et des Chouans* (1806). The third edition was confiscated; Beauchamp was deprived of his post, and in 1809 was compelled to leave Paris for a time.

Beauchamp's biographical and historical works dealing with contemporary events are valuable, owing to the sources at his disposal, but must be used with great caution. The following are worth mention:—*Vie Politique, militaire et privée du général Moreau* (1814); *Catastrophe de Murat, ou Récit de la dernière révolution de Naples* (1815); *Histoire de la guerre d'Espagne et du Portugal, 1807–1813* (1819); *Histoire de la révolution de Piémont* (1821, 1823); *Collection de mémoires relatifs aux révolutions d'Espagne* (1824); *Mémoires secrets et inédits pour servir à l'histoire contemporaine* (1825). *The Mémoires de Fouché* have also been ascribed to him, but it seems certain that he only revised and completed a work really composed by Fouché himself. *See* an article by Louis Madelin in *La Révolution française* (1900).

BEAUCHAMP (bē'chăm), the name of several important English families. The baronial house of Beauchamp of Bedford was founded at the Conquest by Hugh de Beauchamp, who received a barony in Bedfordshire. His eldest son Simon left a daughter, whose husband Hugh (brother of the count of Meulan) was created earl of Bedford by Stephen. But the heir-male, Miles de Beauchamp, nephew of Simon, held Bedford castle against the king in 1137–38. From his brother Payn descended the barons of Bedford, of whom William held Bedford castle against the royal forces in the struggle for the Great Charter, and was afterwards made prisoner at the battle of Lincoln, while John, who sided with the barons under Simon de Montfort, fell at Evesham. With him the line ended, but a younger branch was seated at Eaton Socon, Bedfordshire, where the earthworks of their castle remain, and held their barony there into the 14th century.

The Beauchamps of Elmley, Worcestershire, the greatest house of the name, were founded by the marriage of Walter de Beauchamp with the daughter of Urise d'Abetot, a Domesday baron, which brought him the shrievalty of Worcestershire, the office of a royal steward, and large estates. His descendant William, of Elmley, married Isabel, sister and eventually heiress to William Mauduit, earl of Warwick, and their son succeeded in 1268 to Warwick castle and that earldom, which remained with his descendants in the male line till 1445.

The earls of the Beauchamp line played a great part in English history. Guy, the 2nd, distinguished himself in the Scottish campaigns of Edward I., who warned him at his death against Piers Gaveston. Under Edward II. he was one of the foremost foes of Piers, who had styled him "the black cur of Arden," and with whose death he was closely connected. As one of the "lords ordainers" he was a recognized leader of the opposition to Edward II. By the heiress of the Tonis he left at his death in 1315 a son Earl Thomas, who distinguished himself at Crécy and Poitiers, was marshal of the English host, and, with his brother John, one of the founders of the order of the Garter. In 1369 his son Earl Thomas succeeded; from 1376 to 1379 he was among the lords striving for reform, and in the latter year he was appointed governor to the king. Under Richard II. he joined the lords appellant in their opposition to the king and his ministers, and was in power with them 1388–89; treacherously arrested by Richard in 1397, he was imprisoned in the Tower of London (the Beauchamp Tower being called after him), but liberated by Henry IV. on his triumph (1399). In 1401 he was succeeded by his son Earl Richard, who defeated Owen Glendower, fought the Percys at Shrewsbury, and, after travelling in state through Europe and the Holy Land, was employed against the Lollards and afterwards as lay ambassador from England to the council of Constance (1414). He held command for a time at Calais, and took part in the French campaigns of Henry V., who created him earl and count of Aumale in Normandy. He had charge of the education of Henry VI., and in 1437 was appointed lieutenant of France and of Normandy.

Dying at Rouen in 1439, he left by Isabel, widow of Richard Beauchamp, earl of Worcester, a son, Earl Henry, who was created duke of Warwick, 1445, and is alleged, but without authority, to have been crowned king of the Isle of Wight by Henry VI. He died, the last of his line, in June 1445. On the death of Anne, his only child, in 1449, his vast inheritance passed to Anne, his sister of the whole blood, wife of Richard Neville, earl of Salisbury ("the kingmaker"), who thereupon became earl of Warwick.

Of the cadet branches of the house, the oldest was that of Powyke and Alcester, which obtained a barony in 1447 and became extinct in 1496; from it sprang the Beauchamps Lords St. Amand from 1448, of whom was Richard, bishop of Salisbury first chancellor of the order of the Garter, and who became extinct in 1508, being the last known male heirs of the race. Another cadet was Sir John Beauchamp of Holt, minister of Richard II., who was created Lord Beauchamp of Kidderminster (the first baron created by patent) 1387, but beheaded 1388; the barony became extinct with his son in 1400. Roger, Lord Beauchamp of Bletsoe, summoned in 1363, is said to have been descended from the Powyke branch; his line ended early in the 15th century. Later cadets were John, brother of the 3rd earl, who carried the standard at Crécy, became captain of Calais, and was summoned as a peer in 1350, but died unmarried; and William, brother of the 4th earl, who was distinguished in the French wars, and succeeding to the lands of the Lords Abergavenny was summoned in that barony 1392; his son was created earl of Worcester in 1420, but died without male issue in 1422; from his daughter, who married Sir Edward Neville, descended the Lords Abergavenny.

The Lords Beauchamp of "Hache" (1299–1361) were so named from their seat of Hatch Beauchamp, Somersetshire, and were of a wholly distinct family. Their title, "Beauchamp of Hache," was revived for the Seymours in 1536 and 1559. The title of "Beauchamp of Powyke" was revived as a barony in 1806 for Richard Lygon (descended through females from the Beauchamps of Powyke), who was created Earl Beauchamp in 1815.

BIBLIOGRAPHY.—*See* Sir W. Dugdale, *Baronage* (1675–76) and *Warwickshire* (2nd ed., 1730); W. Courthope, *Rows Roll* (1859); G. E. Cokayne, *Complete Peerage* (1887–98); and J. H. Round, *Geoffrey de Mandeville* (1892). (J. H. R.)

BEAUFORT, HENRY (*c.* 1377–1447), English cardinal and bishop of Winchester, was the second son of John of Gaunt, duke of Lancaster, by Catherine, wife of Sir Hugh Swynford. His parents were not married until 1396, and in 1397 King Richard II. declared the four children of this union to be legitimate. Henry entered the Church, and was consecrated bishop of Lincoln in 1398. He was made chancellor in 1403, but resigned this office in 1404, when he was translated from Lincoln to Winchester as the successor of William of Wykeham. He exercised considerable influence over the prince of Wales, afterwards King Henry V., and, although he steadily supported the house of Lancaster, he opposed the party led by Thomas Arundel, archbishop of Canterbury. A dispute over money left by John Beaufort, marquess of Dorset, caused or widened a breach in the royal family, which reached a climax in 1411. The details are not quite clear, but it

seems tolerably certain that the prince and the bishop, anxious to retain their power, sought to induce Henry IV. to abdicate in favour of his son. Angry at this request, the king dismissed his son from the council, and Beaufort appears to have shared his disgrace. When Henry V. ascended the throne, in 1413, the bishop again became chancellor, and took a leading part in the Government until 1417, when he resigned his office, and proceeded to the council which was then sitting at Constance. His arrival had an important effect on the deliberations of this council, and the compromise which was subsequently made between the rival parties was largely his work. Grateful for Beaufort's services, the new pope, Martin V., offered him a cardinal's hat, which Henry V. refused to allow him to accept. After the king's death in 1422 he became a member of the council, and was the chief opponent of the wild and selfish schemes of Humphrey, duke of Gloucester. In 1424 he became chancellor for the third time, and was mainly responsible for the conduct of affairs during Gloucester's expedition to Hainaut. He was disliked by the citizens of London; and this ill-feeling was heightened when Gloucester, who was a favourite of the Londoners, returned to England and was doubtless reproached by Beaufort for the folly of his undertaking. A riot took place in London, and at the bishop's entreaty, the protector, John, duke of Bedford, came back to England. As this dispute was still unsettled when the Parliament met at Leicester in Feb. 1426, Bedford and the lords undertook to arbitrate. Charged by Gloucester with treason against Henry VI. and his successors, Beaufort denied the accusations, but he resigned the chancellorship.

Anxious to secure his aid for the crusade against the Hussites, Pope Martin again offered him a cardinal's hat, which Beaufort accepted. He went to France in 1427, and was then appointed papal legate for Germany, Hungary and Bohemia; and proceeding eastwards, he made a bold but futile effort to rally the crusaders at Tachau. Returning to England to raise money for a fresh crusade, he was received with great state in London; but his acceptance of the cardinalate had weakened his position, and Gloucester refused to recognize his legatine commission. Beaufort gave way on this question, but an unsuccessful attempt was made in 1429 to deprive him of his see. Having raised some troops he set out for Bohemia; but owing to the disasters which had just attended the English arms in France, he was induced to allow these soldiers to serve in the French war; and in Feb. 1431 the death of Martin V. ended his commission as legate. He accompanied King Henry VI. to Normandy in April 1430, and in Dec. 1431 crowned him king of France. About this time Gloucester made another attempt to deprive Beaufort of his see, and it was argued in the council that, as a cardinal, he could not hold an English bishopric. The general council was not inclined to press the case against him; but the privy council, more clerical and more hostile, sealed writs of praemunire and attachment against him, and some of his jewels were seized. On his return to England he attended the Parliament in May 1432, and asked to hear the charges against him. The king declared him loyal, and a statute was passed freeing him from any penalties which he might have incurred under the Statute of Provisors or in other ways. He supported Bedford in his attempts to restore order to the finances. In Aug. 1435 he attended the congress at Arras, but was unable to make peace with France; and after Bedford's death his renewed efforts to this end were again opposed by Gloucester, who favoured a continuance of the war. On two occasions the council advised the king to refuse him permission to leave England, but in 1437 he obtained a full pardon for all his offences. In 1439 and 1440 he went to France on missions of peace, and, apparently at his instigation, the English council decided to release Charles, duke of Orleans. This step further irritated Gloucester, who drew up and presented to the king a long and serious list of charges against Beaufort; but the council defended the policy of the cardinal, and ignored the personal accusations against him. Beaufort, however, gradually retired from public life, and after witnessing the conclusion of the Treaty of Troyes died at Wolvesey palace, Winchester. The "black despair" which Shakespeare has cast round his dying hours appears to be without historical foundation. He was buried in Winchester cathedral, the building of which he finished. He also refounded and enlarged the hospital of St. Cross near Winchester.

Beaufort was a man of considerable wealth, and on several occasions he lent large sums of money to the king. His interests were secular, and he was certainly proud and ambitious; but Stubbs has pictured the fairer side of his character when he observes that Beaufort "was merciful in his political enmities, enlightened in his foreign policy; that he was devotedly faithful, and ready to sacrifice his wealth and labour for the king; that from the moment of his death everything began to go wrong, and went worse and worse until all was lost."

See Aeneas Sylvius Piccolomini, *Historica Bohemica* (1707); *Proceedings and Ordinances of the Privy Council*, ed. N. H. Nicolas (1834–37); *Historiae Croylandensis continuatio*, trans. H. T. Riley (1854); W. Stubbs, *Constitutional History*, vol. iii. (1895); M. Creighton, *A History of the Papacy during the Period of the Reformation* (1897); and L. B. Radford, *Henry Beaufort* (1908).

BEAUFORT, FRANÇOIS DE VENDÔME, DUC DE (1616–1669), a picturesque figure in French history of the 17th century, was the second son of César de Vendôme, and grandson of Henry IV. by Gabrielle d'Estrées. He served in the first campaigns of the Thirty Years' War. In 1642 he joined in the conspiracy of Cinq Mars against Richelieu, and upon its failure was obliged to live in exile in England until Richelieu's death. Returning to France, he became the centre of a group, known as the "Importants," in which court ladies predominated, especially the duchess of Chevreuse and the duchess of Montbazon. For an instant after the king's death, this group seemed likely to prevail, but Mazarin came to the fore, and Beaufort, accused of a plot to murder Mazarin, was imprisoned in Vincennes, in Sept. 1643. He escaped on May 31 1648, just in time to join the Fronde, which began in Aug. 1648. He was then with the parlement and the princes, against Mazarin. His personal appearance, his affectation of popular manners, his quality of grandson (legitimized) of Henry IV., rendered him a favourite of the Parisians, who called him the *Roi des Halles* ("king of the markets"). But among the members of the parlement and the other leaders of the Fronde, he was regarded as merely a tool. Mazarin, on his return to Paris, exiled him in Oct. 1652. He was allowed to return in 1654 and engaged in no further intrigues. From 1658 onwards he faithfully served the king in naval wars. He was killed in a night sortie while defending Candia against the Turks on June 15 1669.

See the memoirs of the time, notably those of La Rochefoucauld, the Cardinal de Retz, and Madame de Motteville. Also D'Avenel, *Richelieu et la monarchie absolue* (1884); Cheruel, *La France sous le ministère de Mazarin* (1879); and *La France sous la minorité de Louis XIV.* (1882).

BEAUFORT, the name of the family descended from the union of John of Gaunt, duke of Lancaster, with Catherine, wife of Sir Hugh Swynford, taken from a castle in Anjou which belonged to John of Gaunt. There were four children of this union —John, created earl of Somerset and marquess of Dorset; Henry, afterwards bishop of Winchester and cardinal (*see* BEAUFORT, HENRY); Thomas, made duke of Exeter and chancellor; and Joan, who married Ralph Neville, first earl of Westmorland, and died in 1440. In 1396, some years after the birth of these children, John of Gaunt and Catherine were married, and in 1397 the Beauforts were declared legitimate by King Richard II. In 1407 this action was confirmed by their half-brother, King Henry IV., but on this occasion they were expressly excluded from the succession to the English throne.

JOHN BEAUFORT, earl of Somerset (*c.* 1373–1410), assisted Richard II. in 1397 when the king attacked the lords appellants and made himself an absolute ruler. For these services he was made marquess of Dorset, but after the deposition of Richard, in 1399, he was degraded to his former rank as earl. In 1401, however, he was declared loyal, and appeared later in command of the English fleet. He married Margaret, daughter of Thomas Holland, second earl of Kent, and died in March 1410, leaving three sons, Henry, John, and Edmund, and two daughters, Jane or Joan, who married James I., king of Scotland, and Margaret, who married Thomas Courtenay, earl of Devon.

THOMAS BEAUFORT (d. 1426) held various high offices under Henry IV, and took a leading part in suppressing the rising in the north in 1405. He became chancellor in 1410, but resigned this office in Jan. 1412 and took part in the expedition to France in the same year. In 1416 he became lieutenant of Normandy and was created duke of Exeter; and returning to England he compelled the Scots to raise the siege of Roxburgh. Crossing to France in 1418 with reinforcements for Henry V, he took an active part in the subsequent campaign, was made captain of Rouen and went to the court of France to treat for peace. He was then captured by the French at Bauge, but was released, and returned to England when he heard of the death of Henry V in Aug. 1422. He was one of Henry's executors, and it is probable that the king entrusted his young son, King Henry VI, to his care. However this may be, Exeter did not take a very prominent part in the government, although he was a member of the council of regency. Having again shared in the French war, the duke died at Greenwich about the end of the year 1426.

JOHN BEAUFORT (1403–1444), earl, then duke, of Somerset, fought under Henry V in the French wars, and having been taken prisoner remained in France as a captive until 1437. After the death of Richard Beauchamp, earl of Warwick, in 1439, he commanded the English forces, and, with his brother Edmund, was successful in recapturing Harfleur. Although chagrined when Richard, duke of York, was made regent of France, Beaufort led an expedition to France in 1442, and in 1443 was made duke of Somerset. He died, probably by his own hand, in May 1444. He married Margaret, daughter of Sir John Beauchamp, and left a daughter, MARGARET BEAUFORT, afterwards countess of Richmond and Derby, who married, for her first husband, Edmund Tudor, earl of Richmond, by whom she became the mother of King Henry VII.

The title of earl of Somerset descended on the death of John Beaufort in 1444 to his brother EDMUND BEAUFORT, duke of Somerset (*q.v.*), who was killed at St. Albans in 1455. By his marriage with Eleanor Beauchamp, daughter of the fifth earl of Warwick, he left three sons, Henry, Edmund and John, and a daughter, Margaret, who married Humphrey, earl of Stafford.

HENRY BEAUFORT (1436–1464) became duke of Somerset in 1455, and soon began to take part in the struggle against Richard, duke of York, but failed to dislodge Richard's ally, Richard Neville, earl of Warwick, from Calais. He took part in the victory of the Lancastrians at Wakefield in 1460, escaped from the carnage at Towton in 1461 and shared the attainder of Henry VI in the same year. In May 1464 he was captured at Hexham and was beheaded immediately after the battle. The title of duke of Somerset was assumed by his brother, EDMUND BEAUFORT (*c.* 1438–1471), who fled from the country after the disasters to the Lancastrian arms, but returned to England in 1471, in which year he fought at Tewkesbury, and was beheaded after the battle on May 6, 1471. His younger brother JOHN BEAUFORT was killed probably at this battle, and so on the execution of Edmund the family became extinct.

See Thomas Walsingham, *Historia Anglicana,* edited by H. T. Riley (1863–64); W. Stubbs, *Constitutional History of England,* vols. ii and iii (Oxford, 1895); *The Paston Letters,* ed. by J. Gairdner (1904).

BEAUFORT, LOUIS DE (d. 1795), French historian, wrote a *Dissertation sur l'incertitude des cinq premiers siècles de l'histoire romaine* (Utrecht, 1738), an indictment, bold for its time, of traditional history such as Rollin was writing at that very moment. Beaufort also wrote an *Histoire de César Germanicus* (Leyden, 1761), and *La République romaine, ou plan général de l'ancien gouvernement de Rome* (The Hague, 1766).

BEAUFORT, a town of South Carolina, U.S.A., 60 mi. west-southwest of Charleston, on Port Royal island, 14 mi. from the ocean and served by the Charleston and Western Carolina railway; a port of entry and the county seat of Beaufort county. The population in 1930 was 2,776; 1940, 3,185. Beaufort is a charming winter resort with a good harbour and considerable traffic in pine and cypress lumber, rosin, oyster shells, oysters, shrimp and canned vegetables. Truck farming has replaced cotton growing and phosphate rock mining in importance. Fig trees grow there, one of the most northerly points in the eastern United States at which they can be cultivated. On Parris Island, near by, is a station of the U.S. marine corps, with a personnel of 2,000 men. Jean Ribaut, on May 27, 1562, sailed into the harbour, which he named Port Royal, and established a settlement, probably on Parris Island, which lasted but a few weeks. In 1710 the first permanent settlement by the English was made on Port Royal Island, and was named after Henry Somerset, duke of Beaufort. For a brief period early in 1779 the island was occupied by the British. It was fortified by the Confederates at the beginning of the Civil War, but they were driven out on Nov. 7, 1861, and after that the harbour was used as a coaling and repair station by the federal blockading squadron. In 1862 a group of northerners organized the "Port Royal experiment," a successful effort, subsidized by the government, to work the deserted cotton plantations with paid Negro labour.

BEAUFORT SCALE, a series of numbers from 0 to 12 arranged by Admiral Sir Francis Beaufort (1774–1857) in 1806, to indicate the strength of the wind from a calm, force 0, to a hurricane, force 12, "that which no canvas could withstand." The British admiralty accepted the scale for the open sea in 1838 and it was adopted in 1874 by the International Meteorological committee for international use in weather telegraphy. The Beaufort scale as originally drawn up made no reference to the velocity of the wind and various attempts, particularly during the 20th century, have been made to correlate the two. In June 1939 the International Meteorological committee, meeting at Berlin, adopted a table of values referring to an anemometer at a height of six metres (20 ft.). This was not immediately adopted by the official weather services of the United States and Great Britain, where an earlier scale, referring to an elevation of 11 metres (36 ft.), is used. The table below shows the wind speed in miles per hour corresponding to each Beaufort number on the two scales, but omits the description of the criteria used in estimating the speed of the wind.

Beaufort Number	International Scale, 1939		British and U.S. Scale	
	Descriptive term	Wind Speed	Descriptive term*	Wind Speed
0	Calm	0–1		less than 1
1	Light air	2–3	Light	1–3
2	Light breeze	4–7		4–7
3	Gentle breeze	8–11	Gentle	8–12
4	Moderate breeze	12–16	Moderate	13–18
5	Fresh breeze	17–21	Fresh	19–24
6	Strong breeze	22–27	Strong	25–31
7	Moderate gale	28–33		32–38
8	Fresh gale	34–40	Gale	39–46
9	Strong gale	41–48		47–54
10	Whole gale	49–56	Whole gale	55–63
11	Storm	57–65		64–75
12	Hurricane	more than 65	Hurricane	more than 75

*Terms used by U.S. weather bureau. Other English-speaking countries use slightly different designations.

(W. E. K. M.)

BEAUFORT SEA is that part of the Arctic sea that lies between Alaska and the Canadian Arctic islands. It is shallow to the south and east, but to the northwest deepens to 1,600 fathoms or more. It is generally covered with drifting ice and has not been penetrated by any ship although many vessels have navigated its Alaskan border in summer. S. Storkersen (1918) and D. Macmillan (1914) have travelled over its ice and Roald Amundsen and Umberto Nobile (1926) and G. H. Wilkins (1927 and 1928) have flown over it, but many parts of the sea are unexplored. No land is believed to lie within its area. (*See* ARCTIC REGIONS.)

BEAUFORT WEST, a town in South Africa, 339 mi. by rail from Cape Town, 2,792 ft. above sea level, at the foot of the Nieuwveld mountains. Its white population in 1936 was 3,548. It is the largest town in the western part of the Great Karroo. Owing to its dry climate it is recommended as an invalid resort. It has a good water supply from springs and from a reservoir, which has a capacity of 700,000,000 gallons. The town is surrounded by orchards and fields, and many of the streets are bordered with quince hedges. It was founded in 1819 and used to trade with Bechuana and Griqua in ivory, skins and cattle.

BEAUGENCY, town of France, department of Loiret, 16 mi. S.W. of Orléans on the Orléans railway. Pop. (1936), 3,091. It is at the foot of vine-clad hills on the right bank of the Loire, crossed by a bridge of 26 arches dating in part from the 13th century. The lords of Beaugency were powerful from the 11th to the 13th centuries, when the fief was sold to the crown, afterwards passing to the house of Orléans. Joan of Arc defeated the English there in 1429. In 1567 the town was sacked and burned by the Protestants. In Dec. 1870 the German army defeated the French army of the Loire near the river northwest of Beaugency. The chief buildings are the château (mainly 13th century) with a massive (11th century) donjon, and the abbey-church of Notre-Dame, Romanesque but frequently restored. Portions of the Benedictine abbey, to which this church belonged, remain. The hôtel-de-ville, with a decorated Renaissance façade, the church of St. Etienne (pure Romanesque), and several old houses are of interest. The town carries on trade in grain, and has flour mills.

BEAUHARNAIS, EUGÈNE DE (1781–1824), stepson of Napoleon I, was born in Paris on Sept. 3, 1781, the son of the general Viscount Alexandre de Beauharnais (1760–94) and Josephine Tascher de la Pagerie. The father, who was born in Martinique, and served in the American War of Independence, took part in the politics of the French Revolution, and in June-Aug. 1793 commanded the army of the Rhine. He was guillotined (June 23, 1794) not long before the fall of Robespierre. The marriage of his widow Josephine to Napoleon Bonaparte in March 1796 was at first resented by Eugène and his sister Hortense; but their step-father proved to be no less kind than watchful over their interests. In the Italian campaigns of 1796–97 Eugène served as aide-de-camp to Bonaparte, and accompanied him to Egypt in the same capacity. He was wounded during the siege of Acre. The intervention of Eugène and Hortense helped to bring about the reconciliation which took place in 1799 between Bonaparte and Josephine. The services rendered by Eugène at the time of the *coup d'état* of Brumaire (1799) and during the Consulate (1799–1804) established his fortunes.

After the proclamation of the empire, Eugène received the title of prince, with a yearly stipend of 200,000 francs, and became general of the *chasseurs à cheval* of the guard. A year later Eugène received the title of viceroy of Italy with large administrative powers. In the campaign of 1809 Eugène commanded the army of Italy, with General (afterwards Marshal) Macdonald as his *adlatus*. The battle of Sacile, where he fought against the Austrian army of the Archduke John, did not yield proofs of military talent on the part of Eugène or of Macdonald; but on the retreat of the enemy into Austrian territory (owing to the disasters of their main army on the Danube) Eugène's forces pressed them vigorously and finally won an important victory at Raab in the heart of the Austrian empire. Then, joining the main army under Napoleon, on the island of Lobau in the Danube, near Vienna, Eugène and Macdonald acquitted themselves most creditably in the great battle of Wagram, July 6, 1809. He and his Italian contingent distinguished themselves especially at the battles of Borodino and Malojaroslavitz in 1812; and Eugène's soldierly constancy and devotion to Napoleon shone out conspicuously in 1813–14, especially by contrast with the tergiversations of Murat. On the downfall of Napoleon, Eugène retired to Munich, where he continued to reside, with the title duke of Leuchtenberg and prince of Eichstädt. He died in 1824, leaving two surviving sons and three daughters by his wife Augusta of Bavaria.

For further details concerning Eugène *see* F. J. A. Schneidewind, *Prinz Eugen, Herzog von Leuchtenberg in den Feldzügen seiner Zeit* (1857); *Mémoires et correspondance politique et militaire du Prince Eugène,* edited by Baron A. Ducasse (1858–60); A. Purlitzer, *Une Idylle sous Napoléon Ier: le roman du Prince Eugène* (1895); F. Masson, *Napoléon et sa famille* (1897–1900).

BEAUHARNAIS, the name of a French family, well known from the 15th century onward in Orléanais. One of them, Jean Jacques de Beauharnais, seigneur de Miramion, had for wife Marie Bonneau, who in 1661, founded a female charitable order, called after her the Miramiones. François de Beauharnais, marquis de la Ferté-Beauharnais, was a deputy in the states general of 1789, and a devoted defender of the monarchy. He emigrated and served in Condé's army. Later he gave his adherence to Napoleon, and became ambassador in Etruria and Spain; he died in 1823. His brother Alexandre, vicomte de Beauharnais, married Josephine Tascher de la Pagerie (afterwards the wife of Napoleon Bonaparte) and had two children by her—Eugène de Beauharnais (*q.v.*) and Hortense, who married Louis Bonaparte, king of Holland, and became mother of Napoleon III. Claude de Beauharnais comte des Roches-Baritaud, uncle of the marquis and of the vicomte de Beauharnais, served in the navy and became a vice-admiral. He married Marie Anne François (called Fanny) Mouchard, a woman of letters who had a celebrated salon. His son, also named Claude (d. 1819), was created a peer of France in 1814, and was the father of Stéphanie de Beauharnais, who married the grand duke of Baden. (M. P.)

BEAUJEU. The French province of Beaujolais was formed by the development of the ancient seigniory of Beaujeu (department of Rhône, arrondissement of Villefranche). The lords of Beaujeu held from the 10th century onwards a high rank in feudal society. In 1210 Guichard of Beaujeu was sent by Philip Augustus (*see* PHILIP II) on an embassy to Pope Innocent III; he was present at the French attack on Dover, where he died in 1216. His son Humbert took part in the wars against the Albigenses (*q.v.*) and became constable of France. Isabeau, daughter of Humbert, married Renaud, count of Forez; and their second son, Louis, assumed the name and arms of Beaujeu. His son Guichard, called the Great, had a very warlike life, fighting for the king of France, for the count of Savoy and for his own hand. Guichard's son, Edward of Beaujeu, marshal of France, fought at Crécy, and perished in the battle of Ardres in 1351. His son died without issue in 1374, and was succeeded by his cousin, Edward of Beaujeu, lord of Perreux, who gave his estates of Beaujolais and Dombes to Louis II, duke of Bourbon, in 1400. Pierre de Bourbon was lord of Beaujeu in 1474, when he married Anne of France, daughter of Louis XI, and this is why that princess was called "lady of Beaujeu." Louise of Savoy, mother of Francis I, got Beaujolais assigned to herself despite the claims of the constable de Bourbon. In 1531 the province was reunited to the crown; but Francis II gave it back to the Montpensier branch of the Bourbons in 1560, from which house it passed to that of Orleans. The title of comte de Beaujolais was borne by a son of Philippe "Égalité," duke of Orleans.

BEAULY (pronounced *Bewley;* a corruption of *Beaulieu*), town in Inverness-shire, Scotland, on the Beauly in Kilmorack parish, 12 mi. W. of Inverness by the L.M.S. railway. Pop. (1931), 799. Its chief interest is the beautiful remains of the Priory of St. John, founded in 1230 by John Bisset of the Aird, for Cistercian monks. On the right bank of the river is the site of Lovat castle, which once belonged to the Bissets, but was presented by James VI to Hugh Fraser and afterwards demolished. The church of Kirkhill to the southeast contains the Lovat vault. Three miles south of Beauly is the modern Beaufort castle, the chief seat of the Lovats, on the site of a fortress of the time of Alexander II. This was replaced by several castles in succession, of which one—Castle Dounie—was taken by Cromwell and burned by the duke of Cumberland in 1746.

BEAUMANOIR, a seigniory in what is now the department of Côtes-du-Nord, France, which gave its name to an illustrious family. Jean de Beaumanoir, marshal of Brittany for Charles of Blois, and captain of Josselin, is remembered for his share in the famous battle of the Thirty. This battle, sung by an unknown trouvère and retold with variations by Froissart, was an episode in the struggle for the succession to the duchy of Brittany between Charles of Blois, supported by the king of France, and John of Montfort, supported by the king of England. John Bramborough, the English captain of Ploërmel, having continued his ravages, in spite of a truce, in the district commanded by the captain of Josselin, Jean de Beaumanoir sent him a challenge, which resulted in a fight between 30 picked champions, knights and squires, on either side, which took place on March 25, 1351, near Ploërmel. Beaumanoir commanded 30 Bretons, Bramborough a mixed force of 20 Englishmen, six German mercenaries and four Breton partisans of Montfort. The battle, fought with

swords, daggers and axes, was of the most desperate character, in its details very reminiscent of the last fight of the Burgundians in the *Nibelungenlied,* especially in the celebrated advice of Geoffroy du Bois to his wounded leader, who was asking for water: "Drink your blood, Beaumanoir; that will quench your thirst!" In the end the victory was decided by Guillaume de Montauban, who mounted his horse and overthrew seven of the English champions, the rest being forced to surrender. All the combatants on either side were either dead or seriously wounded, Bramborough being among the slain. The prisoners were well treated and released on payment of a small ransom. (See *Le Poème du combat des Trente,* in the *Panthéon littéraire;* Froissart, *Chroniques,* ed. S. Luce, c. iv. pp. 45 and 110 ff., and pp. 338–340.)

BEAUMANOIR, PHILIPPE DE RÉMI, Sire de (d. 1296), French jurist, was born in the early part of the 13th century. The few facts known regarding him are gathered from legal documents: it appears that in 1273 he held the post of *bailli* at Senlis, and in 1280 a similar office at Clermont; he also presided at assizes held at various towns. His chief work, *Coutumes de Beauvoisis* (1690). It is one of the best works of old French law, and was much admired by Montesquieu. Beaumanoir was also a poet, and left over 20,000 verses: among his poems are "La Manekine," "Jehan et Blonde," and "Salut d'Amour."

BEAUMARCHAIS, PIERRE AUGUSTIN CARON DE (1732–1799), French dramatist, was the son of a Paris watchmaker named Caron and at the age of 21 invented a new escapement for watches, which was pirated. The affair brought him into notice at court; he was appointed watchmaker to the king, who ordered from him a watch similar to one he had made for Mme. de Pompadour. Mme. Franquet, the wife of an old court official, persuaded her husband to make over his office to young Caron, and, on her husband's death, a few months later, married the handsome watchmaker. Caron then assumed the name Beaumarchais; and four years later, by purchasing the office of secretary to the king, obtained a patent of nobility.

Beaumarchais's first play was the sentimental drama *Eugénie* (1767), and this was followed by *Les Deux Amis.* His first wife had died within a year of the marriage, and in 1768 he married Mme. Lévêque. Meanwhile he had been sharing in the speculations of the great banker, Joseph Duverney, who, some time before his death in 1770, drew up a settlement acknowledging himself debtor to Beaumarchais for 15,000 francs. Duverney's heir, the comte de la Blache, denied the validity of the document; the matter was put to trial, Beaumarchais gained his cause, but his adversary at once carried the case before the parlement. Beaumarchais was unable to obtain an interview with Goezman, the member of the parlement appointed to report on his case, but at last, just before the day on which the report was to be given in, he was informed privately that, by presenting 200 *louis* to Mme. Goezman and 15 to her secretary, the desired interview might take place; if the result should prove unfavourable the money would be refunded. The decision was adverse, and 200 *louis* were returned, the 15 going as business expenses to the secretary. Beaumarchais, who had learned that there was no secretary save Mme. Goezman herself, insisted on restitution of the 15 *louis,* but the lady denied all knowledge of the affair. Her husband doubtless thought the defeated litigant would be easily put down, and brought an accusation against him for an attempt to corrupt justice. The battle was fought chiefly through the *Mémoires,* or reports published by the adverse parties, and for vivacity of style Beaumarchais's famous *Mémoires* have never been surpassed. He was condemned to civic degradation, and reduced to great straits for two years, when he obtained restitution, and finally triumphed, becoming at the same time something of a popular hero.

During the next few years he was engaged in the king's secret service. He succeeded in inducing the French Government to give ample, though private, assistance in money and arms to the American colonists in their struggle with Great Britain. He himself carried on an enormous traffic with America under the name of Rodrique Hortalez et Cie, employing a fleet of 40 vessels to provide help for the insurgents.

During the same period he produced his two famous comedies. The earlier, *Le Barbier de Seville,* after a prohibition of two years, was put on the stage in 1775. The first representation was a complete failure; but Beaumarchais cut down and remodelled the piece in time for the second representation, when it achieved a complete success. The second and more famous comedy, *Le Mariage de Figaro,* was completed in 1778, but much difficulty was experienced in getting a licence for it, and the opposition of Louis XVI., who alone saw its dangerous tendencies, was not overcome till 1784. The comedy had an unprecedented success. To English readers the Figaro plays are generally known through the adaptations of them in the grand opera of Mozart and Rossini. The court looked on at a play justly characterized by Napoleon as the "Revolution already in action" apparently without a suspicion of its real character.

After his early popularity had waned, he was charged with treason to the republic and was imprisoned in the Abbaye on Aug. 20, 1792. A week later he was released at the intercession of Mme. Houret de la Marinière, who had been his mistress. He took refuge in Holland and England. His memoirs are *Mes six époques.* He returned to Paris in 1796, where he died May 18, 1799.

Gudin de la Brenellerie's *Histoire de Beaumarchais* (1809) was edited by M. Maurice Tourneux in 1888. *See* also L. de Loménie, *Beaumarchais et son temps* (1855), Eng. trans. by H. S. Edwards (1856); M. de Lescure, *Éloge de Beaumarchais* (1886); A. Hallay, *Beaumarchais* (1897); and Sainte-Beuve, *Causeries du lundi,* vol. vi. Beaumarchais's works have been edited by Gudin (1809); by Furne (1827); and by E. Fournier (1876). A variorum edition of his *Théâtre complet* was published by MM. d'Heylli and de Marescot (1869–75). A volume of his letters was published by Louis Thomas in 1923. *See* René Dalseme, *Beaumarchais* (1929).

BEAUMARIS, market town, municipal borough, and county town, Anglesey, Wales, at the northeast end of the Menai Strait. Pop. (est. 1938) 1,589. Area, 4.9 sq.mi. The town is a typical small castle town. Beaumaris castle was built by Edward I in 1293, the name being derived from the marsh ("beau marais") which was drained by the fosse. Communication with the sea by means of a canal enabled ships to discharge provisions for the garrison. The church of St. Mary is of the same period as the castle. The earliest charter was granted by Edward I in 1283 and revised by Elizabeth. As in most towns of similar history, we find the establishment of a free grammar school in Elizabethan times (Beaumaris 1603). The town championed the Conservative cause during the Civil War and the Jacobite revolts. As county town it became a centre for social life, and for maritime and local trade, during the 18th and 19th centuries. After the decline of the coastal trade Beaumaris lived on its past, although it caters to a few visitors during the summer months.

BEAUMONT, Belmont or Bellomont, the name of a Norman and English family, taken from Beaumont-le-Roger in Normandy. In the 11th century Roger de Beaumont, a kinsman of the dukes of Normandy, married a daughter of Waleran, count of Meulan, and their son, Robert de Beaumont (died 1118), became count of Meulan or Mellent about 1080. Before this date, however, he had fought at Hastings, and had added large estates in Warwickshire to the Norman fiefs of Beaumont and Pont Audemer, which he received when his father entered the abbey of St. Peter at Préaux. It was during the reigns of William II and Henry I that the count rose to eminence, and under the latter monarch he became "the first among the counsellors of the king." A "strenuous and sagacious man," he rendered valuable service to both kings in their Norman wars, and Henry I was largely indebted to him for the English crown. Henry of Huntingdon describes him as "the wisest man between this and Jerusalem." He seems to have been a man of independent character, for he assisted Anselm against William Rufus, although he supported Henry I in his quarrel with Pope Paschal II. When Robert died in 1118 his lands appear to have been divided between his twin sons, Robert and Waleran, while a third son, Hugh, became earl of Bedford in 1138.

Robert de Beaumont (1104–1168), justiciar of England, received his father's English fiefs in 1118, and became earl of Leicester. He and his brother, Waleran, were the chief advisers of

Stephen, and helped this king to seize the bishops of Salisbury and Lincoln in 1139; later, however, Robert made his peace with Henry II, and became chief justiciar of England. First among the lay nobles he signed the Constitutions of Clarendon, he sought to reconcile Henry and Archbishop Becket, and was twice in charge of the kingdom during the king's absences in France. The earl founded the abbey of St. Mary de Pré at Leicester and other religious houses, and by a charter confirmed the burgesses of Leicester in the possession of their merchant-gild and customs. His son, Robert, succeeded to the earldom of Leicester, and with other English barons assisted prince Henry in his revolt against his father, the king, in 1173. For this participation, and also on a later occasion, he was imprisoned; but he enjoyed the favour of Richard I, and died in Greece when returning from a pilgrimage in 1190.

WALERAN DE BEAUMONT (1104–1166) obtained his father's French fiefs and the title of count of Meulan in 1118. After being imprisoned for five years by Henry I he spent some time in England, and during the civil war between Stephen and the Empress Matilda he fought for the former until about 1150, when he deserted the king and assisted the empress.

Another member of the Beaumont family, possibly a relative of the earlier Beaumonts, was LOUIS DE BEAUMONT (d. 1333), bishop of Durham from 1317 until his death.

The barony of Beaumont dates from 1309, when HENRY BEAUMONT (died 1340), who was constable of England in 1322, was summoned to parliament under this title.

BEAUMONT, CHRISTOPHE DE (1703–1781), French ecclesiastic, became bishop of Bayonne in 1741, archbishop of Vienne in 1743, and in 1746, at the age of 43, archbishop of Paris. To force the Jansenists to accept the bull *Unigenitus,* he ordered the priests of his diocese to refuse absolution to those who would not recognize the bull, and to deny funeral rites to those who had confessed to a Jansenist priest. While other bishops sent Beaumont their adhesion to his crusade, the *parlement* of Paris threatened to confiscate his temporalities. The king forbade the *parlement* to interfere in these spiritual questions, and upon its proving obdurate it was exiled (Sept. 18, 1753). The "royal chamber," which was substituted, having failed to carry on the administration of justice properly, the king was obliged to recall the *parlement,* and the archbishop was sent into honourable exile (Aug. 1754). An effort was made to induce him to resign the active duties of his see to a coadjutor, but in spite of the most tempting offers—including a cardinal's hat—he refused. On the contrary, to his polemic against the Jansenists he added an attack on the *philosophes,* and issued a formal mandatory letter condemning Rousseau's *Émile.* Rousseau replied in his masterly *Lettre à M. de Beaumont* (1762), in which he insists that freedom of discussion in religious matters is essentially more religious than the attempt to impose belief by force.

De Beaumont's *Mandements, lettres et instructions pastorales* were published in 1780, the year before his death.

BEAUMONT, SIR JOHN (1583–1627), English poet, second son of the judge, Sir Francis Beaumont, was born at Grace-Dieu in Leicestershire in 1583. The death of his father (in 1598) and of his elder brother, Sir Henry Beaumont (in 1605), made the poet early the head of this brilliant family, the dramatist, Francis Beaumont, being a younger brother. John went to Oxford in Feb. 1597, and entered as a gentleman commoner in Broadgates hall, the present Pembroke college. He was admitted to the Inner Temple in 1600, but on the death of Henry he no doubt went down to Grace-Dieu to manage the family estates. He began to write verse early, and in 1602, at the age of 19, he published anonymously his *Metamorphosis of Tabacco,* written in very smooth couplets, in which he addressed Drayton as his "loving friend." He lived in Leicestershire for many years as a bachelor, being one "who never felt Love's dreadful arrow." But in process of time he became a tardy victim, and married a lady of the Fortescue family, who bore him four stout sons, the eldest of whom, another John, was accounted one of the most athletic men of his time. "He could leap 16ft. at one leap, and would commonly, at a stand-leap, jump over a high long table in the hall, light on a settle beyond the table, and raise himself straight up." This magnificent young man was not without literary taste; he edited his father's posthumous poems, and wrote an enthusiastic elegy on him; he was killed in 1644 at the siege of Gloucester. Another of Sir John Beaumont's sons, Gervaise, died in childhood, and the incidents of his death are recorded in one of his father's most touching poems. Sir John Beaumont concentrated his powers on a poem in eight books, entitled *The Crown of Thorns,* which was greatly admired in ms. by the earl of Southampton and others, but which is lost. After long retirement, Beaumont was persuaded by the duke of Buckingham to move in larger circles; he attended court and in 1626 was made a baronet. This honour he did not long survive, for he died on April 19, 1627, and was buried in Westminster Abbey ten days later. The new Sir John, the strong man, published in 1629 a volume entitled *Bosworth Field; with a taste of the variety of other Poems left by Sir John Beaumont.* No more "tastes" were ever vouchsafed, so that it is by this volume and by the juvenile *Metamorphosis of Tabacco* that Beaumont's reputation has to stand. Of late years, the peculiarities of John Beaumont's prosody have drawn attention to his work. He wrote the heroic couplet, which was his favourite measure, with almost unprecedented evenness. Bosworth Field, the scene of the battle of which Beaumont's principal poem gives a vaguely epical narrative, lay close to the poet's house of Grace-Dieu. He writes on all occasions with a smoothness which was very remarkable in the first quarter of the 17th century, and which marks him, with Edmund Waller and George Sandys, as one of the pioneers of the classic reformation of English verse.

The poems of Sir John Beaumont were included in A. Chalmers's *English Poets,* vol. vi. (1810). An edition, with "memorial introduction" and notes, was included (1869) in Dr. A. B. Grosart's *Fuller Worthies' Library;* and the *Metamorphosis of Tabacco* was included in J. P. Collier's *Illustrations of Early English Popular Literature* vol. i. (1863). (E. G.)

BEAUMONT, WILLIAM (1785–1853), American physiologist, was born on Nov. 21, 1785, the son of a farmer. He studied privately under a practitioner, and after being granted a licence to practise by the Third Medical Society of the State of Vermont, became a surgeon in the United States army. His *Experiments and Observations* (1833) indicate Beaumont's importance in settling the chemical nature of digestion, the significance of the gastric juice, and the causes of the interruptions in its secretion.

BEAUMONT and FLETCHER, English dramatists.[1] The names of FRANCIS BEAUMONT (1584–1616) and JOHN FLETCHER (1579–1625) are inseparably connected in the history of the English drama. John Fletcher was born in Dec. 1579 at Rye in Sussex, and baptized on the 20th of the same month. Richard Fletcher, his father, afterwards queen's chaplain, dean of Peterborough, and bishop successively of Bristol, Worcester, and London, was then minister of the parish in which the son was born who was to make their name immortal. That son was just turned of seven when the dean distinguished and disgraced himself as the spiritual tormentor of the last moments on earth of Mary Stuart. When not quite 12 he was admitted pensioner of Bene't college, Cambridge, and two years later was made one of the Bible-clerks: of this college Bishop Fletcher had been president 20 years earlier, and six months before his son's admission had received from its authorities a first letter of thanks for various benefactions, to be followed next year by a second. Four years later than this, when John Fletcher wanted five or six months of his 17th year, the bishop died suddenly of overmuch tobacco and the displeasure of Queen Elizabeth at his second marriage—this time, it appears, with a lady of such character as figures something too frequently on the stage of his illustrious son. He

[1] Recent research has resulted in some variation of opinion as to the precise authorship of some of the plays commonly attributed to them; but this article, contributed to an earlier edition of the *Encyclopædia Britannica,* remains the classical modern criticism of Beaumont and Fletcher, and its value is substantially unaffected. As representing to the end the views of its distinguished author, it is therefore retained as written though with some omissions necessitated by the restricted space available, the results of later research being epitomized in the Bibliographical Appendix at the end. (*Ed.*)

left eight children by his first marriage in such distress that their uncle, Dr. Giles Fletcher, author of a treatise on the Russian commonwealth which is still held in some repute, was obliged to draw up a petition to the queen on their behalf, which was supported by the intercession of Essex, but with what result is uncertain.

From this date we know nothing of the fortunes of John Fletcher, till the needy orphan boy of 17 reappears as the brilliant and triumphant poet whose name is linked for all time with the yet more glorious name of Francis Beaumont, third and youngest son of Sir Francis Beaumont of Grace-Dieu, one of the justices of the common pleas—born, according to general report, in 1586, but, according to more than one apparently irrefragable document, actually born two years earlier. The first record of his existence is the entry of his name, together with those of his elder brothers Henry and John, as a gentleman-commoner of Broadgates hall, Oxford, now supplanted by Pembroke college. But most lovers of his fame will care rather to remember the admirable lines of Wordsworth on the "eager child" who played among the rocks and woodlands of Grace-Dieu; though it may be doubted whether even the boy's first verses were of the peaceful and pastoral character attributed to them by the great laureate of the lakes. That passionate and fiery genius which was so soon and for so short a time to "shake the buskined stage" with heroic and tragic notes of passion and of sorrow, of scorn and rage, and slighted love and jealousy, must surely have sought vent from the first in fancies of a more ardent and ambitious kind; and it would be a likelier conjecture that when Frank Beaumont (as we know on more authorities than one that he was always called by his contemporaries, even in the full flush of his adult fame—"never more than Frank," says Heywood) went to college at the ripe age of 12, he had already committed a tragedy or two in emulation of *Tamburlaine, Andronicus* or *Jeronymo*. The date of his admission was Feb. 4, 1597; on April 22 of the following year his father died; and on Nov. 3, 1600, having left Oxford without taking his degree, the boy of 15 was entered a member of the Inner Temple, his two brothers standing sponsors on the grave occasion. But the son of Judge Beaumont was no fitter for success at the bar than the son of Bishop Fletcher for distinction in the church: it is equally difficult to imagine either poet invested with either gown. Two years later appeared the poem of *Salmacis and Hermaphroditus,* generally attributed to Beaumont, a voluptuous and voluminous expansion of the Ovidian legend, not on the whole discreditable to a lad of 18, fresh from the popular love-poems of Marlowe and Shakespeare, which it naturally exceeds in long-winded and fantastic diffusion of episodes and conceits. At 23 Beaumont prefixed to the magnificent masterpiece of Ben Jonson some noticeable verses in honour of his "dear friend" the author; and in the same year (1607) appeared the anonymous comedy of *The Woman-Hater,* usually assigned to Fletcher alone; but being as it is in the main a crude and puerile imitation of Jonson's manner, and certainly more like a man's work at 22 than at 28, internal evidence would seem to justify, or at least to excuse those critics who in the teeth of high authority and tradition would transfer from Fletcher to Beaumont the principal responsibility for this first play that can be traced to the hand of either. As Fletcher also prefixed to the first edition of *Volpone* a copy of commendatory verses, we may presume that their common admiration for a common friend was among the earliest and strongest influences which drew together the two great poets whose names were thenceforward to be forever indivisible. Entering college at the same age as Fletcher had entered six years earlier, Beaumont had before him a brighter and briefer line of life than his elder. But whatever may have been their respective situations when, either by happy chance or, as Dyce suggests, by the good offices of Jonson, they were first brought together, their intimacy soon became so much closer than that of ordinary brothers that the household which they shared as bachelors was conducted on such thoroughly communistic principles as might have satisfied the most trenchant theorist who ever proclaimed as the cardinal point of his doctrine, a complete and absolute community of bed and board, with all goods thereto appertaining. But in the year following that in which the two younger poets had united in homage to Jonson, they had entered into a partnership of more importance than this in "the same clothes and cloak, etc." with other necessaries of life specified by Aubrey.

In 1608, if we may trust the reckoning which seems trustworthiest, the twin stars of our stage rose visibly together for the first time. The loveliest, though not the loftiest, of tragic plays that we owe to the comrades or the successors of Shakespeare, *Philaster,* has generally been regarded as the first-born issue of their common genius. The noble tragedy of *Thierry and Theodoret* has sometimes been dated earlier and assigned to Fletcher alone; but we can be sure neither of the early date nor the single authorship. The main body of the play, comprising both the great scenes which throw out into full and final relief the character of either heroine for perfect good or evil, bears throughout the unmistakable image and superscription of Fletcher; yet there are parts which for gravity and steady strength of style, for reserve and temperance of effect, would seem to suggest the collaboration of a calmer and more patient hand; and these more equable and less passionate parts of the poem recall rather the touch of Massinger than of Beaumont. In the second act, for example, the regular structure of the verse, the even scheme of the action, the exaggerated braggardism which makes of the hero a mere puppet or mouthpiece of his own self-will, are all qualities which, for better or for worse, remind us of the strength or the weakness of a poet with whom we know that Fletcher, before or after his alliance with Beaumont, did now and then work in common. Even the Arbaces of Beaumont, though somewhat too highly coloured, does not "write himself down an ass," like Thierry on his first entrance, after the too frequent fashion of Massinger's braggarts and tyrants; does not proclaim at starting or display with mere wantonness of exposure his more unlovely qualities in the naked nature of their deformity. Compare also the second with the first scene of the fourth act. In style and metre this second scene is as good an example of Massinger as the first is of Fletcher at his best. Observe especially in the elaborate narrative of the pretended self-immolation of Ordella these distinctive notes of the peculiar style of Massinger; the excess of parenthetic sentences, no less than five in a space of 20 lines; the classical commonplace of allusion to Athens, Rome and Sparta in one superfluous breath; the pure and vigorous but somewhat level and prosaic order of language, with the use of certain cheap and easy phrases familiar to Massinger as catchwords; the flat and feeble terminations by means of which the final syllable of one verse runs on into the next without more pause or rhythm than in a passage of prose; the general dignity and gravity of sustained and measured expression. These are the very points in which the style of Massinger differs from that of Fletcher; whose lightest and loosest verses do not overlap each other without sensible distinction between the end of one line and the beginning of the next; who is often too fluent and facile to be choice or forcible in his diction, but seldom if ever prosaic or conventional in phrase or allusion, and by no means habitually given to weave thoughts within thoughts, knit sentence into sentence, and hang whole paragraphs together by the help of loops and brackets. From these indications we might infer that this poem belongs altogether to a period later than the death of Beaumont; though even during his friend's life it appears that Fletcher was once at least allied with Massinger and two lesser dramatists in the composition of a play, probably the *Honest Man's Fortune,* of which the accounts are to be found in Henslowe's papers.

Hardly eight years of toil and triumph, of joyous and glorious life were spared by destiny to the younger poet between the date assigned to the first radiant revelation of his genius in *Philaster* and the date which marks the end of all his labours. On March 6, 1616, Francis Beaumont died (according to Jonson and tradition) "ere he was 30 years of age," but this we have seen to be inconsistent with the registry of his entrance at Oxford. If we may trust the elegiac evidence of friends, he died of his own

genius and fiery overwork of brain; yet from the magnificent and masculine beauty of his portrait one should certainly never have guessed that any strain of spirit or stress of invention could have worn out so long before its time so fair and royal a temple for so bright and affluent a soul. A student of physiognomy will not fail to mark the points of likeness and of difference between the faces of the two friends; both models of noble manhood, handsome and significant in feature and expression alike—Beaumont's the statelier and serener of the two, with clear thoughtful eyes, full arched brows, and strong aquiline nose, with a little cleft at the tip; a grave and beautiful mouth, with full and finely curved lips; the form of face a long pure oval, and the imperial head with its "fair large front" and clustering hair set firm and carried high with an aspect at once of quiet command and kingly observation: Fletcher's a more keen and fervid face, sharper in outline every way, with an air of bright ardour and glad fiery impatience; sanguine and nervous, suiting the complexion and colour of hair; the expression of the eager eyes and lips almost recalling that of a noble hound in act to break the leash it strains at—two heads as lordly of feature and as expressive of aspect as any gallery of great men can show. That spring of 1616, we may note in passing, was the darkest that ever dawned upon England or the world; for, just 48 days afterwards, it witnessed, on April 23, the removal from earth of the mightiest genius that ever dwelt among men. Scarcely more than a month and a half divided the death-days of Beaumont and of Shakespeare. Some three years earlier by Dyce's estimate, when about the age of 29, Beaumont had married Ursula, daughter and coheiress to Henry Isley of Sundridge in Kent, by whom he left two daughters, one of them posthumous. Fletcher survived his friend just nine years and five months; he died "in the great plague, 1625," and was buried on Aug. 29, in St. Saviour's, Southwark; not, as we might have wished, beside his younger fellow in fame, who but three days after his untimely death had added another deathless memory to the graves of our great men in Westminster Abbey, which he had sung in such noble verse. Dying when just four months short of 46, Fletcher had thus, as well as we can now calculate, altogether some 14 years and six months more of life than the poet who divides with him the imperial inheritance of their common glory.

The perfect union in genius and in friendship which has made one name of the two names of these great twin brothers in song is a thing so admirable and so delightful to remember, that it would seem ungracious and unkindly to claim for either a precedence which we may be sure he would have been eager to disclaim. But if a distinction must be made between the Dioscuri of English poetry, we must admit that Beaumont was the twin of heavenlier birth. Only as Pollux was on one side a demigod of diviner blood than Castor can it be said that on any side Beaumont was a poet of higher and purer genius than Fletcher; but so much must be allowed by all who have eyes and ears to discern in the fabric of their common work a distinction without a difference.

Although the beloved friend of Jonson, and in the field of comedy his loving and studious disciple, yet in that tragic field where his freshest bays were gathered Beaumont was the worthiest and the closest follower of Shakespeare. In the external but essential matter of expression by rhythm and metre he approves himself always a student of Shakespeare's second manner, of the style in which the graver or tragic part of his historical or romantic plays is mostly written; doubtless, the most perfect model that can be studied by any poet who, like Beaumont, is great enough to be in no danger of sinking to the rank of a mere copyist, but while studious of the perfection set before him is yet conscious of his own personal and proper quality of genius, and enters the presence of the master not as a servant but as a son. The general style of his tragic or romantic verse is as simple and severe in its purity of note and regularity of outline as that of Fletcher's is by comparison lax, effusive, exuberant. The matchless fluency and rapidity with which the elder brother pours forth the stream of his smooth swift verse gave probably the first occasion for that foolish rumour which has not yet fallen duly silent, but still murmurs here and there its suggestion that the main office of Beaumont was to correct and contain within bounds the overflowing invention of his colleague. The poet who while yet a youth had earned by his unaided mastery of hand such a crown as was bestowed by the noble love and the loving "envy" of Ben Jonson was, according to this tradition, a mere precocious pedagogue, fit only to revise and restrain the too liberal effusions of his elder in genius as in years. Now, in every one of the plays common to both, the real difficulty for a critic is not to trace the hand of Beaumont, but to detect the touch of Fletcher. Throughout the better part of every such play, and above all of their two masterpieces, *Philaster* and *The Maid's Tragedy*, it should be clear to the most sluggish or cursory of readers that he has not to do with the author of *Valentinian* and *The Double Marriage*. In those admirable tragedies the style is looser, more fluid, more feminine. From the first scene to the last we are swept as it were along the race of a running river, always at full flow of light and buoyant melody, with no dark reaches or perilous eddies, no stagnant pools or sterile sandbanks; its bright course only varied by sudden rapids or a stronger ripple here and there, but in rough places or smooth still stirred and sparkling with summer wind and sun. But in those tragic poems of which the dominant note is the note of Beaumont's genius and a subtler chord of thought is sounded, a deeper key of emotion is touched than ever was struck by Fletcher. The lighter genius is palpably subordinate to the stronger, and loyally submits itself to the impression of a loftier spirit. It is true that this distinction is never grave enough to produce a discord: it is also true that the plays in which the predominance of Beaumont's mind and style is generally perceptible make up altogether but a small section of the work that bears their names conjointly; but it is no less true that within this section the most precious part of that work is comprised. Outside it we shall find no figures so firmly drawn, no such clearness of outline, no such cunning of hands as we recognize in the three great studies of Bellario, Evadne and Aspatia. In his male characters, as for instance in the parts of Philaster and Arbaces, Beaumont also is apt to show something of that exaggeration or inconsistency for which his colleague is perhaps more frequently and more heavily to blame; but in these there is not a jarring note, not a touch misplaced; unless, indeed a rigid criticism may condemn as unfeminine and incongruous with the gentle beauty of her pathetic patience the device by which Aspatia procures herself the death desired at the hand of Amintor. This is noted as a fault by Dyce; but may well be forgiven for the sake of the magnificent scene which follows, and the highest tragic effect ever attained on the stage of either poet. That this as well as the greater part of those other scenes which are the glory of the poem is due to Beaumont might readily be shown at length by the process of comparison. The noble scene of regicide, which it was found expedient to cancel during the earlier years of the Restoration, may indeed be the work of Fletcher; but the part of Evadne must undoubtedly be in the main assigned to the more potent hand of his fellow. There is a fine harmony of character between her naked audacity in the second act and her fierce repentance in the fourth, which is not unworthy a disciple of the tragic school of Shakespeare; Fletcher is less observant of the due balance, less heedful of the nice proportions of good and evil in a faulty and fiery nature, compounded of perverse instinct and passionate reaction. From him we might have had a figure as admirable for vigour of handling, but hardly in such perfect keeping as this of Beaumont's Evadne, the murderess—Magdalen, whose penitence is of one crimson colour with her sin. Nor even in Fletcher's Ordella, worthy as the part is throughout even of the precious and exquisite praise of Lamb, is there any such cunning touch of tenderness or delicate perfume of pathos as in the parts of Bellario and Aspatia. These have in them a bitter sweetness, a subtle pungency of mortal sorrow and tears of divine delight, beyond the reach of Fletcher. His highest studies of female character have dignity, energy, devotion of the heroic type; but they never touch us to the quick, never waken in us any finer and more profound sense than that of applause and

admiration. There is a modest pathos now and then in his pictures of feminine submission and slighted or outraged love; but this submission he is apt to make too servile, this love too dog-like in its abject devotion to retain that tender reverence which so many generations of readers have paid to the sweet memories of Aspatia and Bellario. To excite compassion was enough for Fletcher, as in the masculine parts of his work it was enough for him to excite wonder, to sustain curiosity, to goad and stimulate by any vivid and violent means the interest of readers or spectators. The single instance of noble pathos, the one scene he has left us which appeals to the higher and purer kind of pity, is the death of the child Hengo in *Bonduca*—a scene which of itself would have sufficed to enrol his name for ever on the list of our great tragic poets. But no surer test or better example can be taken of the distinctive quality which denotes the graver genius of either poet than that supplied by a comparison of Beaumont's *Triumph of Love* with Fletcher's *Triumph of Death.* Each little play, in the brief course of its single act, gives proof of the peculiar touch and special trick of its author's hand; the deeper and more delicate passion of Beaumont, the rapid and ardent activity of Fletcher, have nowhere found a more noticeable vent for the expression respectively of the most tender and profound simplicity of quiet sweetness, the most buoyant and impatient energy of tragic emotion.

In the wider field of their comic or romantic drama it is yet easier to distinguish the respective work of either hand. The bias of Fletcher was towards mixed comedy; his lightest and wildest humour is usually crossed or tempered by an infusion of romance; like Shakespeare in this one point at least, he has left no single play without some touch on it of serious interest, of poetic eloquence or fancy, however slight and fugitive. Beaumont, evidently under the imperious influence of Ben Jonson's more rigid theories, seems rather to have bent his genius with the whole force of a resolute will into the form or mould prescribed for comedy by the elder and greater comic poet. The admirable study of the worthy citizen and his wife, who introduce to the stage and escort with their applause *The Knight of the Burning Pestle* through his adventurous career to its untimely end, has all the force and fullness of Jonson's humour at its best, with more of freshness and freedom. In pure comedy, varied with broad farce and mock-heroic parody, Beaumont was the earliest as well as the ablest disciple of the master whose mantle was afterwards to be shared among the academic poets of a younger generation, the Randolphs and Cartwrights who sought shelter under the shadow of its voluminous folds. The best example of the school of Jonson to be found outside the ample range of his own work is *The Scornful Lady,* a comedy whose exceptional success and prolonged popularity must have been due rather to the broad effect of its forcible situations, its wealth and variety of ludicrous incidents, and the strong gross humour of its dialogue, than to any finer quality of style, invention or character. It is the only work of Beaumont and Fletcher which a critic who weighs the meaning of his words can admit to be as coarse as the coarsest work of Ben Jonson.

The buoyant and facile grace of Fletcher's style carries him lightly across quagmires in which a heavier-footed poet, or one of slower tread, would have stuck fast, and come forth bemired to the knees. To Beaumont his stars had given as birthright the gifts of tragic pathos and passion, of tender power and broad strong humour; to Fletcher had been allotted a more fiery and fruitful force of invention, a more aerial ease and swiftness of action, a more various readiness and fullness of bright exuberant speech. The genius of Beaumont was deeper, sweeter, nobler than his elder's; the genius of Fletcher more brilliant, more supple, more prodigal, and more voluble than his friend's. Without a taint or a shadow on his fame of such imitative servility as marks and degrades the mere henchman or satellite of a stronger poet, Beaumont may fairly be said to hold of Shakespeare in his tragedy, in his comedy of Jonson; in each case rather as a kinsman than as a client, as an ally than as a follower: but the more special province of Fletcher was a land of his own discovering, where no later colonist has ever had power to settle or to share his reign. With the mixed or romantic comedy of Shakespeare it has nothing in common except the admixture or alternation of graver with lighter interest, of serious with humorous action. Nothing is here of his magic exaltation or charm of fairy empire. The rare and rash adventures of Fletcher on that forbidden track are too sure to end in pitiful and shameful failure. His crown of praise is to have created a wholly new and wholly delightful form of mixed comedy or dramatic romance, dealing merely with the humours and sentiments of men, their passions and their chances; to have woven of all these a web of emotion and event with such gay dexterity, to have blended his colours and combined his effects with such exquisite facility and swift light sureness of touch, that we may return once and again from those heights and depths of poetry to which access was forbidden him, ready as ever to enjoy as of old the fresh incomparable charm, the force and ease and grace of life, which fill and animate the radiant world of his romantic invention. Neither before him nor after do we find, in this his special field of fancy and of work, more than shadows or echoes of his coming or departing genius. The quality of his genius, never sombre or subtle or profound, bears him always towards fresh air and sunshine. His natural work is in a midday world of fearless boyish laughter and hardly bitter tears. There is always more of rainbow than of storm in his skies; their darkest shadow is but a tragic twilight. What with him is the noon of night would seem as sunshine on the stage of Ford or Webster. There is but one passage in all these noble plays which lifts us beyond a sense of the stage, which raises our admiration out of speech into silence, tempers and transfigures our emotion with a touch of awe. And this we owe to the genius of Beaumont, exalted for an instant to the very tone and manner of Shakespeare's tragedy, when Amintor stands between the dead and the dying woman whom he has unwittingly slain with hand and tongue. The first few lines that drop from his stricken lips are probably the only verses of Beaumont or Fletcher which might pass for Shakespeare's even with a good judge of style—

This earth of mine doth tremble, etc.

But in Fletcher's tragedy, however we may be thrilled and kindled with high contagious excitement, we are never awed into dumb delight or dread, never pierced with any sense of terror or pity too deep or even deep enough for tears. Even his Brunhalts and Martias can hardly persuade us to forget for the moment that "they do but jest, poison in jest." A critic bitten with the love of classification might divide those plays of Fletcher usually ranked together as comedies into three kinds: the first he would class under the head of pure comedy, the next of heroic or romantic drama, the third of mixed comedy and romance; in this, the last and most delightful division of the poet's work the special qualities of the two former kinds being equally blended and delicately harmonized. The most perfect and triumphant examples of this class are *The Spanish Curate, Monsieur Thomas, The Custom of the Country,* and *The Elder Brother.* Next to these and not too far below them, we may put *The Little French Lawyer* (a play which in its broad conception of a single eccentric humour suggests the collaboration of Beaumont and the influence of Jonson, but in style and execution throughout is perfect Fletcher), *The Humorous Lieutenant* (on which an almost identical verdict might be passed), *Women Pleased, Beggars' Bush,* and perhaps we might add *The Fair Maid of the Inn;* in most if not in all of which the balance of exultant and living humour with serious poetic interest of a noble and various kind is held with even hand and the skill of a natural master. In pure comedy *Rule a Wife and have a Wife* is the acknowledged and consummate masterpiece of Fletcher. Next to it we might class, for comic spirit and force of character, *Wit without Money, The Wild Goose-Chase, The Chances,* and *The Noble Gentleman*—a broad poetic farce to whose overflowing fun and masterdom of extravagance no critic has ever done justice but Leigh Hunt, who has ventured, not without reason, to match its joyous and preposterous audacities of superlative and sovereign foolery with the more sharp-edged satire and practical merriment of *King and No King,* where the keen

prosaic humour of Bessus and his swordsmen is as typical of the comic style in which Beaumont had been trained up under Ben Jonson as the high interest and graduated action of the serious part of the play are characteristic of his more earnest genius. Among the purely romantic plays of Fletcher, or those in which the comic effect is throughout subordinate to the romantic, *The Knight of Malta* seems most worthy of the highest place for the noble beauty and exaltation of spirit which informs it with a lofty life, for its chivalrous union of heroic passion and catholic devotion. This poem is the fairest and the first example of those sweet fantastic paintings in rose-colour and azure of visionary chivalry and ideal holiness, by dint of which the romance of more recent days has sought to cast the glamour of a mirage over the darkest and deadliest "ages of faith." The pure and fervent eloquence of the style is in perfect keeping with the high romantic interest of character and story. In the same class we may rank among the best samples of Fletcher's workmanship *The Pilgrim, The Loyal Subject, A Wife for a Month, Love's Pilgrimage,* and *The Lover's Progress*—rich all of them in exquisite writing, in varied incident, in brilliant effects and graceful and passionate interludes. In *The Coxcomb,* and *The Honest Man's Fortune* (two plays which, on the whole, can hardly be counted among the best of their class) there are tones of homelier emotion, touches of a simpler and more pathetic interest than usual; and here, as in the two admirable first scenes between Leucippus and Bacha, which relieve and redeem from contempt the tragic burlesque of *Cupid's Revenge,* the note of Beaumont's manner is at once discernible.

Even the most rapid revision of the work done by these great twin poets must impress every capable student with a sense of the homage due to this living witness of their large and liberal genius. There is the glory and grace of youth in all they have left us; if there be also somewhat too much of its graceless as well as its gracious qualities, yet there hangs about their memory as it were a music of the morning, a breath and savour of bright early manhood, a joyous and vigorous air of free life and fruitful labour, which might charm asleep forever all thought or blame of all mortal infirmity or folly, or any stain of earth that may have soiled in passing the feet of creatures half human and half divine while yet they dwelt among men. For good or for evil, they are above all things poets of youth; we cannot conceive of them grown grey in the dignity of years, venerable with the authority of long life, and weighted with the wisdom of experience. In the Olympian circle of the gods and giants of our race who on earth were their contemporaries and corrivals, they seem to move among the graver presences and figures of sedater fame like the two spoilt boys of heaven, lightest of foot and heart and head of all the brood of deity. In perfect workmanship of lyrical jewellery, in perfect bloom and flower of song-writing, they equal all compeers whom they do not excel; the blossoms of their growth in this kind may be matched for colour and fragrance against Shakespeare's, and for morning freshness and natural purity of form exceed the finest grafts of Jonson. *The Faithful Shepherdess* alone might speak for Fletcher on this score, being as it is simply a lyric poem in semi-dramatic shape, to be judged only as such, and as such almost faultless; but in no wise to be classed for praise or blame among the acting plays of its author, whose one serious error in the matter was the submission of his Dryad to the critical verdict of an audience too probably in great part composed of clowns and satyrs far unlike the loving and sweet-tongued sylvan of his lovely fancy. And whether we assign to him or to Beaumont the divine song of melancholy (*moestius lacrymis Simonideis*), perfect in form as Catullus and profound in sentiment as Shelley, which Milton himself could but echo and expand, could not heighten or deepen its exquisite intensity of thought and word alike, there will remain witness enough for the younger brother of a lyric power as pure and rare as his elder's.

The excess of influence and popularity over that of other poets usually ascribed to the work of Beaumont and Fletcher for some half century or so after their own time has perhaps been somewhat overstated by tradition. Whatever may have been for a season the fashion of the stage, it is certain that Shakespeare can show two editions for one against them in folio; four in all from 1623 to 1685, while they have but their two of 1647 and 1679. Nor does one see how it can accurately or even plausibly be said that they were in any exact sense the founders of a school either in comedy or in tragedy. After Shakespeare there was yet room for Beaumont and Fletcher; but after these and the other constellations had set, whose lights filled up the measure of that diviner zodiac through which he moved, there was but room in heaven for the pallid moonrise of Shirley; and before this last reflex from a sunken sun was itself eclipsed, the glory had passed away from English drama, to alight upon that summit of epic song, whence Milton held communion with darkness and the stars.

(A. C. S.)

Bibliographical Appendix

The chief collected editions of the plays of Beaumont and Fletcher are: *Comedies and Tragedies written by Francis Beaumont and John Fletcher, Gentlemen,* printed by Humphrey Moseley in folio in 1647 as containing plays "never printed before"; *Fifty Comedies and Tragedies written, etc.* (fol. 1679); *Works . . .* (1843–46), edited by Alexander Dyce, which superseded earlier editions by L. Theobald, G. Colman and H. Weber, and presented a modernized text; a second two-volume edition by Dyce in 1852; *The Works of Francis Beaumont and John Fletcher* (1905–12) edited by Arnold Glover and A. R. Waller in the "Cambridge English Classics" from the text of the 2nd folio, and giving variant readings from all separate issues of the plays previous to that edition; and *Works . . .* (1904 ff.), under the general editorship of A. H. Bullen, the text of which is founded on Dyce but with many variant readings, the separate plays being edited by various editors.

The foundation of all critical work on Beaumont and Fletcher is to be found in Dyce. Discrimination between the work of the two dramatists and their collaborators has been the object of a series of studies for the establishment of metrical and other tests. Fletcher's verse is recognizable by the frequency of an extra syllable, often an accented one, at the end of a line, the use of stopped lines, and the frequency of trisyllabic feet. He thus obtained an adaptable instrument enabling him to dispense with prose even in comic scenes. The pioneer work in these matters was done by F. G. Fleay in a paper read before the New Shakspere Society in 1874 on "Metrical Tests as applied to Fletcher, Beaumont and Massinger." His theories were further developed in the article "Fletcher" in his *Biog. Chron. of the Eng. Drama.* Further investigations were published by R. Boyle in *Englische Studien* (vols. v.–x., Heilbronn, 1882–87), and in the New Shakspere Society *Transactions* (1880–86), by Benno Leonhardt in *Anglia* (Halle, vols. xix. *seq.*), and by E. H. Oliphant, a critic who, in *The Plays of Beaumont and Fletcher* (1927), restores to Beaumont much which other critics had denied him. On the sources of the plays *see* E. Köppel in *Münchener Beiträge zur roman. u. eng. Phil.* (Erlangen and Leipzig, 1895). Consult further articles by A. H. Bullen and R. Boyle respectively on Fletcher and Massinger in the *Dict. of Nat. Biog.;* G. C. Macaulay, *Francis Beaumont, a Critical Study* (1883); C. N. Gayley, *Francis Beaumont, Dramatist* (1914) and A. W. Ward's chapter on "Beaumont and Fletcher" in vol. ii. of his *Hist. of Eng. Dram. Lit.* (new ed. 1899); and for the history and bibliography of individual plays E. K. Chambers, *The Elizabethan Stage,* vols. iii. and iv. (1923). Also A. C. Potter, *A Bibliography of Beaumont and Fletcher* (*Harvard Bibliographical Contributions,* 1895).

A list of the plays attributed to Beaumont and Fletcher, with some details, is added, with the premise that, beyond the main lines of criticism laid down in Mr. Swinburne's article above, it is often difficult to dogmatize on authorship. Even in cases where the play was produced long after Beaumont had ceased to write for the stage there can be no certainty that we are not dealing with a piece which is an adaptation by a later hand of an earlier play.

The Joint Works of Beaumont and Fletcher.—The Scornful Lady (acted between 1613 and 1616, pr. 1616) is a farcical comedy of domestic life, in which one scene may be by Massinger. ***Philaster, or***

Love Lies a-Bleeding, is assigned by Macaulay to Beaumont practically in its entirety, while Fleay attributes only three scenes to Fletcher. It was probably acted *c.* between 1608 and 1610, and was printed 1620; it was revised (1695) by Elkanah Settle and (1763) by the younger Colman, probably owing its long popularity to the touching character of Bellario. Beaumont's share also predominated in *The Maid's Tragedy* (acted *c.* 1611, pr. 1619), in *A King and No King* (acted at court Dec. 26, 1611, and perhaps earlier, pr. 1619), while *The Knight of the Burning Pestle* (assigned by Chambers to 1607, pr. 1613), burlesquing the heroic and romantic play of which Heywood's *Four Prentices* is an example, might perhaps be transferred entire to Beaumont's account. In *Cupid's Revenge* (acted at court Jan. 1612, and perhaps at Whitefriars in 1610, pr. 1615), founded on Sidney's *Arcadia,* the two dramatists may have had other collaborators. The *Coxcomb* (acted *c.* 1610, and by the Children of the Queen's Revels in 1612, pr. 1647) seems to have undergone later revision by Massinger or Rowley.

Works Assigned to Beaumont's Sole Authorship.—The Woman Hater (pr. 1607, as "lately acted by the children of Paul's") was assigned formerly to Fletcher. The *Masque of the Inner Temple and Gray's Inn* was presented at Whitehall on Feb. 20, 1613, on the marriage of the Prince and Princess Palatine. Of *Four Plays, or Moral Representations, in One* (printed in 1647), the *Induction,* with *The Triumph of Honour* and *The Triumph of Love,* are by Beaumont.

Works Assigned to Fletcher's Sole Authorship.—The Faithful Shepherdess (pr. *c.* 1609) was ill received on its original production, but was revived in 1634. It was translated into Latin verse by Sir R. Fanshawe in 1658, and Milton's *Comus* owes not a little to it. In *Four Plays in One,* the two last, *The Triumph of Death* and *The Triumph of Time,* are Fletcher's. In the indifferent comedy of *The Captain* (acted 1612–13, revived 1626, pr. 1647) there is no definite evidence of any other hand than Fletcher's, though the collaboration of Beaumont, Massinger, and Rowley has been advanced. Other Fletcher plays are: *Wit without Money* (acted *c.* 1614, pr. 1639); the two romantic tragedies of *Bonduca* and *Valentinian,* both dating from *c.* 1614 and printed in the first folio; *Women Pleased* (*c.* 1620, pr. 1647); *The Woman's Prize, or the Tamer Tam'd* (assigned by Chambers to 1604, acted 1633 at Blackfriars and at court, pr. 1647), a kind of sequel to *The Taming of the Shrew; The Chances* (pr. 1647), taken from *La Sennora Cornelia* of Cervantes, and repeatedly revived after the Restoration and in the 18th century; *Monsieur Thomas* (acted perhaps as early as 1610, pr. 1639); *The Island Princess* (*c.* 1621, pr. 1647); *The Pilgrim* and *The Wild Goose-Chase* (pr. 1652), the second of which was adapted in prose by Farquhar, both acted at court in 1621, and possibly then not new pieces; *A Wife for a Month* (lic. 1624, pr. 1647); *Rule a Wife and Have a Wife* (lic. 1624, pr. 1640). *The Pilgrim* (acted at court, 1621), received additions from Dryden and was adapted by Vanbrugh.

Fletcher in Collaboration with other Dramatists.—External evidence of Fletcher's connection with Massinger is given by Sir Aston Cokaine, who in an epitaph on Fletcher and Massinger wrote: "Playes they did write together, were great friends," and elsewhere claimed for Massinger a share in the plays printed in the 1647 folio. James Shirley and William Rowley have their part in works that used to be included in the Beaumont and Fletcher canon; and to a letter from Field, Daborne and Massinger, asking for £5 for their joint necessities from Henslowe about the end of 1615, there is a postscript suggesting the deduction of the sum from the "mony remaynes for the play of Mr. Fletcher and ours." The problem is complicated when the existing versions of the play are posterior to Fletcher's lifetime, that is, revisions by Massinger or another of pieces which were even originally of double authorship. In this way Beaumont's work may be concealed under successive revisions, and it would be rash to assert that none of the late plays contains anything of his.

Fletcher and Massinger.—R. Boyle joins the name of Cyril Tourneur to those of Fletcher and Massinger in connection with *The Honest Man's Fortune* (acted 1613, pr. 1647), which Fleay identifies with "the play of Mr. Fletcher and ours." *The Knight of Malta* (acted 1618–19, pr. 1647) is regarded by Oliphant as the work of Fletcher, Massinger and Field; *Thierry and Theodoret* (acted *c.* 1617, pr. 1621), perhaps a satire on contemporary manners at the French court as a revision by Massinger of an earlier work by Beaumont and Fletcher, though Beaumont's share in either must be regarded as problematical. Fletcher and Massinger's great tragedy of *Sir John van Olden Barnavelt* (acted 1619) was first printed in Bullen's *Old Plays* (vol. ii., 1883). They followed it up with *The Custom of the Country* (acted *c.* 1619, pr. 1647), based on an English translation (1619) of *Los Trabajos de Persiles y Sigismunda; The Double Marriage* (*c.* 1620, pr. 1647); *The Little French Lawyer* (*c.* 1620, pr. 1647); *The False One* (*c.* 1620, pr. 1647); *The Spanish Curate* (acted 1622, pr. 1647), repeatedly revived after the Restoration, was derived from Leonard Digges's translation (1622) of a Spanish novel, *Gerardo, the Unfortunate Spaniard; The Prophetess* (1622, pr. 1647), afterwards made into an opera by Betterton to Purcell's music; *The Elder Brother* (perhaps originally written by Fletcher *c.* 1614; revised and acted 1635, pr. 1637); *Beggars' Bush* (acted at court 1622, probably then not new, pr. 1647).

Other Combinations.—Fletcher had only a small share in *The Noble Gentleman* (1625–26, pr. 1647), and in *Wit at Several Weapons*—"if he but writ an act or two," says an epilogue on its revival (1623 or 1626). The play is probably a revision by Rowley and Middleton of an early Beaumont and Fletcher play. *A Very Woman* (1634, pr. 1655) is a revision by Massinger, perhaps of *The Woman's Plot,* ascribed to Fletcher and acted at court in 1621. Field worked with Fletcher and Massinger on the lost play of the *Jeweller of Amsterdam* (1619), and perhaps on *The Queen of Corinth* (*c.* 1616, pr. 1647). *The Lover's Progress* (acted 1634, pr. 1647), is probably a revision by Massinger of the Fletcher play licensed in 1623 as *The Wandering Lovers. Love's Cure or The Martial Maid* (1623 or 1625) is thought by Fleay to be a revision by Massinger of a Beaumont and Fletcher play produced as early as 1607–08. W. Rowley joined Fletcher in *The Maid in the Mill* (1623, pr. 1647). *The Nice Valour* (acted 1625–26, pr. 1647) seems to have been altered by Middleton from an earlier play. *The Night Walker* (1633) is a revision by Shirley of a Fletcher play.

Fletcher and Jonson in Collaboration.—The history of *The Bloody Brother or Rollo, Duke of Normandy,* printed in 1639 as by "B. J. F.," is matter of varied speculation. Mr. Oliphant thinks the basis of the play to be an early work (*c.* 1604) of Beaumont, on which is superimposed a first revision (1616) by Fletcher and Jonson, and a subsequent revision (1636–37) by Massinger. The general view is that the main portion of the play is referable to Jonson and Fletcher. Jonson apparently had a share in Fletcher's *Love's Pilgrimage* (pr. 1647), which seems to have been revised by Massinger in 1635.

Fletcher and Shakespeare.—The Two Noble Kinsmen was printed in 1634 as by Mr. John Fletcher and Mr. William Shakespeare. If its first representation was in 1625 it was in the year of Fletcher's death. It was included in the second folio of Beaumont and Fletcher's comedies and tragedies. If Shakespeare and Fletcher worked in concert it was probably in 1612–13, and the existing play probably represents a revision by Massinger in 1625. *Henry VIII.* (played at the Globe in 1613) is usually ascribed mainly to Shakespeare and Fletcher, with a probable revision by Massinger and the conditions of its production were probably similar. Fletcher and Shakespeare are together credited at Stationers' Hall with the lost play of *Cardenio,* destroyed by Warburton's cook.

BEAUMONT, a city of Texas, U.S.A., at the head of navigation on the Neches river, 28m. from the Gulf of Mexico and 70m. N.E. of Galveston; the county-seat of Jefferson county. It is on the Old Spanish Trail, is served by the Kansas City Southern, the Missouri Pacific, the Santa Fe, and the Southern Pacific railways, and by coastwise and deep-sea steamers. The population was 9,427 in 1900; 20,640 in 1910; 40,422 in 1920; 57,732 in 1930; and 59,061 in 1940. Nearly a third are Negroes.

Beaumont is the commercial centre of southeastern Texas and southwestern Louisiana, a region of dense pine and cypress forests, extensive rice plantations, and some of the most important oil fields of the country. Oil refineries, rice mills, shipyards, saw mills, and sash and door factories constitute the leading industries. The output of the 80 establishments within the city in 1939 was valued at $17,846,955. In the same year 1,466 ocean-going steamers entered the port, and its total traffic, consisting chiefly of crude oil and its products, amounted to 20,107,031 tons, valued at $212,055,338. The assessed valuation of property in 1940 was $58,447,850, and bank debits in 1940 amounted to $291,270,119. The city has a commission-manager form of government.

Beaumont was settled in 1828, and was chartered as a city in 1881. Oil was struck in 1901, and in the next 25 years its population increased more than fivefold.

BEAUNE, a town of France, capital of an arrondissement in the department of Côte-d'Or, on the Bouzoise, 23m. S.S.W. of Dijon on the main line of the P.L.M. railway. Pop. (1936) 11,761. Beaune lies in a rich wine-growing region at the foot of the hills of Côte-d'Or. It was a fortified Roman camp and the capital of a separate county united to the duchy of Burgundy, becoming in 1227 the first seat of the Burgundian parlement or *jours généraux* and a ducal residence. On the death of Charles the Bold it sided with his daughter, Mary of Burgundy, but was besieged and taken by the forces of Louis XI. in 1478. Its rank as commune, conceded in 1203, was confirmed in 1521. In the religious wars it at first sided with the League, but opened its gates to the troops of Henry IV., who confirmed its communal privileges. The revocation of the Edict of Nantes dealt a severe blow to the cloth and iron industries, which had previously been a source of prosperity to the town, and it was only through its vineyards that the town regained its importance. In the 18th century there were no fewer than seven monastic buildings in Beaune, besides a Ber-

nardine abbey, a Carthusian convent and an ecclesiastical college. The town is of circular form, and its ancient fortifications have been in part replaced by a promenade separating it from its suburbs. The most interesting feature is the old hospital of St. Esprit (1443). Some buildings surrounding the main courtyard, which has an out-door pulpit and a well with 15th century ironwork, have high-pitched roofs surmounted by dormer windows with decorated gables, recalling the Flemish style. The hospital possesses mural paintings (17th century) in the Salle St. Hugues and an altar-piece, the Last Judgment, attributed to Van Eyck. The principal church, Notre Dame (mainly 12th and 13th centuries), has a fine central tower and a triple portal with handsome wooden doors. The interior contains circular chapels, old glass, and some 15th century tapestries. Two round towers (15th century) are a survival of the castle of Beaune, dismantled by Henry IV. A belfry of 1403 and several houses of the Renaissance period, some built over ancient wine-cellars, are notable. Beaune has tribunals of first instance and of commerce, a chamber of commerce, and a school of agriculture and viticulture. Live stock, cereals, vegetables, oil and vinegar are marketed, and casks, agricultural implements and jewellery manufactured. It is the centre of the wine trade of Burgundy. (*See* BURGUNDY WINES.)

BEAUREGARD, PIERRE GUSTAVE TOUTANT (1818–1893), American soldier, was born near New Orleans, La., on May 28, 1818. At the U.S. military academy he graduated second in his class in 1838, and was appointed lieutenant of engineers. In the Mexican War he distinguished himself in siege operations at Vera Cruz, and took part in all the battles around Mexico, being wounded at Chapultepec. In 1853 he became captain and was in charge of fortification and other engineer works of various points, on the Gulf coast from 1853 to 1860. He had just been appointed superintendent of West Point when the secession of his state brought about his resignation (Feb. 20, 1861). As a brigadier-general of the new Confederate army he directed the bombardment of Fort Sumter, S.C. As the commander of the Southern Army of the Potomac he opposed McDowell's advance to Bull Run, and during the battle was second in command under Joseph E. Johnston. He was one of the five full generals appointed in Aug. 1861, and in 1862 was second in command under Sidney Johnston on the Tennessee. After Johnston's death he directed the battle of Shiloh, subsequent to which he retired to Corinth. This place he defended against the united armies under Halleck, until the end of May 1862, when he retreated in good order to the southward. His health now failing, he was employed in less active work. He defended Charleston against the Union forces from Sept. 1862 to April 1864. In May 1864 he fought a severe and eventually successful battle at Drury's Bluff against Gen. Butler and the Army of the James. Later in the year he endeavoured to gather troops wherewith to oppose Sherman's advance from Atlanta, and eventually surrendered with Johnston's forces in April 1865. After the war he engaged in railway management, became adjutant-general of his state and managed the Louisiana lottery. He died in New Orleans on Feb. 20, 1893. He was the author of *Principles and Maxims of the Art of War* (Charleston, 1863); *Report on the Defence of Charleston* (Richmond, 1864).

See Alfred Roman, *Military Operations of General Beauregard* (1883); Y. R. Le Monnier, "General Beauregard at Shiloh," in *Neale's Monthly*, iii. 147–165 (1914); Gamaliel Bradford, *Confederate Portraits* (1914).

BEAUTY: *see* AESTHETICS; and QUALITIES: *Tertiary Qualities or Values.*

BEAUTY CULTURE is the science of improving personal appearance. It embraces the care of the skin, the hair, the hands and nails, the teeth and the body, to make them conform to the standard regarded by the current generation as beautiful.

Since earliest times, cosmetics have played a part in the social life of civilization. To-day, specialists in beauty culture employ diet, exercise, hygiene, electricity, X-ray, radium, gland stimulation and gland extracts, water cures, sun-treatments, plastic surgery, massage, osteopathy and mental science to create health and beauty.

However, hygiene, sunshine, mental science, etc., constitute only a background for the specialized work of the beauty culturist. Largely, and in actual practice, beauty culture is "the application of cosmetic preparations to the human body by massaging, stroking, kneading, slapping, tapping, stimulating, manipulating, exercising, cleansing, or by means of devices, apparatus or appliances, and arranging, dressing, marcelling, curling, waving, cleansing, singeing, bleaching, colouring, dyeing, tinting or otherwise treating by any means the hair of any person." This inclusive definition is quoted from the Illinois law which requires that anyone who practises beauty culture have a certificate of registration.

The report of the census of manufactures of the department of commerce shows the value of perfumery, cosmetics and toilet preparations manufactured in the United States in 1914 to have been something over $25,000,000. In 1925, the year of the most recent published report, the figures are over $147,000,000.

(D. Co.)

BEAUVAIS, a town of north France, capital of the department of Oise, 49m. N. by W. of Paris, on the Northern railway. Pop. (1936) 18,814. Beauvais lies at the foot of hills on the left bank of the Thérain at its confluence with the Avelon, and at the focus of a large number of roads. Known to the Romans as Caesaromagus, its present name is due to the Gallic Bellovaci, whose capital it was. In the 9th century it became a countship, which about 1013 passed to the bishops, who became peers of France. The English besieged it in 1346 and 1433. The siege of 1472 is famous for its association with Jeanne Hachette. The ancient ramparts are now occupied by boulevards. The cathedral of St. Pierre, in some respects the most daring achievement of Gothic architecture, consists only of a transept and choir with apse and seven apse-chapels. The vaulting in the interior exceeds 150ft. in height. The small Romanesque church of the 10th century known as the Basse Oeuvre occupies the site destined for the nave. Begun in 1247, the work was interrupted by various collapses. The transept was built from 1500 to 1548. Its façades exhibit the rich late Gothic style. The north and south portals and especially their wooden doors are masterpieces respectively of Gothic and Renaissance workmanship, but its artistic treasures are stained glass windows of the 13th, 14th and 16th centuries. The old town centres around the hôtel-de-ville (1752) and the cathedral, and has several mediaeval houses. The episcopal palace (16th century) is a courthouse. The state manufacture of tapestry at Beauvais dates from 1664; cotton and woollen goods and toys are main products. Market-gardening and trade in grain and wine are carried on. The town is the seat of a bishop, a prefect and a court of assizes; it has tribunals of first instance and of commerce.

BEAUVILLIER, the name of a very ancient French family belonging to the country around Chartres, members of which are found filling court offices from the 15th century onward. For Charles de Beauvillier, gentleman of the chamber to the king, governor and *bailli* of Blois, the estate of Saint Aignan was created a countship in 1537. François de Beauvillier, comte de Saint Aignan, after having been through the campaigns in Germany (1634–35), Franche-Comté (1636), and Flanders (1637), was sent to the Bastille for having lost the battle of Thionville in 1640. In reward for his devotion to the court party during the Fronde, Saint Aignan was raised to a duchy in the peerage of France (*duché-pairie*) in 1663. His son Paul, called the duc de Beauvillier, was several times ambassador to England; he became chief of the council of finance in 1685, governor of the dukes of Burgundy, Anjou and Berri from 1689 to 1693, minister of state in 1691, and grandee of Spain in 1701. He married a daughter of Colbert. Paul Hippolyte de Beauvillier, comte de Montrésor, afterwards duc de Saint Aignan, was ambassador at Madrid from 1715 to 1718 and at Rome in 1731, and a member of the council of regency in 1719.

BEAUVOIR, ROGER DE, the *nom de plume* of EUGÈNE AUGUSTE ROGER DE BULLY (1809–1866), French writer, was born in Paris. The son and nephew of public officials who did not approve his literary inclinations, he wrote over the signature of Roger de Beauvoir. He astonished all Paris with his ostentatious

luxury and his adventures, while his romantic novels gave him a more serious, if not durable, reputation. Among the best of them are *L'Écolier de Cluny ou le Sophisme* (1832), which is said to have furnished Alexandre Dumas and Theodore Gaillardet (1808–1882) with the idea of the *Tour de Nesle,* and *Le Chevalier de Saint Georges* (1840). He had married in 1847 an actress, Eléonore Léocadie Doze (1822–1859), from whom he obtained a judicial separation a year or two later, after a long and notorious trial, following which his mother-in-law got him imprisoned for three months and fined 500 francs for a satirical poem, *Mon Procès* (1849). Ruined by extravagance, and tied to his chair by gout, he died in Paris on Aug. 27, 1866.

BEAUX, CECILIA (1863–1942), American portrait-painter, was born in Philadelphia (Pa.), where she became a pupil of William Sartain. But her real art training was obtained in Paris, where she started in the atelier Julien and had the coaching of painters like Robert-Fleury, Bouguereau and Dagnan Bouveret. In 1890 she exhibited at the Paris exposition. Returning to Philadelphia, Miss Beaux obtained in 1893 the gold medal of the Philadelphia Art club and the Dodge prize at the New York National academy, the Saltus gold medal of the National Academy of Design in 1913, and later various other distinctions, including the gold medal of the National Institute of Arts and Letters in 1942, shortly before her death. Among her portraits are those of Bishop Coadjutor Greer (exhibited at the Salon in 1896), Mrs. Roosevelt and her daughter, and Mrs. Larz Anderson. Her "Dorothea and Francesca" and "Ernesta and her Little Brother" are good examples of her skill in painting children. She died Sept. 17, 1942.

BEAVER, a large, aquatic, gnawing mammal (*see* RODENTIA), recognized by its large, flat scaly tail. The Old World beaver (*Castor fiber*) is found in Europe and northern Asia; the very similar American beaver (*C. canadensis*), differs chiefly in the form of the nasal bones of the skull. The beavers form the family Castoridae, in which the hind feet are webbed and the claw of the second hind toe is double. The present day species are both about 4 ft. long, of which nearly one-third is tail. The valuable fur is composed of two kinds of hair—one close-set, silky and gray; the other coarser, longer and reddish-brown. Formerly common in England, the European beaver is now confined to the Elbe, the Rhone and Scandinavia. The American species has also greatly decreased in numbers.



BY COURTESY OF THE NEW YORK ZOOLOGICAL SOCIETY

THE AMERICAN BEAVER (CASTOR CANADENSIS), FORMERLY FOUND IN SMALL STREAMS THROUGHOUT MOST OF NORTH AMERICA

Beavers are gregarious, living in small streams, where, to render the water of sufficient depth to prevent its freezing to the bottom, they build dams of mud, stones and tree trunks. These structures are frequently of great strength and show considerable ingenuity. In the pools made by the dams the American beavers build "lodges," chambers opening under water and formed of the same materials as the dam. The mud freezes hard in winter, keeping out wolves and other enemies. The American beaver depends on the bark of the quaking aspen for food, although that of other trees, water plants and other vegetation is relished. Three or four young are born in April or May. The colony consists of a pair of adults, as a rule, with their young of this and the preceding year. Two-year-olds leave home in the spring and wander, looking for a suitable place to begin a new colony. Many fossil beavers are known in North America and Europe, some of which reached giant size. One of these, *Trogontherium* of the European Pleistocene, occurred with early man. (J. E. HL.)

BEAVER, the lower part of the helmet (*q.v.*) fixed to the neck-armour to protect the face and cheeks; properly it moved upwards, as the visor moved down, but the word is sometimes used to include the visor. The right form of the word, "baver," has been altered from a confusion with "beaver," a hat made of beaver-fur or a silk imitation, also, in slang, called a "castor," from the zoological name of the beaver family.

BEAVERBROOK, WILLIAM MAXWELL AITKEN, 1ST BARON (1879–), was born at Maple (Ont.), May 25, 1879, the son of the Rev. William Aitken, a Presbyterian minister at Maple. At an early age he started business in Halifax (N.S.), but later removed to the wider field of Montreal, where in 1907 he acquired a seat on the stock exchange.

In 1910 he was asked by the Bank of Montreal to investigate the prospects of an amalgamation of three Canadian cement mills. As a consequence of his examination he slipped almost by accident into a scheme for the amalgamation of all the Canadian mills, and made at a stroke an immense fortune. He found himself the object of an organized Press attack, and achieved a considerable unpopularity throughout Canada, but time proved the finance of the Cement Trust to be sound.

At this point Aitken, having attained his predetermined aim of making £1,000,000, retired from business and entered English politics. He won a seat in parliament at Ashton-under-Lyne in Dec. 1910, and became private secretary to Bonar Law. His influence with that statesman, who, in 1911, became Leader of the Opposition, was suspect to many Conservative members. He was raised to the peerage in Jan. 1917 as Baron Beaverbrook of Beaverbrook (N.B.) and Cherkley, Surrey. He had been knighted in 1911 and created a baronet in 1916.

At the outbreak of World War I he had become Canadian "Eye-Witness" at the front. In 1915 he became a representative of the Canadian Government with the Expeditionary Force, taking charge later of the Canadian war records. In Feb. 1918 he joined the cabinet as Chancellor of the Duchy of Lancaster and Minister of Information in charge of propaganda.

For some years before this date Lord Beaverbrook had possessed a financial interest in *The Daily Express,* but had taken no active part in its direction. He now took over entire control and gave the newspaper his whole attention. In 1921 he founded *The Sunday Express,* and after a prolonged struggle established it successfully as a popular Sunday journal. Later he secured a controlling interest in *The Evening Standard.*

On May 14, 1940, Prime Minister Churchill appointed Lord Beaverbrook minister of aircraft production, and later a member of the war cabinet. Churchill declared his minister had "worked magic" in increasing the production of military planes. In May 1941 Beaverbrook became minister of supply, after relinquishing his former cabinet office. In 1942 he became British lend-lease administrator in the United States.

BEAVER DAM, a city of Dodge county, Wis., U.S.A., 65 mi. northwest of Milwaukee, on Beaver lake, and served by the Chicago, Milwaukee, St. Paul and Pacific railroad and the Chicago and North Western railroad. The population in 1940 was 10,356. Dodge county is a rich farming district, and the county fair held at Beaver Dam has a wide reputation. The manufactures of the city include stoves, shoes, cheese, canned vegetables, hemp tow, refrigerators and other articles which have a wide market. Beaver Dam was settled in 1841 and incorporated in 1856.

BEAVER FALLS, a city of Beaver county, Pennsylvania, U.S.A., on a plateau 50 ft. above the Beaver river, three and one-half miles from its confluence with the Ohio, and about 30 mi. N.W. of Pittsburgh. It is served by the Pennsylvania and the Pittsburgh and Lake Erie railways. The population was 12,802 in 1920, of which 2,656 were foreign-born white, and it was 17,098 in 1940.

This is the important manufacturing city of the populous and busy Beaver valley. There are coal mines, stone quarries and gas wells in the vicinity, and within five miles of Beaver Falls there are about 75 factories with an annual output valued at $60,878,400. The leading manufactures are seamless tubing, cold-drawn steel products, porcelain enamelled steel, cork products, drilling and excavating equipment, industrial keys of all types, ceramics, chinaware, buses, castings and corrugated boxes. Geneva college, established in 1849 at Northwood, Ohio, by the Reformed Presbyterian Church, was moved in 1880 to College Hill, now a part of Beaver Falls. Beaver Falls (originally called Brighton) was settled in 1801; incorporated in 1868; and became a third-class city in 1930.

BEAVER MUSK: *see* CASTOREUM.

BEAWAR or **NAYANAGAR,** a town of British India, the administrative headquarters of the Merwara district in Ajmere Merwara. It is 33 mi. from Ajmere. Pop. (1941), 36,330. It trades in raw cotton, has cotton presses and the Krishna mills.

BEBEERINE (BIBIRINE, CURINE), $C_{36}H_{38}N_2O_6$, a dextrorotatory alkaloid of the greenheart (*q.v.*) tree, *Nectandra rodiaei.* It is accompanied by the levorotatory stereoisomer, and is also found in curare. It has been used as an antipyretic agent.

(L. F. SL.)

BEBEL, AUGUST (1840–1913), for many years the most popular and influential leader of the German Social Democratic party, was born at Deutz, a suburb of Cologne, on Feb. 22, 1840, the son of a noncommissioned officer in the Prussian army. At the age of 14 he was apprenticed to a master turner in the town of Wetzlar. In 1858, after the completion of his apprenticeship, he began the customary *wanderjahre* of the German journeyman, visiting middle and south Germany, western Austria and northern Switzerland. At that time no real labour movement existed in Germany. The movement based on the *Communist Manifesto,* issued by Marx and Engels on the eve of the revolution of 1848, had been suppressed when the strong reaction set in, and its remaining supporters were few and obscure. Thus it was that Bebel, though a Protestant, joined during his *wanderjahre* one of the network of Catholic journeymen's clubs in south Germany which were inspired by the social reformer, Father Kolping; but in 1860 he left, and did not join another.

Bebel won his first oratorical success at a working man's study circle at Leipzig against Socialist members who wished to turn the society into a political one. For some years he was one of the most popular leaders of the non-Socialist labour movement. But he was gradually converted by the force of events to the Social Democratic *Allgemeine Deutsche Arbeiterverein* founded by Lassalle at Leipzig in May 1863. His conversion was completed on the arrival in Leipzig of Wilhelm Liebknecht (*q.v.*), who had been expelled from Prussia, and now became his friend. Liebknecht was better educated than Bebel, but Bebel had the sharper eye and keener sense of practical politics.

The Austro-Prussian War of 1866, provoked by Bismarck, found Liebknecht and Bebel among its strongest opponents. When it was over and the North German federation had been constituted under the hegemony of Prussia, the two friends founded, with others, the Saxon People's Party (*Sächsische Volkspartei*), with a program proclaiming "inexorable war against the political conditions created in Germany by the war" and demanding the union of Germany in a democratic state. Unlike similar parties in south Germany the *Sächsische Volkspartei* decided to participate in the elections for the newly created *Reichstag.* Bebel was elected deputy for the 17th electoral division of Saxony, which included the industrial centres of Glauchau and Meerane, which he represented in the *Reichstag* until 1877, when he surrendered this safe seat to the party and won one of the divisions of Dresden. Almost all his speeches at that time were protests against the splitting up of Germany, accompanied by sharp criticism of resultant conditions, which provoked some stormy interruptions. While Liebknecht desired to confine the parliamentary action of the party to protest, Bebel energetically took part in debates on matters of economic interest for the working classes, demanding measures in their favour, voting for these in division, and so obtaining the abolition of some abuses. In 1869, at a congress held at Eisenach, at which Bebel was the principal speaker, the union of the *Sächsische Volkspartei* and the other Socialist organizations which supported Liebknecht and Bebel, with the seceding members of the Lassallian organizations, was accomplished. A Social Democratic party was formed on the basis of the Eisenach program, which embodied the principles of the International Working Men's association, whose general council was in London. The new party declared itself a member of the association as far as German law permitted. (*See* INTERNATIONAL, THE.)

In the early summer of 1870, on the outbreak of the Franco-Prussian War, Bebel and Liebknecht declared, during a discussion in the *Reichstag* on the war loan, that they would "neither vote the loan, because that would be a vote of confidence in a Government that by its procedure in 1866 had prepared the war, nor reject it, because such a rejection might be interpreted as approving Bonaparte's wanton and cruel policy," and that they would consequently abstain from voting. This action drew down on them violent abuse in the *Reichstag* and in the press. But in November, after the German victory of Sedan, the North German Government asked for another 100,000,000 thalers for the continuance of the war to compel the cession of Alsace and Lorraine; not only Bebel and Liebknecht, but the three Lassallian members who had voted for the original loan, refused to vote this money. Bebel and Liebknecht put forward a motion asking the *Reichstag,* since the newly formed French Republic had expressed a desire for peace, "to urge the chancellor to work for an early peace, renouncing any annexation of French territory." This motion, and the reasons given for it by Bebel, provoked an unprecedented outburst of rage. A number of deputies attacked him with clenched fists and coarse abuse, and in the press Bebel and Liebknecht were denounced as "enemies of their country."

Bebel was re-elected by his constituents to the new *Reichstag,* though all the other Social Democrat candidates were beaten. In the *Reichstag* he opposed Bismarck's war against the Roman Catholic Church, and predicted its failure; in a later speech he opposed the prolongation of the dictatorship in Alsace-Lorraine and criticized the help given to the bourgeois government of France in beating down the Paris Commune. He declared that the eyes of the European proletariat were fixed on Paris. The struggle there might only be an "outpost skirmish," but before many decades had passed "the war cry of the Paris proletariat—war on palaces, peace to the hovels, death to poverty and idleness—would be the battle cry of the European proletariat." Bismarck referred to this speech of Bebel's when in the autumn of 1878 he spoke in the *Reichstag* in defence of his Exceptional Law against Social Democracy. It had, he declared, clearly shown him the dangerous character of the Socialist agitation. There is reason to doubt the accuracy of this statement; at that time Bismarck was disturbed by the entirely legal parliamentary policy of the party (it had brought forward a bill demanding a maximum working day of ten hours), not by its revolutionary agitation. But whatever his reasons, Bismarck from that time repeatedly tried to promote measures hampering the activity of the Social Democrats. At first the Bismarckian press sounded the alarm against Bebel's declaration. Then the police and the public prosecutors took open action against the speakers of the "Bebel party," with the result that its membership increased, that Bebel's popularity was second to none with the workers, and that even non-Socialist circles recognized him as the most brilliant speaker in the *Reichstag.*

He was highly respected for his modest way of living on his earnings as a small master turner (he had set up for himself after victimization by an ill-disposed employer). In 1866 he had married a railwayman's daughter, who was an affectionate companion and indefatigable helper; she died in 1910. His daughter (b. 1869) had her father's eagerness for learning and her mother's unselfish modesty.

On March 11, 1872, Bebel and Liebknecht were tried at Leipzig on a charge of "treasonable intentions." An enormous mass of documents, printed and otherwise, was produced by the public prosecutor as evidence, but not the slightest proof of their participation in any act tending to high treason was discovered, though the defendants frankly admitted the revolutionary nature of their aims. During the fortnight's trial the daily press incited the jury against them. They were declared guilty, and were sentenced to two years' confinement in a fortress, a sentence declared, not only by Socialists, but by many radicals, to be a judicial scandal. But, for Bebel, the sentence proved a blessing in disguise. His health was so seriously affected by overwork that his friends feared for his life, since they knew that he could not be induced to take a reasonable holiday. The two men were interned in the castle of Hubertusburg in rooms arranged as cells, but they enjoyed the liberties usually granted to persons sentenced to detention in a fortress. They could walk every day in the garden, at their own request they received a piece of land to cultivate, and eventu-

ally Liebknecht was allowed to visit Bebel in his cell to give him lessons in English and French. Bebel also studied works on economics, history and science, making copious notes and almost all his writings on social politics were prepared or planned during his detention at Hubertusburg. Before he entered on this term of imprisonment Bebel had been condemned by the Leipzig District Council to nine months' imprisonment and exclusion from the *Reichstag* for a criticism on William I. of Prussia. But at the by-election necessitated by this sentence Bebel was re-elected, receiving twice as many votes as the coalition candidate; in 1874 he was re-elected to the new *Reichstag* by a similarly large majority. All over the country the prosecution of Social Democrats was pursued with increasing severity, and after a short period of freedom Bebel was again sentenced to nine months' imprisonment. He served these two terms in the fortress of Königstein and in the prison of Zwickau.

The fruit of this enforced leisure appeared in *Der Deutsche Bauernkrieg* (1876) and a translation of the treatise by Yves Guyot and Sigismond Lacroix on the "Social Teaching of Christianity," with a critical commentary on it and an appendix on the present and future position of women, which revolutionized the ideas of many members of the party on that question. Up to that time the final word on the woman question among the majority of German working-men had been "Man's place is the factory, woman's the home," and the adage seemed to be confirmed by the position in the engineering and similar trades. But Bebel, who had lived in a textile centre and had made exact investigations, perceived that it left out of account the social changes consequent on technical progress. He therefore expressed much sympathy with the movement for the political and social emancipation of women, regarded at that time by most Social Democrats as a mere caprice of middle-class women, and supported it, unmoved by the derision and even angry criticism of most Socialist colleagues. During a later term of imprisonment he elaborated his *Die Frau und der Sozialismus* (1893), which also contained a criticism of capitalist society, and a description of the forces impelling it to a social cataclysm which would make Socialism a necessity, concluding with a description of the Socialist transformation of society, its possibilities, and its realization by a policy of economic expediency, social justice and humanitarian ethics. This book was enormously popular with German working-men and their sympathizers; it ran into 52 editions, and was translated into many languages. Bebel's writings on the woman question contributed very substantially to popularize the demand for equal citizenship for women, and to make woman suffrage part of the political programme of German Social Democracy.

The persecution of the Socialists led to the union at Whitsuntide 1875 of the two rival Socialist parties and the foundation of a United Socialist Party whose programme was severely criticized by Karl Marx in a private circular letter to other members of the Eisenach party (Bebel being then in prison). But its programme met the practical requirements of the moment, and at the general election of 1877 the Socialist vote increased from 350,000 (1874) to 493,000. Bismarck realized the futility of the prosecutions, and promoted an Exceptional Law to make the existence of an organized Socialist Party impossible and to prohibit the publication of its literature. Against this bill Bebel delivered (Sept. 16, 1878) a speech in the *Reichstag*, in which he described Bismarck's early attempt to secure the co-operation of the Socialists in his struggle with the Liberals, and revealed the conferences between Bismarck and Lassalle in the winter of 1863–64. He asserted that the projected law would never accomplish its purpose; the ideals of the movement were too deeply implanted in the hearts of thousands of workers. If their meetings and societies were suppressed the workers, like the early Christians, would devote themselves with religious zeal to the propagation of its ideas, and it was absolutely impossible for the Government to suppress this widespread underground activity.

The law was nevertheless promulgated and rigorously executed, causing no little perplexity among Social Democratic leaders. But Bebel, with his strong practical sense, created with Liebknecht and Wilhelm Hasenclever, an office at Leipzig to assist the victims of the law; this office increased the confidence of the party in its three promoters, and provided a much needed political party centre; a party paper was published in Zurich by exiled members of the party. Some of the statements in this paper called forth severe criticism from Marx and Engels. Early in December 1880 Bebel, with one of the three Zurich managers of the paper, Eduard Bernstein, went to London and effected an understanding with these revered intellectual founders of the movement. In *My Years in Exile* Bernstein wrote: "Bebel, who at this time was in the full prime of his intellectual powers, delighted both the old men with his frankness and the exhaustive explanations which he gave them on the political situation in Germany and the state of the party." Three months earlier, the first congress of the German Social Democratic Party had been held at Schloss Wyden, in the canton of Zurich, and there, as at the two later congresses held abroad on account of the Bismarckian law, Bebel struck the keynote for the tactics of the party. There was, nevertheless, some confusion about the significance of the Marx-Engels theory of Socialism, to remedy which the *Neue Zeit* was founded by Kautsky with the strong support of Bebel and Bernstein.

After the inglorious end of the Exceptional Law in 1890 the party, at its Erfurt congress, adopted a new programme with a theoretical introduction by Karl Kautsky, and the *Neue Zeit* became an authoritative weekly party organ. Dissension, however, continued. In Berlin and other northern centres the belief among younger members of the movement that a social upheaval was now due led to the demand for a more radical policy, while in the south Georg von Vollmar, a Bavarian deputy, advocated a moderate opportunist policy towards the Caprivi government. Bebel fought both sections; the youth movement soon subsided, but Vollmar's policy found many adherents in Munich and the south. The dispute turned largely on agrarian policy, and on this Bebel was defeated for the first time on a question of importance at a party congress (Breslau, 1895). He took his defeat calmly, and his influence in the party was little impaired. At Hamburg (1897) he carried a resolution opposed by Liebknecht, and at Hanover (1899) carried another against a book by Eduard Bernstein, *Evolutionary Socialism* (Eng. trans. 1909), written to oppose the view that a reformist policy was useless in view of the imminent collapse of capitalist society. Bebel made a speech of six hours against it, and his resolution, unanimously passed, reaffirmed the principle of the class-war and defined the historic task of the working-classes as the achievement of the greatest possible welfare for all by the socialization of the means of production and exchange.

In 1903 this dispute was renewed at the party congress at Dresden, where Bebel made a passionate speech leading to a resolution, almost unanimously carried, against the participation by Social Democrats in a bourgeois administration; but the resolution was so worded that most "revisionists" (or moderate party) were able to vote for it, as it condemned, they said, principles they had never advocated. Nevertheless the resolution had far-reaching international effects, for it was moved as binding on the international movement by the Guesdists (*see* GUESDE, JULES BASILE) at the international congress at Amsterdam in 1904. Jean Jaurès opposed it because it would render impossible the political tactics which he thought indispensable in France. There followed an unforgettable oratorical duel between Jaurès and Bebel, in which the latter came off victor.

One point made by Jaurès remained unanswered; he had declared that the German party, in spite of its magnificent organization, lacked the two essential means of proletarian action—the revolutionary and the parliamentary. Bebel did not forget the reproach. In subsequent years he carried out personally the struggle against militarism by land and sea, and against imperialism; in congresses and in the *Reichstag* he pointed out that under the modern policy of alliances a new war could hardly be restricted to any two States, but would assume European dimensions; he denounced as criminal folly the systematic violent incitement against England by considerable sections of the German nationalists. In a speech against the von Tirpitz policy (*Reichstag*, Jan. 22, 1903) he said: "Especially during recent years and also dur-

ing the Boer War I have emphatically maintained the opinion that I could not imagine a greater misfortune than a serious quarrel between England and Germany." During the Morocco crisis of 1911 (*see* GERMANY: *The German Empire*) Bebel opposed the action of the German government more violently, and he and his colleagues backed a pamphlet by Bernstein which declared the increase of the German navy to be the "real English danger" to the German people. But before the outbreak of World War I, Bebel died of heart failure at Passug, Grisons, Switzerland, on Aug. 13, 1913, lamented by the whole Socialist movement.

Many passages from his speeches are included in Franz Klüss, *August Bebel, der Mann und sein Werk* (1923). (E. BN.; X.)

BEBINGTON, a municipal borough in Cheshire, England, 3 mi. S. of Birkenhead on the L.M.S. and G.W. joint railway. Pop. (est. 1938) 40,980. Area, 19.13 sq.mi. It is on the south bank of the river Mersey. The church of St. Andrew, with tower and spire, contains some good Norman arches. At nearby Storeton are important and extensive freestone quarries. Bebington, which includes the model village of Port Sunlight (for the workers at Lever Bros.), was incorporated in 1937.

BEBUNG, in music, an effect principally associated with the clavichord, consisting of the prolongation or repetition of a note, not by striking it again, but by continuing to press the key slightly with the finger. The effect was much admired and was cited by C. P. E. Bach in a well known passage as a reason for preferring the clavichord to the pianoforte, on which it is not possible. Less commonly the term is also applied to the tremolo of a singer and to the throbbing or pulsating tone of a violin. "Balancement" (Fr.) means the same thing.

BECCAFICO (Ital. "figpecker"), a name applied to a small bird, the orphean warbler (*Sylvia hortensis*) of southern Europe; also to several allied species (*see* WARBLER).

BECCAFUMI, DOMENICO DI PACE (1486–1551), Italian painter, of the school of Siena, was the son of a peasant, Giacomo di Pace, who worked on the estate of Lorenzo Beccafumi, who adopted the boy and sent him to study painting in the city. Known afterwards as Domenico Beccafumi, or earlier as Il Mecarino, he showed extraordinary industry and talent. He painted a vast number both of religious pieces for churches and of mythological decorations for private patrons. But the work by which he will be longest remembered is the pavement of the cathedral of Siena, on which he worked from 1517 to 1544, which had been begun 150 years before. He made very ingenious improvements in the technical processes employed, and laid down multitudinous scenes from the stories of Ahab and Elijah, of Melchizedek, of Abraham and of Moses. Beccafumi at one time or another essayed almost every branch of fine art. He made a triumphal arch and an immense mechanical horse for the procession of the emperor Charles V on his entry into Siena.

BECCARIA, CESARE BONESANA, MARCHESE DE (1738–1794), Italian publicist, was born at Milan and educated in the Jesuit college at Parma. He was a brilliant mathematician, but his principal work was done in economics. He held an official position under the Austrian government, and issued reports on corn supplies, the reform of the coinage, population and other questions. In 1768 he was appointed to a chair of law and economy founded expressly for him at the Palatine college of Milan. In 1771 he was made a councillor of state and a magistrate, and in 1790 he was appointed a member of a public commission for the reform of civil and criminal jurisprudence in Lombardy. His lectures on political economy, published after his death by Custodi, anticipated in a remarkable way the conclusions of Adam Smith. He insisted on the necessity of the division of labour and of the maximum return from labour, and deduced from this the nature and function of capital. He also expounded the laws of the relation between the growth of population and subsistence in anticipation of Malthus. In a report dated 1780, he proposed a metric system based on astronomical and nominal magnitudes and physical properties. About 1761 he and his friends the Verris formed in Milan a society for the study of social and political questions, and in 1764 they began to issue a periodical, *Il Caffè,* in imitation of the *Spectator.* In the same year Beccaria published the famous little treatise *Dei Delitti e delle Pene* (*On Crimes and Punishments*), which passed through six editions in 18 months, and was translated into 22 European languages. The French translation, by Morellet (1766), contained an anonymous preface by Voltaire. In the preface to this book first appeared the phrase "the greatest happiness of the greatest number." It advocated the prevention of crime rather than punishment, and promptness in punishment where punishment was inevitable; above all, it condemned confiscation, capital punishment and torture. Beccaria's ideas directly influenced the reforming activities of Peter Leopold, grand duke of Tuscany (who abolished capital punishment), and of Catherine II, empress of Russia; in England, Bentham and Romilly advocated his ideas; and his theories were enthusiastically received in France, and were utilized in the revolutionary code.

BIBLIOGRAPHY.—P. Villari, *Le Opere di Cesare Beccaria* (Florence, 1854) contains among other things, the *Dei Delitti,* the articles from *Il Caffè,* and the Milan lectures on political economy; there is an English translation of the *Dei Delitti* by J. A. Farrer (1880). *Beccaria's Scritti e lettere inediti* were published at Milan in 1910. *See* also C. Phillipson, *Three Criminal Law Reformers* (1923).

BECCARIA, GIOVANNI BATTISTA (1716–1781), Italian physicist, was born at Mondovi, and entered the religious order of the Pious Schools in 1732. He became professor of experimental physics, first at Palermo, then at Rome, and later at Turin, where he died. Beccaria, who was a fellow of the English Royal society, did much, in the way both of experiment and exposition, to spread a knowledge of the electrical researches of Franklin and others. His principal work was the treatise *Dell' Elettricismo Naturale ed Artificiale* (1753; Eng. trans. 1776).

BECCLES, municipal borough, Suffolk, England, on the right bank of the river Waveney, 8 mi. W. of Lowestoft on the L.N.E.R. Pop. (est. 1938) 6,408. Its site overlooks the Waveney. The church of St. Michael, wholly Perpendicular, is a fine example of the style and has a detached bell tower. Roos hall, in the vicinity, is a moated manor of brick, of the 16th century. Printing works, malting, boilermaking and agricultural implement works are the chief industries. Beccles was incorporated in 1584. It is governed by a mayor, four aldermen and 12 councillors. Area 3.1 sq.mi. It is included in the Lowestoft parliamentary division of east Suffolk. The corporation is the principal landowner.

BÊCHE-DE-MER or **TREPANG** (Malay, *tripang*), dried holothurians used in the gelatinous soups considered a luxury by the Chinese and other eastern peoples. The name was not originally a French word, but is gallicized from Portuguese *Bicho da mar,* seaworm. Holothurians are a class of Echinoderma (*q.v.*) popularly called "sea cucumbers" from their shape. Those used for trepang mostly belong to the genus *Holothuria, e.g., H. edulis.* These live on coral reefs, from the eastern archipelago down to the Great Barrier reef of Australia, also on the Californian coast, where there is a large trade in them. The body is from 6 in. to 4 ft. long, and the skin contains minute structures of lime, fewer in the better kinds. On the Pacific coast the finest is the "brown with teats," *i.e.,* tube feet; followed in order by the large black, the small black, the red-bellied and the white. They are prepared for use by being boiled for about 20 minutes, and then dried first in the sun and afterwards over a fire.

BECHER, JOHANN JOACHIM (1635–1682), German chemist, physician, scholar and adventurer, was born at Spires in 1635. After a hard childhood and youth, in which study was difficult because of the necessity of supporting his mother and brothers, Becher began an extraordinary career in which the publication of learned works alternated with the development of enterprises of colonization and trade. His first book, an edition of Salzthal's *Tractatus de lapide trismegisto,* appeared in 1654, when he was 19, and was followed by a score of considerable works. At Munich he was suggesting to the elector of Bavaria the establishment of colonies in South America and a monopoly of the cloth trade, until he was driven to flight by the anger of the merchants; in 1666 he was in Vienna under the protection of Count Zinzendorf, and after an interval in Bavaria was again in Vienna proposing a Rhine-Danube canal and the opening up of trade with the Low Countries, and later employed in experiments for transmuting the Danube sand into gold. He fell into disgrace with

Zinzendorf, fled to Holland and then to England, where he died in 1682. His ideas and experiments on the nature of minerals and other substances are set forth in *Physica Subterranea* (Frankfort, 1669); an edition of this, published at Leipzig in 1703, contains two supplements, *Experimentum chymicum novum* and *Demonstratio Philosophica,* arguing the truth and possibility of transmuting metals, *Experimentum novum ac curiosum de minera arenaria perpetua,* a paper on timepieces, and *Specimen Becherianum,* a summary of his doctrines by Stahl.

BECHUANALAND, a territory in southern Africa named after its inhabitants, the Bechuana. It includes the Bechuanaland Protectorate and British Bechuanaland. The latter area, lying between the Orange and Molopo rivers, was included in Cape Colony (*q.v.*) in 1895. The protectorate, estimated at 275,000 sq.mi., is bounded on the west by South-West Africa, on the north by Portuguese West Africa and the Zambezi river, on the northeast by Southern Rhodesia, on the southeast by the Transvaal, on the south by the Molopo and Nossob rivers. Its mean elevation is estimated at about 3,300 ft. The greater part is gently undulating, but in the east, near the Transvaal border, are several groups of bold hills. Most of the Bechuanaland hills are of the inselberg type. The lowest areas, probably not much above 2,000 ft., occur in the northeast and southwest. Here and there are "pans," or hollows, which are apparently due to the action of wind and of the trampling and wallowing of game. Their floors are covered with tufaceous limestone, or sandy mud, unless the rock is exposed.

In the eastern part of the country ancient granites, gneisses and schists outcrop, and representatives of the Nama, Waterberg and Karroo systems must extend for some distance into the protectorate from the Transvaal and Southern Rhodesia. Some of these have been proved about Palachwe. The greater part of the region, however, is covered by the Kalahari sands, which are generally stained red, but which may be white where the colouring material has been reduced along the watercourses. Alluvium and saliferous marls occur in the Okavango basin. There is very little surface water, except in the rainy season, and very little run-off, since rain sinks easily into the sands. In the dry season the only rivers which maintain their flow are the Zambezi, Chobe, Marico, Limpopo and the effluents from the Okavango marshes. Water can be obtained not far below the surface in the beds of the larger rivers. A grant from the Colonial Development fund enabled considerable progress to be made in the development of water supplies. In 1941, 140 boreholes had been completed, of which 102 had by 1945 been successful, although the water in some cases has been brackish. In the northern part of the country are large marshy depressions, such as that about the shallow Lake Ngami (*q.v.*) in the northwest. This is connected by the Botletle river with another wide depression, in which is the Makarikari salt pan.

The winter climate (May to August) is delightful. The summers are intensely hot. In the dry season the nights may be cool, while the days are still hot, though sudden falls of temperature are likely to occur. The rainfall varies from about 18 to 25 in., with rather more in the northeast, and less in the southwest. Most of the rain falls between December and the end of April in heavy and short showers. Dust storms are frequent. Malaria is prevalent, especially in the low-lying and damper parts.

True forest is rare, but a large proportion of the country is covered with thorn savannah, species of acacia predominating. In parts a dense thorny undergrowth, between the trees, makes traffic almost impossible. Indigo and cotton plants grow wild, and a species of wild watermelon, tsoma, is very abundant. Though there is little surface water, plant roots can generally reach down to the layer of wet sand. Even the Kalahari "Desert" in the west is largely covered with bush; its dead, overgrown sand dunes point to more arid conditions in the past. On the other hand, in parts of the country there are remains of ancient trees, which, together with the size of the stream beds, appear to indicate a period of greater rainfall. It has been suggested that the destruction of the trees was due to caterpillars. A considerable amount of destruction in recent times has been done by domesticated animals, and by the native practice of burning the grass toward the end of the dry season. For some distance to the north of Mafeking the country has been denuded of trees to supply Kimberley with fuel.

Toward the north the number of tropical species in the bush gradually increases, and the *Adansonia digitata* (baobab), *Hyphaene crinita, Balsamodendron africanum, Aloe rubrolutea,* etc., become common. On rocky sites succulents, such as *Aloe dichotoma,* and *Euphorbia Dinteri,* abound. The typical grasses of Bechuanaland are species of *Aristida, Eragrostis, Fingerhuthia, Panicum,* etc. There is much good grazing in the country.

The protectorate is fairly rich in wild animals, which include many species of antelope, as well as elephants, hippopotami, rhinoceroses, giraffes, buffaloes, lions, leopards, hyaenas and jackals. Among the birds are the ostrich and bustard. Poisonous snakes such as puff adders and cobras, are numerous; so are scorpions, tarantulas, spiders, flying beetles, locusts, "white ants" (termites) and mosquitoes. Crocodiles occur in some of the rivers. The principal fish are the catfish and yellow fish. In the temporary streams, fish burrow into the mud before it hardens for the dry season.

Population, Land and Towns.—According to the 1936 census the population consisted of 1,899 Europeans, 260,064 Bantu, 66 Asiatics and 3,727 "coloured" or mixed. Many of the Bantu are settled on tribal reserves, which have been clearly delimited, and which are inalienable. In addition to these lands there are large extents of crown land. A comparatively small amount of land was disposed of to white settlers, with the exception of a few farms in Ngamiland. Title to lands, known as the Tuli, Gaberones and Lobatsi blocks of farms, were granted to the British South African company. The Lobatsi block was cut up into farms, some of which are occupied. The Tati district, lying between the Rhodesian border and the Shashi river, was formerly part of Matabeleland. It has an extent of about 2,000 sq.mi. The land and mineral rights belong to the Tati Co., Ltd. Portions of this district, within easy reach of the railway, have been marked off into farms of from 2,000 to 5,000 acres. These are available for settlement, and some have been taken up.

Two small towns are situated on the railway—Gaberones and Francistown, the latter being the centre of the gold mining area of the Tati district, and the most important white settlement in the protectorate. Some of the native villages are of considerable size. Serui (Serowe), chief place of the Bamangwato, pop. 30,000, is probably the largest native town in South Africa. It was founded by Khama in 1903 about 250 mi. N.N.E. of Mafeking and 35 mi. from Palapye Road, in country which is better watered than that about the former capital, Palachwe. Kanye (Kanya), is the chief place of Bangwaketse, pop., 23,000, 80 mi. from Mafeking and 30 from the nearest railway station, Lobatsi. Others include Molepolole, chief place of Bakwena, pop., 10,000; Mochudi, chief place of Bakgatla, pop., 8,000; Maun, chief place of Batawana, pop., 5,000. Lehututu is the chief centre of western Bechuanaland. Well defined roads run from Molepolole and Kanye to Lehututu, some 300 mi. to the west. Water pits have been dug at intervals along the roads.

Occupations.—In spite of fairly fertile soil, agriculture gives uncertain and often scant returns, owing to the uncertainty and meagreness of the rains. The British South Africa company has an experimental farm, 7 mi. from Lobatsi railway station. The chief native crops are millet and maize. Bechuanaland is essentially a pastoral area. The veld is of the "sweet" and "sour" varieties, the former making excellent pasture. Though rinderpest in 1896 swept off more than 90% of the cattle, their numbers quickly recovered.

The small number of horses and mules in the territory is due to the prevalence of horse sickness. Great care is taken to prevent the introduction of contagious cattle diseases, especially east coast fever, which has been prevented from entering the country. No cattle, sheep, goats, pigs, horses, mules or donkeys, no skins or horns, no vehicles, except railway stock and motor cars, nor any wagon gear or harness may be imported without written permission. No cattle may be moved from one district of the protectorate to another without permission in writing. Cattle cannot be moved out of the Bamangwato reserve, where pleuro-pneumonia exists.

A good deal of trapping of wild animals is done; the skins are sold to white traders. The old hunting rights over tribal territory are reserved to the various chiefs, on the condition that they observe a close season. A small amount of gold mining is carried on in the Tati district. The output for the financial year 1940 was 18,015 ozs. of gold and 1,206 ozs. of silver. Copper has also been reported in this area, and coal has been proved near Palachwe.

Communications.—The length of the railway line running through the Bechuanaland Protectorate is 394 mi., including about 70 mi. through the Francistown district. The line enters the protectorate at Ramathlabama Spruit, 16 mi. north of Mafeking and 886 mi. north of Capetown, and leaves it at mileage 1,289 (about half-way between Ramaquabane Siding and Plumtree). The Rhodesia Railways, Limited, has constructed several dams in connection with the working of the line. The roads from railway stations and sidings to the principal villages serve for motor transport, but about 50 mi. west of the railway line the tracks are very sandy and generally unsuited for motor traffic except on a few routes, which motor trucks and the more high-powered cars are able to negotiate. Telegraph and telephone lines, linking Southern Rhodesia with the Union of South Africa, follow the railway, and are owned and worked by the Southern Rhodesia government. The only telegraph and telephone branches are from Palapye Road to Serowe for a distance of approximately 35 mi., and from Palapye Road to Macloutsi and Fort Tuli. The administration and control of the postal department in the protectorate is vested in the postmaster-general of the Union of South Africa, subject to the authority of the resident commissioner. In 1939 there were 23 post offices. In 1936 two government wireless stations were erected, one at Mafeking and the other at Maun.

Trade.—Imports in 1940 totalled £440,543 ($1,686,935) and exports £445,772 ($1,707,307). For customs purposes the area is treated as part of the Union of South Africa, which pays a sum of money quarterly to the protectorate. The latter collects its own customs duties on intoxicating liquors made in, and imported from, South Africa. No intoxicating drink may be imported without written permission. A written permission is also required for the importation of arms and ammunition.

The chief imports consist of articles of clothing, blankets, plows, iron and tin ware and groceries. The principal exports include hides, skins and wool, cattle for both slaughter and breeding purposes in South Africa, timber for fuel and pit props, and, in years of good harvests, a certain amount of grain. The yearly export of cattle involves about 20,000 or 30,000 head. Goats and sheep are also exported. All export of livestock has to take place through one of the six points of exit—Ramathlabama, Ramaquabane, Sequane, Kwaganae, Kavimba, Kazungula. A payment of 2*s*.6*d*. a head is charged on all cattle sent out of the country. Cattle dealers entering the protectorate to buy cattle need a licence.

Government.—The form of government is similar to that of Basutoland. Efforts are made to maintain the tribal system. The territory is administered by a resident commissioner under the direction of the high commissioner for Basutoland, the Bechuanaland Protectorate and Swaziland. For administrative purposes, the territory is divided into ten districts, each with a district commissioner, who is assisted in the maintenance of law and order by a force of police. The headquarters of the administration and the seat of the resident commissioner are beyond the borders of the protectorate, at Mafeking, in the Cape Province of the Union of South Africa.

In 1920, councils of Europeans and natives were established to advise the commissioner on matters affecting Europeans and natives respectively. The commissioner, however, exercises all the powers of a supreme court. In 1938 the "Special Court of the Bechuanaland Protectorate," created in 1912, was abolished. A high court was established, which exercises, in respect to civil and criminal proceedings in the territory, all the powers and authorities vested in the supreme court of the Union of South Africa. Three classes of subordinate courts were also created. The native chiefs adjudicate on all matters arising among their own tribesmen, though the latter have the right of appeal to the court of a magistrate, or assistant commissioner.

A tax of 25*s*. for every hut used as a dwelling place is levied annually, and an additional tax of 3*s*. a hut is charged, and credited to a native fund for the purposes of education, and of general improvement in the reserves. In the tribal areas the tax is collected by the chiefs, who receive a commission not exceeding 10%. Elsewhere it is collected by officers appointed by the commissioner. Any excess of expenditure over revenue has been met by an imperial grant-in-aid. There is no public debt. The Bechuanaland Protectorate police force consists of European personnel of some 7 officers, 4 warrant officers and 41 other ranks and 226 native noncommissioned officers and men.

Labour.—There is only a limited internal demand by Europeans for native labour, mainly in the comparatively small areas open to the white settler in the Tati and Ghanzi districts, and in the Tuli, Gaberones and Lobatsi blocks of farms. About 7,000–8,000 men leave for labour in the mines and elsewhere in the Union of South Africa. Native labour is recruited by labour agents, who must hold a licence, deposit or find security for £100, and fix a domicile in the territory, where any civil process may be served in respect of breach of contract.

Education, Religion, etc.—In 1939 there were 11 schools for white children, two for coloured, and 131 native schools. The latter are situated in the native villages, and in the reserves. About 10,000 native children attend these schools, and the number would probably be greater but for the custom of sending the boys away to distant cattle posts. The native schools are supported by the native fund, which also makes a contribution to Tiger Kloof, an institution in British Bechuanaland for the training of teachers. At the 1936 census, 24,156 males and 23,145 females were returned as literate. Several Christian denominations are represented in the country. In the principal native villages there are well-built churches, which were paid for by the natives. For Europeans there are churches at Serowe and Francistown. No one may practise as a physician, surgeon or chemist without a licence. There are government hospitals at Lobatsi, Serowe, Francistown and mission hospitals at Kayne, Mochudi, Molepolole, Maun and Sofala. Railway medical officers travel up and down the railway line. (R. U. S.; P. W. I.)

HISTORY

Bechuanaland was visited by Europeans from Cape Colony in the last quarter of the 18th century. Travellers and explorers, such as M. H. K. Lichtenstein and W. J. Burchell, both distinguished naturalists, and the Rev. John Campbell, one of the founders of the Bible society, had made known the main features of the southern part of the country by 1821. About 1817 Mosilikatze, the founder of the Matabele nation, fleeing from the wrath of Chaka, the Zulu king, began a career of conquest during which he ravaged a great part of Bechuanaland before he finally settled in the north, in what is now Matabeleland. Meanwhile the London Missionary society had founded in 1818 a station at Kuruman and thither came in 1821 the noted Scottish missionary, Robert Moffat (*q.v.*). For 50 years Moffat made Kuruman his headquarters and largely through his efforts—he was preacher, teacher, carpenter, blacksmith and many other things—the Bechuana, a teachable people, made remarkable progress, many becoming Christians. Among other things Moffat reduced the Bechuana language to writing. He was joined in 1841 by David Livingstone (*q.v.*), who later on began the systematic exploration of the northern regions. The connection between Cape Colony and Bechuanaland became close and the Cape law courts from 1836 onward claimed jurisdiction in southern Bechuanaland. The Bechuana chiefs were, however, regarded as independent. When, by the Sand River convention of 1852, the British government acknowledged the independence of the Transvaal Boers, no frontier was indicated save the Vaal river and the Boers soon began to encroach upon the lands of the Bechuana.

The Struggle with the Boers.—This was the beginning of a struggle which lasted for over 30 years. Livingstone quickly perceived the importance of the matter. It was not only the Bechu-

ana that the Boers sought to subdue; the future of the territories to the north was at stake. The Boers had attacked Sechele, chief of the Bakwena tribe, and had looted the European stores and Livingstone's house at Kolobeng (Sechele's capital) and they endeavoured to stop traders and missionaries going north. "The Boers," wrote Livingstone in his *Missionary Travels* (1857 ed., p. 39) "resolved to shut up the interior and I determined to open the country." Moffat, on his part, complained in 1858 to Sir George Grey, the governor of Cape Colony, and the molestation of British subjects going north was stopped. Claims by the Boers to tax the Barolong tribe were made later and this, in 1870, led their chief, Montsioa, to threaten to appeal to the British for redress. To this the Boers replied by sending President Pretorius and Paul Kruger to meet Montsioa (Aug. 1870). They invited the Barolong to join the Transvaal to save their territory from becoming British, to which Montsioa answered "No one ever spanned in an ass with an ox in one yoke." The Boer and Bechuana claims were submitted to R. W. Keate, lieutenant-governor of Natal. He awarded certain lands to the Transvaal, but not Montsioa's territory. Nevertheless attacks upon and intrigues against the Barolong continued and in 1874 Montsioa asked to be taken under British protection. Two years later (Aug. 1876) Khama, chief of the Bamangwato, the largest and most important Bechuana tribe, made a similar request. In his letter to the high commissioner, Khama declared the Boers were coming into his country and he did not like them. "Their actions are very cruel among us black people" (he said). "We are like money, they sell us and our children."

These representations by the Barolong and the Bamangwato, supported by the representations of Cape politicians, led, in 1878, to the occupation of southern Bechuanaland by a British force under Colonel (afterwards General Sir Charles) Warren. A small police force continued to occupy the district until April 1881, but the home government refused to take the country under British protection. On the withdrawal of the police, southern Bechuanaland fell into a state of anarchy. The Transvaal War of that date offered opportunities to the freebooting Boers of the west which were not to be lost. In 1882 they set up the republic of Stellaland, with Vryburg as its capital, and forthwith proceeded to establish the republic of Goshen, farther north, in spite of the protests of Montsioa, and established a small town called Rooi Grond as capital. In South Africa, as well as in England, strong feeling was aroused by this aggression. By the London Convention of Feb. 1884, part of eastern Bechuanaland was included in Boer territory but further expansion was prohibited. In spite of the convention the Boers remained in Stellaland and Goshen—which were west of the new Transvaal frontier—and in April 1884 the Rev. John Mackenzie, who had succeeded Livingstone, was sent to the country to arrange matters. This proved, with the limitations imposed upon Mackenzie, an impossible task; he was accused of being too "pro-Bechuana" and was recalled (July 30). In his place Cecil Rhodes was sent out as deputy commissioner. Rhodes was then leader of the opposition in the Cape Parliament and in that assembly had protested against allowing the Transvaal "and its allies"—an allusion to the German backing the Boers then had—"to acquire the whole of the interior. Bechuanaland was the neck of the bottle . . . and we [the Cape Colony] must secure it."

Rhodes's mission like that of Mackenzie was, however, a failure. While he was in Goshen, Commandant P. J. Joubert entered the country and attacked Montsioa. Declaring that the Boers were making war on Great Britain, Rhodes returned to Capetown. The Cape ministry of the day was controlled by the Afrikander Bond (*q.v.*) and while willing to secure Bechuanaland was very unwilling to offend the Transvaal Boers. But when on Sept. 10, 1884, the Boers proclaimed the country under the protection of the Transvaal a crisis was reached.

British Protectorate Established.—This breach of the London convention, "made," said President Kruger, "in the interests of humanity," provoked strong indignation in Great Britain, while the high commissioner in South Africa, Sir Hercules Robinson, supported by Rhodes, counselled prompt measures. Action was indeed inevitable and Sir Charles Warren was again sent out, this time to clear Bechuanaland of the filibusters. Before Sir Charles Warren reached Africa, Sir Thomas Upington, the Cape premier, and Sir Gordon Sprigg, the treasurer-general, went to Bechuanaland and arranged a "settlement" which would have left the Boer filibusters in possession, but the imperial government refused to take notice of this "settlement." Sir Charles Warren's force—4,000 strong—had reached the Vaal river in Jan. 1885. On Jan. 22 Kruger met Warren at the Modder river, and endeavoured to stop him from proceeding farther. Warren, however, continued his march, and without firing a shot broke up the republics of Stellaland and Goshen. On Sept. 30, 1885, Bechuanaland was formally taken under British protection. That portion lying to the south of the Molopo river was described as British Bechuanaland, and was constituted a crown colony. In 1895 this district was annexed to Cape Colony.

The rest of the country became the Bechuanaland Protectorate and was administered as a crown colony. A proposal in 1895 that the protectorate should come under the rule of the British South Africa company was frustrated by the opposition of Khama and other chiefs and by the occurrence of the Jameson raid, the raiders having started from Bechuana territory. Reserves were set aside for the various tribes, who, under the control of the resident commissioner, possess autonomy. A railway linking the Cape railways to Rhodesia was built near the eastern border of the protectorate, and along this railway white settlements grew up. When the Union of South Africa was formed, in 1910, the protectorate remained under direct imperial rule.

The Union and many white settlers have expressed the wish for incorporation under Article 151 of the South Africa act. The position of the British government, however, is that made public June 20, 1935 (Cmd. 4948, 1935): No transfer to take place until the inhabitants of the territory, both native and European, had been consulted and until parliament had expressed its opinion. No definite action had been taken up to 1945.

BIBLIOGRAPHY.—The early chapters of David Livingstone's *Missionary Travels in South Africa* (1857) are invaluable. Other first-hand authorities are: J. Campbell, *Travels in South Africa* (1815); *Travels . . . a Second Journey . . .* (1822); Robert Moffat, *Missionary Labours and Scenes in Southern Africa* (1842); A. A. Anderson, *Twenty-five Years in a Waggon in the Gold Regions of Africa*, vol. i. (1887). *See* also, John Mackenzie, *Austral Africa, Losing it or Ruling it* (1887); J. D. Hepburn, *Twenty Years in Khama's Country* (1895); W. D. Mackenzie, *John Mackenzie* (1902); histories dealing with South Africa as a whole, and the Annual Report, *Bechuanaland Protectorate*, issued by the Dominions Office, London; M. Perham and L. Curtis, *The Protectorates of South Africa* (1935). (*See* also SOUTH AFRICA, UNION OF.) (F. R. C.; X.)

BECK, CHRISTIAN DANIEL (1757–1832), German philologist, historian, theologian and antiquarian, was born at Leipzig, Jan. 22, 1757. He studied at Leipzig university, where he was appointed professor of Greek and Latin literature in 1785. This post he resigned in 1819 in order to take up the professorship of history, but he resumed it in 1825. He also had the management of the university library, was director of the institute for the deaf and dumb and filled many educational and municipal offices. In 1784 he founded a philological society, which grew into a philological seminary, superintended by him until his death. In 1808 he was made a *Hofrath* by the king of Saxony, and in 1820 a knight of the civil order of merit. His philological lectures, in which grammar and criticism were subordinated to history, were largely attended by hearers from all parts of Germany. He died at Leipzig, Dec. 13, 1832.

He edited Pedo Albinovanus (1783), Pindar and the Scholia (1792–95), Aristophanes (with others, 1794, etc.), Euripides (1778–88), Apollonius Rhodius (1797), Demosthenes, *De Pace* (1799), Plato (1813–19), Cicero (1795–1807), Calpurnius Siculus (1803). He translated Ferguson's *Fall of the Roman Republic* and Goldsmith's *History of Greece*, and added two volumes to Bauer's Thucydides. *See* Nobbe, *Vita C.D. Beckii* (1837); and G. Hermann, *Opuscula*, v. 312.

BECK (or BEEK), **DAVID** (1621–1656), Dutch portrait-painter, was born at Arnheim in Guelderland. He was trained by Van Dyck, from whom he acquired the fine manner of pencil-

ling and sweet style of colouring peculiar to that artist. He also possessed Van Dyck's freedom of hand and rapidity of execution, so much so that King Charles I, once observing the expeditious manner of Beck's painting, exclaimed, "Faith! Beck, I believe you could paint riding post." He was appointed portrait-painter and chamberlain to Queen Christina of Sweden and he executed portraits of most of the sovereigns of Europe to adorn her gallery. Most of his work was done in England and Sweden. His death at the Hague was suspected of being due to poisoning.

BECK, JAKOB SIGISMUND (1761–1840), German philosopher, was born at Danzig in 1761. Educated at Königsberg, he became professor of philosophy first at Halle (1791–99) and then at Rostock. He devoted himself to criticism and explanation of the doctrine of Kant, and in 1793 published the *Erläuternder Auszug aus Kants kritischen Schriften,* which has been widely used as a compendium of Kantian doctrine. He endeavoured to explain away certain of the contradictions which are found in Kant's system by saying that much of the language is used in a popular sense for the sake of intelligibility, *e.g.,* where Kant attributes to things-in-themselves an existence under the conditions of time, space and causality, and yet holds that they furnish the material of our apprehensions. Beck maintains that the real meaning of Kant's theory is idealism; that of objects outside the domain of consciousness, knowledge is impossible, and hence that nothing positive remains when we have removed the subjective element. Matter is deduced by the "original synthesis." Similarly, the idea of God is a symbolical representation of the voice of conscience guiding from within. The value of Beck's exegesis has been to a great extent overlooked owing to the greater attention given to the work of Fichte. Besides the three volumes of the *Erläuternder Auszug,* he published the *Grundriss der Krit. Philosophie* (1796), containing an interpretation of the Kantian *Kritik* in the manner of Salomon Maimon.

See Ueberweg, *Grundriss der Gesch. der Philos. der Neuzeit* (1914); Dilthey, in the *Archiv für Geschichte der Philos.,* vol. ii. pp. 592–650 (1889). For Beck's letters to Kant, *see* R. Reicke, *Aus Kants Briefwechsel* (Königsberg, 1885).

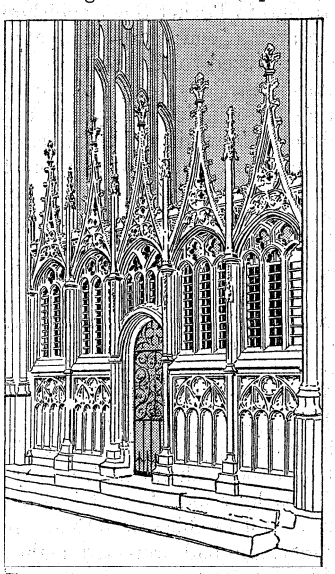
BECKENHAM, a municipal borough in the parliamentary borough of Bromley, Kent, England, 10 mi. S.S.E. of London by the Southern railway. Pop. (1938) 70,590. Area 9.3 sq.mi. It is a long straggling town extending from the site of the western tower of the former Crystal palace almost to the south end of Bromley, and contains a residential suburb in Shortlands. The church of St. George was built in 1866 on the site of an ancient Perpendicular church. From 1894 to 1935, when it was incorporated, the town was governed by an urban district council. Among the buildings and institutions are the county school (1931), with about 600 pupils, the town hall (1932), the Sir Frederick Milner home for ex-service men (1924), the King William IV home for the widows of naval officers, and the Ada Lewis homes for retired governesses (1925). Langley park is the headquarters of the Wellcome physiological research laboratories.

BECKER, HEINRICH (1770–1822), German actor, whose real name was BLUMENTHAL, was born at Berlin. He obtained, while quite a young man, an appointment in the court theatre at Weimar, at that time under Goethe's auspices. The poet appointed him stage-manager, entrusted him with leading parts, and consulted him on the staging of his plays. Becker, although he was at his best in comedy, played Vansen in *Egmont,* the leading parts of several of Schiller's plays—notably Burleigh in *Maria Stuart,* Karl Moor in *Die Räuber,* and Antonio in *Torquato Tasso.* Becker left Weimar in the spring of 1809, played for a short time at Hamburg (under Schröder) and at Breslau, and then began a wandering life. Broken in health and ruined in fortune he returned in 1820 to Weimar, where he died in 1822.

Becker was twice married. His first wife, CHRISTIANE LUISE AMALIE BECKER (1778–97), played Euphrosyne in the opera *Das Petermännchen,* and it is under this name that Goethe immortalized her in a poem which first appeared in Schiller's *Musen Almanach* of 1799.

BECKER, WILHELM ADOLF (1796–1846), German classical archaeologist, was born in Dresden. In 1842 he was appointed professor of archaeology at Leipzig. The works by which Becker is most widely known are the *Gallus* or *Römische Scenen aus der Zeit Augusts* (1838, new ed. by Göll, 1880–82) and the *Charicles* or *Bilder altgriechischer Sitte* (1840, new ed. by Göll, 1877–78), which describe the everyday life of the ancient Greeks and Romans in the form of a romance. More important is the great *Handbuch der röm. Alterthümer* (1843–68), completed after Becker's death by Marquardt and Mommsen. Other works of his are *De Comicis Romanorum Fabulis* (1837), *De Romae Veteris Muris atque Portis* (1842), *Die römische Topographie in Rom* (1844), and *Zur römischen Topographie* (1845).

BECKET, THOMAS (1118–1170), by his contemporaries more commonly called Thomas of London, English chancellor and archbishop of Canterbury under Henry II. His mother was a native of Caen; his father, who came of a family of small Norman landowners, had been a citizen of Rouen, but migrated to London before the birth of Thomas, and held at one time the dignified office of port-reeve, although he ended his life in straitened circumstances. The young Thomas received an excellent education. At the age of ten he was put to school with the canons of Merton priory in Surrey. Later he spent some time in the schools of London, which enjoyed at that time a high reputation, and finally studied theology at Paris. Returning at the age of 22 he was compelled, through the misfortunes of his parents, to become a notary in the service of a wealthy kinsman, Osbert Huit Deniers, who was of some importance in London politics. About 1142 a family friend brought Thomas under the notice of Archbishop Theobald, of whose household he at once became an inmate. He accompanied the primate to Rome in 1143, and also to the council of Reims (1148), which Theobald attended in defiance of a prohibition from the king. It appears to have been at some time between the dates of these two journeys that he visited Bologna and Auxerre, and began those studies in the canon law to which he was largely indebted for his subsequent advancement and misfortunes. Although the bent of his mind was legal, he never made himself an expert jurist; but he had the art of turning his knowledge, such as it was, to excellent account. In 1151 he was sent to Rome by the archbishop with instructions to dissuade the Curia from sanctioning the coronation of Stephen's eldest son Eustace. It is said that Thomas distinguished himself by the ability with which he executed his commission; in any case it gave him a claim on the gratitude of the Angevin party which was not forgotten. In 1154 he was promoted to be archdeacon of Canterbury, after first taking deacon's orders. In the following year, Henry II., at the primate's recommendation, bestowed on him the important office of chancellor. In this capacity Thomas controlled the issue of royal writs and the distribution of ecclesiastical patronage; but it was more important for his future that he had ample opportunities of exercising his personal fascination upon a prince who was comparatively inexperienced, and 13 or 14 years his junior. He became Henry's bosom friend and was consulted in all affairs of state. It had been the hope of Theobald that Becket's influence would be exercised to support the extensive privileges which the church had wrested from Stephen. But the chancellor, although preserving friendly relations with his old patron, subordinated the interests of the church to those of his new master. Under his administration the church was severely taxed for the prosecution of Henry's foreign wars; and the chancellor incurred the reproach "of plunging his sword into the bowels of his



THE NORTH TRANSEPT OR "MARTYRDOM" OF CANTERBURY CATHEDRAL WHERE THOMAS BECKET WAS MURDERED, DEC. 29, 1170

mother." Like Wolsey later he identified himself with the military aspirations of his sovereign. It was Thomas who organized the Toulouse campaign of 1159; even in the field he made himself conspicuous by commanding a company of knights, directing the work of devastation, and superintending the conduct of the war after the king had withdrawn his presence from the camp. When there was war with France upon the Norman border, the chancellor acted as Henry's representative; and on one occasion engaged in single combat and unhorsed a French knight of reputation. Later it fell to his part to arrange the terms of peace with France. He discharged the duties of an envoy with equal magnificence and dexterity; the treaty of May 1160, which put an end to the war, was of his making.

In 1162 he was transferred to a new sphere of action. Henry bestowed on him the see of Canterbury, left vacant by the death of Theobald. The appointment caused some murmurs; since Becket, at the time when it was made, was still a simple deacon. But it had been desired by Theobald as the one means of averting an attack on clerical privileges which had been impending almost since the accession of Henry II.; and the bishops accepted it in silence. Henry on his side looked to find in Becket the archbishop a coadjutor as loyal as Becket the archdeacon; and anticipated that the church would once more be reduced to that state of dependence in which she had stood during the latter years of Henry I. Becket, however, disappointed all the conflicting expectations excited by his appointment. He did not allow himself to be made the king's tool; nor on the other hand did he attempt to protect the church by humouring the king in ordinary matters. He devoted himself to ascetic practices, confined himself to the society of churchmen, and resigned the chancellorship in spite of a papal dispensation (procured by the king) which authorized him to hold that office concurrently with the primacy. By nature a violent partisan, the archbishop now showed himself the uncompromising champion of his order and his see. Hence he was on the worst of terms with the king before a year had elapsed. They came into open conflict at the council of Woodstock (July 1163), when Becket successfully opposed the king's proposal that a land-tax, known as the sheriff's aid, which formed part of that official's salary, should be henceforth paid into the exchequer. But there were more serious differences in the background. Becket had not shrunk from excommunicating a tenant-in-chief who had encroached upon the lands of Canterbury, and had protected against the royal courts a clerk named Philip de Brois who was charged with an assault upon a royal officer. These disputes involved questions of principle which had long occupied Henry's attention, and Becket's defiant attitude was answered by the famous Constitutions of Clarendon (*q.v.*) in which the king defined, professedly according to ancient use and custom, the relations of church and State. Becket and the bishops were required to give these constitutions their approval. Henry's demands were more defensible in substance than might be supposed from the manner in which he pressed them on the bishops. On the most burning question, that of criminous clerks, he offered a compromise. He was willing that the accused should be tried in the courts Christian provided that the punishment of the guilty were left to the lay power. Becket's opposition rested upon a casuistic interpretation of the canon law, and an extravagant conception of the dignity attaching to the priesthood; he showed, moreover, a disposition to quibble, to equivocate, and to make promises which he had no intention of fulfilling. His conduct may be excused on the ground that the bishops were subjected to unwarrantable intimidation. But when he renounced his promise to observe the constitutions his conduct was reprobated by the other bishops, although approved by the pope. It was fortunate for Becket's reputation that Henry punished him for his change of front by a systematic persecution in the forms of law. The archbishop was thus enabled to invoke the pope's assistance, and to quit the country with some show of dignity.

Becket fled to France in Nov. 1164. He at once succeeded in obtaining from Alexander III. a formal condemnation of the constitutions. But Alexander, a fugitive from Italy and menaced by an alliance of the emperor with an anti-pope, was indisposed to take extreme measures against Henry; and six years elapsed before the king found himself definitely confronted with the choice between an interdict and a surrender. For the greater part of this time the archbishop resided at the Burgundian monastery of Pontigny, constantly engaged in negotiations with Alexander, whose hand he desired to force, and with Henry, from whom he hoped to extract an unconditional submission. In 1166 Becket received from the pope a commission to publish what censures he thought fit; of which he at once availed himself to excommunicate the king's principal counsellors. In 1169 he took the same step against two of the royalist bishops. In more sweeping measures, however, the pope refused to support him, until in 1170 Henry infringed the rights of Canterbury by causing Archbishop Roger of York to crown the young king. In that year the threats of the pope forced Henry to a reconciliation which took place later at Fréteval on July 22. It was a hollow truce, since the subject of the constitutions was not mentioned; and Thomas returned to England with the determination of riding roughshod over the king's supporters. If he had not given a definite pledge to forgive the bishops who had taken part in the young king's coronation, he had at least raised expectations that he would overlook all past offences. But the archbishop prevailed upon the pope to suspend the bishops, and before his return published papal letters which, in announcing these sentences, spoke of the constitutions as null and void. It was only to be expected that such a step, which was virtually a declaration of war against the king, should arouse in him the strongest feelings of resentment. The archbishop's murder, perpetrated within a month of his return to England (Dec. 29, 1170), was, however, the work of over-zealous courtiers and regretted by no one more than Henry.

Becket was canonized in 1172. Within a short time his shrine at Canterbury became the resort of innumerable pilgrims. Plenary indulgences were given for a visit to the shrine, and an official register was kept to record the miracles wrought by the relics of the saint. The shrine was magnificently adorned with the gold and silver and jewels offered by the pious. It was plundered by Henry VIII., to whom the memory of Becket was specially obnoxious; but the reformers were powerless to expunge the name of the saint from the Roman calendar, on which it still remains. Even to those who are in sympathy with the principles for which he fought, the posthumous reputation of Becket must appear strangely exaggerated. It is evident that in the course of his long struggle with the State he fell more and more under the dominion of personal motives. At the last he fought not so much for an idea as for the humiliation of an opponent by whom he had been ungenerously treated. William of Newburgh appears to express the verdict of the most impartial contemporaries when he says that the bishop was *zelo justitiae fervidus, utrum autem plene secundum scientiam novit Deus:* "burning with zeal for justice, but whether altogether according to wisdom God knows."

BIBLIOGRAPHY.—The correspondence of Becket and most of the contemporary biographies are collected by J. C. Robertson in *Materials for the History of Thomas Becket* (Rolls Series, 1875–85). *See* also the *Vie de Saint Thomas,* by Garnier de Pont Sainte Maxence (1859), and for the chronology of the controversy, Eyton's *Itinerary of Henry II.* Among modern authorities are: Morris, *Life and Martyrdom of St. Thomas Becket* (1885); Lhuillier, *Saint Thomas de Cantorbéry* (1891–92); J. C. Robertson, *Becket* (1859); F. W. Maitland, *Roman Canon Law in the Church of England,* c. iv.; J. A. Froude in his *Short Studies,* vol. iv., and Freeman in his *Historical Essays* (1871), give noteworthy but conflicting appreciations.

(H. W. C. D.)

BECKFORD, WILLIAM (1709–1770), alderman of the city of London, was Lord Mayor in 1762 and 1769. He was one of the chief organizers of the city's opposition to the dominance of Lord Bute, and afterwards to the encroachments of George III. Though publicly ridiculed for his grammar and accent, he was feared for his great wealth and independence. In 1768 he brought all his influence to bear in support of Wilkes and on the latter's instigation broke through all court etiquette in 1770 when presenting a city remonstrance to the king against his arbitrary conduct: George having rejected the petition in a discourteous manner, Beckford appalled the courtiers by "answering back" in a firm but respectful speech whose approximate words are engraved

on his monument in the Guildhall. His son was also named William Beckford (*q.v.*).

BECKFORD, WILLIAM (1760–1844), the author of *Vathek,* was born on Oct. 1, 1760, and at the age of 11 inherited a princely fortune from his father, Alderman Beckford. He studied architecture under Sir W. Chambers and music under Mozart. In 1780 he published *Biographical Memoirs of Extraordinary Painters,* and in the same year went to Holland, Germany, Austria and Italy. He married Lady Margaret Gordon in 1783, and spent his brief married life in Switzerland. In 1783 also, his first travel book, *Dreams, Waking Thoughts and Incidents,* was printed, but he suppressed the whole edition, save six copies. After his wife's death (1786) he travelled in Spain and Portugal. In 1797 he published *Azemia* and in 1796, *Modern Novel Writing,* both satires on the minor novel. After his return to England he sold his old house, Fonthill Abbey, Wiltshire, and began to build a magnificent residence on which he expended in about 18 years the sum of £273,000. He was a famous collector of books, pictures and objects of applied art. His eccentricities, together with the strict seclusion in which he lived, gave rise to scandal, probably unjustified. In 1822 he sold his house, together with its splendid library (he had bought Gibbon's library at Lausanne), to John Farquhar, and soon after one of the towers, 260ft. high, fell, destroying part of the villa in the ruins. Beckford built another great house on Lansdown Hill, near Bath, where he lived until his death. Beckford's great wealth and his endless eccentricities inevitably had their effect on the popular imagination, and probably added zest to the appreciation of his one great achievement, *Vathek.* But the extraordinary power of this short book of less than 40,000 words gives him a place of his own in 18th century literature. *Vathek* is an oriental tale of a megalomaniac Arabian caliph who gives himself to the service of Eblis (the devil), moves from crime to crime, and in the end finds himself, with the beautiful Nouronihar, in the splendours of the hall of Eblis, tormented with a burning heart. *Vathek* was written by Beckford in French, and the translation, by the Rev. Samuel Henly, appeared in 1786, before the original, against Beckford's orders. The French translation appeared at Lausanne in 1787, and a revision thereof at Paris in the same year. A second revision of the French version was published in London in 1815. The accompanying episodes to the main story were not published during his lifetime. *Vathek* stands apart from the numerous oriental tales of the time by what Mr. Saintsbury has called the "sombre magnificence" of the end, pages which are "hard to parallel in the later literature of prose fiction." In 1834 Beckford published *Italy; with Sketches of Spain and Portugal,* a compressed and revised version of *Dreams, Waking Thoughts and Incidents.* In 1835 he issued perhaps his best travel book, *Recollections of an Excursion to the Monasteries of Alcobaça and Batalha*—a journey made in 1794. Beckford had a seat in parliament from 1784 to 1793, and again from 1806 to 1820. He left two daughters, the elder of whom was married to the 10th duke of Hamilton.

See Cyrus Redding, *Memoirs of William Beckford of Fonthill* (1859); S. Mallarmé's preface to *Le Vathek de Beckford,* a reprint of the Paris edition (1876); Dr. R. Garnett's introduction to his edition of *Vathek* (1893); Lewis Melville, *Life and Letters of William Beckford* (1910); S. Lane-Poole, "The Author of Vathek," in the *Quarterly Review* (Oct. 1910); *The Episodes of Vathek,* trans. by Sir F. T. Marzials, introd. by Lewis Melville (1912); Herbert B. Grimsditch, "William Beckford's Minor Works" in the *London Mercury* (Oct. 1926).

BECKINGTON or **BEKYNTON, THOMAS** (*c.* 1390–1465), English statesman and prelate, was born at Beckington in Somerset, and was educated at Winchester and New College, Oxford. Having entered the church he held many ecclesiastical appointments, and became dean of the Arches in 1423; then devoting his time to secular affairs he was sent on an embassy to Calais in 1439, and to John IV., count of Armagnac, in 1442. At this time Beckington was acting as secretary to Henry VI., and soon after his return in 1443 he was appointed lord privy seal and bishop of Bath and Wells. The bishop erected many buildings in Wells, and died there on the 14th of January 1465. The most important results of Beckington's missions to France were a Latin journal, written by himself, referring to the embassy to Calais; and another, written by one of his attendants, relating to the journey to Armagnac.

Beckington's own journal is published in the *Proceedings of the Privy Council,* vol. v., edited by N. H. Nicolas (1835); and the other journal in the *Official Correspondence of Thomas Bekynton,* edited by G. Williams for the Rolls Series (1872), which contains many interesting letters. This latter journal has been translated into English by N. H. Nicolas (1828). *See* G. G. Perry, "Bishop Beckington and Henry VI.," in the *English Historical Review* (1894).

BECKLEY, a rapidly growing city in the midst of the "smokeless" coal-fields and heavy timber stands of West Virginia, U.S.A., 72m. S.E. of Charleston; the county seat of Raleigh county. It is on Federal Highways 19 and 21, and is served by the Chesapeake and Ohio and the Virginian railways. Its population was 9,357 in 1930; 12,852 in 1940 by the federal census. It lies on a broad plateau of the Alleghanies, 2,500ft. above sea-level, in a picturesque setting, and has a delightful summer climate. Primarily it is a trading and social centre for the extensive mining and lumbering undertakings in the neighbourhood. The assessed valuation of property in 1940 was $11,467,022, and the resources of the four banks amounted to $10,233,822.

BECKUM, chief town of a southeastern subdivision in the district of Münster, in the Prussian province of Westphalia, Germany. Pop. (1939) 12,271. Brewing, distilling and lime-burning are the main industries.

BECKWITH, JAMES CARROLL (1852–1917), American portrait-painter, was born at Hannibal, Mo., on Sept. 23, 1852. He studied at the National Academy of Design, New York city, and in Paris (1873–78) under Carolus Duran. Returning to the United States in 1878, he gradually became a prominent figure in American art. He took an active part in the formation of the Fine Arts society, and was president of the National Free Art league, which attempted to secure the repeal of the American duty on works of art. Among his portraits are those of W. M. Chase (1882), of Miss Jordan (1883), of Mark Twain, T. A. Janvier, Gen. Schofield and William Walton. In 1904 he exhibited at St. Louis "The Nautilus" and a portrait of Mrs. Beckwith. Yale university, Johns Hopkins university, and the New York public library have examples of his works, and the New York public library has a collection of his crayon and pencil drawings. He died in New York on Oct. 24, 1917.

BECKWITH, SIR THOMAS SYDNEY (1772–1831), British general, in 1791 entered the 71st regiment in which he served in India and elsewhere until 1800, when he obtained a company in Col. Coote Manningham's experimental regiment of riflemen. In 1802 he was promoted major and in the following year lieutenant colonel. Beckwith aided Sir John Moore in the training of the troops which afterwards became the Light Division. In 1806 he served in the expedition to Hanover and in 1807 in that which captured Copenhagen. Beckwith took part in the great march of Craufurd to the field of Talavera, in the advanced guard fights on the Coa in 1810 and in the campaign in Portugal. On the formation of the Light Division he was given a brigade command in it. After the brilliant action of Sabugal, Beckwith had to retire for a time from active service. In 1812 he went to Canada as assistant quartermaster general, and he took part in the war against the United States. In 1814 he became major general, and in 1815 was created Knight Commander of the Bath. In 1827 he was made colonel commandant of the Rifle Brigade. He went to India as commander in chief at Bombay in 1829, and was promoted lieutenant general in the following year. He died on Jan. 15, 1831, at Mahableshwar.

His elder brother, Sir GEORGE BECKWITH (1753–1823), served in the American War of Independence, and was made governor of Bermuda in 1797, and of St. Vincent in 1804. As governor of Barbados (1808–14) he captured the French islands of Martinique (1809) and Guadeloupe (1810). Sir George Beckwith commanded the forces in Ireland, 1816–20. He died in London on March 20, 1823.

BECKX, PIERRE JEAN (1795–1887), general of the Society of Jesus, was born at Sichem, Belgium, on Feb. 8, 1795,

and entered the novitiate of the order at Hildesheim in 1819. He was head of the order from 1853 to 1883. His tenure of office was marked by an increased zeal for missions in Protestant lands, and by the removal of the society's headquarters from Rome to Fiesole near Florence in 1870. His chief literary work was the often-translated *Month of May* (Vienna, 1843). He died at Rome on March 4, 1887.

BECQUE, HENRY FRANÇOIS (1837–1899), French dramatist, was born in Paris. He wrote the book of an opera *Sardanapale,* adapted from Byron, for the music of M. Victorin Joncières in 1867, but his first important work, *Michel Pauper,* appeared in 1870. The importance of this sombre drama was first realized when it was revived at the Odéon in 1886. *Les Corbeaux* (1882) established Becque's position as an innovator, and in 1885 he produced his most successful play, *La Parisienne.* Becque produced little during the last years of his life, but his disciples carried on the tradition he had created. He died in May 1899, and his collected works, *Théâtre Complet* (3 vols.) appeared in that year.

See his *Querelles littéraires* (1890), and *Souvenirs d'un auteur dramatique* (1895), consisting chiefly of reprinted articles in which he does not spare his opponents.

BÉCQUER, GUSTAVO ADOLFO (1836–1870), Spanish poet and romance-writer, was born at Seville, and died in great poverty at Madrid, where he had earned a precarious living by translating foreign novels. His works were published posthumously in 1873 (7th ed. 1911). In such prose tales as *El Rayo de Luna* and *La Mujer de piedra,* Bécquer is manifestly influenced by Hoffmann, and as a lyric poet he has analogies with Heine.

See Fr. Schneider, *G. A. Bécquer* (1914).

BECQUEREL, the name of a French family, several members of which have been distinguished in chemical and physical research.

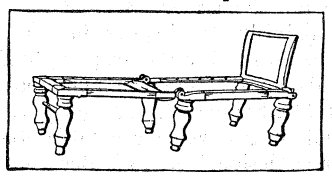
ANTOINE CÉSAR BECQUEREL (1788–1878) was born at Châtillon sur Loing on March 8, 1788. After passing through the École Polytechnique he became *ingénieur-officier* in 1808, and saw active service with the imperial troops in Spain from 1810 to 1812, and again in France in 1814. He then resigned from the army. His earliest scientific work was in mineralogy, but he soon turned his attention to the study of electricity and especially of electrochemistry. In 1837 he received the Copley medal from the Royal Society "for his various memoirs on electricity, and particularly for those on the production of metallic sulphurets and sulphur by the long-continued action of electricity of very low tension," which it was hoped would lead to increased knowledge of the "recomposition of crystallized bodies, and the processes which may have been employed by nature in the production of such bodies in the mineral kingdom." In biological chemistry he worked at the problems of animal heat and at the phenomena accompanying the growth of plants, and he also studied meteorological questions and observations. His works include: *Traité d'électricité et du magnétisme* (1834–40), *Traité de physique dans ses rapports avec la chimie* (1842), *Éléments de l'électro-chimie* (1843), *Traité complet du magnétisme* (1845), *Éléments de physique terrestre et de météorologie* (1847), and *Des climats et de l'influence qu'exercent les sols boisés et déboisés* (1853). He died on Jan. 18, 1878, in Paris, where from 1837 he had been professor of physics at the Musée d'Histoire Naturelle.

His son, ALEXANDRE EDMOND BECQUEREL (1820–91), was born in Paris on March 24, 1820, and was in turn his pupil, assistant and successor at the Musée d'Histoire Naturelle; he was also appointed professor at the short-lived Agronomic Institute at Versailles in 1849, and in 1853 received the chair of physics at the Conservatoire des Arts et Métiers. Edmond Becquerel paid special attention to the study of light, investigating the photochemical effects and spectroscopic characters of solar radiation and the electric light, and the phenomena of phosphorescence, particularly as displayed by the sulphides and by compounds of uranium. In connection with these latter inquiries he devised his phosphoroscope, an apparatus which enabled the interval between exposure to the source of light and observation of the resulting effects to be varied at will and accurately measured. He published in 1867–68 a treatise in two volumes on *La Lumière, ses causes et ses effets.* He also investigated the diamagnetic and paramagnetic properties of substances and the phenomena of electrochemical decomposition; and proposed a modified statement of Faraday's law which was intended to cover certain apparent exceptions. He died in Paris on May 11, 1891.

His son, ANTOINE HENRI BECQUEREL (1852–1908), who succeeded to his father's chair at the Musée d'Histoire Naturelle in 1892, was born in Paris on Dec. 15, 1852, studied at the École Polytechnique (where he was appointed a professor in 1895), and in 1875 entered the department *des ponts et chaussées,* of which in 1894 he became *ingénieur en chef.* He was the discoverer of radioactivity, having found in 1896 that uranium at ordinary temperatures emits an invisible radiation which in many respects resembles Röntgen rays, and can affect a photographic plate after passing through thin plates of metal. For these researches he was in 1903 awarded a Nobel prize jointly with Pierre Curie. He also engaged in work on magnetism, the polarization of light, phosphorescence and the absorption of light in crystals. He died at Croisic in Brittany on Aug. 25, 1908.

BED, a general term for a resting or sleeping place for men and animals, and in particular for the article of household furniture for that object, and so used by analogy in other senses, involving a supporting surface or layer (a word of Teutonic origin, *cf.* Ger. Bett). Assyrians, Medes and Persians had beds of stone, wood or metal and frequently decorated their furniture with inlays or *appliqués* of metal, mother-of-pearl and ivory.

Greek and Roman Beds.—The Greek bed had a wooden frame, with a board at the head and bands of hide laced across, upon which skins were placed. At a later period the bedstead was often veneered with expensive woods; sometimes it was of solid ivory veneered with tortoise-shell and with silver feet; often it was of bronze. The pillows and coverings also were costly and beautiful. Small cushions were placed at the head and sometimes at the back of the Roman beds. The bedsteads were high and could only be ascended by the help of steps. They were often arranged for two persons, and had a board or railing at the back as well as the raised portion at the head. The counterpanes were sometimes very costly, generally purple embroidered with figures in gold; and rich hangings fell to the ground masking the front. The bedsteads themselves were often of bronze inlaid with silver, and Heliogabalus, like some modern Indian princes, had one of solid silver. In the walls of some of the houses at Pompeii bed niches are found which were probably closed by curtains or sliding partitions. The marriage bed, *lectus genialis,* was much decorated, and was placed in the atrium opposite the door. A low pallet-bed used for sick persons was known as *scimpodion.*



THE FRAME OF AN EGYPTIAN BED

The Middle Ages.—The ancient Germans lay on the floor on beds of leaves covered with skins, or in a kind of shallow chest filled with leaves and moss. In the early middle ages they laid carpets on the floor or on a bench against the wall, placed upon them mattresses stuffed with feathers, wool or hair, and used skins as a covering. They appear to have generally lain naked in bed, wrapping themselves in the large linen sheets which were stretched over the cushions. In the 13th century luxury increased, and bedsteads were made of wood much decorated with inlaid, carved and painted ornament. They also used folding beds, which served as couches by day and had cushions covered with silk laid upon leather. At night a linen sheet was spread and pillows placed, while silk-covered skins served as coverlets. Curtains were hung from the ceiling or from an iron arm projecting from the wall. In the 12th-century mss. the bedsteads appear much richer, with inlays, carving and painting, and with embroidered coverlets and mattresses in harmony. Curtains were hung above the bed, and a small hanging lamp is often shown. In the 14th century the woodwork became of less importance, being generally entirely covered by hangings of rich materials. Inventories from the beginning of the 14th century give details of these hangings lined

with fur and richly embroidered. Then it was that the tester bed made its first appearance, the tester being slung from the ceiling or fastened to the walls, a form which developed later into a room within a room, shut in by double curtains so as to exclude all draughts. The space between bed and wall was called the *ruelle,* and very intimate friends were received there. In the 15th century beds became very large, reaching to 7 or 8 ft. by 6 or 7 ft. Viollet-le-Duc says that the mattresses were filled with pea-shucks or straw—neither wool nor horsehair is mentioned—but feathers also were used. At this time great personages were in the habit of carrying most of their property about with them, including beds and bed-hangings, and for this reason the bedsteads were for the most part mere frameworks to be covered up; but about the beginning of the 16th century bedsteads were made lighter and more decorative, since the lords remained in the same place for longer periods. Louis XIV had an enormous number of sumptuous beds, as many as 413 being described in the inventories of his palaces. Some of them had embroideries enriched with pearls, and figures on a silver or golden ground. The carving was the work of Proux or Caffieri, and the gilding by La Baronnière. The great bed at Versailles had crimson velvet curtains on which "The Triumph of Venus" was embroidered. So much gold was used that the velvet scarcely showed. Under the influence of Madame de Maintenon "The Sacrifice of Abraham," which is now on the tester, replaced "The Triumph of Venus." In the 17th century, which has been called "the century of magnificent beds," the style *à la duchesse,* with tester and curtains only at the head, replaced the more enclosed beds in France, though they lasted much longer in England. In the 18th century feather pillows were first used as coverings in Germany, which in the fashions of the bed and the curious etiquette connected with the bedchamber followed France for the most part. The beds were *à la duchesse,* but in France itself there was great variety both of name and shape—the *lit à alcove, lit d'ange,* which had no columns, but a suspended tester with curtains drawn back, *lit à l'Anglaise,* which looked like a high sofa by day, *lit en baldaquin,* with the tester fixed against the wall, *lit à couronne* with a tester shaped like a crown, a style which appeared under Louis XVI, and was fashionable under the Restoration and Louis Philippe, and *lit à l'impériale,* which had a curved tester, are a few of their varieties. The *lit en baldaquin* of Napoleon I is still at Fontainebleau, and the Garde Meuble contains several richly carved beds of a more modern date. The custom of the "bed of justice" upon which the king of France reclined when he was present in parliament, the princes being seated, the great officials standing, and the lesser officials kneeling, was held to denote the royal power even more than the throne. Louis XI is credited with its first use, and the custom lasted till the end of the monarchy.

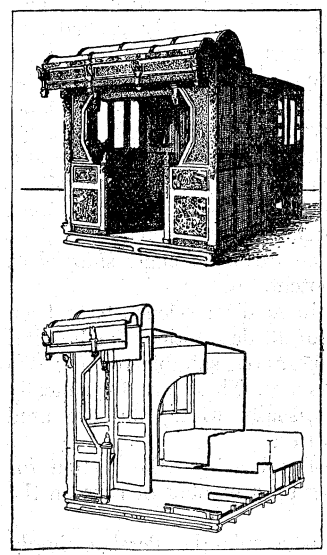


FROM VIOLLET-LE-DUC, "DICTIONNAIRE DU MOBILIER FRANÇAIS"

A BED OF THE CRUSADING PERIOD IN THE 12TH CENTURY

The most outstanding feature of this bed was the inclining mattress. Frames were elaborately decorated and the canopy was newly introduced from the East

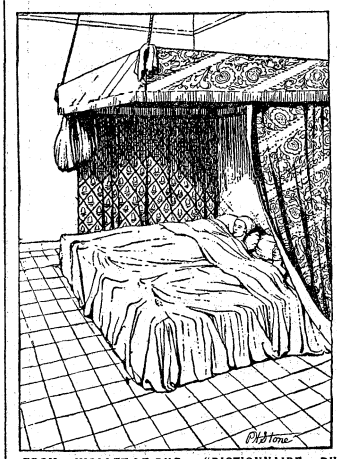
The Ceremonial Bed.—From the habit of using this bed to hear petitions, etc., came the usage of the *grand lit* which was provided wherever the king stayed, called also *lit de parement* or *lit de parade,* rather later. Upon this bed the dead king lay in state. The beds of the king and queen were saluted by the courtiers as if they were altars, and none approached them even when there was no railing to prevent it. These railings were apparently placed for other than ceremonial reasons originally, and in the accounts of several castles in the 15th century mention is made of a railing to keep dogs from the bed. In the *chambre de parade,* where the ceremonial bed was placed, certain persons, such as ambassadors or great lords, whom it was desired to honour, were received in a more intimate fashion than the crowd of courtiers. The *petit lever* was held in the bedroom itself, the *grand lever* in the *chambre de parade.* At Versailles women received their friends in their beds, both before and after childbirth, during periods of mourning, and even directly after marriage—in fact in any circumstances which were thought deserving of congratulation or condolence. During the 17th century this curious custom became general, perhaps to avoid the tiresome details of etiquette. Portable beds were used in high society in France till the end of the *ancien régime.* The earliest of which mention has been found belonged to Charles the Bold (see *Memoirs* of Philippe de Comines). They had curtains over a light framework, and were in their way as fine as the stationary beds.



BY COURTESY OF THE CHICAGO NATURAL HISTORY MUSEUM

EXTERIOR AND INTERIOR VIEWS OF A CHINESE BED OF THE KIEN LUNG PERIOD, 1736–95

Iron beds appear in the 18th century; the advertisements recommend them as free from the insects which sometimes infested wooden bedsteads, but one is mentioned in the inventory of the furniture of the castle of Nerac in 1569, *un lit de fer et de cuivre, avec quatre petites colonnes de laiton, ensemble quatre satyres de laiton, quatre petits vases de laiton pour mettre sur les colonnes; dedans le dit lit il y a la figure d'Olopherne ensemble* small brass columns, together with four brass satyrs and four small brass columns, together with four brass satyrs and four small brass urns to place on the columns; within the said bed there is a figure of Holofernes together with that of Judith, these being of alabaster). In Scotland, Brittany and Holland the closed bed with sliding or folding shutters has persisted till our own day, and in England—where beds were commonly quite simple in form—the four-poster, with tester and curtains all round, was the usual citizen's bed till the middle of the 19th century. Many fine examples exist of 17th-century carved oak bedsteads, some of which have found their way into museums. The later forms, in which mahogany was usually the wood employed, are much less architectural in design. Some exceedingly elegant mahogany bedsteads were designed by Chippendale, Hepplewhite and Sheraton and there are signs that English taste is returning to the wooden bedstead in a lighter and less monumental form; indeed the most modern type of all, the divan, has reduced the bed to the utmost simplicity of form. (J. P.-B.)



FROM VIOLLET-LE-DUC, "DICTIONNAIRE DU MOBILIER FRANÇAIS"

A BED OF THE 15TH CENTURY

Although large, beds of this period were lightly constructed, so that they could be easily carried from place to place. The coverings were often of the finest fabrics

The Modern Metal Bedstead.—The manufacture of metallic bedsteads on a commercial scale began in the Midlands of England, chiefly in and around Birmingham, in the middle of the 19th century, and quickly attained great importance, many types of such sleeping accommodation being exported to almost every country in the world.

The modern demand is for something lighter than the very heavy cast-iron bedstead of the middle 19th century, and this is

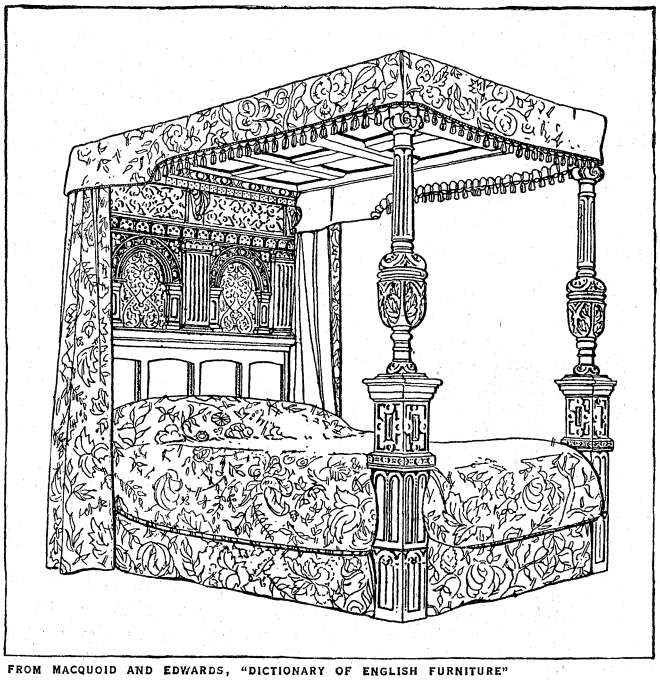
being catered for by much more dainty designs, also by bedsteads the parts of which are welded together, thus disposing of the heavy castings found on the earlier metallic designs. The brass bedstead is still used, although wooden bedsteads, of which the patterns are numerous, are generally preferred. Thousands of light iron combination or "single" patterns are exported to different countries, chiefly South Africa; these consist of two "D" shaped ends with galvanized mesh on frame, eliminating the old-fashioned laths and stretcher, and are very easily packed and assembled. They are supplied with portable fourpost tops, with curtain rods for mosquito nets where the conditions demand them. The heavy brass type of bedstead is still sold chiefly to South America. The iron and brass fourposter still finds favour in Egypt and the far east. Some very beautiful designs in square and round brass tube bedsteads, with pearl and other ornaments, are also in great demand, and are made and finished in many ways; oxidized silver, nickel plate and bronze being popular.

Huge bedsteads resembling houses are occasionally shipped at great cost for the use of Eastern potentates.

The great strides accomplished in medical science have been helped by the supply of bedsteads of all descriptions for hospital use: operating tables, spinal carriages, etc., suitable for any disease, operation or medical requirement. These are hygienically painted by the spraying process, usually white, and are used extensively in hospitals in all countries.

Eastern Beds.—In the near east it has been the custom for years to make beds simply by piling up a number of rugs on the floor of a room.

Cushions are also in use, but as a rule the Persian simply reclines upon these piles in some soft garment and makes no



FROM MACQUOID AND EDWARDS, "DICTIONARY OF ENGLISH FURNITURE"

A FOUR POSTER BED OF OAK FROM THE TUDOR PERIOD IN ENGLAND

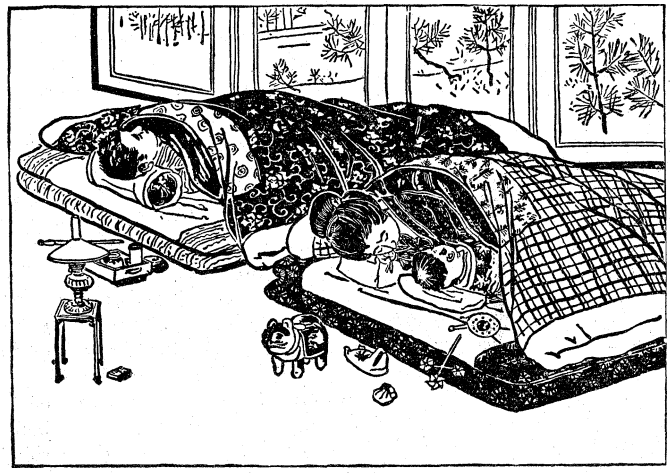
This type of bed, canopied and provided with hangings so that it could be completely curtained in, was common in England for several centuries. The decoration of interlaced strapwork framed in wide pilasters, is indicative of the period

use of sheets, blankets or other lighter coverings.

In India the inhabitants live in the open to such an extent that the designing and ornamentation of beds is negligible except for the use of royalty.

In China, however, beds not unlike those of the Egyptians were used some 2,000 years ago and we find replicas of them in pottery in the tombs of the Han period (206 B.C.–A.D. 220). The beds of China reflected the various periods of design just as they did in England and some magnificent specimens have come to light executed in carved wood and in lacquers. During the Ming period (1368–1644) and probably earlier, it became the custom in some sections to enclose the beds with gauze or netting, and later they were made along the back-walls of a small square room with a small ante-chamber cut off by sliding doors. An interesting example of this type exists intact in the Chicago Natural History museum, Chicago, Ill. These beds were covered with matting and were never as soft and voluptuous as those of the near east. The pillows were made of wood, porcelain or stone, carved in such a way as to fit the neck and lower part of the sleeper's head.

In Korea and northern China the *gudeul* or floor is made of flat stones, bricks or earth, with flues under the top layer; some-



AFTER A DRAWING BY JIKICHI INOUYE

JAPANESE BED

The Japanese sleep between quilts (*futon*) on the *tatami*- (mat-) covered floor. In the morning the bedding is put in the closet and the room is used for dining

what below the level of the floor is a fire-place. When cooking is going on the heat circulates through the flues in the floor and sleeping places are arranged on the warm spots.

In Japan the whole floor about 12 ft.sq., covered with a *tatami* or mat, is a bed. The people sleep between *shiki-futon* or under quilt and *kake-futon* or over quilt. It is warmed during cold weather with a *kotatsu* or little wooden box holding a charcoal burner. The use of the *kotatsu* has disadvantages, often causing skin-diseases, vitiating the air, and sometimes starting fires. For these reasons it is falling into disuse; but whole families may still be found who sleep on the same *tatami,* their feet towards the burner, and their bodies radiating from that point like the spokes of a wheel. (Y. K.)

BED, in geology, a term used when rocks are arranged in more or less distinct layers; these are the beds of rock or strata. Normally the bedding of rocks is horizontal, or very nearly so; when the upper and lower surfaces of a bed are parallel, the bedding is said to be regular; if it is thickest at one point and thins away thence in every direction the bedding is lenticular. Beds may be many feet thick, as in some sandstones, or so thin as to be like sheets of paper; *e.g.,* paper shales, such thin beds being often termed layers or laminae; intermediate regular varieties may be called flags, flagstones or tilestones. Bedding is confined to rocks which have been formed under water or by the agency of wind; these are the "stratified" rocks.

Where rapidly moving currents of water (or air) are transporting or depositing sand, etc., the bedding is generally not horizontal, but inclined more or less steeply; this brings about the formation of what is variously called "cross-bedding," "diagonal bedding," "current bedding" or, improperly, "false-bedding." (*See* SEDIMENTARY ROCKS.) Igneous materials, when deposited through the agency of water or air, exhibit bedding, but no true stratification is seen in igneous rocks that have solidified after cooling, although in granites and similar rocks the process of weathering frequently produces an appearance resembling this structure. Miners not infrequently describe a bed of rock as a "vein," if it is one that has some economic value; *e.g.,* a vein of coal or ironstone.

BEDAR: *see* CASTE (INDIAN).

BEDARESI, YEDAIAH (1270–1340), Jewish poet, physician and philosopher of Provence. His most successful work was an ethical treatise, *Behinath 'Olam* (Examination of the

World), a didactic poem, translated into English by Tobias Goodman.

BÉDARIEUX, town of France, department of Hérault, on the Orb, 27 mi. N.N.W. of Béziers by rail. Pop. (1936) 7,827. It has a 16th-century church and bridge. Bédarieux is in a zone of woollen and cloth industry based on the sheep-rearing of the hills to the north and northeast, and its cloth-making, carried on under royal privilege from the 17th century to the Revolution employed, in 1789, 5,000 men, besides many occupied in wool- and cotton-spinning. In spite of modern English machinery, the industry declined with the Levant trade, but it has revived a little with the opening up of coal mines. Bédarieux also has tanneries and leather dressing and it trades in timber and farm produce; it has a board of trade arbitration.

BEDAWI: *see* BEJA.

BEDAYAT: *see* NUBA, THE.

BEDAYRIA: *see* ARABS.

BEDBUG (*Cimex lectularius*), a nocturnal insect belonging to the family Cimicidae in the order Hemiptera (*q.v.*). The adult is reddish brown in colour, broad and flat, 4 to 5 mm. long, and apparently wingless. The short broad head has a 3-segmented rostrum, 4-segmented antennae and fits into the broadly semi-lunar prothorax. The mesothorax bears the greatly atrophied, scale-like first pair of wings. The body is densely covered with short hairs and bristles, the latter sabre-shaped and sharply toothed at apex and along the convex margin. The male has a more pointed abdomen terminated by a large curved penis lying in a deep groove of the left side of the eighth segment. The female has on the right side of the fourth (or fifth) abdominal segment a copulatory pouch that is indicated ventrally by a notch in the caudal margin of the segment. This is the organ of Ribaga, beyond which is a mass of cellular tissue called the organ of Berlese. In mating, the male injects the spermatozoa into the organ of Ribaga, from which they pass through the organ of Berlese and reach the genital tract by wandering through the general body cavity. This is unique, since in other insects the spermatozoa are inserted into the female by way of the vagina.

The peculiar disagreeable odour of bedbugs is due to the secretion of the scent or stink glands so characteristic of heteropterous insects. Bedbugs (*C. lectularius*) are among the most cosmopolitan of human parasites. They are shy creatures that seek concealment during the day in tufts or folds of mattresses, in cracks and joints of bedsteads, even in the hollow frames of metal beds, beneath loosened wallpaper, behind baseboards, window casings, cracks in the wall, or wherever they can find shelter. From these hiding places the bugs come forth at night to suck the blood of man. After feeding, they retreat to their hiding places to digest the meal, which may require several days. Adult specimens have lived a year without food. The female lays an average of 200 or more eggs at the rate of three or four a day under favourable conditions with temperatures above 70° F. and ample opportunities to feed. No eggs are laid at temperatures below 50° F., and starved females soon stop laying eggs. The eggs hatch in six days or longer, depending upon the temperature. There are five nymphal stages, and the nymph must feed before it will moult to the next stage. In favourable temperatures, it requires from four to six weeks to reach maturity. There may be three or more generations a year.

This bug will feed on poultry and other animals as well as on man. Close relatives are *C. hemipterus* of tropical Africa and Asia, which have the same habits, and various species feed on bats, swallows and martins. Control involves vigilant cleanliness and thorough application of repressive measures. Rooms may be fumigated or heated to temperatures of 120° to 125° F. for several hours. Hiding places may be treated with a good fly spray. The chemical known as DDT (Dichloro-diphenyl-trichloroethane) gives remarkable control. (H. B. Hd.)

BEDDGELERT (St. Kelert's Grave), village and civil parish, Caernarvonshire, Wales. Pop. (1931) 771. The narrow pass of Aberglaslyn leads into the Snowdon country, and at the foot of that mountain the Colwyn, from the northwest, and the Glaslyn (vale of Gwynant), from the northeast, meet in a picturesque hollow in which the village has grown. The name of Beddgelert most likely means "Grave of St. Kelert," but the district has many associations with the princes of north Wales of the early middle ages and is linked with the well-known legend of Llewelyn ap Jorwerth's faithful hound, Gelert, who protected the prince's sleeping son by killing a wolf, but was killed by the father, who returned to find bloodstains and fancied the dog had slain his child. There are Welsh variants of this tale, which is also well known in other forms in the folklore of other lands. The finding of a Roman shield, and some direct evidences have led to the view that the Roman trackway from Segontium to Uriconium passed near the village, and Dinas Emrys, an important early native fortification, is situated on a hill about a mile up the valley.

The village is famed as a tourist centre.

BEDDINGTON AND WALLINGTON, a municipal borough in the Mitcham parliamentary division of Surrey, England, 10 mi. from London by the Southern railway, on the river Wandle. Pop. (est. 1938) 30,880. Area 4.76 sq.mi. Beddington park, from the 14th century the seat of the Carews, was bought in 1864 for the Royal Female orphanage. There are about 206 ac. of pleasure grounds in the borough. A public library was opened in 1936. Beddington and Wallington were governed by an urban district council from 1915 to 1937, when they were incorporated. The district is mainly residential, being convenient to London.

BEDDOES, THOMAS (1760–1808), English physician and scientific writer, was born at Shifnal, Shropshire, on April 13, 1760. After being educated at Bridgnorth grammar school and at Pembroke college, Oxford, he studied medicine in London under John Sheldon (1752–1808). In 1784 he published a translation of L. Spallanzani's *Dissertations on Natural History,* and in 1785 produced a translation, with original notes, of T. O. Bergman's *Essays on Elective Attractions.* He took his degree of doctor of medicine at Oxford in 1786, and, after visiting Paris, where he became acquainted with Lavoisier, was appointed reader in chemistry at Oxford university in 1788. He resigned his readership in 1792. In the following year he published *Observations on the Nature of Demonstrative Evidence,* and the *History of Isaac Jenkins,* a story which powerfully exhibits the evils of drunkenness, and of which 40,000 copies are reported to have been sold. About the same time he began to work at his project for the establishment of a "Pneumatic Institution" for treating disease by the inhalation of different gases. In this he was assisted by Richard Lovell Edgeworth, whose daughter, Anna, became his wife in 1794. In 1798 the institution was established at Clifton, its first superintendent being Humphry Davy, who investigated the properties of nitrous oxide in its laboratory. The institution became an ordinary hospital, and was relinquished by its projector in the year before his death on Dec. 24, 1808.

A life of Beddoes, by Dr. John E. Stock was published in 1810.

BEDDOES, THOMAS LOVELL (1803–1849), English dramatist and poet, son of the physician Thomas Beddoes, was born at Clifton on July 20, 1803. His mother was a sister of Maria Edgeworth, the novelist. He was sent to Bath grammar school and then to the Charterhouse. In 1820 he was entered at Pembroke college, Oxford, and in his first year published *The Improvisatore,* afterwards carefully suppressed, and in 1822 *The Bride's Tragedy,* which showed him as the disciple of the later Elizabethan and Jacobean dramatists. Beddoes was one of the first outside the limited circle of Shelley's own friends to recognize Shelley's genius, and he was certainly one of the earliest imitators of his lyrical method. In the summer of 1824 he met Mrs. Shelley and Walter Savage Landor in Italy. In 1825 he took his degree at Oxford, and in that year began the fantastic and incoherent drama, *Death's Jest Book; or, The Fool's Tragedy;* but he continued to revise it until his death, and it was only published posthumously. He studied anatomy and physiology at Göttingen (1825–29) and at Würzburg (1829–32); and in Zürich practised as a physician until, in 1839, the anti-liberal riots in the town rendered it unsafe for him, and he had to escape secretly. In 1847 he returned to Frankfurt, where he lived with a baker called Degen, to whom he became much attached, and whom he persuaded to become an actor. He took Degen with him to Zürich, where he chartered the theatre for one night to give his friend a chance of playing Hotspur. The two separated at Basle, and in a fit of dejection (May 1848) Beddoes tried to bleed himself to death. Later, he took curare, from the effects of which he died on

Jan. 26, 1849. His mss. he left in the charge of his friend Kelsall.

In one of his letters to Kelsall Beddoes wrote:—"I am convinced the man who is to awaken the drama must be a bold, trampling fellow—no creeper into worm-holes—no reviser even—however good. These re-animations are vampire cold." In spite of this, Beddoes was himself a "creeper into worm-holes," a close imitator of Marston and of Cyril Tourneur, especially in their familiar handling of the phenomena of death, and in the remoteness from ordinary life of the passions portrayed. In his blank verse he caught, to a certain degree, the manner of his Jacobean models, and his verse abounds in beautiful imagery, but his *Death's Jest Book* is only finished in the sense of having five acts completed; it remains a bizarre production which appeals to few minds, and to them rather for the occasional excellence of the poetry than as an entire composition. His lyrics show the influence of Shelley as well as the study of 17th century models, but they are by no means mere imitations, and some of them, like the "Dirge for Wolfram" ("If thou wilt ease thy heart") and "Dream Pedlary" ("If there were dreams to sell"), are among the most exquisite of 19th century lyrics.

Kelsall published Beddoes' great work, *Death's Jest Book; or, The Fool's Tragedy,* in 1850. The drama is based on the story that a certain Duke Boleslaus of Münsterberg was stabbed by his court-fool, the "Isbrand" of the play (*see* C. F. Floegel, *Geschichte der Hofnarren,* Leipzig, 1789, pp. 297 *et seq.*). He followed this in 1851 with *Poems of the late Thomas Lovell Beddoes,* to which a memoir was prefixed. The two volumes were printed together (1851) with the title of *Poems, Posthumous and Collected.* All these volumes are very rare. Kelsall bequeathed the Beddoes mss. to Robert Browning, with a note stating the real history of Beddoes' illness and death, which was kept back out of consideration for his relations. Browning is reported to have said that if he were ever professor of poetry his first lecture would be on Beddoes, "a forgotten Oxford poet." Mr. (now Sir) Edmund Gosse obtained permission from Browning to use the documents and edited a fuller selection of the *Poetical Works* (1890) for the "Temple Library," supplying a full account of his life. He also edited the *Letters of Thomas Lovell Beddoes* (1894), containing a selection from his correspondence, which is full of gaiety and contains much amusing literary criticism. *See* also the edition of Beddoes by Ramsay Colles in the "Muses' Library" (1906).

BEDE, BEDA or **BAEDA** (672 or 673–735), English historian and theologian. Of Baeda, commonly called "the Venerable Bede," almost all that we know is contained in the short autobiographical notice which he has appended to his *Ecclesiastical History:* "Thus much concerning the ecclesiastical history of Britain, and especially of the race of the English, I, Baeda, a servant of Christ and priest of the monastery of the blessed apostles St. Peter and St. Paul, which is at Wearmouth and at Jarrow, have with the Lord's help composed, so far as I could gather it, either from ancient documents, or from the tradition of the elders, or from my own knowledge. I was born in the territory of the said monastery, and at the age of seven I was, by the care of my relations, given to the reverend Abbot Benedict (Biscop), and afterwards to Ceolfrid, to be educated. From that time I have spent the whole of my life within that monastery devoting all my pains to the study of the scriptures; and amid the observance of monastic discipline, and the daily charge of singing in the church, it has ever been my delight to learn or teach or write. In my 19th year I was admitted to the diaconate, in my 30th to the priesthood, both by the hands of the most reverend Bishop John (of Hexham), and at the bidding of Abbot Ceolfrid. From the time of my admission to the priesthood to my (present) 59th year, I have endeavoured, for my own use and that of my brethren, to make brief notes upon the Holy Scripture, either out of the works of the venerable fathers, or in conformity with their meaning and interpretation." Then follows a list of his works, so far as, at that date, they had been composed. As the *Ecclesiastical History* was written in 731, we obtain the following dates for the principal events in Bede's uneventful life: birth, 672–673; entrance into the monastery, 679–680; ordained deacon, 691–692; priest, 702–703.

The monastery of Wearmouth was founded by Benedict Biscop in 674, and that of Jarrow in 681–682. Though five or six miles apart, they were intended to form a single monastery under a single abbot, and so Bede speaks of them in the passage given above. It is with Jarrow that Bede is chiefly associated, though no doubt from the close connection of the two localities he would often be at Wearmouth. The preface to the prose life of Cuthbert proves that he had stayed at Lindisfarne prior to 721, while the Epistle to Egbert shows that he had visited him at York in 733. It is in his works that we must chiefly seek to know him. They fall into three main classes: (1) scientific; (2) historical; (3) theological. The first class comprises works on grammar, one on natural phenomena, and two on chronology and the calendar. These last were inspired largely by the Paschal Question, which was the subject of such bitter controversy between the Roman and Celtic Churches in the 7th century. They form a natural transition to the second class. In this the chief place is held by the *Ecclesiastical History of the English Nation.* By this Bede has justly earned the title of the Father of English History. By this almost exclusively he is known to others than professed students. It is indeed one of the most valuable and one of the most beautiful of historical works. Bede had the artist's instinct for proportion, the artist's sense for the picturesque and the pathetic. His style, too, modelled largely on that of Gregory in the *Dialogues,* is limpid and unaffected. And though it would be wrong to call Bede a critical historian in the modern sense of the words, he showed a very unusual conscientiousness in collecting his information from the best available sources, and in distinguishing between what he believed to be fact, and what he regarded only as rumour or tradition.

Other historical works of Bede are the *History of the Abbots* (of Wearmouth and Jarrow), and the lives of Cuthbert in verse and prose. The *History of the Abbots* and the prose life of Cuthbert were based on earlier works which still survive. In the case of the latter it cannot honestly be said that Bede has improved on his original. In the *History of the Abbots* he was much nearer to the facts, and could make additions out of his own personal knowledge. The Epistle to Egbert, though not historical in form, may be mentioned here, because of the valuable information which it contains as to the state of the Northumbrian Church, on which the disorders and revolutions of the Northumbrian kingdom had told with disastrous effect. It is probably the latest of Bede's extant works, as it was written in Nov. 734, only six months before his death. The third or theological class of writings consists mainly of commentaries, or of works which, if not commentaries in name, are so in fact. They are based largely on the works of the four great Latin Fathers, SS. Augustine, Jerome, Ambrose and Gregory, though Bede's reading is very far from being limited to these. His method is largely allegorical. For the text of Scripture Bede used both the Latin versions, the Itala and the Vulgate, often comparing them. But he certainly knew Greek, and possibly some Hebrew. Indeed it may be said that his works, scientific, historical and theological, practically sum up all the learning of western Europe in his time, which he thus made available for his countrymen. And not for them only; for in the school of York, founded by his pupil Archbishop Egbert, was trained Alcuin (Ealhwine), the initiator, under Charles the Great, of the Frankish schools, which did so much for learning on the continent. And though Bede made no pretensions to originality, least of all in his theological works, freely taking what he needed, and (what is very rare in mediaeval writers) acknowledging what he took, "out of the works of the venerable Fathers," still everything he wrote is informed and impressed with his own special character and temper. His earnest yet sober piety, his humility, his gentleness, appear in almost every line. "In history and in science, as well as in theology, he is before all things the Christian thinker and student." (Plummer's *Bede,* i. 2). Yet it should not be forgotten that Bede could hardly have done what he did without the noble library of books collected by Benedict Biscop.

Several quaint and beautiful legends have been handed down as to the origin of the epithet of "venerable" generally attached to his name. Probably it is a mere survival of a title commonly given to priests in his day. It has given rise to a false idea that he lived to a great age, some mediaeval authorities making him 90 when he died. But he was not born before 672 (*see* above); and though the date of his death has been disputed, the traditional year, 735, is most probably correct. This would make him at most sixty-three. Of his death a most touching and beautiful account has been pre-

served in a contemporary letter. His last hours were spent, like the rest of his life, in devotion and teaching, his latest work being to dictate, amid ever-increasing bodily weakness, a translation into the vernacular of the Gospel of St. John, a work which unhappily has not survived. It was a fitting close to such a life as his.

BIBLIOGRAPHY.—The above sketch is largely based on the present writer's essay on Bede's life and works, prefixed to his edition of Bede's *Historia Ecclesiastica, etc.* (Clarendon Press, 1896). *Beda der Ehrwürdige und seine Zeit,* by Dr. Karl Werner (Vienna, 1875), is excellent. Gehle, *Disputatio . . . de Bedae vita et scriptis* (Leyden, 1838) is still useful. Dr. William Bright's *Chapters of Early English Church History* (3rd ed. Clarendon Press, 1897) is indispensable. *See* also Ker, *Dark Ages,* p. 141 *et seq.* Of the collected works of Bede the most convenient edition is that by Giles in 12 vols. (1843–44), which includes translations of the *Historical Works.* The Continental folio editions (Basle, 1563; Cologne 1612 and 1688) contain many works which cannot by any possibility be Bede's. The edition of Migne, *Patrologia Latina* (1862 *et seq.*) is based on a comparison of the Cologne edition with Giles and Smith (*see* below), and is open to the same criticism.

On the chronology and genuineness of the works commonly ascribed to Bede, *see* Plummer's ed., i., cxlv-clix.

On the mss., early editions and translations of the *Historia Ecclesiastica, see* Plummer *op. cit.,* i., lxxx-cxxxii. The edition of Whelock (Camb. 1643–44) is noteworthy as the first English edition of the Latin text, and as the *editio princeps* of the Anglo-Saxon version ascribed to King Alfred (*see* ALFRED THE GREAT). Smith's edition (Camb. 1722) contained not only these, but also the other historical works of Bede, with notes and appendices. It is a monument of learning and scholarship. The most recent edition is that with notes and introduction by the present writer, referred to above. It includes also the *History of the Abbots* and the Epistle to Egbert. Of books iii. and iv. only, there is a learned edition by Professors Mayor and Lumby of Cambridge (3rd ed. 1881). A cheap and handy edition of the text alone is that by A. Holder (Freiburg im Breisgau, 1882). The best known modern English translation is that by the Rev. L. Gidley (1870). Of the minor historical works a good edition was edited by Rev. J. Stevenson for the Eng. Hist. Soc. in 1841; and a translation by the same hand was included in *Church Historians of England,* vol. i., part ii. (1853). *See* also Plummer's edition, p. cxxxii.–cxlii. (C. P.)

BEDE, CUTHBERT, the pen-name of Edward Bradley (1827–1889), English author, who was born at Kidderminster on March 25, 1827. He entered Durham university in 1845, studied later at Oxford, took holy orders, and eventually became rector of Stretton in Rutlandshire. Here he gained a reputation as a humorist and numbered among his friends Cruikshank, Frank Smedley, Mark Lemon and Albert Smith. He is chiefly known as the author of *The Adventures of Mr. Verdant Green, an Oxford Freshman* (1853), which he illustrated himself and of which a third part appeared in 1856. In 1883 he was given the living of Lavington, Lincolnshire, where he died on Dec. 12, 1889.

BEDFORD, EARLS AND DUKES OF. The present English title of duke of Bedford comes from a line of earls and dukes in the Russell family. In Jan. 1550 John, Baron Russell, was created earl of Bedford, and in May 1694 his descendant, William, the 5th earl, became duke of Bedford. The title of duke of Bedford had, however, been previously held, notably by the third son of Henry IV.; and the earlier creations will first be considered here.

JOHN PLANTAGENET (1389–1435), duke of Bedford, third son of Henry IV., king of England, was born on June 20, 1389, and created duke of Bedford by his brother, Henry V., in 1413. He acted as lieutenant of the kingdom during Henry's expedition to France in 1415, and in Aug. 1416 commanded the ships which defeated the French fleet at the mouth of the Seine, and was instrumental in relieving Harfleur. Again appointed lieutenant in July 1417, he marched against the Scots, who abandoned the siege of Berwick at his approach; and on his return to London he brought Sir John Oldcastle to trial and was present at his execution. In Dec. 1419, he resigned his office as lieutenant, and joined the king in France. Returning to England, he undertook the lieutenancy for the third time in June 1421, and in the following May conducted the queen to join Henry in Normandy. He then took his brother's place and led the English troops to the relief of Cosne, but on hearing of the king's serious illness, he left the army and hurried to his side. Henry's last wish was that Bedford should be guardian of the kingdom and of the young king, and that Philip the Good, duke of Burgundy, should act as regent in France. But when Philip declined to undertake this office, it, too, was assumed by Bedford, who, after the death of the French king, Charles VI., in Oct. 1422, presided at a session of the parlement of Paris, and compelled all present to take an oath of fidelity to King Henry VI. Meanwhile the English Parliament had decided that Bedford should be "protector and defender" of the kingdom, and that in his absence the office should devolve upon his brother Humphrey, duke of Gloucester. Confining himself to the conduct of affairs in France the protector took up Henry V.'s work of conquest, captured Meulan and other places, and sought to strengthen his position by an alliance with Philip of Burgundy. This task was rendered more difficult as Gloucester had just married Jacqueline, countess of Holland and Hainaut, a union which gave the English duke a claim on lands which Philip hoped to secure for himself. Bedford, however, having allayed Philip's irritation, formed an alliance with him and with John VI., duke of Brittany, at Amiens in April 1423, and himself arranged to marry Anne, a sister of the Burgundian duke. This marriage was celebrated at Troyes in the following June, and the war against Charles, the dauphin of France, was prosecuted with vigour and success. Bedford sought to restore prosperity to the districts under his rule by reforming the debased coinage, granting privileges to merchants and manufacturers, and removing various abuses. He then granted some counties to Philip to check the growing hostility between him and Gloucester, and on Aug. 17, 1424, gained a great victory over a combined army of French and Scots at Verneuil. But in spite of the efforts of the protector the good understanding between England and Burgundy was partially destroyed when Gloucester invaded Hainaut in Oct. 1424.

The ambition of his brother gave Bedford trouble in another direction also; for on his return from Hainaut, Gloucester quarrelled with the chancellor, Henry Beaufort, bishop of Winchester, and the council implored Bedford to come to England to settle this dispute. He reached London in Jan. 1426 and after concluding a bond of alliance with Gloucester effected a reconciliation between the duke and the chancellor; and knighted the young king, Henry VI. Bedford then promised to act in accordance with the will of the council, and in harmony with the decision of this body, raised a body of troops and returned to France in March 1427. Having ordered Gloucester to desist from a further attack on Hainaut, he threatened Brittany and compelled Duke John to return to the English alliance; and the success of his troops continued until the siege of Orleans, to which he consented with reluctance, was undertaken in Oct. 1428. Having assured himself that Philip was prepared to desert him, Bedford sent orders to his army to raise the siege in April 1429. He then acted with great energy and judgment in attempting to stem the tide of disasters which followed this failure, strengthened his hold upon Paris, and sent to England for reinforcements; but before any engagement took place he visited Rouen, where he sought to bind the Normans closer to England, and after his return to Paris resigned the French regency to Philip of Burgundy in accordance with the wish of the Parisians. Retaining the government of Normandy, Bedford established himself at Rouen and directed the movements of the English forces with some success. He did not interfere to save the life of Joan of Arc. He was joined by Henry VI. in April 1430, when the regency was temporarily suspended, and he secured Henry's coronation at Paris in Dec. 1431. In Nov. 1432 his wife Anne died, and in April 1433 he was married at Thérouanne to Jacqueline, daughter of Pierre I., count of St. Pol.

But notwithstanding Bedford's vigour the English lost ground steadily; and the death of Anne and this marriage destroyed the friendly relations between England and Burgundy. Negotiations for peace had no result, and when the duke returned to England in June 1433 he told Parliament that he had come home to defend himself against the charge that the losses in France were caused by his neglect, and demanded that his detractors should make their accusations public. The chancellor replied that no such charges were known to the king or the council, and the duke was thanked for his great services. As chief councillor he offered to take a smaller salary than had been previously paid to Gloucester, and undertook this office in Dec. 1433, when his demands with

regard to a continual council were conceded. Bedford, who was anxious to prosecute the war in France, left England again in 1434, but early in 1435 was obliged to consent to the attendance of English representatives at a congress held to arrange terms of peace at Arras. Unable to consent to the French terms, the English envoys left Arras in September, and Philip of Burgundy made a separate treaty with France. Bedford only lived to see the ruin of the cause for which he struggled so loyally. He died at Rouen on Sept. 14, 1435, and was buried in the cathedral of that city. He left a natural son, Richard, but no legitimate issue. Bedford was a man of considerable administrative ability, brave and humane in war, wise and unselfish in peace. He was not responsible for the misfortunes of the English in France, and his courage in the face of failure was as admirable as his continued endeavour to make the people under his rule contented and prosperous.

The chief contemporary authorities for Bedford's life are: *Vita et gesta Henrici Quinti*, ed. T. Hearne (1727); E. de Monstrelet, *Chronique*, ed. L. D. d'Arcq (1857–62); William of Worcester, *Annales rerum Anglicarum*, ed. J. Stevenson (1864). *See* also P. A. Barante, *Histoire des ducs de Bourgogne* (1824); *Proceedings and Ordinances of the Privy Council of England*, ed. J. R. Dasent (1890–99); W. Stubbs, *Constitutional History*, vol. iii. (1895).

In 1470 GEORGE NEVILL (*c.* 1457–1483), son of John, earl of Northumberland, was created duke of Bedford; but after his father's attainder and death at the battle of Barnet in 1471 he was degraded from the peerage.

The next duke of Bedford was JASPER TUDOR (*c.* 1430–1495), half-brother of King Henry VI. and uncle of Henry VII. He was made earl of Pembroke in 1453. Having survived the vicissitudes of the Wars of the Roses he was restored to his earldom and created duke of Bedford in 1485. The duke, who was lord-lieutenant of Ireland from 1486 to 1494, died without legitimate issue on Dec. 21, 1495.

JOHN RUSSELL, 1st earl of Bedford (*c.* 1486–1555), was a son of James Russell (d. 1509). In 1513 he took part in the war with France. He was with Henry at the Field of the Cloth of Gold in 1520, and, returning to military service, when the French war was renewed, lost his right eye at the siege of Morlaix in 1522. In 1523 he went secretly to France, where he negotiated a treaty between Henry and Charles, duke of Bourbon, who was anxious to betray the French king, Francis I. After a short visit to England, Russell was sent with money to Bourbon, joining the constable at the siege of Marseille. In 1524 he visited Pope Clement VII. at Rome, and, having eluded the French, who endeavoured to capture him, was present at the battle of Pavia in Feb. 1525, returning to England about the close of the year. In Jan. 1527 he was sent as ambassador to Clement, who employed him to treat on his behalf with Charles de Lannoy, the general of Charles V. The next few years of Russell's life were mainly spent in England. He entered Parliament for Buckingham in 1529, and although an opponent of the party of Anne Boleyn, retained the favour of Henry VIII. He took an active part in suppressing the Pilgrimage of Grace in 1536, and was one of the commissioners appointed to try the Lincolnshire prisoners. He now received many high honours and offices. In 1539, when Charles V. and Francis I. were threatening to invade England, he was sent into the west, and crossed to France when Henry attacked Francis in 1544. He was in command of an army in the west of England in 1545, and when Henry died in Jan. 1547 was one of the executors of his will. Under Edward VI. Russell was lord high steward and keeper of the privy seal, and the defeat which he inflicted on the rebels at Clyst St. Mary, near Exeter, in Aug. 1549, was largely instrumental in suppressing the rising in Devonshire. In Jan. 1550 he was created earl of Bedford, and was one of the commissioners appointed to make peace with France in this year. He opposed the proposal to seat Lady Jane Grey on the throne; supported Queen Mary, who reappointed him lord privy seal; and assisted to prevent Sir Thomas Wyat's rising from spreading to Devonshire. In 1554 he went to Spain to conclude the marriage treaty between Mary and Philip II., and, soon after his return, died in London on March 14, 1555. By extensive acquisitions of land, Bedford was the founder of the wealth and greatness of the house of Russell. Among the many properties which fell into his hands was Covent Garden, and seven acres of land in London formerly the property of the protector Somerset. He left an only son, Francis, who succeeded him in the title.

See *State Papers during the Reign of Henry VIII.* (1831–52); J. H. Wiffen, *Historical Memoirs of the House of Russell* (1833); *Calendar of State Papers, Edward VI. and Mary* (1861); *Letters and Papers of Henry VIII.* (1862–1901); J. A. Froude, *History of England, passim* (1881 fol.).

FRANCIS RUSSELL, 2nd earl of Bedford (*c.* 1527–1585), was educated at King's Hall, Cambridge. He took his seat in the House of Lords as Lord Russell in 1552. Russell was in sympathy with the reformers, whose opinions he shared, and was in communication with Sir Thomas Wyat; and was imprisoned during the earlier part of Mary's reign. He then visited Italy; came into touch with foreign reformers; and fought at the battle of St. Quentin in 1557. When Elizabeth ascended the throne, in Nov. 1558, the earl of Bedford, as Russell had been since 1555, became an active figure in public life. He was made a privy councillor, and was sent on diplomatic errands to Charles IX. of France and Mary queen of Scots. From Feb. 1564 to Oct. 1567 he was governor of Berwick and warden of the east marches of Scotland, in which capacity he conducted various negotiations between Elizabeth and Mary. When the northern insurrection broke out in 1569, Bedford was sent into Wales, and he sat in judgment upon the duke of Norfolk in 1572. In 1576 he was president of the Council of Wales, and in 1581 was one of the commissioners deputed to arrange a marriage between Elizabeth and Francis, duke of Anjou. Bedford died in London on July 28, 1585.

FRANCIS RUSSELL, 4th earl of Bedford (1593–1641), was the only son of William, Lord Russell of Thornhaugh, to which barony he succeeded in Aug. 1613. In May 1627 he became earl of Bedford by the death of his cousin, Edward, the 3rd earl. When the quarrel broke out between Charles I. and the Parliament, Bedford supported the demands of the House of Commons as embodied in the Petition of Right, and in 1629 was arrested for his share in the circulation of Sir Robert Dudley's pamphlet, "Proposition for His Majesty's service," but was quickly released. The Short Parliament meeting in April 1640 found the earl as one of the king's leading opponents. He was greatly trusted by John Pym and Oliver St. John, and is mentioned by Clarendon as among the "great contrivers and designers" in the House of Lords. In July 1640 he was among the peers who wrote to the Scottish leaders refusing to invite a Scottish army into England, but promising to stand by the Scots in all legal and honourable ways; and his signature was afterwards forged by Thomas, Viscount Savile, in order to encourage the Scots to invade England. In the following September he was among those peers who urged Charles to call a parliament, to make peace with the Scots, and to dismiss his obnoxious ministers; and was one of the English commissioners appointed to conclude the Treaty of Ripon. When the Long Parliament met in Nov. 1640, Bedford was generally regarded as the leader of the Parliamentarians. Bedford was essentially a moderate man. He did not wish to alter the government of the Church, was on good terms with Archbishop Laud, and, although convinced of Strafford's guilt, was anxious to save his life. In the midst of the parliamentary struggle Bedford died of small-pox on May 9, 1641. Bedford was the head of those who undertook to drain the great level of the fens, called after him the "Bedford Level." He spent a large sum of money over this work and received 43,000 acres of land, but, owing to various jealousies and difficulties, the king took the work into his own hands in 1638, making a further grant of land to the earl.

See J. H. Wiffen, *Historical Memoirs of the House of Russell* (1833); J. L. Sanford, *Studies and Illustrations of the Great Rebellion* (1858); Clarendon, *History of the Rebellion, passim* (1888).

JOHN RUSSELL, 4th duke of Bedford (1710–1771), second son of Wriothesley Russell, 2nd duke of Bedford, by his wife, Elizabeth, daughter and heiress of John Howland, of Streatham, Surrey, was born on Sept. 30, 1710, and succeeded his brother Wriothesley (1708–32), 3rd duke of Bedford. The new duke joined the opposition to Sir Robert Walpole, and in Nov. 1744 became first lord of the admiralty in the administration of Henry Pelham. He was subsequently lord-lieutenant of Ireland 1756–57, and lord privy seal in the Bute cabinet of 1761. In 1762 he was sent to France to

treat for peace, and signed the Peace of Paris in 1763. He was lord president of the council in the Grenville cabinet in the same year. When the ministry fell in July 1765, the duke of Bedford became the leader of a political party known as the "Bedford party," or the "Bloomsbury gang." He himself did not return to office, but his friends joined the Grafton ministry in Dec. 1767, a proceeding which provoked "Junius" to write his "Letter to the duke of Bedford." The duke died at Woburn on Jan. 15, 1771.

See J. H. Wiffen, *Historical Memoirs of the House of Russell* (1833); *Correspondence of John, 4th Duke of Bedford*, ed. Lord John Russell (1842–46); Horace Walpole, *Memoirs of the Reign of George II.* (1847); W. E. H. Lecky, *History of England*, vol. iii. (1892); and *Memoirs of the Reign of George III.*, ed. G. F. R. Barker (1894).

FRANCIS RUSSELL, 5th duke of Bedford (1765–1802), eldest son of Francis Russell, marquess of Tavistock (d. 1767), by his wife, Elizabeth (d. 1768), daughter of William Keppel, 2nd earl of Albemarle, was baptized on July 23, 1765. In Jan. 1771 he succeeded his grandfather as duke of Bedford, and was educated at Westminster school and Trinity college, Cambridge, afterwards spending nearly two years in foreign travel. Regarding Charles James Fox as his political leader, he joined the Whigs in the House of Lords, and became a member of the circle of the prince of Wales, afterwards George IV. Bedford was greatly interested in agriculture. He established a model farm at Woburn, and made experiments with regard to the breeding of sheep. He was a member of the original board of agriculture, and was the first president of the Smithfield club. He died at Woburn on March 2, 1802, and was buried in the family burying-place at Chenies. The duke was never married, and was succeeded in the title by his brother John.

See J. H. Wiffen, *Historical Memoirs of the House of Russell* (1833); E. Burke, *Letter to a Noble Lord* (1837); Lord Holland, *Memoirs of the Whig Party* (1854); and Earl Stanhope, *Life of Pitt*.

JOHN RUSSELL, 6th duke of Bedford (1766–1839), was succeeded as seventh duke by his eldest son, Francis (1788–1861), who had an only son, William (1809–72), who became duke on his father's death in 1861. When the eighth duke died in 1872, he was succeeded by his cousin, Francis Charles Hastings (1819–91), who was member of parliament for Bedfordshire from 1847 until he succeeded to the title. The ninth duke was the eldest son of Maj.-Gen. Lord George William Russell (1790–1846), who was a son of the sixth duke. He married Elizabeth, daughter of George John, 5th earl de la Warr, and his sons, George William Francis Sackville (1852–93), and Herbrand Arthur (1858–1940), succeeded in turn to the title. Hastings William Sackville (1888–), Herbrand's son, was the twelfth.

BEDFORD, municipal borough, and county town of Bedfordshire, England, 49 mi. N.N.W. of London by the L.M.S. railway. Pop. (1938 est.) 45,760. It lies in the fertile valley of the Ouse, mainly north of the river. Near the site was a small Roman station controlling the ford; while the rich cemetery of Kempston indicates early Saxon occupation. Bedford (*Bedcanforda, Bedanforda, Bedeford*) is first mentioned in 571, when Cuthwulf defeated the Britons here. It subsequently became a Danish borough and was captured by Edward the Elder in 914. Owing to its central position and fordable river site it became the capital of the nascent shire to which it gave its name (*see* BEDFORDSHIRE). In Domesday, as the county town, it was entered apart from the rest of the shire, and was assessed for ship service. The prescriptive borough received its first charter from Henry II. The privileges included a gild-merchant, all tolls, and liberties and laws in common with the citizens of Oxford. This charter was confirmed by successive sovereigns down to Charles II. The castle, first mentioned in 1136, was destroyed in 1224, and the gardens of the Swan hotel now occupy the site. During the 15th century, owing to the rise of other market towns, Bedford became less prosperous. Henry VIII granted a November fair to St. Leonard's hospital, which was still held in the 19th century at St. Leonard's farm, the site of the hospital. Mary granted fairs in Lent and on the Feast of the Conception, and also a weekly market. In the 17th century Bedford carried on trade in coal, brought by the Ouse from Lynn and Yarmouth. The town was also one of the earliest centres of the lace trade, to the success of which French refugees in the 17th and 18th centuries largely contributed.

Bedford was represented in the parliament of 1295, and after that date two members were returned until 1885. It remained a parliamentary borough until 1918, but later formed, with Kempston and some rural areas, the Bedford parliamentary division.

The church of St. Paul, mainly Decorated and Perpendicular, contains the tomb of Sir William Harper or Harpur (*c.* 1496–1573), lord mayor of London, a notable benefactor of his native town of Bedford. Portions of the tower of St. Peter's church are probably of pre-Conquest date; St. Mary's is in part Norman, and St. John's Decorated; but the bodies of these churches are largely restored. There are some remains of a Franciscan friary of the 14th century. The Congregational chapel called Bunyan's or the "Old Meeting" stands on the site of the building in which John Bunyan preached from 1656 onward. In the town he underwent a long but in part nominal imprisonment. In the panels of a fine pair of bronze doors in the chapel are scenes illustrative of Bunyan's *Pilgrim's Progress*. Bedford is noted for its grammar school, founded by Edward VI in 1552, and endowed by Sir William Harper. The existing buildings, however, date from 1891 and later. The Harper trust also supports other educational establishments. There are statues of John Bunyan (1874) and John Howard (1894) the philanthropist. There are two parks. Bedford has a large trade as a market town for agricultural produce, and extensive iron, steel and engineering works as well as breweries and automobile works. The municipal borough is under a mayor, 7 aldermen and 21 councillors. Area 7·8 sq.mi.

BEDFORD, a city of Indiana, U.S.A., 70m. south by west of Indianapolis; in the heart of the Indiana limestone district; the county seat of Lawrence county. It is on Federal highway 50, state highways 37, 58 and 450 and is served by Chicago, Indianapolis and Louisville railway (Monon route) and the Chicago, Milwaukee, St. Paul and Pacific railway. The population in 1940 was 12,514 by the federal census. "Bedford limestone" is one of the most highly prized building materials in the country. It is shipped to all parts of the United States and Canada and to some European countries, and has been used for public buildings in many cities. Bedford was settled in 1825 and incorporated as a city in 1889.

BEDFORD, a borough and county seat of Bedford county, Pennsylvania, U.S.A., on the Raystown branch of the Juniata river, 38 mi. S. by W. of Altoona. It is at the junction of federal highways 30 and 220 and is a point of entrance to the Pennsylvania turnpike. It is served by the Pennsylvania railroad. The population in 1930 was 2,953; in 1940 it was 3,268 by federal census. It lies in a beautiful valley at an altitude of 1,060 ft., in the heart of the Alleghenies. Bedford Springs, one mile south, is a fashionable summer resort. Bedford manufactures peanut products, handles, telephone pins and wood products.

A settlement was made there about 1750 by an Indian trader, Robert Ray, and the place was originally known as Raystown. Ft. Bedford, an important frontier post for many years, was built in July 1751. The town was laid out in 1766 and incorporated in 1795. Washington went there in 1794 to review the army sent to quell the Whisky Insurrection. His headquarters, as well as other interesting 18th century houses, are still standing.

BEDFORD, a town of Virginia, U.S.A., 25 mi. S.W. of Lynchburg, on the Norfolk and Western railroad; the county seat of Bedford county. The population in 1940 was 3,973. It lies nearly 1,000 ft. above sea level, eight miles from the Blue Ridge mountains of Virginia over which the Blue Ridge parkway passes and where the famous Peaks of Otter mountains are located. Bedford owns its own hydro-electric plant, on the James river. The principal manufactures are woollens, silks, labels and various rubber goods. Bedford is an important tobacco market. Tomatoes and other vegetables are canned in large quantities in Bedford county. The national home of the Benevolent Protective Order of Elks is in Bedford. No municipal taxes are levied on real estate, personal property or automobiles. The town was established and made the county seat by an act of the state legislature in 1782.

BEDFORDSHIRE (abbreviated Beds.) a south midland county of England, bounded northeast by Huntingdonshire, east by Cambridgeshire, southeast by Hertfordshire, west by Buckinghamshire, and northwest by Northamptonshire. It is among the smaller English counties, having an area of 473 sq.mi. It lies principally in the middle part of the Ouse basin, which, entering in the northwest traverses the rich vale of Bedford in a very winding course to reach the northeast of the county near St. Neots. A small part of the main Chiltern chain is included in the south, but most of the county is lowland and forms part of the Wash drainage system. In the south the headwaters of the Lea (Thames basin) fall within the county, and in the north a few tributaries of the Nen.

Geological Formations.—The main features are controlled by geological formations dipping to the southeast and outcropping in a general southwest to northeast direction. The Middle Oolites predominate in the north of the county, the Oxford Clay occupying the low country around Bedford. The Great Oolite is exposed by the Great Ouse above the town, with alternating limestones and clays, seen in quarries. The Cornbrash is represented by 2 ft. of limestone, but the Kellaways Rock, with its masses ("doggers") of cemented sand, is well exposed near Bedford. Next the Lower Greensand forms an elevated tract running from Potton through Ampthill to Woburn and Leighton Buzzard, where the sand is dug for various purposes. Above this comes the Gault Clay, occupying the broad vale of the Ivel and extending to the chalk. This rises abruptly from the lowland, to bare heights over 600 ft., high in the Dunshill moors and the Chiltern hills above Dunstable. At the base of the chalk is the Chalk Marl; above this is the hard Totternhoe Stone, a well-marked feature. The Lower Chalk next above is capped similarly by hard chalk as at Royston and elsewhere. The upper Chalk-with-Flints occurs near the southeastern boundary. Patches of glacial boulder clay and gravel overlie the rocks. Fossil, rhinoceros, mammoth, etc., with palaeolithic implements, have been found in most parts in the valley gravels of the Ouse basin. Occupation of the area during later prehistoric periods was slight. The small area of chalkland within the county is sufficient explanation for this. On the chalk hills are a number of earthworks probably dating for the most part from the Early Iron Age. The Late Celtic settlements, judging from the remains, extended over a restricted area which coincided with the Lower Greensand and Gault from Leighton Buzzard to Potton, good corn-growing country. Roman settlements, too, were thickest here. At Dunstable (Durocobrivae) was a posting-station on Watling street, at the crossing of the Icknield street. Another road ran approximately north through Stotford, Biggleswade, and Sandy to Godmanchester. Bedford and Shelford were stations at fords across the Ouse and Ivel respectively.

Origin of County.—In contradistinction to the southern shires in general (*see* BERKSHIRE) Bedfordshire is not a prehistoric unit, for early man avoided the swampy and forested lowlands. In Saxon times, however, the valleyward movement of population advanced far, and with better means of cultivation and forest-clearing the rich agricultural valleys were centres of attraction. The river and valley routes, moreover, guided penetration and influenced settlement. Most of the midland counties date from the conquest of Mercia from the Danes in the 9th and 10th centuries. This reconquest proceeded by the valleys, and thus Bedfordshire took shape after the struggles of King Edward (919–921). The first mention of the county named from the town comes in 1016, when King Canute laid waste the whole shire. The Domesday survey reveals an almost complete substitution of Norman for English holders. In the Civil War of Stephen's reign the county suffered severely. Again the county was thrown into the Barons' War, when Bedford Castle was the scene of three sieges before it was demolished by the king's orders in 1224.

In the Civil War of the 17th century the county was one of the foremost in opposing the king. Clarendon observes that Charles had no visible party or fixed quarter in the county. Bedfordshire had received considerable numbers of Protestant refugees from the continent and was becoming one of the historic centres of dissent. In this connection one should note that Elstow is famous as the home of John Bunyan.

The county produced no great religious houses. The Augustinian Dunstable priory remains only as a part of the parish church. Judith, niece of William the Conqueror, established the Benedictine nunnery of Elstow, of which the imperfect church remains. There are portions also of the Gilbertine Chicksands priory and of a Cistercian foundation at Old Warden. There is some Norman or pre-Norman work, as at Clapham church, but the predominant styles are Decorated and Perpendicular.

The town of Bedford (*q.v.*) is noted for its schools—Bedford school, the Modern school, the high school and the Modern School for Girls. There is a technical institute at Luton.

Industries and Communications.—Bedfordshire has always been a prominent agricultural rather than manufacturing county. From the 13th to the 15th century sheep farming flourished. Tradition says that the straw-plait industry owes its introduction to James I, who transferred to Luton the colony of Lorraine plaiters whom Mary Queen of Scots had settled in Scotland. Similarly the lace industry is associated with Catherine of Aragon. As late as the 19th century the lace makers kept "Cattern's Day" as the holiday of their craft. The Flemings, expelled by Alva's persecution (1569), brought the manufacture of Flemish lace to Cranfield, whence it spread to surrounding districts. The revocation of the Edict of Nantes, and consequent French migration, gave further impetus to the industry.

The main L.N.E.R. line traverses the east of the county, through Biggleswade. The London to Bedford line is under control of the L.M.S.; and the Bletchley and Cambridge line (L.M.S.R.) crosses these lines at Sandy and Bedford respectively. The London and Bletchley (L.M.S.R.) line serves Leighton Buzzard in the southwest and branches thence to Dunstable and Luton. A branch of the L.M.S.R. connects Bedford with the L.N.E.R. at Hitchin. There were about 960 mi. of roads in the county in 1943.

In 1939 about 79% of the total area of 301,829 ac. (excluding water surfaces) was under crops or grasses. In addition there were 8,603 ac. of rough grazing. The chief crop is wheat, for which the soil in the vale of Bedford is specially suited; while on the sandy loam of the Ivel valley, around Biggleswade, market-gardening is extensively carried on, the crops going, with much dairy produce, principally to London. The manufacture of agricultural machinery and implements employs a large number of hands at Bedford and Luton. Luton, however, is specially noted for the manufacture of straw hats. Straw-plaiting was once extensively carried on in this neighbourhood by women and girls in their cottage homes. Another local industry surviving is the manufacture of pillow-lace. Many of the lace designs are French; Mechlin and Maltese patterns are also copied.

Administration.—Bedfordshire is divided into nine hundreds, Barford, Biggleswade, Clifton, Flitt, Manshead, Redbornestoke, Stodden, Willey, and Wiscamtree, and the liberty, half hundred, or borough of Bedford. In the 11th century there were three additional half hundreds, viz., Stanburge, Buchelai, and Weneslai, which had by the 14th century become parts of the hundreds of Manshead, Willey, and Biggleswade respectively. Until 1574 one sheriff did duty for Bedfordshire and Buckinghamshire, the shire court of the former being held at Bedford. The county is in the midland circuit and assizes are held at Bedford. It has one court of quarter-sessions and seven petty sessional divisions. The boroughs of Bedford, Dunstable, and Luton have separate commissions of the peace, and Bedford a separate court of quarter-sessions. There were 124 civil parishes in 1943. Bedfordshire is in the diocese of St. Albans (having been transferred from Ely) and the archdeaconry of Bedford. The National Trust owned 381 ac. in 1942.

The area of the administrative county is 473 sq.mi., with a population of 261,980 estimated in 1938. Between Sept. 1939 and Feb. 1941 the population increased by 19%, owing to wartime evacuation from London and increased industrial and agricultural effort. The municipal boroughs are Bedford, Dunstable and Luton; the urban districts are Ampthill, Biggleswade, Kempston,

adjoining Bedford on the southwest, Leighton Buzzard and Sandy.

There are four rural districts. The county is divided into three parliamentary divisions, the Bedford, Luton, and Mid Division. Bedford was a parliamentary borough until 1918.

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See also *Bedfordshire Notes and Queries,* ed. F. A. Blades; *Transactions of the Bedfordshire Natural History and Field Club,* and *Victoria County History* (1904).

BÉDIER, JOSEPH (1864–1938), French scholar, was born Jan. 28, 1864, in Paris and was appointed professor of mediaeval French language and literature at the Collège de France in 1893. He won the degree of *docteur-ès-lettres* with *Les Fabliaux,* a work on early French poetry which was crowned by the Académie Française. The publication of his *Roman de Tristan et Iseult* (1900) set a European seal on his reputation. In *Les Légendes épiques* (1908) he developed, with a wealth of picturesque detail, his theory that the great cycles of romance grew up along the pilgrim routes of mediaeval France. He thus supplied an ingenious and romantic interpretation of the Charlemagne, Guillaume, and Quatre Fils Aymon cycles, which directly contradicted the theory of their origin from a primitive common epic material maintained by Gaston Paris and his successors. Bédier's exquisite and lucid style gained him innumerable admirers among scholars and laymen alike.

BEDLAM, the popular name of Bethlehem hospital, the first English lunatic asylum. It was originally founded by Simon FitzMary, sheriff of London, in 1247, as a priory for the sisters and brethren of the order of the Star of Bethlehem. It had as one of its special objects the housing and entertainment of the bishop and canons of St. Mary of Bethlehem, the mother-church, on their visits to England. Its first site was in Bishopsgate street. It is not certain when lunatics were first received in Bedlam, but it is mentioned as a hospital in 1330 and some were there in 1403. In 1547 it was handed over by Henry VIII. with all its revenues to the City of London as a hospital for lunatics. With the exception of one such asylum in Granada, Spain, the Bethlehem hospital was the first in Europe. It became famous and afterwards infamous for the brutal ill-treatment meted out to the insane. In 1675 it was removed to new buildings in Moorfields and finally to its present site in St. George's road, in south-east London. The word "Bedlam" has long been used generically for all lunatic asylums.

BEDLINGTON, urban district (called Bedlingtonshire), Northumberland, England, 5 mi. S.E. of Morpeth, on a branch of the L.N.E.R. Pop. (1938) 27,310. Area, 14.1 sq.mi. It lies on high ground above the river Blyth, 2½ mi. above its mouth. Bedlington (Betlingtun) and the hamlets belonging to it were bought by Cutheard, bishop of Durham, between 900 and 915 and, although in Northumberland, became part of the county palatine of Durham over which Bishop Walcher was granted royal rights by William the Conqueror. Bedlington lost these special privileges in 1536 although it remained in the hands of the bishops of Durham until taken over by the Ecclesiastical Commissioners in 1866. Bedlingtonshire was made part of Northumberland for civil purposes by acts of Parliament in 1832 and 1844.

The church of St. Cuthbert shows good transitional Norman details. Its dedication recalls the resting place of the body of Cuthbert of Lindisfarne, removed from Durham after the Norman Conquest.

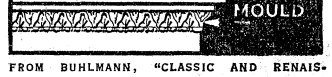
The modern growth was due almost entirely to the development of the rich coal field, though brickmaking and agriculture are important. The port of Blyth is partly in Bedlingtonshire.

BEDLOE, WILLIAM (1650–1680), English informer, was born in Chepstow on April 20, 1650. He appears to have been well educated; he was certainly clever, and after coming to London in 1670 he became acquainted with some Jesuits and was occasionally employed by them. Calling himself now Capt. Williams, now Lord Gerard or Lord Newport or Lord Cornwallis, he travelled from one part of Europe to another; he underwent imprisonments for crime, and became an expert in all kinds of duplicity. Then, in 1678, following the lead of Titus Oates, he gave an account of a supposed popish plot to overthrow the English Government, and his version of the details of the murder of Sir E. B. Godfrey was rewarded with £500. Emboldened by his success he denounced various Roman Catholics, and having become very popular lived in luxurious fashion. Afterwards his fortunes waned, and he died at Bristol on Aug. 20, 1680. Bedloe wrote a *Narrative and impartial discovery of the horrid Popish Plot* (1679), but all his statements are extremely untrustworthy.

See J. Pollock, *The Popish Plot* (1903); A. A. Marks, *Who killed Sir Edmond Berry Godfrey?* (1905); Sir John Richard Hall, *Four Famous Mysteries* (1922); R. W. Postgate, *Murder, Piracy and Treason* (1926).

BEDMAR, ALPHONSO DELLA CUEVA, MARQUIS OF (1572–1655), Spanish diplomatist, became ambassador to the republic of Venice in 1607. When Bedmar took up this appointment, Venice had just concluded an alliance with France, Switzerland and the Netherlands, to counterbalance the power of Spain. Assisted by the duke of Ossuna, viceroy of Naples, Bedmar formed a plan to bring the city into the power of Spain. The plot, fixed for Ascension Day, 1618, was discovered and Bedmar left Venice. It has sometimes been suggested that the details of the plot existed only in the minds of the Venetian senators, and that its disclosure was a ruse to get rid of Bedmar, who was certainly intriguing against Venice. In 1622 Bedmar was made a cardinal, and soon afterwards became bishop of Oviedo, a position which he retained until his death, which occurred at Oviedo on Aug. 2, 1655. The authorship of an anonymous work, *Squitinio della libertà Veneta,* published at Mirandola in 1612, has been attributed to him.

See C. V. de Saint-Réal, *Oeuvres,* tome iv. (1745); P. J. Grosley, *Discussion historique et critique sur la conjuration de Venise* (1756); P. A. N. B. Daru, *Histoire de la république de Venise* (1853); A. Baschet, *Histoire de la chancellerie secrète à Venise* (1870).



FROM BUHLMANN, "CLASSIC AND RENAISSANCE ARCHITECTURE"

BED-MOULD, in architecture, the moulding, or combination of mouldings projecting from the wall or frieze directly under the jutting portion of a cornice, as a means of support; the lowest member of a classical cornice. *See* ORDER.

BEDOUIN: *see* ARABS.

BEDOUL. In the mountains of the Sinai peninsula, inhabiting the tombs, are the Bedouls, the "changed ones," who are said to have been Jews and to have abandoned their faith some centuries ago.

BED-SORE, a form of ulceration or sloughing occurring in persons who, through sickness or old age, are confined to bed, and resulting from pressure or irritation by faeces or urine. Bed-sores denote a low nutritive condition of the tissues. They may occur wherever there is pressure, and lack of cleanliness is an important factor in their production. Nevertheless, where the lower reflex arc is broken by lesion of the spinal cord or of posterior nerves or nerve-roots bed-sores of unusual severity and rapid onset are almost inevitable. All parts subjected to pressure or friction must be frequently washed with soap and warm water, and dried with a warm, soft towel. The part should then be bathed in a solution of corrosive sublimate in spirits of wine and, finally, dusted with an oxide of zinc and starch powder. Pressure may be relieved over bony prominences by a water or air pillow. Where bed-sore threatens, the skin becomes dead white or dusky red and the redness does not disappear on pressure. The surrounding tissues become oedematous and pain is often severe, except in paralysis. As the condition progresses, pain ceases, the epidermis becomes raised as in a blister, and finally becomes detached. Even now actual ulceration can be prevented if proper care be taken; but failing this, the skin sloughs and an ulcer forms. In treating this, the position of the patient must be such that no pressure is allowed on the sloughing tissue, and the parts should be dusted with animal charcoal and iodoform and protected with a dry dressing.

When the slough has separated and the sore is clean, friar's balsam may hasten healing.

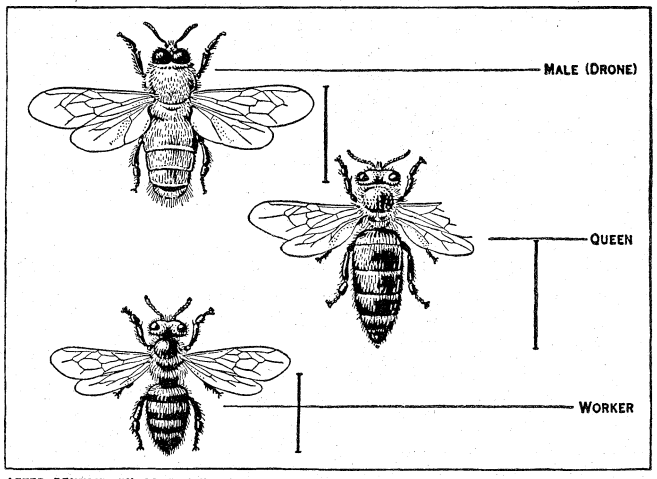
BEDSTRAW, a genus of plants (*Galium*) of the family Rubiaceae with about 300 species, found chiefly in temperate parts of the northern hemisphere, many of them being common weeds. The flowers are minute, but are often aggregated into large panicles (*see* FLOWER). Common British species are the yellow bedstraw (*G. verum*) and the goosegrass or cleavers (*G. Aparine*), which bears hooks on the stems, leaves and fruits. Both the foregoing are found in Europe and North America. In the United States and Canada there are some 60 species of *Galium*, several of which are introduced weeds. Among the more conspicuous are the sweet-scented bedstraw (*G. triflorum*), which grows throughout that continent and also in Europe and Asia; the northern bedstraw (*G. boreale*), with profuse clusters of white flowers, found across N. America and also in the British Isles and across northern Europe and Asia; the great bedstraw (*G. Mollugo*), called also wild madder and baby's-breath, an Old World plant, naturalized from Newfoundland to Ohio; the wild licorice (*G. circaezans*), found in dry woods from Quebec to Minnesota and southward; and the California bedstraw (*G. californicum*), a yellow-flowered species, native to the Coast ranges. Some species, including *G. verum, G. trifidum* and *G. boreale,* yield dyes.

BEDWORTH, manufacturing town and urban district (1928), Warwickshire, England, 3½ mi. S. of Nuneaton on the L.M.S.R. Pop. (est. 1938) 20,431. Area, 12.4 sq.mi.

A tramway connects with Coventry, and the Coventry canal passes through. Coal and ironstone are mined extensively; and hats, tape, ribbons and trimmings are made. There are also brickworks.

Similar industries are carried on in the populous district which extends southward towards Coventry.

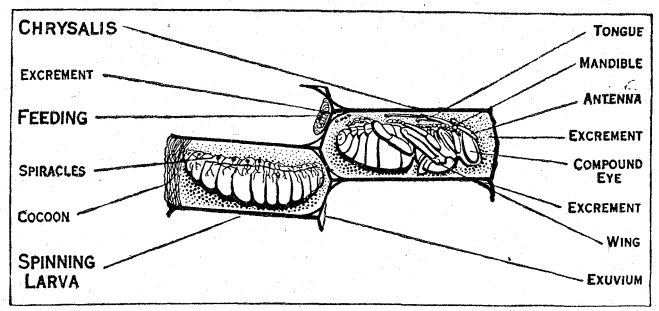
BEE, the name given to a large group of insects forming the superfamily *Apoidea* of the order HYMENOPTERA (*q.v.*). Their



AFTER BENTON, BY COURTESY OF THE U.S. DEPARTMENT OF AGRICULTURE

FIG. 1.—THREE MEMBERS OF THE HONEY-BEE (APIS MELLIFICA) COMMUNITY

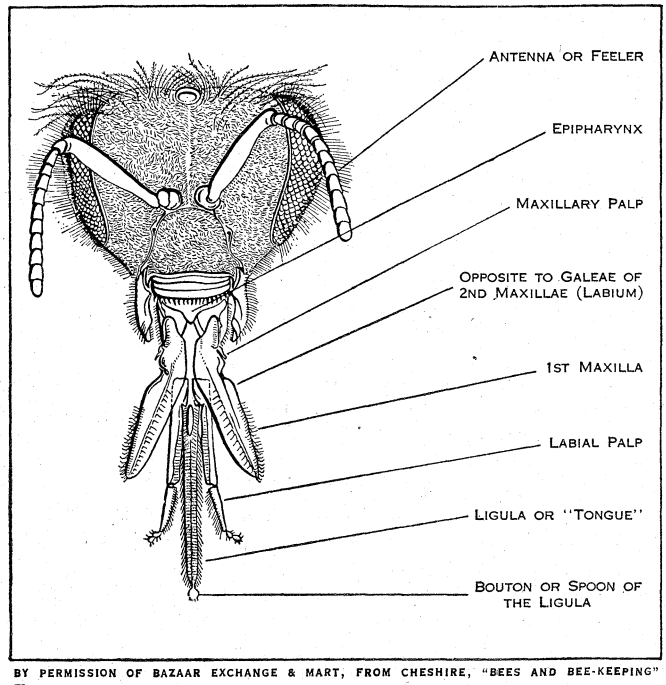
chief distinguishing features are correlated with their habit of obtaining pollen and nectar from flowers. Most species of bees are hairy and over parts of the body the hairs are branched or



BY PERMISSION OF BAZAAR EXCHANGE & MART, FROM CHESHIRE, "BEES AND BEE-KEEPING"

FIG. 2.—LARVA AND PUPA OF THE HONEY-BEE

feathery. The labium and maxillae are developed in the form of a proboscis for extracting nectar, the principal part concerned being the ligula, which is modified to form the so-called tongue. Adaptations for pollen-collecting are found on the hind legs, the tibia and first joint of the tarsus usually being dilated and densely

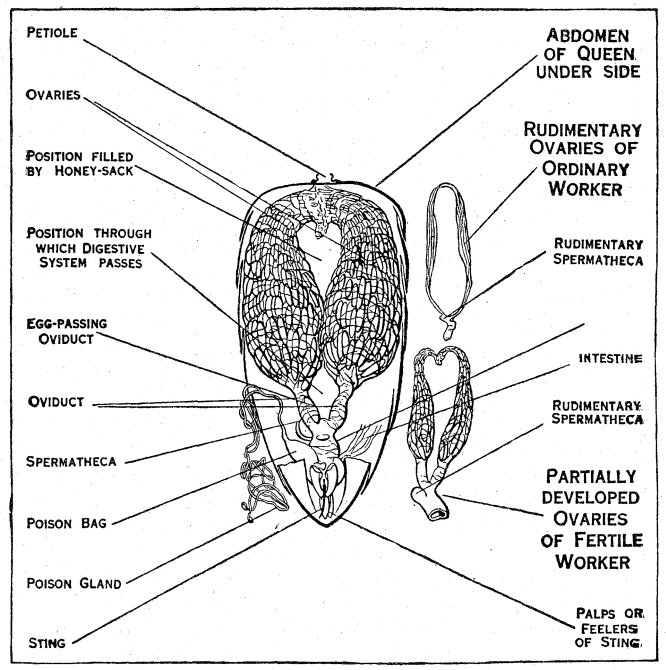


BY PERMISSION OF BAZAAR EXCHANGE & MART, FROM CHESHIRE, "BEES AND BEE-KEEPING"

FIG. 3.—MAGNIFIED DETAIL STUDY OF THE HEAD AND APPENDAGES OF THE HONEY-BEE

covered with pollen-carrying hairs; in some bees the under side of the abdomen is also beset with regularly arranged hairs.

The eggs of bees are laid singly in chambers or cells, each nest containing several or, in the hive bee, many thousand cells: along with each egg sufficient food is deposited to nourish the

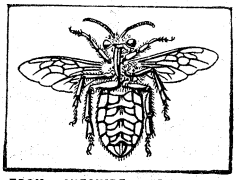


BY PERMISSION OF BAZAAR EXCHANGE & MART, FROM CHESHIRE, "BEES AND BEE-KEEPING"

FIG. 4.—THE OVARIES OF QUEEN AND WORKER HONEY-BEES

larva until it pupates. Nectar and pollen form the food of bees, and their larvae (or brood) are fed upon the same ingredients except that the nectar is regurgitated as honey before being supplied to them. The majority of bees are "solitary," like

other insects, and are represented by ordinary males and females, each female constructing a nest for her brood. On the other hand, the bumble-bees, the hive-bees and the "stingless" bees of the tropics are "social" insects living in large communities. In addition to fertile females (queens) and males, such communities comprise a far greater number of other females, "workers," with imperfectly developed ovaries. Social bees construct nests out of wax secreted by themselves. The social species are treated separately (*see* SOCIAL INSECTS). Solitary bees nest in a variety of situations: many, such as *Andrena* and *Halictus,* construct burrows in the ground with the individual cells leading off from the main passage. Others, such as *Osmia,* utilize existing hollows or crevices whether they be in wood, bramble-stems or mortar: they may even occupy empty snail-shells or keyholes. About 10 to 20 cells usually compose a nest, but one of 230 cells is recorded. The mason bee (*Chalicodoma*) of southern Europe builds its nest often on large stones: the individual cells are constructed of soil and small pebbles mixed with saliva and the whole nest is plastered over with the same material until it assumes a dome-shaped form, about the size of half an orange. The carpenter bees of the genus *Xylocopa* include the largest of all bees and are widespread in warm countries, although one species occurs as far north as Paris. These giant bees tunnel by means of their powerful jaws in dry wood for a distance of a foot or more, dividing their burrows into a series of cells formed of agglutinated wood particles. The genus *Megachile* includes the leaf-cutting bees which nest in soil, in wood, or in hollow stems. The cells are thimble-like in form and constructed of rounded pieces of leaves or petals which are cut by the jaws of the bee from roses and other plants: the more ovoid pieces form the bottoms and side-walls of the cells; these are closed by several circular pieces which are firmly pressed down to form closely fitting lids. (*See* SOCIAL INSECTS.)



FROM CHESHIRE, "BEES AND BEE-KEEPING"

FIG. 5.—UNDER SIDE OF HIVE-BEE, SHOWING WAX SCALES ON ABDOMEN

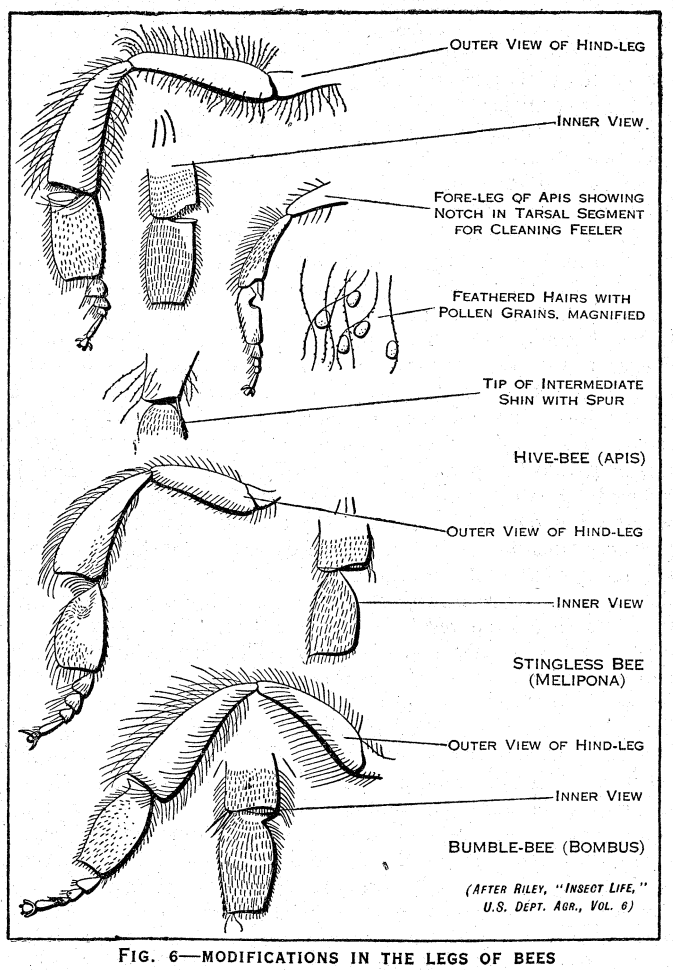


FIG. 6—MODIFICATIONS IN THE LEGS OF BEES

A number of solitary bees construct no nests of their own but live as inquilines or "cuckoo-parasites" in those of other species: such bees are less hairy than usual and lack special modifications for pollen-collecting. The black and yellow species of *Nomada* lay their eggs in nests of *Andrena,* and their larvae are nourished at the expense of those of the latter, which become starved out. Another parasitic bee, *Stelis,* utilizes a species of *Osmia* as its host: its eggs are laid earlier than those of the *Osmia* and are placed towards the bottom of the food-mass in the cells, whereas the eggs of the host are laid upon the surface of the food. Both larvae feed amicably at first but finally the *Stelis* larva attacks and devours that of the *Osmia.*

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BEEKEEPING

Beekeeping is the art of so caring for honeybees that they may be able to produce honey for human use in excess of their own needs. This art is supported by various lines of scientific work. Beekeeping is of great antiquity and was practised long before the scientific basis was known, but after the invention of the modern beehive in 1851, methods of management were possible which added greatly to the productivity of colonies, and beekeeping has grown into an important business. The greatest advance has been made in countries where honey production is developed commercially. If honeybees produced no honey, they would still be important because of the pollination services they render. Not all areas are equally suitable for honey production, and it is not economically practical to modify an area in this respect. Man is unable to modify the behaviour or physiology of bees and must perform all operations with them in accordance with their inherent functions. By study of their behaviour it has been possible to control the development of the colony so that the highest population is attained when it is most profitable and to avoid some inherent manifestations of behaviour such as swarming. By such changes, all in accordance with normal bee activities, beekeeping has become more profitable not only in producing food but in providing pollination.

The Bee Colony.—A colony of honeybees is composed of as many as 80,000 to 90,000 individual bees living together in a cavity on beeswax combs built by the bees themselves. They are individually unable to perform normal functions and the maintenance of the colony depends upon a division of labour. That the work of a colony may progress harmoniously, colony duties must be performed by different individuals, and this is brought about by a change of duties according to the age of the individual workers. If bees of the proper age are lacking, their duties may be undertaken by bees of some other definite age, but not by all other bees. There is also division of labour based on one bee

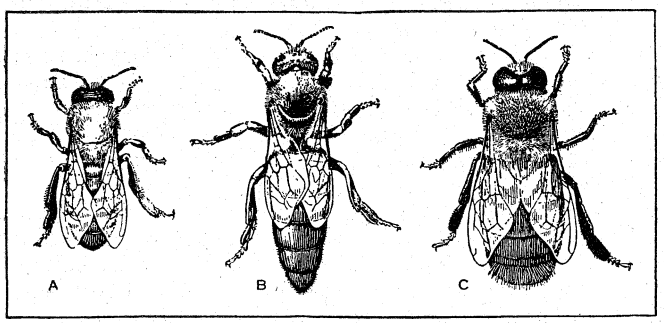


FIG. 7.—THE HONEYBEE: A, WORKER; B, QUEEN; C, DRONE

(the queen) producing the eggs and others that only mate with the queen.

The nest in which a colony lives is formed of parallel combs suspended from the top of the cavity. Under human care, the cavity is a beehive. Each comb is a double layer of cells, and

these cells fit base to base so that a cell on one side impinges on three cells of the opposite side. Cells are of two sizes, the smaller, five to the inch, being used for rearing worker bees and pollen storage. The larger, four to the inch, are used for rearing drones, for honey storage and other uses, but under modern methods the larger cells are restricted and all cell uses are met by worker cells, thus inhibiting the rearing of large numbers of drones. The cavity containing combs is protected by propolis, a resinous secretion of various plants collected by workers and used to cover rough surfaces in the cavity. It serves to waterproof the nest cavity.

The Queen.—The queen bee is a fully developed female and, after being in a colony for some time, is the mother of the other bees. Her sole function is egg laying, and at the height of the season she may lay 1,800 eggs daily. Under exceptional conditions she may lay double that number daily for several days. The egg is attached by an adhesive and is erect on the waxen base of the cell. She normally lays one egg to a cell, and when more than one egg is found, it may indicate a failing queen. Queen bees are developed in cells larger than those of the normal comb, the royal cell being vertical, pitted outside and round inside. The period of development is about 16 days. After emerging, the queen wanders about the combs and receives little attention from hive mates. When five to eight days old, she flies from the hive to mate with a drone on the wing, usually high in the air. When the queen has freed herself from the drone she returns to the hive, and in about two days after mating is ready for egg laying duties. Only in exceptional cases do queens mate more than once. The number of eggs laid depends on the need of the colony and on the ability of worker bees to care for brood. If a queen dies or is lost when eggs or young brood are available, the workers rear another queen, but if death of the queen occurs when there is nothing from which to rear another, the colony soon dies. When a queen becomes weakened by age or other causes, she is superseded, this usually taking place prior to her death. Queens may live for three years or more but before death are often replaced by the beekeeper.

Worker Bees.—The most numerous caste of bees is the workers, which have all female organs in undeveloped condition. Worker bees normally lay no eggs but if a colony is queenless, they may lay eggs which develop only into drones (*see* PARTHENOGENESIS). The period of development is 21 days. Worker bees feed the brood, clean the hive, guard against intruders, construct combs, collect pollen and nectar and incidentally bring about pollination of many of the visited flowers. The term of life of a worker is determined by the labour that it performs, and life is shortened when nectar is abundant. The continuance of life of the colony over winter depends on the ability of workers to maintain a suitable temperature for muscular activity of the colony, since bees do not hibernate but remain active throughout winter. In winter the queen lays no eggs but remains passive among the workers. While worker bees are engaged in winter heat production, the labour involved is less than that of collection, and the length of life is prolonged enough to enable the colony to survive. In summer workers often die after six weeks, while in winter they may live six months.

Drones.—Male bees or drones appear in a colony in spring, after brood rearing has well begun for worker bees. Drones develop from unfertilized eggs (*see* PARTHENOGENESIS), the period of development being 24 days. The number of drones reared depends more on the type of cells in the central part of the combs, and if there are many drone cells more drones are reared. When the time arrives when drones are to be reared, the queen may migrate to a distant part of the hive to locate drone cells. Drones die in mating, but since normally only one drone mates with each queen, most drones die of other causes. They are tolerated so long as nectar is coming to the colony, but when a dearth occurs, drones are driven from the hive to starve. They rarely die a natural death, and virtually none survive until winter. Drones perform no important colony function other than reproduction. They consume much honey and are fed by workers so long as they are allowed to remain.

Orderly Behaviour of Members of the Colony.—The conduct of the colony is so harmonious that some are inclined to attribute high intelligence to bees. A bee flies, feeds larvae, and performs all other functions as well the first time as the last, and there is little improvement from practice, hence it is clear that the behaviour is instinctive. The typical behaviour of a honeybee, like that of insects generally, is inherent. While bees show memory of location, this constitutes almost their sole adaptation to changing conditions. Inability to make adjustments often results in death, and makes it necessary that the care of bees be based on knowledge of their normal instincts.

Cycle of the Year.—Beekeepers often state that the beekeeper's New Year begins in late summer, for at that time the purpose of the beekeeper changes to direct attention to the work of the year ahead. The time of New Year depends on where bees are kept, but everywhere that bees exist there is a variable period during which no brood is reared, this being the broodless or winter period. The New Year begins six to eight weeks prior to cessation of brood rearing, during which time bees are reared to survive the broodless period. Winter is the time when bees require the greatest care, even though the beekeeper does not then handle them. Bees remain active throughout winter, even when they do not fly from the hive. In autumn they are inactive, but when the temperature in the hive drops to 57° F., the bees form a winter cluster in the centre of the hive where the last brood was reared. They fill vacant cells in this area, one bee to a cell, and between combs they form parallel circles, larger in the central part, to form a compact and roughly spherical cluster which serves to conserve the heat generated by muscular activity. The bees in the circles between combs perform two services, the innermost being active in heat production and the outer ones forming an effective insulating zone. Heat is produced by movements of the abdomen, antennae or legs, and when the temperature outside drops toward zero, bees fan their wings to produce heat. The insulating zone is effective because of the minute dead air spaces formed by hairs on the body and the tracheoles in the body. Temperatures within the cluster vary inversely with the temperature of the air immediately outside the cluster, and in severe weather the inner temperature may rise to 94° F., but not higher, because when that temperature is reached the top of the cluster is loosened to permit escape of warmed air. Bees thus have two specific temperatures to which they react, that of cluster formation and that of escape of warmed air, and this seems to indicate an exact temperature sense. When the winter cluster period has passed, brood rearing begins, and this may be induced by two types of conditions. If bees are subjected to severely low temperatures, or if they are wintering on honey that produces much faecal matter (called dysentery by the beekeeper), the temperatures of the cluster may rise to 94° F., and when that occurs, the queen instinctively begins to lay eggs. Such winter brood rearing often results in the death of the colony. On the other hand, when the first nectar or pollen is produced, if temperatures permit flight, the temperature of the part of the hive occupied by bees rises to 94° F., and this also induces egg laying. The second reaction is normal, and occurs in spring early enough to permit the colony to rear bees to replace the worker population. In the period of spring brood rearing, bees are reared to provide the enormous number of bees for the harvest. Since the population increases in spring and early summer, the colony reaches the peak of population, and the skill of the beekeeper is shown by his ability to provide conditions for the colony in stores, protection and space within the hive, so that this high population is attained prior to the harvest. The unskilled beekeeper relies on the harvest to stimulate his bees to greater population. Adjustment of population to the heaviest nectar gathering varies according to the time of the harvest, and usually the harvest comes in early summer, which necessitates heavy stores for spring. The skilled beekeeper provides his bees with abundant stores in autumn, so that there is no necessity for spring feeding. The tendency to leave more stores has been marked among progressive beekeepers since about 1916, and it is impossible to leave enough stores in a small hive. From this has grown the method of wintering colonies in two hive bodies,

one above the other, thus providing all the factors of safe wintering and heavy colony development.

The Brood Cycle.—The amount of brood in a colony varies within the season. There is a great impetus to brood rearing until the peak is reached, after which the amount declines. During late summer, the amount of brood equals about half that of the spring period, unless there is a heavy secretion of nectar. As population advances to the peak, incoming nectar and pollen make little difference if the colony is well supplied, but in autumn the colony reduces the brood until finally brood rearing ceases. Swarming occurs as the bees advance to the peak. It often happens that in early spring nectar is secreted heavily, from which the bees obtain only some help in progressing to the peak, because the colony is not yet up to adequate gathering strength and also because spring weather is often unsuited to heavy gathering.

Swarming.—As colony population increases, congestion often occurs in the brood area and the colony prepares to divide by swarming. First queen cells are built, from which will emerge the queen to head that part of the colony remaining in the original hive. When the queen cells are sealed, the swarm issues, composed of the old queen and most of the worker bees in the hive at the time. The bees rush from the hive into the air, and shortly begin to fly in great circles. The circles progress toward some support on which the bees form the swarm cluster. The bees are organized in flight and form the cluster in response to odour produced by worker bees. If left alone, scouts are sent out to locate a cavity suitable for a new home, but at this stage the beekeeper interferes by capturing the swarm. The bees are simply shaken into a container and carried to a hive, into which they move quickly. The queen bee normally accompanies the swarm, but if she fails to do so, the swarm cluster breaks and the bees return to the original hive. The queen is not leader of the swarm. If the original colony is prosperous, secondary swarm may issue, each headed by an unmated queen, but second swarms are rarely able to build up enough to survive and their issuance is avoided. Second swarms are usually fleet on the wing. Since swarming divides the colony at a critical time, the beekeeper does his utmost to prevent it.

Nectar Gathering.—Worker bees collect nectar from any available nectar source when weather permits, but in each locality there are a few periods, usually a few weeks long, when nectar is brought to the hives in larger amounts, adequate to provide more honey than required by the bees. These periods are known as honey flows. It is important that the beekeeper learn when honey flows occur, so that he may assist the colonies to maximum population prior to the beginning of the harvest period. In general nectar secretion is heavier in temperate regions, and best at high latitudes and altitudes. Contrasting day and night temperatures are common in areas of heavy nectar secretion. The plant source of nectar varies according to prevailing imported or native plants that secrete nectar, and the beekeeper does not find it profitable to plant anything for nectar production. In North America at least half the nectar producing the commercial honey crop is derived from introduced plants, such as clovers, alfalfa (lucerne) and buckwheat. Honeys vary according to the floral source of the nectar, and the variations include flavour, odour and colour. Most clovers yield honey of light colour and mild flavour, while buckwheat provides a dark honey of more pronounced flavour. Yields of nectar vary, not only in different locations but from season to season. Exploring bees locate nectar sources and communicate with hive mates by means of a circular dance. Field bees then collect the nectar and carry it to the hive where it is turned over to young bees for ripening, which takes place in the warmed brood nest. Later excess moisture is eliminated and the ripened honey is stored in upper parts of the hive if temperature conditions permit. Since ripening and storage of honey require considerable comb space, it is important that the beekeeper provide room for both processes. Space beyond that required for the stored honey must be provided, and the skill of the beekeeper is indicated by the room made available at this time. Room for ripening and storage is usually not provided too long in advance, but must be available before it is needed. If adequate space is not given, gathering ceases and the bees hang out in front of the hive in a manner well known to all beekeepers. The upper hive bodies used for storage are called supers. As additional supers are required, they are preferably placed beneath those already filled but not ready for removal. This adjustment of hive parts reduces danger of swarming, facilitates ripening of the honey and gives better results in the honey crop than does the placing of supers at the top. Results vary considerably according to the rapidity of the honey flow and the amount of moisture that must be eliminated from the nectar.

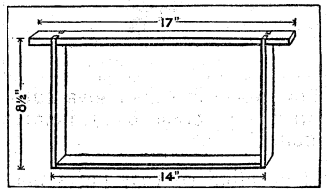
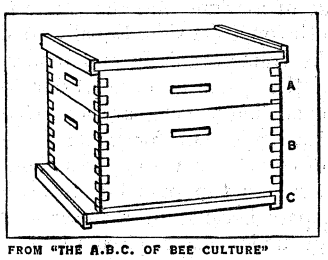


FIG. 8.—THE STANDARD FRAME OF GREAT BRITAIN, 14 X 8½ INCHES

Beehives.—A colony of bees under human management lives in a hive. In days of antiquity a straw skep was used, styles of these varying in different areas. The skep is still used in parts of Europe, but elsewhere it serves only as a symbol of beekeeping. When bees were imported to the United States, straw skeps were not used, but boxes and hollow logs served the same purpose. All hives of these older types are deficient because it is impossible to provide added space when needed, and because it is impossible to handle the combs or to examine the colony completely, thus it is impossible to perform the many functions of a skilled beekeeper. This problem was appreciated many years ago and several efforts were made to devise a hive suitable to colony control. The great Polish-German beekeeper Johann Dzierzon (discoverer of parthenogenesis in drones of the honeybee) devised a cupboard opening at the rear in which bars were suspended on which the bees built comb. Other beekeepers devised frames for the combs, but the early frames were difficult to handle because they soon became fastened to the containing box with propolis. The noted Swiss naturalist, François Huber, devised a hive consisting of frames hinged so that observations might be made of bee behaviour on any comb surface.



FROM "THE A.B.C. OF BEE CULTURE"
FIG. 9.—THE IMPROVED LANGSTROTH HIVE
This type, popular among American beekeepers, has a flat roof-board covering the frames allowing ¼ in. between roof and top bars for bees to pass from frame to frame

The Baron von Berlepsch improved the Dzierzon hive by constructing frames for the combs, still retaining the form of a cupboard opening at the rear. In 1851 the Rev. L. L. Langstroth of Philadelphia, Pa., hit upon the plan of making a hive opening at the top, to contain frames constructed with a space free on all sides, this space being called the bee space. If a space of ¼ in. to ½ in. is left, the bees do not deposit propolis or build combs in it. This discovery formed the basis of all modern colony management. A hive opening at the top makes it possible to expand the hive as needed without limit. Hives opening at the rear are still preferred in German-speaking countries, and hives opening at the top are used in all other parts of the world. The failure of beekeeping to develop as an industry in German-speaking lands is due largely to the use of hives of the Dzierzon type. The outer dimensions of the frames made by Langstroth were $17\frac{3}{8}$ in. by $9\frac{1}{8}$ in., the length later being changed to $17\frac{5}{8}$ in., and this slightly modified frame is standard for all countries in which honey production is important. In the British Isles a smaller frame is employed, having been selected as a standard at a period of the development of beekeeping when small hives were in common use (1890). In most of France, Italy, the Balkans and Russia, a deeper frame is used, known as the Dadant or Dadant-Blatt. The exact size or shape of the frame is less important than other considerations, but if the hive is too small, or only one hive body is used there is not adequate room for the development of powerful colonies, hence swarming is intensified and the colonies fail to gather the full crop. Elaborate hive shelters with space between the outside and the part occupied

by the bees are used in the British Isles. In the United States the hive usually consists of a plain box made of four pieces of wood, and when outer protection is needed, it is given as added insulation. The simple box makes manipulation easier during those parts of the year when bees are handled. The beehive is a home for the bees and a tool of the beekeeper, and the plain box is as good a home for bees as any that has been devised. It is a far simpler tool for the beekeeper than complicated hives of any sort. All hives in an apiary should be alike so that parts may be interchanged.

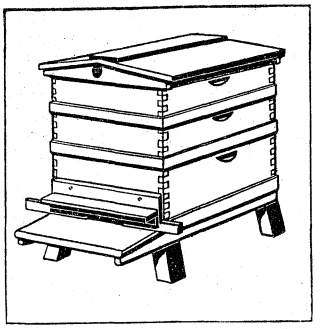


FIG. 10.—THE W.B.C. HIVE SUITABLE FOR COMB OR EXTRACTED HONEY

Other Beekeeping Appliances.—Many other tools have been devised to facilitate work of the beekeeper. The honey extractor, invented by Major Hruschka and introduced to Great Britain and the United States about 1865, makes it possible to remove honey from large combs by centrifugal force and then return the combs to the hive to be refilled. This makes possible the modern production of honey. Various types of extractors are in use. The greatest mechanical development was made in the United States and Canada where mechanical progress was stimulated by commercial honey production. In older types of extractors the honey is thrown from one side of a frame and the frame is then turned to remove honey from the opposite side. Equally good results are obtained by placing the frames radially and removing the honey from both sides of the frame at once. Prior to extracting honey, the cappings over honey cells are removed with a hand knife or by uncapping equipment for larger operators. Queen excluders are pieces of equipment with spaces about $\frac{1}{6}$ in. across through which worker bees can pass but through which queens and drones cannot pass because of their greater size. These excluders are helpful under some circumstances. While good when properly used, improper use may seriously retard the growth of the colony. Comb foundation is another important invention, consisting of sheets of pure beeswax on which are embossed the bases of cells of the honeycomb. These wax sheets are fastened in frames and given to colonies, and worker bees secrete additional wax to extend the side walls of the cells, thus saving much wax secretion. The chief benefit of comb foundation is that its use controls the size of cells and reduces the amount of drone comb. Comb foundation was formerly manufactured in presses or in hand-driven mills with embossed cylinders, but power-driven mills have been developed in which comb foundation is manufactured by the ton. Smokers are small furnaces with attached bellows in which smoldering decayed wood, burlap or other material generates smoke. The smoker is so devised that a blast of cool smoke may be directed over the bees to subdue them when handled. Equipment has also been devised to pump honey, to care for honey cappings after their removal from the combs, for straining honey, for honey storage and to facilitate other labour performed by the beekeeper. Catalogues of appliance manufacturers show all such equipment and may be had on application.

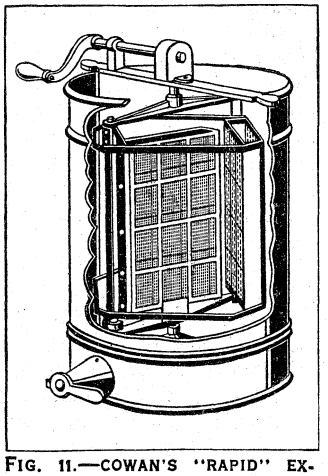


FIG. 11.—COWAN'S "RAPID" EXTRACTOR
Part of outer casing is removed to show the frame cases hung at the angles of a revolving iron frame

Evolution of Beekeeping Practice.—Prior to the invention of the Langstroth hive, honey was sometimes removed from combs by heating or pressing, and was commonly eaten in the comb. Beekeepers of that period sometimes placed receptacles on top of hives in which bees built combs and stored honey, the honey and receptacle being sold together. Special boxes were often made for such use. The hive devised by Langstroth was shallow to induce bees to more rapidly enter these boxes above the hive. The invention of the honey extractor led many beekeepers to consider selling their product in liquid form, and there was a brief early period when honey extractors were widely used. Beekeepers of that period had not learned the necessity of allowing honey to remain on the hives until thoroughly ripened and much of the honey then extracted fermented and was lost. The invention of comb foundation and the invention of the one-piece wooden section (1874) to hold slightly less than one pound of comb honey directed attention to the production of section comb honey. The wooden sections are made of basswood (linden) and this is the only wood suitable for the bending necessary in section construction. In the late '80s the production of comb honey became popular and this period in beekeeping lasted to the turn of the century. An added reason for comb honey production was that there were then no adequate laws to curtail food adulteration, and much extracted honey was sophisticated. While comb honey production was popular, hives were made smaller to crowd the bees into the small sections in the supers. As hives became smaller and smaller, colonies were also smaller, swarming was serious, one of the brood diseases destroyed many colonies and finally beekeeping became too hazardous for profit. During this era of small hives, the British standard frame was adopted. The passage of the federal food and drugs act of 1906 in the United States, soon followed by similar laws in the several states and in other countries, together with simultaneous experimentation on better methods of extracted honey production, led to the gradual abandonment of comb honey production. During World War I the demand for comb honey almost disappeared while that for extracted honey rapidly increased, and this change led to a rapid shift to extracted honey production in the United States and Canada, accompanied by a great increase in the number of commercial honey producers. It was at this period of development that emphasis on large-scale production became evident in these countries. When comb honey gave way to extracted honey production, discussions again arose regarding hives and frame sizes, but just prior to World War I the Bee Culture Laboratory of the United States department of agriculture began to advocate the use of two-story Langstroth hives throughout the year, heavy stores for winter, heavy added protection for winter and the maintenance of stronger colonies throughout the year. This movement was greatly stimulated during World War I. The use of two-story hives makes it undesirable that deeper frames be used, and the frame devised by Langstroth for the production of box honey is suitable for brood rearing and equally suitable for use in supers. Relatively few American beekeepers now use the frame 2 in. deeper than the Langstroth, originally devised by Moses Quinby and advocated by Charles Dadant. These changes in beekeeping methods with related changes in equipment have all been due primarily to conditions outside the control of the beekeeper, and his task has been to adjust his industry to changing social and economic conditions. Comb honey production has almost disappeared in the United States and Canada and is

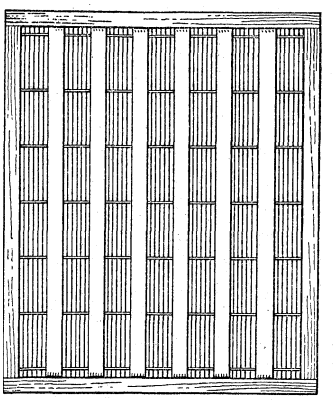
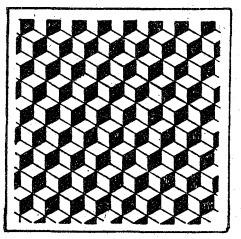


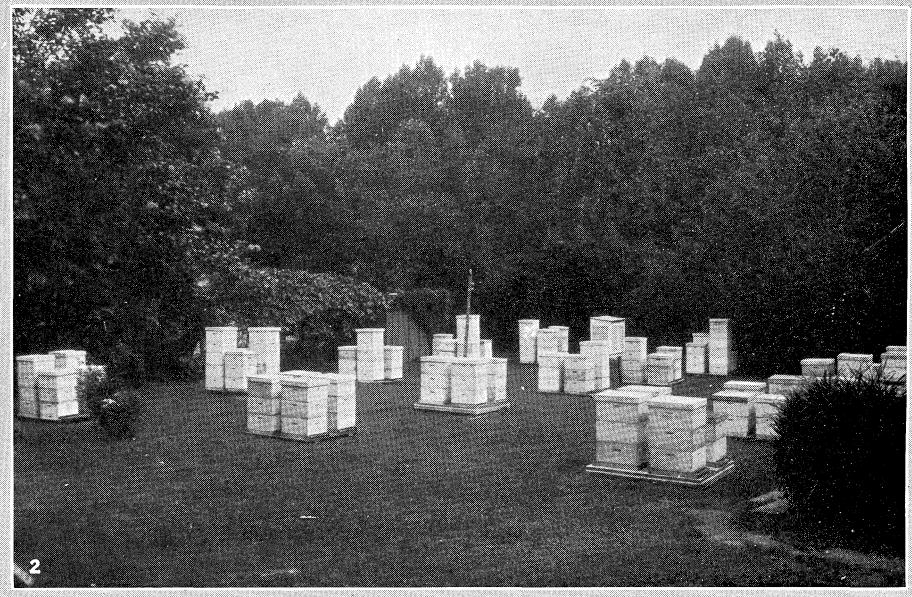
FIG. 12.—PERFORATED ZINC QUEEN EXCLUDER



FROM CHESHIRE, "BEES AND BEE-KEEPING"

FIG. 13.—COMB FOUNDATION, SHOWING PORTION OF TYPE-METAL PLATE









BY COURTESY OF (1) THE NEW ZEALAND HIGH COMMISSIONER, (2, 3, 4) THE UNITED STATES DEPARTMENT OF AGRICULTURE

VIEWS OF BEE FARMS

1. View of the Ruakura Farm of Instruction in Bee-keeping, New Zealand
2. The Somerset Apiary of the United States Bureau of Entomology
3. An early type of apiary in which the bees were kept in boxes without movable frames
4. Removing the honeycomb from the hives at the Somerset Apiary

disappearing everywhere.

Races of Bees.—The honeybee is native to the old world and is found throughout Europe, Asia and Africa. In parts of Asia the native bees are not true honeybees but belong to other species. The giant bee of India and the Philippines is larger than the honeybee and is incapable of management. Smaller bees of India, *Apis indica* and *Apis florea* produce small yields of honey.

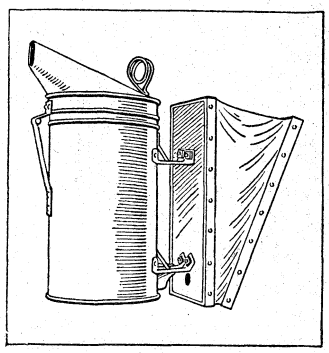


FIG. 14.—SMOKER

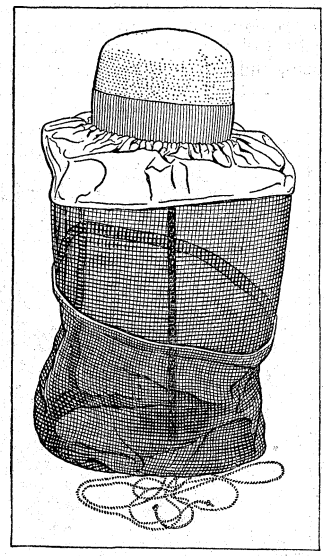


FIG. 15.—BEE VEIL WITH WIRE CLOTH FRONT

Cultivated bees of India and China are larger races of *indica*. In regions to which the honeybee is native, variations of colour and markings are noted, and the races are usually named for the places of origin. The common races are black (German), Cyprian, Carniolan, Caucasian and Italian, and other races have been described, differing not only in colour but in behaviour. Bees of Great Britain were originally black but apparently differ from black bees of Germany and France. In heather regions of northwestern Germany, the adjacent Netherlands and southwestern France, a black bee occurs which differs from other bees and is named the heather bee. Bees are not native to the Americas and were introduced early in colonial days by the Spanish and British settlers. Some records exist of these importations but it is difficult to establish their authenticity. Bees were brought to Massachusetts in 1634 and spread westward rapidly, the first bees being blacks. It was long supposed that these bees had been brought from England, but observations of the behaviour of heather bees and such black bees as may be found in the United States suggest that the colonists obtained the bees in Holland. It is worthy of mention that the Pilgrims had a colony in Leyden. Italian bees were introduced to America in the early '60s and bees of this race are superior to the original stock for American methods. In the '80s much interest was shown in new races and bees were tested from various lands. Bees from Cyprus are unmanageable and those from Carniola swarm excessively but have some good traits. Caucasian bees are the gentlest known. Difficulties of importation have reduced adherents to these races. Italian bees bred in the United States are superior to newly introduced stock, and they are preferred by most American, Canadian and British beekeepers as well as in Australia, New Zealand and elsewhere.

Practical Management of Bees.—The task of the beekeeper is to provide conditions for the colonies so that they may perform their labours to his advantage. This necessitates handling of colonies, but should be done only when helpful. To open a colony, smoke is blown into the entrance and over the frames as the cover is removed. This drives back the guards which gorge themselves with honey and become more tractable. The frames are loosened with an appropriate tool and may be removed. The frame is lifted by lugs at the ends of the top bar, and to examine the opposite side, the top bar is brought to a vertical position, and by using the top bar as a pivot, the frame is turned. This is important when fresh honey is present in the combs, and is good practice at all times. Beekeepers wear veils, several types of which are available, but gloves are usually an encumbrance. If bees have collected excessive propolis, this may be scraped off. This is easier in spring. The skilled beekeeper can know the condition of the apiary by examining a colony or two. Some maintain a colony on scales to get a daily record of the nectar gathered. During the active season, the important work of the beekeeper is to provide adequate room for ripening and storing honey. At other periods, a populous colony with a good queen needs only stores, space for brood rearing or for the winter cluster, and protection in severe weather. A queen may be replaced when she shows signs of failing, but this should usually not be done in spring nor in autumn. The best time to requeen is just after midsummer, so that the new queen may be established before the last brood of the year is reared. The use of at least two-hive bodies throughout the year is the foundation of sound practice. With this method, swarming is less common, room is available for full colony strength and adequate stores may be available. Feeding of honey or sugar syrup has been abandoned by skilled beekeepers except to supplement honey of low quality for winter or to make up for shortages. The chief problems of the beekeeper are prevention or control of swarming, and proper care in winter. Swarm control is necessary to success, since such division of the colony occurs at the time when it works the greatest harm. If more colonies are desired, it is preferable to divide colonies artificially after the honey flow. Since swarming is due to a congestion of bees in that part of the hive used for brood rearing, prevention consists chiefly in inducing bees to work in the supers, or in relieving congestion by manipulation. Two common methods used are that some brood is removed or the queen is removed or caged, the amount of brood removed or the duration of a queenless condition being determined by the persistence of the colony in swarming as shown by construction of queen cells. In extracted honey production, an empty hive body with combs containing the queen is placed at the bottom of the tier and over it a queen excluder. Above this are placed two or more supers and at the top is placed the brood. This manipulation produces conditions of a swarm at the bottom and of a parent colony at the top, under one hive cover. Swarming is not evidence of colony prosperity.

Methods of Wintering.—In most climates where bees are kept, they are benefited by extra protection in cold weather. Since bees are cold-blooded, they do not become too warm if insulated. Some hives are made with insulated walls, but they rarely contain enough insulation, they are cumbersome and are not used by extensive beekeepers. The single-walled hive is not adequate protection in cold climates, and various ways have been tested to provide insulation. This may be done with the British hive by filling the space inside the outer case. The simpler method is to place the hive in an outer case to hold one or more colonies. Insulating material, sawdust, well dried leaves, shavings or chaff may be packed in the provided space. It is not always recognized that insulation is helpful where winters are mild. Losses in winter are often heavier in mild climates than in cold regions. No specific advice regarding insulation needs is possible,

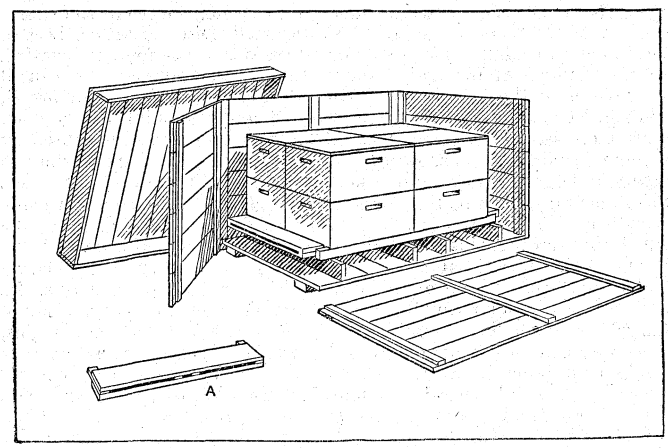


FIG. 16.—ONE METHOD OF PACKING BEES FOR WINTER USED IN COLD CLIMATES: A. DETAIL OF TUNNEL TO HIVE

but it is helpful to pack bees in Florida and southern California, and it is impossible to insulate a colony too heavily. If the cover is sealed, the beekeeper may readily determine whether his hives are adequately insulated. If moisture condenses in any part of the hive, or if combs become mouldy, more insulation will be useful. Dead bees on the bottom board are also evidence of inadequate packing. Upper openings to permit escape of moist air are detrimental because they cool the hive and nullify the insulation. A colony should not be opened in cold weather, since that induces excessive heat production.

Service of Bees in Pollination.—Fertilization of the flower ovule depends upon a union of the ovule with a pollen tube which carries the male element of the plant. A majority of flowers cannot be fertilized by pollen from the same flower, or may produce seed better if pollen from another flower is provided. In some instances, such as varieties of apple, flowers of some varieties cannot be fertilized by pollen of the same variety. In buckwheat and other plants, two forms of flowers occur, differing in length of pistils and stamens. This facilitates cross pollination. For plants having moist or sticky pollen, wind is not an effective carrying agent and these plants are pollinated by insects that fly from flower to flower to collect nectar or pollen. Of the thousands of species of flower visiting insects, the honeybee is the only species fully under the control of man and available for carrying pollen wherever pollination service is needed. Intense cultivation reduces nesting and hibernating places for wild species of insects. Cleaner fence rows, cutting of vegetation on roadsides and other modern practices reduce the number of insects available for pollination service. An important factor in reduction of beneficial species is the wide use of insecticides, aimed at the reduction of injurious species and equally effective against beneficial species. Insecticidal dusts usually cause heavier losses than do sprays because they are carried by wind. The use of aeroplanes for applying insecticides has multiplied the damage. The demand for more perfect fruit brings on the use of larger amounts and more frequent applications of insecticides, and all such practices reduce insect populations. Reductions in pollination insects have reached the scope of national calamities.

During World War I, no effort was made in Germany to support the beekeeping industry, and since the methods there used are such that neglect soon ends in death of colonies, the number of colonies was greatly reduced. By the close of the war pollination insects were so scarce that it was necessary to stimulate beekeeping by providing sugar for feeding without the tax levy, and to use evasive measures to curtail importations of honey to encourage internal production. When the first five-year plan was adopted in the soviet union, the former plan of having small fields separated by earthen barriers, once common in the black earth country and the steppes, was abandoned in favour of large collective farms. This reduced the places for nesting and hibernation of wild pollinating species, and a rapid decline in seed production at once occurred. Under the second five-year plan it was proposed to increase the number of colonies of bees from 5,000,000 to 40,000,000. The significant fact in these cases is that recourse was had to honeybees in each instance.

Diseases of Bees.—Bees are subject to various diseases, and a method of treatment for one bee disease was described as early as 1769. Not until bacteria were found to be pathogenic were the causes of some of the worst of these diseases learned. Diseases attack bees in the larval and adult stages, both being periods when food is ingested. In the United States and Canada the greatest damage is caused by diseases of the brood, especially the disease American foul brood, while in Europe greater losses are often attributed to adult bee diseases, acarine disease and Nosema disease. American foul brood is caused by a spore-forming bacillus, *Bacillus larvae,* which in the spore stage is highly resistant to heat and other disinfection. The organism enters the alimentary canal of the young larva and remains dormant because growth of the organism is inhibited by the high sugar content of the gut during feeding. When feeding ceases and the sugar is absorbed, the bacilli begin growth and soon bacteria have consumed the larval body, since this organism is both pathogenic and putrefactive. Its presence also inhibits growth of other organisms in the decaying larva. Larval remains adhere tightly to the cell wall and the dried remains, the scale, can rarely be removed by worker bees. Because of this, combs containing scales are removed in treatment, but in the early 1940s it began to be noted that some colonies effectively remove scales. This characteristic came to be known as resistance, although no actual resistance to the disease occurs. The safest treatment for this disease is to burn combs, bees and honey. European foul brood is caused by an organism usually known as *Bacillus pluton,* although its appearance indicates that it is not a bacillus. Dr. Allan Grant Lochhead claims that the stage causing the disease is a morphological form of *Bacillus alvei.* Whether the disease is caused by a distinct organism or by a stage of another bacterium is immaterial. The causal stage does not survive immersion in honey and adult bees readily remove larval remains so that healthy larvae can be reared in the cells. Colonies of Italian bees suffer less from this disease than do black bees, and the first method of treatment used was to introduce Italian

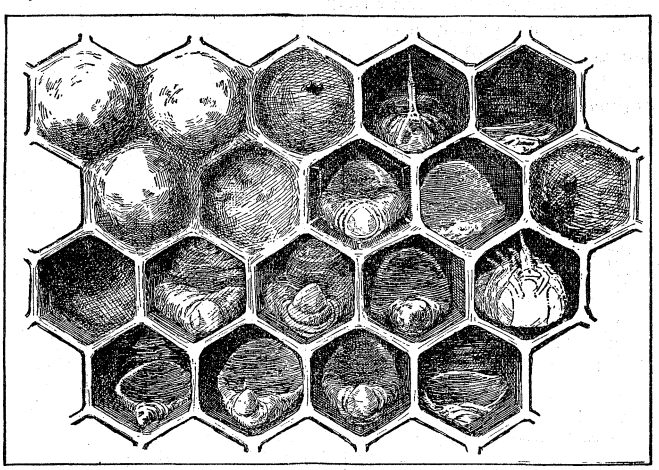


FIG. 17.—AMERICAN FOUL BROOD, SHOWING VARIATIONS IN APPEARANCE OF LARVAE AND PUPAE ATTACKED

queens. The disease spread rapidly and fatally in that period of American beekeeping when small hives were used to produce comb honey, and in the weakened colonies this disease caused great losses. European foul brood attacks colonies in late spring and early summer, and disappears when nectar is gathered freely. The accepted treatment consists only in keeping all colonies strong, and the use of two-story hives with abundant supplies of honey for winter and spring has caused this disease virtually to disappear. A third brood disease known as sacbrood, caused by a filtrable virus, is often observed. It is somewhat characteristic of the disease that adult bees make little effort to remove dead larvae. No treatment is needed, but some beekeepers requeen colonies showing sacbrood for fear that the disease is properly to be attributed to queen failure. Two diseases of brood have been described in Europe as caused by fungi, but neither appears to be serious and neither is found in North America.

Adult bees show abnormal behaviour and may die of several abnormal conditions, acarine disease, Nosema disease, dysentery and arsenical or other poisoning. The behaviour of affected bees, often called symptoms, is essentially alike for all these, because flight is impeded, and symptoms are worthless for diagnosis. Acarine disease is caused by the presence in the tracheal trunks of the thorax of mites of the species *Acarapis woodi,* which feeds on bee blood by piercing the tracheae. All stages of the mite occur in the tracheae and only fertile females migrate by leaving the spiracles. There is a nonpathogenic mite in parts of Europe which is a counterpart of this species that occurs on the outside of bees and which does not cause a disease. When the tracheal trunks have been occupied for some time, the lining becomes bronzed, and bees heavily infested with mites are unable to fly. An infested bee usually dies, but volatile materials are being developed in England which destroy

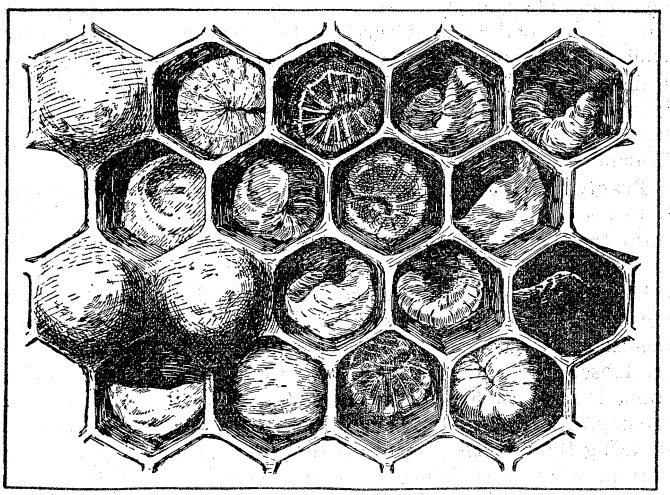


FIG. 18.—EUROPEAN FOUL BROOD, SHOWING VARIATIONS IN APPEARANCE OF LARVAE ATTACKED

mites without harming bees. Acarine disease occurs throughout much of Europe, and in Great Britain is known as the Isle of Wight disease. It is not known to occur in North America, and in 1922 the United States enacted a law to control introduction of adult bees to prevent this disease from entering. Nosema disease is caused by a protozoon, *Nosema apis,* described in Bavaria about 1906, at which time it was thought to be more serious than any brood disease. In the United States this organism is found in many colonies that show no abnormal death rate and no abnormal behaviour. The organism is most abundant in spring and early summer, being carried over from winter when it increases. Conditions under which this organism is propagated are not clear, but when bees suffer from an accumulation of faeces, Nosema increases. The organism enters the adult bee through feeding and passes into cells of the alimentary tract. After an increase in the number of organism and spore formation, the spores leave the bee in faeces. It is assumed that watering places are sources of infestation. Dwight Elmer Minnich and Hans Petersen have found that the presence of this organism does not interfere with digestive processes. Since the organism occurs when no disease is known to exist, it is believed that it is not highly detrimental and that it is a secondary invader. No treatment is essential. When a colony of bees is confined in winter on stores of low quality, faeces rapidly accumulate (dysentery), and whenever this happens, the temperature of the centre of the cluster is raised to 94° F., at which brood rearing begins. This entails more food consumption and the bees are in a vicious cycle. The remedy lies in prevention, namely the leaving of good quality honey in well protected hives. When a colony seems to have wintered well, death of bees may occur rapidly when brood rearing begins, a condition known as spring dwindling. The vitality of bees that survive winter is so depleted that they cannot meet the demands of brood rearing and die. The remedy lies in better wintering methods. An amoeba has been found in the Malpighian tubules which is thought to be harmful. Bacterial invasion of the blood stream of workers has been described. Various names have also been used for conditions of unknown cause, such as bee paralysis, May disease, June disease and disappearing disease; all these names are meaningless.

Enemies of Bees.—Various birds and insects feed on adult bees. The larvae of two species of moth enter and destroy the combs, usually after removal from the hive. Moth larvae tunnel the combs and build silken tubes spotted with their faeces. Pupation occurs after larval feeding is complete, usually in secluded spots and often by burrowing slightly into the wood. Neither moth damages strong colonies, but may invade combs on which bees are living if the colony becomes weak. When a larval disease is present, the combs may be riddled by moth larvae and the damage is attributed to the moth larvae. Fumigation will destroy the larvae and paradichlorobenzene destroys moth eggs. The bee louse, *Braula coeca,* is found on adult bees, being seen on queens chiefly in autumn. This is not a true parasite and feeds at the mouth of the bee. If bee lice are present in numbers, the infested bees become hairless. The bee louse has been introduced into the United States repeatedly but not until about 1920 was it established in Maryland, New York and Ohio. It is easily overlooked in extracted honey production but the tunnels formed by louse larvae in cappings are conspicuous on comb honey.

Organized Work in Beekeeping.—Since so many people are interested in beekeeping, it naturally follows that organizations for the promotion of their mutual interests within the industry have been formed in many lands, the nature of the societies depending on the special interests of the membership, and the manner in which beekeeping is adapted to the respective regions. In some countries the societies are composed chiefly of amateur beekeepers or fanciers, but where commercial development is feasible, the organizations take on that emphasis. In the United States, entomologists interested in apiculture, apiary inspectors, honey packers, bee appliance manufacturers and queen breeders maintain their separate organizations. Several co-operative honey marketing organizations operate in Canada and the United States. A vast literature on beekeeping has been developed, but in recent times the number of different books on the subject is less than formerly. Periodical literature appears in many languages, and in the interval between the world wars there were about 100 separate journals. Many bulletins and pamphlets on different phases of beekeeping practice are issued by educational institutions. A few libraries have been established to bring the literature together for use and preservation. In Europe libraries have been formed chiefly by associations of beekeepers, such as the Scots and British, while in the United States beekeeping libraries are in educational and research institutions. Good libraries are at the University of Wisconsin, Cornell university and the U.S. department of agriculture. The celebrated Drory beekeeping library, chiefly of first editions, was purchased by the University of Berlin. The beekeeping industry is protected by laws on various subjects. Where danger exists that bees may be poisoned by ill-advised applications of poisonous insecticides, laws have been enacted to prevent such applications during the blossoming period of fruits. Laws in various states and provinces provide for inspection of apiaries by qualified persons to prevent spread of brood diseases. The United States enacted a law (1922) controlling importation of adult bees to safeguard the American industry from the introduction of additional diseases. The honey industry is protected by enforcement of general food laws which serve to prevent adulteration of honey. Information on honey market conditions is provided in the United States by semimonthly reports from producing areas and from the chief markets, issued by the federal department of agriculture. During World War II, the industry in the United States was protected by regulations governing honey prices, sales of honey to manufacturers of foodstuffs, materials for the manufacture of beekeeping equipment and allied regulations, all of which were inaugurated primarily to safeguard bees as pollinating agents for the increase of seed crops.

The size of the beekeeping industry has made necessary the development of firms for the manufacture of equipment for the beekeeper, for the preparation of honey for urban markets through blending and proper care to produce uniform quality to be sold under brand names, firms to supply queen bees and bees in cages without combs to beekeepers of colder areas to compensate for winter losses and to increase the number of colonies, firms to manufacture beeswax candles, cosmetics and other products of wax, and other ramifying commercial organizations dependent on beekeeping.

Elementary and advanced courses in beekeeping are presented by several U.S. universities, chiefly in preparation for teaching and research, and students from other countries have taken advantage of these facilities. Educational work developed differently in various beekeeping regions. In Europe this work is undertaken by organizations of beekeepers, and in Great Britain the county organizations provide examination of colonies and advice by qualified experts, while on the continent there are several institutions for research and educational effort. In the United States and Canada this is a function of the colleges of agriculture. Educational work as aids to those already engaged in beekeeping practice is provided through specialists located at the colleges of agriculture, and several colleges offer correspondence courses in the subject. Training for boys and girls in elementary beekeeping is given in 4-H clubs. All the educational work in North America originated in the period of World War I. Research in fields that are beyond the facilities of the individual beekeeper is provided by various laboratories supported by federal, state and provincial governments, and similar research institutions are located in some countries on the continent of Europe.

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BEECH, the name for well-known trees of the genus *Fagus,* members of the family Fagaceae to which belong also the oaks, chinquapins, chestnuts and tanbarks. The name beech is from the Anglo-Saxon *boc, bece* or *beoce* (Ger. *Buche,* Swedish *bok*), words meaning a book and a beech tree. The connection of the beech with the graphic arts is supposed to have originated in the fact that the ancient Runic tablets were made from thin slabs of beechwood. Ten species, several with well-known horticultural varieties, have been described; all are indigenous to the northern hemisphere.

The European beech (*Fagus sylvatica*) is a common and important forest tree spreading from southern Norway and Sweden to the Mediterranean. It is a native of England and a commonly planted tree in Scotland and Ireland. It occurs in the Swiss Alps up to elevations of 5,000 ft.; it abounds in Russia, and is widely distributed in Asia Minor and the provinces of Iran. Beechmast, the fruit of this tree, was at one time known in England as buck; the county Buckingham was so named because of its famous beech forests. Beechmast has been used as a food in times of distress and famines, and produces an abundant supply of food for game animals and swine which are turned into beech forests to forage on the fallen fruits. In France the fruits are used for feeding pheasants and fattening domestic poultry. The well-ripened nuts yield from 17% to 20% of a nondrying oil suitable for illumination, and are said to be used in certain parts of France in cooking and as a substitute for butter.

European beech features broadly oval, lustrous, dentate leaves, which often persist on the branchlets through the winter, although dead. Conspicuously elongated, shiny, chestnut-brown winter buds, unisexual flowers which are monoecious, and smooth olive-gray bark which remains unbroken even on the oldest and largest trunks are other diagnostic features. Several well-known varieties are important decorative plants. These include the graceful weeping beech (var., *pendula*); the bronze or copper beech (var. *atropunicea*), a form with purple or copper-coloured leaves; and the cutleaf beech (var. *laciniata*), featuring sharp, deeply

lobed leaves.

The American beech (*F. grandifolia*), is a large American tree with similar botanical features. It ranges from New Brunswick to Minnesota and south to Florida and Texas. It attains its best development on dry sandy loams, but is found on a variety of sites throughout its range. It is one of the principal trees of the northeastern climax forest where it is found in association with hard maple, yellow birch and sometimes eastern hemlock. Root suckering is prevalent, and a considerable portion of the natural reproduction has its origin under the parent trees in this manner. Several varieties of the American beech are also recognized; these include *pubescens, caroliniana* and *ferruginea.* The wood of this tree is used for veneer, flooring, novelties, turnery, furniture, and is destructively distilled for charcoal, wood alcohol and acetate of lime. In 1940 the cut in the United States amounted to 164,740,000 ft. B.M.

The antarctic beeches belong to the genus *Nothofagus.* This comprises a group of 17 trees widely distributed through the forests of Australia, New Zealand and South America. (E. S. Hr.)

BEECHAM, SIR THOMAS (1879–), British conductor and impresario, was born on April 29, 1879, the elder son of Sir Joseph Beecham, 1st baronet. He was educated at Rossall school and Wadham college, Oxford, and gave his first concert with the Queen's hall orchestra in London in 1905. He founded and afterward conducted the New Symphony and Beecham Symphony orchestras, and also the Beecham Opera company with which he produced *The Wreckers,* among other works, at His Majesty's theatre in 1909. After producing operas by Delius (*Village Romeo and Juliet*), Strauss (*Electra*) and others at Covent Garden theatre in the spring of 1910, he followed this season in the summer with another at His Majesty's, which had *Cosi fan tutte, Il Seraglio, Feuersnot* and *Shamus O'Brien* among its leading features, and yet another at Covent Garden in the autumn, when Strauss' *Salome* was given for the first time in London. In 1911 and 1912 he was associated with the memorable first appearance of the Russian ballet in London at Covent Garden. Not less noteworthy were his activities in 1913, when he produced *Der Rosenkavalier* at Covent Garden in the spring, *Ariadne auf Naxos* in the summer at His Majesty's (in conjunction with Sir Herbert Tree) and in the autumn at Drury Lane a series of Russian operas, including *Boris Godounov, Ivan the Terrible* and *Khovantchina,* in which Fyodor Chaliapin made his first appearance in England. Subsequent productions for which he was responsible included *Prince Igor, Coq d'Or, Nuit de Mai, Rossignol* and *La Légende de Joseph* in 1914, and a large number of performances in English, given under the most difficult conditions, during the succeeding years of World War I. In 1916 he was knighted, and in the same year he succeeded to the baronetcy. After further seasons in 1919 and 1920 Sir Thomas suspended for some years his operatic activities, which, though so successful artistically, had entailed heavy financial losses, and disbanded his company, whose members subsequently formed themselves into the British National Opera company and carried on independently upon a co-operative basis. In 1927, however, he took up the cause again and invited the support of the general musical public for an imperial league of opera, having for its object the permanent establishment of opera in London, and also in some of the leading provincial centres, upon an assured financial basis. Under this scheme opera lovers throughout the country were asked to pledge themselves to subscribe 10*s.* per annum for five years, whereby it was estimated that a sum of £60,000 per annum would be obtained to serve as a subsidy for the undertaking. The project was endorsed by the press and leading musical authorities, but the response of the public did not come up to expectations.

BEECH DROPS (*Epifagus virginiana* or *Leptamnium virginianum*), a North American perennial of the broom-rape family, Orobanchaceae, called also cancer root. It is parasitic on the roots of the American beech from New Brunswick to Wisconsin, and southward to Florida and Louisiana. The slender, wiry, much-branched brown stems bear scattered inconspicuous scales but no leaves. The numerous flowers are borne in small clusters at the ends of the branches; the uppermost flowers, about $\frac{1}{3}$ in. long, are whitish-purple and sterile, while the lower are minute and seed-bearing. Throughout the woodlands of eastern North America the beech drops is usually the most common parasitic flowering plant. Its roots are attached by suckers to the roots of the beech and its seeds will germinate only when in contact with the roots of that tree.

BEECHER, HENRY WARD (1813–1887), U.S. preacher, was born in Litchfield (Conn.), on June 24, 1813, eighth child of the Calvinistic minister Lyman Beecher and his wife Roxana. His early education included six months at his sister Catherine's seminary in Hartford and a dreamy period at the Boston Latin school during which he said he "went to school in Boston harbour"; in 1830 he entered Amherst college. Although achieving no special distinction as a student, he was active in college affairs and through careful training became a fluent extemporaneous speaker and a successful lecturer on temperance and phrenology in his undergraduate days. But he had always looked upon his career as foreordained, and it became a matter of course with him that he should enter the Lane Theological Seminary in Cincinnati (O.), of which his father was president, and from which he graduated in 1837. His home and surroundings at this time provided an unusually literary atmosphere; his elder sister Catherine, at 35 years of age, already had two books to her credit and one in the press, while Harriet, who was destined to become famous as an authoress later (*see* Stowe, Harriet Elizabeth), had won a $50 prize offered by the *Western Literary Journal.* Henry Ward himself read omnivorously, and when his father needed the Rev. Thomas Brainerd's aid in his heresy trial his 23-year-old son was left in charge of what Harriet called "our family newspaper," the Cincinnati *Journal.*

Probably influenced in part by Calvin Stowe, the youth was already moving away from the stern theology of his father. To his betrothed, Eunice Bullard, he wrote, "I cannot assent. What then? Preach I will, licensed or not. On that point I am determined. If I can do no better, I will go far out into the West, build a log cabin among the lumbermen and trappers, or whoever may seek employment in the forests, and devote myself to trying to interest them in religious services, far from the busy haunts of men. What will you do if this is the only course left me? Will you go with me into the wilderness?" It was not necessary for the young preacher and his bride to go into the wilderness. Receiving a subsidy from the Home Missionary society, he took up his pastorate at Lawrenceburgh, a little river town in Indiana, where he acted both as sexton and preacher. Two years later he accepted a call to a new church in Indianapolis. His *Seven Lectures to Young Men,* which appeared in 1844, in which he treated the commoner vices with realistic description and with youthful and exuberant rhetoric, won him not only a local but a national reputation. As a result of this literary success, added to his activity in the State Horticultural society, he was made editor of the *Western Farmer and Gardener,* which further helped to make his name more widely known. In 1847 he accepted a call to the pastorate of Plymouth church (Congregational), then newly established in Brooklyn, N.Y. The situation of the church in such close proximity to New York, the stalwart character of the man who had organized it, and the peculiar eloquence of Beecher combined to give it probably the largest membership of any congregation of the day. Beecher at once became a recognized leader. Although investigations have shown that he may have been rather more backward even than other members of his family and church in declaring against slavery, and although he was never technically an abolitionist, the dramatic scene of his mock public auction of the white slave girl has impressed itself in the popular mind as one of the outstanding episodes in the anti-slavery crusade. His attitude was that slavery was to be overthrown under the constitution and in the union by trusting to an awakened conscience, enforced by an enlightened self-interest. Later he also identified himself with woman suffrage.

Large as was Beecher's church and lecture audience, his sphere of influence was still further extended by his contributions to the *Independent,* to Robert Bonner's *Ledger* and to other periodicals. He was editor in chief of the *Independent* from 1861 to

1863, and in 1870 he founded and became editor in chief of a religious undenominational weekly, *The Christian Union*, afterward the *Outlook*, in which as in his pastorate of Plymouth church he was succeeded by Lyman Abbott (*q.v.*). Nevertheless, it was in the pulpit that Beecher was seen at his best. Because of his mastery of the English tongue, his dramatic power, his vivid imagination, the catholicity of his sympathies, his passionate enthusiasm which for the moment made his immediate theme seem to him the one theme of transcendent importance, his humour alternating with pathos, he was a preacher with an almost unrivalled following in his own time and country. John Hay called him "the greatest preacher the world has seen since St. Paul preached on Mars Hill." His favourite theme was love: love of man was to him the fulfilment of all law; love of God was the essence of all Christianity; religion was a life of liberty in love. The later years of his life were darkened by the charge which was brought against him by Theodore Tilton of having had improper relations with Tilton's wife, and both before and during the law suit in which it involved him, his reputation as a man of honour and as a clergyman suffered. During a part of this time he also was the first incumbent of the Lyman Beecher lectureship on preaching at Yale Divinity school. He died of apoplexy in Brooklyn on March 8, 1887.

Beecher's books, besides his published sermons, include: *Plymouth Collection of Hymns and Tunes* (1855); *Star Papers* (1855); *New Star Papers* (1859); *American Rebellion, Report of Speeches delivered in England at Public Meetings in Manchester, Glasgow, Edinburgh, Liverpool, and London* (1864); *Norwood: A Tale of Village Life in New England* (1867); *The Life of Jesus the Christ* (1871), completed by his sons (1891); and *Yale Lectures on Preaching* (1872–74).

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BEECHER, LYMAN (1775–1863), U.S. clergyman, born at New Haven (Conn.) on Oct. 12, 1775, was a descendant of one of the founders of the New Haven colony. He graduated from Yale (1797) having studied theology under Timothy Dwight. He preached in several churches in the east and in the Second Presbyterian church of Cincinnati (O.), and became president and professor of didactic and polemic theology (1832–50) of the newly established Lane theological seminary at Cincinnati. The last ten years of his life were spent with his son, Henry Ward Beecher, in Brooklyn (N.Y.), where he died on Jan. 10, 1863. Magnetic in personality, incisive and powerful in manner of expression, he was in his prime an eloquent pulpit orator.

His daughter, CATHERINE ESTHER (1800–1878), was born at East Hampton (L.I.) on Sept. 6, 1800. She was educated at Litchfield seminary, and conducted schools for girls in Hartford (Conn.) and in Cincinnati. She wrote and lectured on education of women and in favour of better primary schools; she radically opposed suffrage for women, holding woman's sphere to be domestic. The National Board of Popular Education, a charitable society which she founded, sent hundreds of women as teachers into the south and west. She died on May 12, 1878, in Elmira (N.Y.). Among her publications are *An Essay on Slavery and Abolition with Reference to the Duty of American Females* (1837); *A Treatise on Domestic Economy* (1842); *The True Remedy for the Wrongs of Women* (1851); and *Woman's Profession as Mother and Educator* (1871).

His son, EDWARD BEECHER (1803–1895), was born at East Hampton (L.I.) on Aug. 27, 1803, graduated from Yale in 1822, and studied theology at Andover. He held several pastorates; from 1830–44 he was president of Illinois college, Jacksonville (Ill.); he was senior editor of the *Congregationalist* (1849–55), and an associate editor of the *Christian Union* from 1870. In 1872 he settled in Brooklyn (N.Y.), where he was pastor of the Parkville church (1885–89), and where he died on July 28, 1895. He wrote *History of the Alton Riots* (1837), *Statement of Anti-Slavery Principles* (1837) and several religious books.

CHARLES BEECHER (1815–1900), another of Lyman's sons, was born at Litchfield (Conn.) on Oct. 7, 1815. He graduated from Bowdoin college in 1834, and held pastorates at Fort Wayne (Ind.), Newark (N.J.) and Georgetown (Mass.). From 1870–77 he lived in Florida, where he was state superintendent of public instruction (1871–73). He died at Georgetown (Mass.) on April 21, 1900. He was an accomplished musician, and assisted in the selection and arrangement of music in the *Plymouth Collection of Hymns and Tunes*. His works include *David and His Throne* (1855), and *Spiritual Manifestations* (1879).

See Lyman Beecher, *Collected Works* (1852); *Autobiography and Correspondence* (1863–64), ed. by Charles Beecher; and studies by D. H. Allen (1863), J. G. White (1882), and E. Hayward (1904); *see* also Constance M. Rourke, *Trumpets of Jubilee* (1927).

BEECHWORTH, a town of Bogong co., Victoria, Australia, 171 mi. N.E. of Melbourne. Pop. 2,852. It is a centre of gold mining (Ovens gold fields) but much land is under fruit and grain cultivation. Industries: tanning, iron founding, coachbuilding.

BEEF, flesh from mature cattle used for food. It is an excellent source of high-quality protein, energy in the form of fat, valuable mineral salts (chiefly iron and phosphorus) and some of the B vitamins. Beef is highly digestible and very palatable.

Because of their extensive digestive tract, cattle are able to subsist entirely upon roughage such as pasture, hay, fodder, silage and other crop residues. Cattle are produced extensively in regions where topography or deficient rainfall makes more intensive agricultural production impractical. To the extent that cattle are produced upon pasture, beef is a seasonal product, being available in greatest abundance at the close of the normal grazing season. Cattle not sufficiently fat for slaughter are frequently sold as feeders to be fattened on hay, silage, fodder, grain and by-product feeds. Through this fattening process, beef is made available the year round. The best beef is produced from the beef breeds which were originally developed for that purpose in the British Isles. Much beef is also produced as a by-product from dairy animals and work oxen. Such beef falls into the lower grades.

The percentage relationship of beef carcass to live weight will vary from 40% to 65%, with an average of 54%. The fatter the animal, the more meat it will yield. Animals that carry little intestinal contents will yield more beef than those carrying much "fill." Cattle which show "quality," *i.e.*, have thin hides, refined shanks and trim heads, "dress out" better than those which are coarse in these details.

There has been a distinct trend toward younger and lighter beef. The yearling or baby beef is slaughtered at 10–16 mo., weighing from 750 lb. to 1,200 lb. after intensive grain feeding. It produces the small, tender, high-quality roasts and steaks.

Over most of the world beef cattle are produced on grass and roughage. South American beef is produced on pasture alone. Only in the United States, Canada and the British Isles are grain feeds used extensively in cattle fattening. Grain feeds have made possible the production of finished cattle at younger ages. By-products such as sugar beet pulp, molasses and distillers grains are extensively used in cattle fattening.

Beef carcasses are classified, largely on the basis of sex, into steers, heifers, cows, bulls and stags. Steers are castrated males and heifers are immature females usually under two years of age. Heifers mature earlier than steers and tend to fatten more readily. If fed the same ration as steers, heifers are invariably fatter. This has caused many Americans to be prejudiced against heifer carcasses. In Great Britain, on the contrary, heifer beef is considered by many to be superior to steer beef. Steer and heifer carcasses are classified together by the federal grading system. Cows are mature females, many of which are marketed because of age or inefficient production. Cow carcasses are usually more angular than heifer carcasses. Bulls are uncastrated males. They usually show a characteristic crest on their necks. The flesh of the older bulls is usually coarse and dark in colour. Young, well-fattened bulls may be used for carcass beef. Older bulls, and especially those in thin flesh, are designated as sausage or bologna bulls and are boned out for sausage material. Stags are males

which were castrated after reaching maturity. They show the same characteristics as bull carcasses and are used in the same way.

The classes are subdivided into grades which are determined by conformation, finish or fatness, and quality. The ideal beef carcass should be compact and straight-sided, and should yield a high percentage of the more valuable cuts (rib, loin and round). Fat determines to a large extent the tenderness, juiciness and flavour of beef, so there is close correlation between grade and fatness. The external fat or covering should be firm, white, smooth and evenly distributed. Excessive fatness lowers the grade. Quality includes a number of items, such as marbling, texture, firmness, colour of fat and lean, and youth. Marbling, which is the interspersing of fat with the lean, is one of the best indications of quality. Texture is determined by the size of the muscle bundles. Fine texture is associated with tenderness, although perhaps this is not infallible. Firmness of meat is taken as an indication of quality. A bright cherry-red lean and a creamy-white fat is preferred by the trade. The meat from young animals is generally considered to be more tender than that from mature animals which have had more exercise. Consequently, meat which shows youth and has soft, porous bones with pronounced cartilages is generally preferred.

The grades of steers and heifers in descending scale are prime, choice, good, commercial, utility, cutter and canner. The percentage of beef which will grade prime is negligible, and to all practical purposes, choice is the top grade. The first five grades are sold as carcass beef and cuts. Cutters are generally sold only as wholesale cuts. Canners are the lowest grade and must be boned out and sold as boneless cuts and sausage material. Cows, bulls and stags are graded good, commercial, utility, cutters and canners. The major portion of the beef is sold by the packer as carcass beef. For ease in handling, this is divided into fore- and hindquarters. Some beef is sold as wholesale cuts. The wholesale bone-in cuts from the forequarter are rib, chuck, brisket, navel end and shank; those from the hindquarter are round, loin end, short loin and flank. Relatively little beef is frozen as wholesale cuts.

The plainer grades of beef carcasses, especially canners, are boned out into boneless cuts and trimmings. Boneless cuts are used largely for institutional use, either fresh or frozen. Only a small amount of beef is cured as corned beef and dried beef. Beef is canned in many forms, such as roast beef, corned beef, beef stew, beef hash and chili con carne. Beef is also an important ingredient of sausage, especially of the dry or summer sausage. Boneless ground beef may be cooked and dehydrated. When compressed it forms an important food in emergency army rations.

Ripening.—Beef is generally improved in tenderness and flavour by aging or ripening; *i.e.*, hanging for 10–14 days at 36° F. Breaking down changes in the meat are brought about by enzymes and bacteria which hydrolyze connective tissue.

Retail cuts of beef vary greatly in various localities. The loin end is used for sirloin steak or it may be roasted. The top part of the round is cut off and may be used as a rump roast. The round is generally used for round steak. The lower part of the round is rather tendinous and is generally used as a pot roast or for grinding. The hind shank is used for soupbones or may be boned out. The front part of the loin known as the short loin is used for steak—producing club, T-bone and porterhouse steaks. The triangular flank cut lacks tenderness. The flank steak is removed and the balance trimmed up for stew beef or grinding.

From the forequarter, the rib cut is generally used for roasts, although if needed it may be cut into steaks. The chuck may be cut into roasts, pot roasts, steak and grinding material. The front shank is generally used for soupbones, although it may be boned out and ground. The brisket and navel end may be boned out and corned or may be cut up into stew beef or ground.

Cookery.—The cookery method used will depend on the location of the cut (whether it is tender or lacking in tenderness), the grade of the cut and its thickness.

Roasts from the rib, loin or rump, of good quality, may be oven-roasted. From the plainer grades of beef these same cuts should be braised. Chuck roasts from all grades of beef should be braised. (For diagram of cuts of beef *see* COOKERY.)

Loin steaks from the better grades of beef, if ¾ in. thick or thicker, may be broiled. If less than ¾ in. thick or from the lower grades of beef, they should be pan-broiled. Round steaks from the better grades of beef may be pan-broiled, others should be braised. The less tender cuts such as plate, flank, shanks and neck may be cooked in water, braised or ground. (*See* MEAT.)

Beef By-products.—The most valuable by-product is the hide, which represents 7% of the live weight. This is used for leather. The body hair is used for felt, the ear hair for brushes and the tail hair for upholstery. Edible beef suet is used for oleo oil and oleostearine, both of which are used for oleomargarine, salad oils and lard compounds. Inedible fats are used for soap, glycerine, lubricants and leather dressing.

Bones, hoofs and horns may be used for novelties. Bones may be ground into bone meal which is used for casehardening steel and for animal feed. Edible bones and connective tissue are cooked to make gelatin. Glue is made from inedible bones. Some blood is used for textile sizing, waterproof glue and pharmaceutical use. Most of the blood is dried and used for animal feed.

Casings are used for sausage, lard and cheese containers and goldbeaters skins. Miscellaneous parts not suitable for human food are cooked, dried and ground for poultry and animal feed. There are many edible offal parts which are valuable food, such as liver, heart, tongue, brain, sweetbread (thymus gland), tail and tripe. The tripe is the muscular wall of the first and second stomachs of the beef.

From many of the glands and organs, pharmaceutical by-products are made which play an important part in modern medicine. Best known of these are insulin and adrenalin, made from the pancreas and suprarenals, respectively. There are also extracts made from the pituitary, pineal, thyroids, parathyroids, liver, pancreas and sex glands. Bone marrow and rennin are other by-products. These products not only are a boon to mankind but serve to increase the price paid to producers for live animals or to reduce the cost of dressed meat to consumers.

International Trade.—The chief surplus beef-producing countries are Argentina, Uruguay, Australia, Brazil and New Zealand, in the order given. The chief importer of beef is the United Kingdom. Beef shipped from South America to Europe is usually shipped as chilled beef. Some frozen and some canned beef also are exported to Europe. Because of the long time en route, beef shipped from Australia and New Zealand must be frozen.

South American carcass beef cannot be imported into the

World Trade in Beef and Veal
1924–28, 1929–33, 1934–38

Principal countries	Average 1924–28	Average 1929–33	Average 1934–38
	Million pounds	*Million pounds*	*Million pounds*
Exports			
Argentina[1,2]	1,616	1,075	1,066
Uruguay[1]	310	244	204
Australia[1,2]	194	163	246
Brazil[1,2]	104	153	135
New Zealand[1]	76	59	113
Canada[1]	37	12	14
China[3]	32	28	15
Netherlands	31	15	21
Denmark	23	37	31
United States	22	16	15
Imports			
United Kingdom[4]	1,517	1,385	1,388
Germany[5]	304	70	49
Italy[6]	179	116	68
France[7]	159	84	41
Belgium[5]	148	72	27
United States[5]	60	59	80
Netherlands	45	31	20

[1]Canned meat not classified according to kind of meat.
[2]Dried or preserved meat not classified according to kind of meat.
[3]All kinds of fresh, chilled and frozen meat. Japanese import statistics indicate that Chinese exports are almost exclusively beef. Including Manchuria.
[4]Imports less re-exports.
[5]Canned meat not classified according to kind of meat.
[6]All kinds of fresh, chilled and frozen meat.
[7]Including other kinds of meat except mutton and pork for fresh, chilled and frozen; for tinned meat, all kinds through 1928, and thereafter all kinds except pork.

United States because of a quarantine against foot and mouth disease. However, canned meats which have been thoroughly sterilized may be imported after having been approved by meat-inspection officials. (*See* CATTLE; MEAT TRADE.)

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BEEF EATER: *see* YEOMEN OF THE GUARD.

BEE FLY, any member of the family Bombyliidae of the order Diptera (*q.v.*), many of which resemble bees in appearance; most of them have a long proboscis and obtain nectar from flowers. Their coloration, which is sometimes metallic, is due to dense hair and pubescence; in many species the body bears patches of scales and these are sometimes present on the wings; they are delicate and easily abraded. The larvae are, insofar as known, predaceous or parasitic. The large bee fly, *Bombylius major,* of holarctic distribution, is parasitic on solitary bees; it is one of the earliest to appear in spring; larvae of several species of *Villa* are of importance in destroying eggs of grasshoppers; while others are parasites of caterpillars. *Anthrax anale* is a parasite of tiger beetle larvae; the habits of the European *A. trifasciata,* parasitic on the wall bee, are described by Fabre. In Africa several species of *Villa* and *Thyridanthrax* are parasitic on the puparia of tsetse flies. *Villa (Hemipenthes) morio* is directly injurious, being parasitic on the beneficial ichneumonid, *Banchus femoralis.* Too little is known about the biology of the species to form a conclusion about their value to man; those known to be beneficial are very common. The largest and most showy species are tropical but species with a length of half an inch occur in temperate regions. Many are quite small, and their immature stages unknown. There are about 2,000 known species. (C. H. CN.)

BEEFSTEAK CLUB, the name of several clubs formed in London during the 18th and 19th centuries. The first seems to have been that founded in 1709 with Richard Estcourt, the actor, as steward: its badge was a gridiron. Its fame was eclipsed in 1735 when the Sublime Society of Steaks was established by John Rich at Covent Garden theatre, of which he was then manager. It is said that Lord Peterborough supping one night with Rich in his private room, was so delighted with the steak the latter grilled him that he suggested a repetition of the meal the next week. From this started the club: among its members, who called themselves "the Steaks," were William Hogarth, David Garrick, John Wilkes, Bubb Doddington and many other celebrities. The rendezvous was the theatre till the fire in 1808, when the club moved first to the Bedford Coffee House, and the next year to the Old Lyceum. In 1785 the prince of Wales joined, and later his brothers the dukes of Clarence and Sussex became members. On the burning of the Lyceum, "the Steaks" met again in the Bedford Coffee House till 1838, when the New Lyceum was opened, and a large room there was allotted the club. The club ceased to exist in 1867. Thomas Sheridan founded a Beefsteak club in Dublin at the Theatre Royal in 1749, and of this Peg Woffington was president. The modern Beefsteak club was founded by A. Stuart-Wortley in 1876. Its first premises were over Toole's theatre in King William St. Strand. In 1898 it moved to its present residence in Green St., Leicester Sq.

See J. Timbs, *Clubs and Club Life in London* (1873); Walter Arnold, *Life and Death of the Sublime Society of Steaks* (1871).

BEE LINE HIGHWAY, a thoroughfare connecting Kansas City, Mo., with Canon City, Colo. It is the shortest route between these two points. Graded and improved throughout most of its 675 mi., it crosses the flat, rolling plains of Kansas to the San Isabel National forest at the foot of the Rocky mountains, passing through Ottawa, Council Grove, Lindsborg, La Crosse, Eads and Pueblo.

BEELZEBUB, BEELZEBUL, BAALZEBUB. Baalzebub was the name of the god of the Philistine city Ekron, to whom Ahaziah of Israel when sick sent to inquire whether he should recover (II Ki. i, 1–18). The meaning of the name is obscure. Baal (*q.v.*) the common title for a Semitic deity, especially a local deity, is often found compounded with the name of the city where the deity was worshipped: *cf.* place names such as Baal Hazor (II Sam. xiii, 23), Baal Hermon (Judges iii, 3), probably contracted from a fuller form Beth Baal X=temple of the deity of X, as in Beth Baal Meon (Josh. xiii, 17). But as no place Zebub is known, and the Baal of Zebub would in any case hardly be god of Ekron, such an explanation of Baalzebub is improbable. *Zebub* is found as a noun=flies (Isa. vii, 18, Eccles. x, 1), and the most probable explanation of Baalzebub is that it means "God of flies," *i.e.,* the god who can bring or send away flies. Pliny records in his *Natural History* that the inhabitants of Elis in time of pestilence cried to "the Disperser of Flies," and that as soon as sacrifice was offered to the deity the flies perished and the pestilence ceased.

The epithet "Disperser of Flies" is attached in Greek literature to the names of Zeus and Hercules. Flies, like mice, were in ancient times recognized as bringers of disease, and it seems quite likely that a god who was able to drive away flies should be regarded as one who had power over disease: the fame of such a god in Ekron would doubtless be known to Ahaziah. Barton says that flies are still specially prevalent about Ekron (*A Year's Wanderings in Bible Lands,* pp. 216 *seq.*).

The form Beelzebub, found in the English New Testament (Matt. x, 25, xii, 24, 27; Mark iii, 22; Luke xi, 15:18 *seq.*) is due to the influence of the Vulgate: the Greek form is *Βεεζεβούλ* or *Βεελζεβούλ.* If the latter is accepted it has been explained as equivalent to the Rabbinic זְבוּל בְּעַל (*bĕʿēl zĕbūl*)=Lord of the Dwelling, *i.e.,* of the region in which demons dwell. But the Rabbinic זְבוּל (*zĕbūl*) is used only of the heavenly or earthly temple of God, which makes such an interpretation very unlikely. More probably, though not certainly, the name is really to be identified with the Old Testament Baalzebub, the final *b* having been corrupted to *l,* as Bab-el-Mandeb in popular speech becomes Bab-el-Mandel.

As a god of healing Baalzebub may well have been supposed to have power over demons, since in Semitic thought diseases were regarded as inflicted by demons (*see* Strack and Billerbeck, *Das Evangelium nach Matthäus,* pp. 631 *sqq.*).

(W. L. W.)

BEER, the beverage obtained by the alcoholic fermentation of a malted cereal, usually barley malt with or without other starchy material, and to which hops have been added, is of great antiquity. In fact, the oldest inscribed clay document extant, thought to date back to the ancient Babylonia of 6000 B.C., is interpreted as depicting a scene of the preparation of a crude type of beer for sacrificial purposes. The Babylonian beer, of which 16 different types were made by 4000 B.C. and whose production constituted an important industry, was made from barley, barley and spelt and spelt with admixtures of honey. Hops or similar bittering plants are thought to have first been used around 3000 B.C., although the first definite record of the hop plant itself dates back to only the 6th century B.C. In the imperial Egypt of the Pharaohs about 3000 B.C. beer, of which four types were in common use, represented an important food item in the daily diet. The peasant and labourer, who were recompensed by the king, received daily four loaves of bread and two jugs of beer and it was customary for mothers to bring beer to their sons in school. Beer always played an important role in the religious life of Egypt, where the introduction of brewing was attributed to Isis, the goddess of nature. Rameses III (1200 B.C.) prides himself in his temple inscriptions to have consecrated to the deities some 466,303 jugs of beer. The Egyptian beer was usually prepared from under-baked bread made of coarsely crushed germinated barley. The bread was cut into small pieces, soaked in water in a large jug and left to ferment for about a day, fermentation being started by air-borne yeasts. The mass was then forced through a woven sieve into another vessel and the resulting whitish, foaming and slightly sourish beverage was ready for consumption. The beer was frequently sweetened with dates or

spiced with various types of herbs. In preparing beer for the peasants and labourers, filtration was usually omitted so that their beer, in contrast to the "refined" brews imbibed by the kings, nobles and officials, amounted merely to a fermented mash still containing the hulls of the cereals used.

China, about 2300 B.C., had its beer-like beverage called "kiu," just as the Incas of South America, long before the discovery of that continent, made their light and heavy beverages "chicha" and "sora" from fermented corn.

The records of such classical writers as Herodotus, Pliny, Tacitus and others represent a rich source of information on cereal beverages and the methods of their preparation in many countries of both the near east and Europe. From their observations one may conclude that beer of one form or another was known to nearly all peoples in ancient times whose geographic location permitted the cultivation of cereals. Thus the art of brewing spread from Egypt to Greece, from whence it was acquired by the Romans, among whom its products gained great popularity. Pliny mentions the use of beer also in Gaul and Spain.

The peoples of northern Europe appear to have discovered the process of brewing independently. The old Germanic tribes made their "peor" or "bior" from mashed germinated or strongly steeped barley. This was the beverage, sourish in taste, described by Tacitus. However, analysis of beverage remnants in a vessel dating back to the later iron age show that another, somewhat stronger beer made from wheat and honey was also known. This beer was most probably termed "alo" in old High German and reminds one of the English "ale" of high alcoholic content. It also supports the assertion of the Greek writer, Poseidonius, that the Celts brewed beer from wheat and honey. Pieces of broken jugs, excavated in northern Bohemia and dating back to the same period, contained remnants of beer aromatized with myrrh, probably in place of the then unknown hop. Pytheas, a navigator from Massilia (Marseilles), who visited the British Isles in the 4th century B.C., recorded the observation that its inhabitants made a fermented beverage from grain and honey. Thus throughout antiquity there are references to the almost universal use of fermented cereal beverages.

Brewing at Monasteries.—Although in the early mediaeval period beer was produced in nearly every larger household, where the task was performed mainly by women, the art of brewing flourished especially in monasteries. By A.D. 820 the brewing of beer was thoroughly established as an essential activity in every well-provided monastery. Thus, a building plan drawn up in that year for the rapidly expanding monastery of Saint Gall in Switzerland provided for three separate breweries, each adjacent to a bakery. Brewing and baking were in fact always closely associated, both in antiquity and in mediaeval times. Each of these monastic breweries produced a different type of beer. One type, destined for the monks and special guests, each of whom was allocated approximately one gallon of beer per day, was a strong beverage made from barley or wheat. The two other types, intended for the lowly pilgrims and the poor, were made from oats. The beers were lightly hopped, wild hops growing in the vicinity being used. As a rule, oats constituted the chief brewing grain until the 13th century, oats being the most abundant cereal crop harvested in large sections of continental Europe. (*See* also BREWING.)

Use of Hops.—Although the use of hops is of great antiquity, it was by no means universal and a great variety of different aromatic and bitter herbs was used until well into the 14th century A.D. What appears to be the first record of hop cultivation in Europe occurs in the accounts of the Abbey of St.-Germain-des-Prés for the first years of the 9th century which state that hops were frequently accepted as rental payment from land tenants. By 840 hops were in cultivation in the Hallertau region of Germany, although subsequently the right to cultivation was withdrawn from the small farmers and vested in the hands of the nobility and the Church, leading to the creation of regional hop monopolies. Hops were used in the earliest American beers, the plant being cultivated chiefly in the New England states. With westward expansion, its cultivation also spread. After 1905 the chief hop producing centres in America were the states of Oregon, Washington and California on the Pacific coast, and New York on the Atlantic coast.

Beer in Early America.—Columbus, while exploring the coast of Central America in 1502, was presented by friendly Indians with "a sort of wine made from maize, resembling English beer." There is evidence that various types of beer were also made by the natives of North America for many hundreds of years before that time. In an account of the first colonization attempt of Virginia by the British in 1548, beer production from corn is mentioned. In 1612, two Dutch settlers erected at the southern end of Manhattan island several block houses, one of which served as a brewery. Ten years later the first public brewery was established in New Amsterdam by its first governor, Peter Minuit. The choice of Plymouth as a landing place by the Pilgrim Fathers was in some measure determined by the fact that the supply of beer on the "Mayflower" was prematurely exhausted, as is recorded in a manuscript from 1622, "For we could not now take time for further search or consideration; our victuals being much spent, especially our beer. . . ." The Massachusetts Bay colony enacted the first licensing law in 1637, awarding the exclusive right to brewing to a Captain Sedgwick, who "hath before this time set up a brewhouse at his great charge, and very commodious for this part of the country." The same colony had in 1634 fixed the price of beer or ale at "one penny a quart at the most" and five years later raised it to two pence. In 1651 the first order regulating the quality of beers was issued, based upon the varying quantities of malt utilized in their production. In order to further local agriculture, the import of barley, wheat and malt was prohibited in 1655. The order, however, was rescinded five years later when it failed in its purpose and led to the increased consumption of distilled liquors. In Pennsylvania the first brewery was erected in Pennsbury Manor, near Philadelphia, by William Penn in 1683, forming the foundation of a rapidly expanding industry which a few years later entered into active competition with England by exporting its beer to the West Indies. Little authentic information is available concerning beer and brewing in the other colonies during that period.

Brewing flourished in the new world and by the time of the American Revolution had attained considerable economic importance. Several of the leading figures of the Revolution either were brewers or were interested in fostering the industry. They included Thomas Jefferson, Samuel Adams, Patrick Henry, Israel Putnam and Benjamin Rush. James Madison favoured a high import duty on beer in order to promote brewing in all states. A recent discovery is the recipe for making beer written by George Washington, whose Mount Vernon estate was equipped with a small brewery.

Types of Beer.—Although the term beer is frequently employed to designate fermented malt beverages in general, a distinction exists between the so-called "lager" beers of the type most popular with the American consumer, and the "ales" brewed mostly in Great Britain, both with respect to their method of production and their final taste characteristics. In the brewing of lager beer, bottom fermentation is employed, so termed because the type of yeast selected settles to the bottom of the fermenting tank after completion of fermentation. The temperature at which fermentation is carried out is very low, ranging from 47° to 55° F. After fermentation has terminated, the "green" beer is aged in huge storage tanks for a period lasting from one to two months or longer, temperatures near the freezing point of water (32°–34° F.) being maintained. During storage, the beer becomes "mature," *i.e.*, it clears up, acquires mellowness, and becomes charged with carbon dioxide gas, all important factors in the final taste appeal of the finished product. It is from this phase of the brewing process that the beer derives its name, the German term for storage being "lager." In ale brewing, on the other hand, the yeast selected is of the top-fermenting type, *i.e.*, it rises to the top of the fermenting ale, forming a relatively thick foam. Also, somewhat higher fermentation temperatures (68°–75° F.) as well as storage temperatures (40°–46° F.) are employed.

Of American lager beers, nearly all of which were originally

introduced by German brewers about the middle of the 19th century and which since then have largely displaced the top-fermented beers then in vogue, the Pilsener and Dortmunder types enjoy by far the greatest popularity. These beers are characterized by a pale colour, a medium hop flavour, a relatively strong carbonation, and an alcohol content of 3.0-3.8% by weight. These two types, which differ only slightly, comprise the major volume of American beer production. The Vienna type, with its amber colour and very mild hop taste, and the various Munich type beers with their dark-brown colour, full-bodied and somewhat sweet malt flavour, slight hop taste and alcohol contents ranging from 3.0-5.0% by weight have never attained more than local importance in regions having concentrated foreign populations. Bock beer, thought to have originated in the German city of Einbeck whose name was confused with "ein Bock" (a goat), is brewed in winter for consumption in the spring. It is a heavier beer, similar in colour to the Munich type, with a slightly sweet malt flavour and a more pronounced hop taste than regular pale beer. The California steam beer, available in some regions on the Pacific coast, is characterized by a very high carbon dioxide gas content which renders the beverage highly effervescent. All but the last of these beers first gained prominence in the German cities and localities after which they are named.

Ale, stout and porter are top-fermented beers which now form a relatively small percentage of the total American beer production, but which to this day have retained their popularity in England to the virtual exclusion of lager beers. Ale has a pale bright colour, a rather pronounced hop flavour and a more tart taste than beer. Its alcohol content is also higher, ranging from 4.0–5.0% by weight. It probably originated in England where, in the 15th century, it was brewed without the addition of hops. Different types of ale are produced, such as cream ales and sparkling ales, so called because their relatively high carbonation produces a rich foam and a strong effervescence when they are poured, in contrast to the common or stock ales with their lower carbonation. Porter is a dark-brown beverage with a full-bodied malty flavour, a slightly sweet taste and a less pronounced hop flavour than ale. Its alcohol content averages about 5.0% by weight. Stout possesses a very dark colour, a rich sweet malty flavour combined with a rather strong bitter hop taste and an alcohol content of 5.0–6.5% by weight. Weissbier, a special type of ale peculiar to the Berlin region of Germany and produced to a very limited extent also in America, is made of wheat and barley malt, has a very pale colour, a somewhat tart taste and a rich foam.

There are several other special types of beer or beer-like cereal beverages which enjoy only local favour or are consumed for dietetic reasons. Among the former may be mentioned the Faro and Lambic beers found in Belgium which are fermented with wild yeasts and are rather acidic in character. To the second category belong the various malt tonics of high nutritive value and low alcohol content and often enriched with minerals and vitamins, and the so-called near-beers which are similar to the Pilsener type beers but have an alcohol content of less than 0.4% by weight.

Composition of Beer.—Beer is a readily assimilable food beverage possessing a number of desirable nutritive attributes. Although the composition of different beers will vary somewhat, an analysis of a typical American lager beer will show it to contain approximately 91% of water, 0.5% of protein matters, 4.6% of carbohydrates, 0.2% of mineral substances, and 3.65% of alcohol. It also contains certain vitamins of the B-complex. The protein constituents are of a highly assimilable type, the carbohydrates are comprised mainly of maltose and dextrin, and the mineral substances include phosphates, sulphates and others. A 12-ounce bottle of beer will furnish somewhat over 170 calories. Beer, when consumed at meal-time, is said to have a favourable effect upon the digestibility of other foods by increasing appetite, and by promoting a more abundant secretion of gastric juice and a more active movement of the stomach. The carbon dioxide gas in the beer also is thought to be beneficial. Extensive tests have shown that beer with an alcohol content of 3.2% is not intoxicating when consumed in moderate amounts. The small amount of alcohol in beer, which supplies somewhat over half of its calories, is absorbed rapidly by the blood and is then slowly converted into energy. Beer is best served at a temperature of 42° to 45° F., at which temperature the foam is at its best, the volatile gases escape and the delicate aroma and pleasing flavour of the beer are preserved.

Taxation and Statistics.—Beer has been subject to taxation in one form or another in many countries and for many years. The principles of taxation differ somewhat in different countries. Thus, in England the tax is based upon the strength or specific gravity of the "wort," which is the beer in its unfermented state. In Canada, on the other hand, the tax is placed upon malt used in brewing. In Germany and several other European countries the tax per unit measure of beer is prorated on the annual production of each brewery, while in the United States a standard tax per barrel of finished beer is imposed.

Taxation of beer in America was introduced during the colonial period, the Massachusetts Bay colony imposing its first tax on beer in 1668. During the Revolutionary War, the brewing of beer on a commercial scale came to a virtual halt and several states of the new republic exempted beer and brewing from all taxes for varying periods of time in an endeavour to revive the industry and at the same time combat the growing consumption of distilled beverages. Massachusetts, for example, in an "act to encourage the manufacture of strong beer, ale and other malt liquors," passed in 1789, freed brewers from all taxes for five years. Federal taxation of beer, with the exception of an import duty of 5 cents per gallon enacted by the first congress, was unknown until after the outbreak of the Civil War, when a tax of $1 per barrel was imposed in 1862. This tax rate was maintained with few changes until America's entry into World War I, when it was raised to $3 per barrel, and finally, in 1919, to $6 per barrel. On Jan. 16, 1920, the brewing industry in the United States ceased to exist when the Eighteenth, or prohibition, amendment went into effect. With repeal of prohibition on March 22, 1933, the federal tax on beer was established at $5 per barrel. It was subsequently increased to $6 on July 1, 1940, to $7 on Nov. 1, 1942, and to $8 on April 1, 1944. Beer is subjected to taxation also in all states of the Union, the tax rates ranging from a low of $0.62 per barrel in several states to a high of $6.62 in three states. During the first ten years of the relegalization of beer, the total tax contributions of beer amounted to $3,935,000,000, of which approximately $2,780,000,000 was in federal taxes and the balance in state and local taxes.

Year	Total sales (in bbl. of 31 gal.)	Federal revenue
1933	6,277,728	$ 35,158,312
1934	32,266,039	168,959,585
1935	42,228,831	215,563,879
1936	48,759,840	249,126,437
1937	55,391,960	281,584,099
1938	53,926,018	273,192,458
1939	51,816,874	263,340,995
1940	53,014,230	264,579,036
1941	52,799,181	316,741,027
1942	60,586,219	366,161,237
1943	68,491,045	455 634,420

Despite increased tax burdens placed on beer in most countries, world beer production increased steadily after 1933. In that year total production for all countries was 3,870,202,133 gal. By 1938 it had risen to 6,076,085,260 gal. The three leading beer producing countries, which account for nearly two-thirds of the world total, are the United States, Germany and the United Kingdom, in the order named.

The trend in beer sales and tax collections in the United States are indicated in the accompanying table for the fiscal years 1933–1943.

(F. P. S.)

BEERBOHM, SIR MAX (1872–), British caricaturist and writer, was born in London Aug. 24, 1872, a half-brother of Sir Herbert B. Tree (*q.v.*), the actor. He was educated at Charterhouse and Merton college, Oxford. Before he had left Oxford, Beerbohm had made a reputation as an essayist of wit and polish, *The Yellow Book* offering him a congenial hospitality. This reputation was maintained, when he succeeded G. B. Shaw as dramatic critic to *The Saturday Review*, by the judiciously small amount of work which he published and its almost uniformly high accomplishment, in essays, fiction and parody alike. This includes *The Works of Max Beerbohm* (1896); *The Happy Hypocrite* (1897); *More* (1899); *Zuleika Dobson* (1911); *Seven Men* (1919); *And Even Now* (1920).

As a caricaturist, Beerbohm's fame followed a parallel line, and his skill as a draughtsman increased with the years. Among his published drawings are *Caricatures of Twenty-five Gentlemen* (1896); *The Poet's Corner* (1904); *Fifty Caricatures* (1913); *Seven Men* (1919); *A Survey* (1921); *Rossetti and His Circle* (1922), and *Observations* (1925). As a sophisticated commentary on the social and literary life of his time, Beerbohm's economical and often caustic drawings stand alone; his residence in Italy, at Rapallo, after 1910, gave him many advantages for the detached observation of personalities and tendencies, although once or twice it may have endangered his perspective; and he is free from a fear of acid comment which has dimmed the art

of caricature in England since the early Victorian age. He was knighted in 1939. (*See* CARICATURE.) (J. H. M.)

BEERSHEBA (Mod. BĪR ES-SEBA'), Simeonite town on the border line between the waste and the cultivated land and referred to frequently in the Bible as the southern limit of Palestine. A famous sanctuary, it was the scene of several theophanies. The digging of its well is attributed in Genesis to both Abraham and Isaac, and into the wilderness of Beersheba Hagar wandered forth with Ishmael. Here the two sons of Samuel exercised judgeship and Elijah sought refuge in its neighbourhood from the vengeance of Jezebel. In Roman times it was the metropolis of a flourishing district and the ruined sites of many a town can still be seen in the waste land to the south. An important inscription of the time of the Constantines found at Beersheba gives a list of towns and the military dues from each. Later the city became an episcopal see. The name probably means "seven wells" in spite of efforts to prove otherwise. Three wells with evident marks of antiquity can be seen and four others are said to have been located. The outlines of the ancient town are still discernible and among them can be traced the foundations of a church. The modern town has an installation of water pumped from the largest well, the "well of Abraham," by an oil engine. During the attack on Egypt in World War I it was the headquarters of the Turkish army, and the amenities of the town were greatly improved. Population (1931) 2,959. Beersheba was captured by British troops on Oct. 31, 1917, a brilliant charge into the town by the Australian mounted division saving the wells from destruction by the Turks. The town was connected by rail with Rafa and has a British military cemetery.

Battle of Beersheba, Oct. 31, 1917.—The capture of Beersheba, which opened the way for the penetration of the Turkish front in Palestine, and ultimately to the capture of Jerusalem, is described under PALESTINE, OPERATIONS IN.

BEESWAX, a product of digestion secreted by the worker-bee for constructing the cell-walls of the honeycomb; it is estimated that about 10 lb. of honey are consumed for one pound of wax secreted. Beeswax is a yellowish solid of agreeable, somewhat honey-like odour and of a faint balsamic taste. It is insoluble in water but soluble in carbon tetrachloride (warm ether dissolves beeswax, but it is not soluble in this solvent in the cold) and chloroform. The commercial value of beeswax for polishes is due to its texture. In early times it was preferred to tallow for candles on account of its higher melting point and freedom from smell. The modern use of beeswax for church candles is in accordance with religious ordinance, based on mystical considerations. European and some Japanese waxes are derived from the common bee, *Apis mellifica,* whereas the bulk of the African and Indian waxes are from other varieties, especially *Apis dorsata.* Large quantities are exported from East Africa, South America and the West Indies, and considerable quantities are produced in the United States.

After removal of the honey by draining or by means of a centrifuge, the combs are melted in hot water and the wax strained from gross impurities (dead bees, cocoons, etc.); the residue is pressed to obtain more wax. In large-scale operation the melted honeycombs are expressed in a hydraulic press. The press-residues are boiled up with water and re-pressed. The cake still contains about 10% of wax, which is recovered by extraction with a volatile solvent; such "extracted wax" is darker and of lower quality than that obtained by expression.

Beeswax varies in colour from golden yellow to almost black, depending on the care used in its preparation and also on the age and food of the bees. To preserve the quality and colour, beeswax must always be melted in water and never by direct heat. For some purposes the wax must be bleached; the most satisfactory method is to expose the wax in the form of thin films to the action of moist air and sunlight. The addition of a little oil of turpentine accelerates the process. Ozone may be used, but bleaching by chemical oxidizers, such as chlorine, etc., is less satisfactory, since the product is unsuitable for many purposes (*e.g.,* candles).

Beeswax consists chiefly of free cerotic acid and myricin (myricyl palmitate), with small quantities of other higher fatty acids and alcohols, and about 10% of hydrocarbons. East Indian (Ghedda) wax, like most waxes from the far east, exhibits marked analytical differences from that of European origin.

Beeswax, besides being used for church ceremonial candles, is also employed in the manufacture of wax polishes, ointments, encaustic paints, lithographic inks, modelling wax, etc.

(E. L.; G. H. W.)

BEET, a biennial vegetable producing a thick, fleshy taproot during the first season and a leafy flowering stem in the following season. It is a cultivated form of the plant *Beta vulgaris* (family *Chenopodiaceae*), which grows wild on the coasts of Europe, North Africa and Asia as far as India. The small green flowers are borne in clusters. Many varieties are cultivated for their large fleshy roots, under the names of mangel-wurzel or mangold, field beet, sugar beet and garden beet. The cultivation of sugar beet is dealt with under SUGAR.

The garden beet has been cultivated from very remote times as a salad plant, and for general use as a table vegetable. It has swollen carrot-shaped or turnip-like roots, the "flesh" of which ranges in colour from nearly white to deep red, often with concentric zones of lighter red or white. It is boiled and is prepared as a pickle, as well as in various other forms. The tops are also eaten as a pot-herb. Beet is in much more common use on the continent of Europe as a culinary vegetable than in Great Britain, where it has, however, been cultivated for upwards of two centuries. In 1941 over 6,000,000 bushels were grown for sale in the United States.

The beet *Beta vulgaris* var. *Cicla* is cultivated for the leaves, which are used as spinach. The midribs and stalks of the leaves are also stewed and eaten as sea-kale, under the name of Swiss chard (*see* CHARD OR SWISS CHARD).

The garden beet prospers in a deep, rich, well-prepared soil. If manure is required, it should be turned under deeply in preparing the ground. The seeds should be sown in drills 15 in. to 2 ft. apart, in April or early in May, and the plants are afterward to be thinned to about 8 in. apart in the row, but not more, since moderate-sized roots are preferable; in the United States they are sown 3 to 4 in. apart. In the United States the beets are harvested when 2 to 3 in. in diameter but in Great Britain and in Europe they are allowed to go to the end of October or later. They must be taken up before the frost can injure them. The roots must not be bruised and the leaves must be twisted off —not closely cut. In the north the crop may be wholly taken up in autumn and stored in a pit or cellar, beyond reach of frost. If it is desired to have fresh roots early, the seeds should be sown at the end of February or the beginning of March; and if a succession is required, a few more may be sown by the end of March.

Production of the Sugar Beet.—Garden beet, commonly called beetroot in Europe, is largely grown as a vegetable, but commercially the sugar beet is much the more important. This has been specialized by developing its sugar content and is extensively cultivated for sugar production. It is little cultivated except in the United States and in Europe. Before World War I the production of sugar beet was almost as great as that of sugar cane, but it has been much reduced, while that of the sugar cane has increased and from 1925 to 1941 was about twice as great. The production of sugar beet as raw sugar in the leading beet-growing countries of the world is shown below:

Country	1938
	Tons
Great Britain	353,000
Germany	2,327,000
U.S.S.R.	2,535,000
Czechoslovakia	586,000
United States	1,803,000
France	937,000
Poland	602,000
Other countries	2,818,000
World production	11,608,000

In the United States during 1930–39 the states growing sugar beet were chiefly Colorado, California, Nebraska, Michigan, Montana, Idaho, Utah and Wyoming in the order named.

For many years the introduction of sugar beet cultivation in British agriculture has been advocated, and exhaustive experiments have proved that there is no natural difficulty in growing crops equal in every respect to those grown on the continent of Europe. The obstacles were the reluctance of farmers to grow the crop unless they were sure of a market, and the equal reluctance of capitalists to establish sugar factories unless they could be assured of a constant and sufficient supply of the raw material. In these circumstances the government was appealed to for assistance. The British Sugar (Subsidy) act was passed in 1925. This provided for the payment from the exchequer of a subsidy of 19s. 6d. per cwt. of home-grown sugar, continuing on this basis for four years, being then reduced to 13s. for three years, and to 6s. 6d. for another three, after which it would cease. In 1925 a preference was also given to home-produced sugar in the excise duties.

Under this stimulus sugar factories were rapidly erected in various districts and the acreage of sugar beet increased. The following statement shows the development in each season:

	1926–27	1927–28	1930–34	1938–39
Acres of sugar beet	129,463	229,200	322,000	348,000
No. of factories	14	19	18	18
Tons of sugar beet delivered	1,117,072	2,000,000	3,215,000	3,952,000
Tons of sugar produced	153,487	260,000	497,000	591,000

The production of beet sugar in the United States is encouraged by maintaining a substantial import duty on sugar produced outside the United States. The production of beet sugar at 10-year intervals from 1910 to 1940 in the United States was 546,000, 1,165,000, 1,293,000 and 1,897,000 tons. (V. R. B.)

BEETHOVEN, LUDWIG VAN (1770–1827), German musical composer, was baptized (probably, as was usual, the day after birth) on Dec. 17, 1770, at Bonn.

Parentage and Childhood.—His family is traceable to a village near Louvain, in Belgium, in the 17th century. In 1650 a lineal ancestor of the composer settled in Antwerp. Beethoven's grandfather, who came to Bonn in 1732, and became one of the court musicians of the archbishop-elector of Cologne, was an amiable man whom Ludwig van Beethoven, though only four years old when his grandfather died, remembered with affection to the end of his life. Beethoven's father, a tenor singer at the archbishop-elector's court, was a bad-tempered man whose wage-earning capacity declined with his ability to keep sober. His wife, Magdalena Leym, or Laym—née Keverich, for this was her second marriage—was, like the court musicians, a domestic in electoral palaces. The example of Mozart suggested to Beethoven's father that his son might be profitable as a *Wunderkind.* He accordingly began to give him a severe musical training, especially on the violin, when he was only five years old, at about which time they left the house in which he was born (515 Bonngasse, now preserved as a Beethoven museum).

At nine years of age Beethoven entered upon a course of clavier lessons under a singer named Pfeiffer, and obtained a little general education from a certain Zambona. Van den Eeden, the court organist, and an old friend of his grandfather, taught him the organ and the pianoforte, with the result that in 1781 Van Eeden's successor, C. G. Neefe, was able to allow the boy to act occasionally as his deputy. With his permission Beethoven published in 1783 his earliest extant composition, a set of variations on a march by Dressler. The title-page states that they were written in 1780 *"par un jeune amateur Louis van Beethoven âgé de dix ans."* Beethoven's father could not make up his mind whether thus to antedate the compositions of his infant prodigy, or, as in the case of the three sonatas also written in 1783, to postdate his birth. Accordingly Beethoven for a long time believed that he was born in 1772, and the certificate of his baptism hardly convinced him, because he knew that he had an elder brother named Ludwig who died in infancy.

In the year of these first compositions, 1783, Beethoven was given the post of cembalist in the Bonn theatre, and in 1784 his position of assistant to Neefe became official. In a *catalogue raisonné* of the archbishop-elector's court musicians we find "No. 14, Ludwig Beethoven" described as "of good capacity, still young, of good, quiet behaviour and poor," while his father (No. 8) "has a completely worn-out voice, has long been in service, is very poor, of fairly good behaviour, and married."

First Visit to Vienna.—In the spring of 1787 Beethoven paid a short visit to Vienna, where he astonished Mozart by his extemporizations and had a few lessons from him. How he was enabled to afford this visit is not clear. After three months the illness of his mother, to whom he was devoted, brought him back. She died in July, leaving a baby girl, one year old, who died in November. For five more years Beethoven remained at Bonn supporting his family, of which he had been since the age of 15 practically the head, as his father's bad habits steadily increased until in 1789 Ludwig was officially entrusted with his father's salary. He had already made several lifelong friends at Bonn, of whom the chief were Count Waldstein and Stephan Breuning; and his prospects brightened as the archbishop-elector, in imitation of his brother the Emperor Joseph II., enlarged the scale of his artistic munificence.

By 1792 the archbishop-elector's attention was thoroughly aroused to Beethoven's power, and he provided for Beethoven's second visit to Vienna. The introductions which he and Count Waldstein gave to Beethoven, the prefix "van" in Beethoven's name (which looked well though it was not really a title of nobility), and, above all, his astonishing playing and extemporization, quickly secured his footing with the exceptionally intelligent and musical aristocracy of Vienna, who to the end of his life treated him with genuine affection and respect, bearing with his rudeness and irascibility, not as with the eccentricities of a fashionable genius, but as with the agonies of a passionate and noble nature.

Biographical Sources.—Beethoven's life, though outwardly uneventful, was one of the most pathetic of tragedies. His character has had the same fascination for his biographers as it had for his friends, and there is probably hardly any great man in history of whom more is known and of whom so much of what is known is interesting. The interest which it arouses has led to voluminous controversy on various points; and on the identity of Beethoven's *Unsterbliche Geliebte,* Dr. Kalischer abuses Thayer in terms that rival the breeding of Bentley as his musical scholarship recalls the erudition of Boyle. On such dangerous ground encyclopaedists may excusably fear to tread.

The general lines of Beethoven's life are graphically traced, for English readers, in Grove's article thereon in the *Dictionary of Music and Musicians;* while the monumental biography of Thayer, who devoted his whole life to collecting materials, furnishes fuller information and deserves, it may be added, more mannerly treatment than it has received from those who find occasion to correct it. Thayer, rescuing Beethoven's character from the sentimental legends which had substituted melodrama for life, dealt unflinchingly with the facts, until the mass of grotesque and sometimes sordid detail only threw into clearer light the noble character and passionate zeal for the highest moral ideals throughout every distress and temptation to which a hasty and unpractical temper and the growing shadow of a terrible misfortune could expose a man.

Relations with Haydn.—The man is surpassed only by his works, for in them he had that mastery which was denied to him in what he himself calls his attempt to "grapple with fate." During his studies with Haydn some of the special difficulties that lay in his own character already showed themselves. Haydn, who seems to have heard of Beethoven on the latter's first visit to Vienna in 1787, passed through Bonn in July 1792, and was greatly impressed by his powers. It was probably at his instigation indeed that the archbishop sent Beethoven to Vienna to study under him. But Beethoven did not get on well with him, and

found him perfunctory in correcting his exercises. Haydn appreciated neither his manners nor the audacity of his compositions, and abandoned whatever intentions he may have had of taking Beethoven with him to England in 1794.

Beethoven could do without sympathy, but a grounding in strict counterpoint he felt to be a dire necessity; so he continued his studies with Albrechtsberger, a mere grammarian who had the poorest opinion of him, but who could, at all events, be depended on to attend to his work. The key to the situation is that Mozart had died at the age of 36, just at the time that Beethoven came to Vienna, and that Haydn was profoundly shocked by the untimely loss of the greatest musician he had ever known. At such a time Beethoven's tactlessness doubtless combined with his clumsy efforts at academic exercises to confirm Haydn in the belief that the sun had set for ever in the musical world, and prejudiced him against those bold features of style and form which the whole of his own artistic development had gone far to justify.

It is at least significant that those early works of Beethoven in which Mozart's influence is most evident, such as the septet, aroused Haydn's open admiration, whereas he hardly approved of compositions like the sonatas, op. 2 (dedicated to him), in which his own influence is stronger. Neither he nor Beethoven was articulate except in music, and it is impossible to tell what Haydn meant, or what Beethoven thought he meant, in advising him not to publish the last and finest of the three trios, op. 1. But whatever Haydn meant, he cannot have failed to contrast the achievements of Mozart, who after a miraculous boyhood had produced at the age of 25 some of the greatest music Haydn had ever seen, with the slow and painful development of his uncouth pupil, who at the same age had hardly a dozen presentable works to his credit. There is no evidence that Haydn ever came to understand Beethoven; and many years passed before Beethoven realized the greatness of the master whose teaching had so disappointed him.

Rising Fame and Popularity.—From the time Beethoven settled permanently in Vienna, which he was soon induced to do by the kindness of his aristocratic friends, the only noteworthy external features of his career are the productions of his compositions. In spite of the usual hostile criticisms of his music in respect of its obscurity, exaggeration and so forth, his reputation became world-wide and by degrees actually popular; nor did it ever decline, for as his later works became notorious for their supposed extravagance and unintelligibility his earlier works became better understood. He was no man of business, but he was incalculably suspicious and exacting in money matters, which in his later years frequently turned up in his conversation as a grievance, and at times, especially during the depreciation of the Austrian currency between 1808 and 1815, were a real anxiety to him. Nevertheless, under good management his external prosperity would have been great. He was always a personage of importance, as is testified by every anecdote, including the poorly attested tale of his cramming his hat tighter on his head to show Goethe how to put royalty in its place.

In 1814 it seemed as if the summit of his fame was reached when his 7th symphony was performed, together with a hastily written cantata, *Der glorreiche Augenblick* and the absurd firework entitled *Wellingtons Sieg oder die Schlacht bei Vittoria,* once popular in England as the "Battle Symphony." The occasion for this performance was the Congress of Vienna; and the Government placed the two halls of the Redouten-Saal at his disposal for two nights, while he himself was allowed to invite all the sovereigns of Europe. In the same year he received the freedom of the city, an honour much valued by him. After that time his immediate popularity, as far as new works were concerned, became less pronounced, as that of his easy-going contemporaries began to increase. Yet there was, not only in the emotional power of his earlier works, but also in the known cause of his increasing inability to appear in public, something that awakened the best popular sensibilities; and when his two greatest and most difficult works, the ninth symphony and parts of the *Missa Solennis,* were produced at a memorable concert in 1824, the storm of applause was overwhelming, and the composer, who was on the platform in order to give the time to the conductor, had to be turned round by one of the singers in order to *see* it.

Deafness.—Signs of deafness had given Beethoven grave anxiety as early as 1798. For a long time it is known, he had successfully concealed it from all but his most intimate friends, while he consulted physicians and quacks with eagerness; but neither quackery nor the best skill of his time availed him, and it has been pointed out that the root of the evil lay deeper than could have been supposed during his lifetime. Although his constitution was magnificently strong and his health was preserved by his passion for outdoor life, a post-mortem examination revealed a very complicated state of disorder, evidently dating from youth (if not inherited) and aggravated by bad food and neglect.

The touching document addressed to his brothers in 1802, and known as his "will," should be read in its entirety, as given by Thayer (iv. 4). No verbal quotation short of the whole will do it justice. It runs almost as one long unbroken sentence through the whole tragedy of Beethoven's life as he knew it then and foresaw its future. It dwells upon his natural love of society and his dread of it in his present and future condition. It reproaches men for judging him to be pugnacious and obstinate without suspecting that he may be incurably ill, and terrified lest the cause should appear. Beethoven declared that when those near him had heard a flute or a singing shepherd while he heard nothing, he was only prevented from taking his life by the thought of his art, for it seemed impossible for him to leave the world until he had brought out all that of which he felt himself to be capable. He requests that after his death his doctor shall be asked to describe his illness and to append it to this document in order that at least then the world may be as far as possible reconciled with him. He leaves his brothers his property, such as it is, and declares that only force of character has preserved his life and his courage through all his misery.

And, indeed, his art and his courage rose far above any level attainable by those artists who are slaves to the "personal note," for his chief occupation at the time of this document was his 2nd symphony, the most brilliant and triumphant piece that had ever been written up to that time. On a smaller scale, in which mastery was the more easily attainable as experiment was more readily tested, Beethoven was sooner able to strike a tragic note, and hence the process of growth in his style is more readily traceable in the pianoforte works than in the larger compositions which naturally represent a series of crowning results. Only in his last period does the pianoforte cease to be Beethoven's normal means of expression. Accordingly, the sonatas may conveniently be given a more prominent place than the greater works in our discussion of Beethoven's art. They are a key to all the rest.

Anxieties.—Deafness is a cause of much inconvenience in conversation long before it is noticeable in music, and in 1806 Beethoven could still conduct his opera *Fidelio* and be much annoyed by inattention to his nuances; and his last appearance as a player was not until 1814, when he made a great impression with his B flat trio, op. 97. At the end of Nov. 1822 an attempt to conduct proved disastrous. The touching incident in 1824 has been described; but up to the last Beethoven seems to have found or imagined that ear-trumpets (of which a collection is now preserved at Bonn) were of use to him in playing to himself, though his friends were often pained when the pianoforte was badly out of tune, and were overcome when Beethoven in soft passages did not make the notes sound at all. The instrument sent to him by Broadwood in 1817–18 gave him great pleasure and he answered it with a characteristically cordial and quaint letter in the best of bad French. His fame in England was often a source of great comfort to him, especially in his last illness, when the London Philharmonic Society, for which the 9th symphony was written and a 10th symphony projected, sent him £100 in advance of the proceeds of a benefit concert which he had begged them to give—being in very straitened circumstances, as he would make no use of the money which he had deposited in the bank for his nephew.

This nephew was the cause of most of his anxiety and distress

in the last 12 years of his life. His brother, Kaspar Karl, had often given him trouble; for example, by obtaining and publishing juvenilia, such as the trio-variations, op. 44, the sonatas, op. 49, and other trifles, of which the late opus number is thus explained. In 1815, after Beethoven had quarrelled with his oldest friend, Stephan Breuning, for warning him against trusting his brother in money matters, Kaspar died, leaving a widow of whom Beethoven strongly disapproved, and a son, nine years old, for the guardianship of whom Beethoven fought the widow through all the law courts.

The boy turned out unworthy of his uncle's persistent devotion, and gave him every cause for anxiety. He failed in all his examinations, including an attempt to learn some trade in the polytechnic school, whereupon he fell into the hands of the police for attempting suicide, and, after being expelled from Vienna, joined the army. Beethoven's passionately affectionate nature could neither educate nor understand a human being whose impulses were not strenuous. The boy had really a not much better chance in his uncle's hands than in his mother's. A judicial decision most unfortunately stopped his being sent to a good school in Russia. But Thayer, a faithful judge in matters of humanity, points out that long after the sentimental biographers of Beethoven had done their worst for the nephew, that person pulled himself together and married respectably. He did nothing so mean in requital of Beethoven's inexhaustible affection as the spirit shown by writers who omit to record this.

Character.—Beethoven suffered throughout his whole life for lack of outlet for his affections. He was often deeply in love and made no secret of it; but, after some vaguely rumoured sowings of wild oats he became as fierce as Browning in his resentment of the "artistic temperament" in morals; and his attachments, though mostly to persons unattainably above him in rank, never gave rise to scandal or ridicule. Penitence is not a fashionable virtue in this 20th century; but Joachim has finely described Beethoven as a penitent; and this characteristic does not narrow, but enhances, the unorthodoxy, the humour and tragedy which in his art are blended as inextricably as in Shakespeare and in life. Beethoven's orthodoxy in morals amuses the Philistine when it shows itself in his objections to Mozart's *Don Giovanni,* and in his reasons for selecting the subject of *Fidelio* for his own opera. But genius is far too independent of convention to abuse it; and Beethoven's character, with its masterfulness, its *saeva indignatio* and its penitence, is as far beyond the shafts of Philistine wit as his art.

At the beginning of 1827 Beethoven had projects for a 10th symphony, music to Goethe's *Faust,* and (under the stimulus of his newly acquired collection of Handel's works) any amount of choral music, compared to which all his previous compositions would have seemed but a prelude. But he was in bad health; the hospitality of his brother Johann, did not include bedroom fires and closed carriages; and it resulted in a chill which ended in a fatal illness. A week before his death Beethoven was still full of his projects. Three days before the end he added a codicil to his will, and saw Schubert, whose music had aroused his keen interest. But Beethoven was not able to speak to him, though he afterwards spoke of the Philharmonic Society and the English; almost his last words being "God bless them." On March 26, 1827, during a fierce thunderstorm, he died.

BEETHOVEN'S WORKS

The Three Styles.—The division of Beethoven's work into three styles has been universally accepted, and is based on obvious facts. The styles, however, are not rigidly separated, either in themselves or in chronology. Nor can the popular description of Beethoven's first manner as "Mozartian" be accepted as doing justice to a style which differs more radically from Mozart's than Mozart's differs from Haydn's. The style of Beethoven's third period is no longer regarded as "showing an obscurity traceable to his deafness"; but we have, perhaps, only recently outgrown the belief that his later treatment of form is revolutionary.

The peculiar interest and difficulty in tracing Beethoven's artistic development are that the changes in the materials and range of his art were as great as those in the form, so that he appears in the light of a pioneer, while the art with which he started was nevertheless already a perfectly mature and highly organized thing. And he is also extraordinary in this, that his power of constructing perfect works of art never deserted him while he revolutionized his means of expression. This may be true, though less obviously, of other great artists. But in mature art vital differences in works of similar form are generally more likely to be overlooked than to force themselves on the critic's attention. And when they become so great as to make a new epoch, it is generally at the cost of a period of experiment with perishable results. Nevertheless Beethoven's art moves farther from Mozart's than Mozart's moves from Handel's; and this in a process of development so smooth that its true "periods" should be marked as special stages for each particular work.

Evidence of the Sketch-books.—No artist has ever left more authoritative documentary evidence as to the steps of his development than Beethoven. In boyhood he seems to have acquired the habit of noting down all his musical ideas exactly as they first struck him. It is easy to see why in later years he referred to this as a "bad habit," for it must often take longer to jot down a crude idea than to reject it. But Beethoven had acquired that habit; and thereby he has, perhaps, misled some critics into over-emphasizing the contrast between his "tentative" self-critical methods and the quasi-extempore outpourings of Mozart. But it is probable that in every thoughtful mind every apparently sudden inspiration is preceded by some anticipatory mood in which the idea was sought and its first faint indications tested and rejected so instantaneously as to leave no impression on the memory.

The number and triviality of Beethoven's preliminary sketches should not, then, be taken as evidence of a timid or vacillating spirit. But if we regard his sketches as his diary their significance becomes inestimable. They cover every period of Beethoven's career, and represent every stage of nearly all his important works, as well as of innumerable trifles, including ideas that did not survive to be worked out. And the type of self-criticism is the same from beginning to end. The sketches of the first period show no lack of attention to elements that seem more prominent in the third. The difference between Beethoven's three styles appears first in its full proportions when we realize this complete continuity of his method and art.

First Period Works.—While he was handling a range of ideas not, to modern ears, glaringly different from Mozart's, he had no reason to use a glaringly different language. His contemporaries, however, found it more difficult to see the resemblance; and, though their criticism was often violently hostile, they saw with prejudice a daring originality which we may as well learn to appreciate with study.

Beethoven himself in later years partly affected and partly felt a lack of sympathy with his own early style. But he had other things to do than to criticize it. Modern prejudice has not his excuse, and the neglect of Beethoven's early works is no less than the neglect of the key to the understanding of his later. It is also the neglect of a mass of mature art that already places Beethoven on the same plane as Mozart, and contains perhaps the only traces in all his work of a real struggle between the forces of progress and those of construction. The truth is that there are several styles in Beethoven's first period, in the centre of which, "proving all things," is the true and mature Beethoven, whose scope is destined to expand beyond recognition.

The promise appears in the very earliest works. The pianoforte quartets which he wrote at the age of 15 are, no doubt, clumsy and childish in execution to a degree that contrasts remarkably with the works of Mozart's, Mendelssohn's or Schubert's boyhood; yet they contain material actually used in the sonatas, op. 2, Nos. 1 and 3. And the passage in op. 2, No. 3, is that immediately after the transition (bar 27 *et seq.*) where, as Beethoven then states it, it embodies one of his most epoch-making discoveries, namely, the art of organizing a long series of apparently free modulations by means of a systematic progression in the bass. In the childish quartet the principle is only dimly felt, but it is indisputably present; and it afterwards gives inevitable dramatic truth to such passages as the climax of the development in the sonata, op. 57

(commonly called Appassionata), and, throughout the chaos of the mysterious introduction to the C major string-quartet, op. 59, No. 3, prepares us for the world of loveliness that arises from it.

The First Sonatas.—The first three pianoforte sonatas, op. 2, show the different elements in Beethoven's early style as clearly as possible. Sir Hubert Parry has aptly compared the opening of the sonata, op. 2, No. 1, with that of the finale of Mozart's G minor symphony, to show how much closer Beethoven's texture is. The slow movement (also adapted from a juvenile quartet) well illustrates the rare cases in which Beethoven imitates Mozart to the detriment of his own proper richness of tone and thought, while the finale in its central episode brings a misapplied and somewhat diffuse structure in Mozart's style into direct conflict with themes as Beethovenish in their terseness as in their sombre passion.

The second sonata is flawless in execution, and entirely beyond the range of Haydn and Mozart in harmonic and dramatic thought, except in the finale. And it is just in the adoption of the luxurious Mozartian rondo form as the crown of this work that Beethoven shows his true independence. He adopts the form, not because it is Mozart's but because it is right and because he can master it. The opening of the second subject in the first movement (bar 58 *et seq.*) is a wonderful application of the harmonic principle already mentioned in connection with the early piano quartets. In all music nothing equally dramatic can be found before the D minor sonata, op. 31, No. 2, which is rightly regarded as marking the beginning of Beethoven's second period. The slow movement, like those of op. 7 and a few other early works, shows a thrilling solemnity that immediately proves the identity of the pupil of Haydn with the creator of the 9th symphony.

The little scherzo no less clearly foreshadows the new era in music by the fact that in so small and light a movement a modulation from A to G sharp minor can occur too naturally to excite surprise. If the later work of Beethoven were unknown there would be very little evidence that this sonata was by a young man, except, perhaps, in the abruptness of style in the first movement, an abruptness which is characteristic, not of immaturity, but of art in which problems are successfully solved for the first time. This abruptness is, however, in a few of Beethoven's early works carried appreciably too far. In the sonata in C minor, op. 10, No. 1, for example, the more vigorous parts of the first movement lose in breadth from it, while the finale is almost stunted.

Boldness and Breadth.—But Beethoven was not content to express his individuality only in an abrupt or epigrammatic style. From the outset breadth was also his aim, and while he occasionally attempted to attain a greater breadth than his resources would properly allow (as in the first movement of the sonata, op. 2, No. 3, and that of the violoncello sonata, op. 5, No. 1, in both of which cases a kind of extempore outburst in the coda conceals the collapse of his peroration), there are many early works in which he shows neither abruptness of style nor any tendency to confine himself within the limits of previous art.

The C minor trio, op. 1, No. 3, is not more remarkable for the boldness of thought that made Haydn doubtful as to the advisability of publishing it, than for the perfect smoothness and spaciousness of its style. These qualities Beethoven at first naturally found easier to retain with less dramatic material, as in the other trios in the same opus, but the C minor trio does not stand alone. It represents, perhaps, the most numerous, as certainly the noblest, class of Beethoven's early works. Certainly the smallest class is that in which there is unmistakable imitation of Mozart, and it is significant that almost all the examples of this class are works for wind instruments, where the technical limitations narrowly determine the style and discourage the composer from taking things seriously. Such works are the beautiful and popular septet, the quintet for pianoforte and wind instruments (modelled superficially, yet closely and with a kind of modest ambition, on Mozart's wonderful work for the same combination) and, in a more free, but not more weighty style, the trio for pianoforte, clarinet and violoncello, op. 11, and the horn sonata, op. 17.

The Second Period.—It is futile to discuss the point at which Beethoven's second manner may be said to begin, but he has himself given us excellent evidence as to when and how his first manner (as far as that is a single thing) became impossible to him. Through quite a large number of works, beginning perhaps with the great string quintet, op. 29, new types of harmonic and emotional expression had been assimilated into a style at least intelligible from Mozart's point of view. Indeed, Beethoven's favourite way of enlarging his range of expression often seems to consist in allowing the Titanic force of his new inventions and the formal beauty of the old art to indicate by their contrast a new world grander and lovelier than either. Sometimes, as in the C major quintet, the new elements are too perfectly assimilated for the contrast to appear. The range of key and depth of thought are beyond those of Beethoven's first manner, but the smoothness is that of Mozart.

In the three pianoforte sonatas, op. 31, the struggle of the transition is as manifest as its accomplishment is triumphant. The first movement of the first sonata (in G major) deals with widely separated keys on new principles. These are embodied in a style which for abruptness and jocular paradox is hardly surpassed by Beethoven's most nervous early works. The exceptionally ornate and dilatory slow movement reads almost like a protest; while the finale begins as if to show that humour should be beautiful, and ends by making fun of the beauty. The second of these sonatas (in D minor) is the greatest work which Beethoven had as yet written. Its first movement, already cited above in connection with the dramatic rising bass in op. 2, No. 2, is like that of the Sonata Appassionata, a *locus classicus* for such powerful devices. And it is worth noting that the only sketch known of this movement is a sketch in which nothing but its sequential plan is indicated. In the third sonata Beethoven enjoys on a higher plane an experience which he had often indulged in before, the attainment of smoothness and breadth by means of a delicately humorous calm which gives scope to the finer subtleties of his new thoughts.

Beethoven himself wrote to his publisher that these three sonatas represented a new phase in his style; but when we realize his artistic conscientiousness it is not surprising that they should be contemporary with larger works like the 2nd symphony, which are characteristic rather of his first manner. His whole development is ruled by his determination to let nothing pass until it has been completely mastered; and, long before this, his sketch-books show that he had many ambitious ideas for a 1st symphony, and that it was a deliberate process that made his ambitions dwindle into something that could be safely realized in the masterly little comedy with which he began his orchestral career. The easy breadth and power of the 2nd symphony represent an amply sufficient advance, and leave his forces free to develop in less expansive forms those vast energies for which afterwards the orchestra and the string-quartet were to become the natural field.

Beethoven's Rubicon.—In the Waldstein sonata, op. 53, we see Beethoven's second manner forcibly displacing his first; that is to say, we reach a state of things in which the two can no longer form an artistic contrast. The work, as we know it, is not only perfect, but has all the qualities of art in which the newest elements have long been familiar. The opening is on the same harmonic train of thought as that of the sonata, op. 31, No. 1, but there is no longer the slightest need for a paradoxical or jocular manner. On the contrary, the harmonies are held together by an orderly sequence in the bass, and the onrush is that of some calm diurnal energy of nature.

The short introduction to the finale is harmonically and emotionally the most profound thing in the sonata, while the finale itself uses every new resource in the triumphant attainment of a leisure more splendid than any conceivable in the most spacious of Mozart's rondos. Yet it is well known that Beethoven originally intended the beautiful Andante in F, afterwards published separately, to be the slow movement of this sonata. That Andante is, like the finale, a spacious and gorgeous rondo, which probably Beethoven himself could not have written at an earlier period. The modulation to D flat in its principal theme, and that to G flat near the end, are its chief harmonic effects and stand out in beautiful relief within its limits. After the first movement of the Waldstein sonata they would be as out of place as the line, "But hist! I must dissemble " in a play by Ibsen.

The sketch-books show that Beethoven when he first planned the sonata, was by no means inattentive to the balance of harmonic colour in the whole scheme, but that at first he did not realize how far that scheme was going to carry him. He originally thought of the slow movement as in E major, a remote key to which, however, he soon assigned the more intimate position of complementary key in the first movement. He then worked at the slow movement in F with such zest that he did not discover until the whole sonata was finished that he had raised the first and last movements to an altogether higher plane of thought, though the redundancy of the two rondos in juxtaposition and the unusual length of the sonata were so obvious that his friends ventured to point them out.

Beethoven's revision of his earliest works is now known to have been extensive and drastic; but this is the first instance—and *Fidelio* and the quartet in B flat, op. 131, are the only other instances—of any later work needing important alteration after it was completely executed.

Central Masterpieces.—From this point up to op. 101 we may study Beethoven's second manner entirely free from any survivals of his first, even as a legitimate contrast; though it is as impossible to fix a point before which his third manner cannot be traced as it is to ignore the premonitions of his second manner in his early works. The distinguishing features in Beethoven's second style are the result of a condition of art in which enormous new possibilities have become so well known that the need for paradoxical emphasis has vanished, but the remoter issues have not yet come into view. Hence these works have become for most people the best-known and best-loved type of classical music. In their perfect fusion of untranslatable dramatic emotion with every beauty of musical design and tone they have never been equalled, nor is it probable that any other art can show a wider range of thought embodied in a more perfect form. In music itself there is nothing else of so wide a range without grave artistic defects from which Beethoven is entirely free. Wagnerian opera aims at an ideal as truly artistic, but in range so far wider than Beethoven's that it passes beyond the bounds of pure music altogether. Within those bounds Beethoven remained, and even the apparent exceptions (such as *Fidelio* and his two great examples of "programme music," the Pastoral symphony and the sonata, Les Adieux) only show how universal his conception of pure music is. Extraneous ideas had here struck him as magnificent material for instrumental music, and he never troubled to argue whether instrumental music is the better or worse for expressing extraneous ideas.

To describe the works of Beethoven's second period here would be to describe a library of well-known classics. Further illustrations will be found in the articles on SONATA FORMS; CONTRAPUNTAL FORMS; HARMONY and INSTRUMENTATION. It remains here to indicate the essential features of his third style, and to conclude with a survey of his influence on the history of music.

The Third Period.—Beethoven's third style arose imperceptibly from his second. His deafness had very little to do with it; indeed, all his epoch-making discoveries in orchestral effect date from the time when he was already far too much inconvenienced to test them in a way which would satisfy anyone who depended more upon his ear than upon his imagination. The general features of Beethoven's latest style may be paralleled by the tendencies of all great artists who have handled their material until it contains nothing that has not been long familiar with them.. Such tendencies lead to an extreme simplicity of form, underlying an elaboration of detail which may at first seem bewildering until we realize that it is purely the working out to its logical conclusions of some idea as simple and natural as the form itself. The form, however, will be not merely simple, but individual. Different works will show such striking external differences of form that a criticism which applies merely *a priori* or historic standards will be tempted by the fallacy that there is less form in a number of such markedly different works than in a number of works that have one scheme in common.

The extreme simplicity of Beethoven's themes in the first two movements of the quartet in B flat, op. 130, and the tremendous complexity of the texture into which they are woven, at first seem mysterious and intangible rather than astonishing. The boldness with which the slow introduction is blended in broad statement and counter-statement with the allegro, is directly impressive, as is also the entry of the second subject with its dark harmony and tone, but the work needs long familiarity before its vast mass of thought reveals itself to us in its true lucidity. Such works are "dark with excessive bright." When we enter into them they are transparent as far as our vision extends, and their darkness is that of a depth that shines as we penetrate it. In all probability only a veil of familiarity prevents our finding the same kind of difficulty in Beethoven's earlier works.

Increasing Polyphony.—What is undoubtedly newest in the last works is their ubiquitous polyphony, an element always essential to the life of a composition, but never so prominent before, except in regular fugues. Polyphony inevitably draws attention to detail, and thus Beethoven in his middle period found its more obvious forms but little conducive to the breadth of designs which were not as yet sufficiently familiar to take any but the foremost place. Hence, among other interesting features of that second period, his marked preference for themes founded on rhythmic figures of one note, *e.g.*, the famous "four taps" in the C minor symphony; an identical rhythm in a melodious theme of very different character in the G major concerto; a similar figure in the Sonata Appassionata; the first theme of the scherzo of the F major quartet, op. 59, No. 1, and the five drum-beats in the violin concerto. Such rhythms give thematic life to an inner part without distracting attention from the surface. But in proportion as polyphony loses its danger, so does the prominence of such rhythmic figures decrease, until in Beethoven's last works they are no more noticeable than other kinds of simplicity. The impression of crowded detail is naturally more prominent the smaller the means with which Beethoven works and the less outwardly dramatic his thought. Thus those most gigantic of all musical designs, the 9th symphony, and the Mass in D, are, but for the mechanical difficulties of the choral writing, as directly impressive as the works of the second period; and the enormous pianoforte sonata, op. 106, is in its first three movements easier to follow than the extremely terse and subtle works on a smaller scale that preceded it (sonata in A major, op. 101, and the two sonatas for violoncello, op. 102).

New Fugue Forms.—Beethoven's increasing need for polyphony soon led him to write in fugue, not only, as previously, by way of episodic contrast to passages and designs in which the form and not the texture is the main object of interest, but as the consummation of a unity of form and texture that allows the mind to concentrate itself on the texture alone. This union was not effected without a struggle, the traces of which present a parallel to the abrupt sententiousness of some of Beethoven's early works. In his fugue-writing the impulse is so dramatic that it demands all Beethoven's firmness and resource in relation to the form of the whole piece. Yet the listener must attend not to the whole form, but must listen to the texture only, and let the form remain in the background of his mind. This notion is, in relation to the style, a paradox; and accordingly the texture is forced upon the listener's attention by a continual series of ruthlessly logical bold strokes of harmony. From this and from the notorious violence of Beethoven's choral writing, and also from his well-known technical struggles in his years of pupilage, the easy inference has been drawn that Beethoven never was a great master of counterpoint. Beethoven himself might afford to think so; but his art is on the plane where an imperfect style becomes no worse than an imperfect instrument of which the defects can all be turned into qualities. And the fact is that Beethoven's counterpoint becomes rough only under dramatic and emotional stress. No doctor of music could do better triple counterpoint than that in the andante of the string quartet in C minor, op. 18, No. 4, and there is no trace of crudeness in Beethoven's handling of harmonies, basses, or inner parts at any period of his career.

Beethoven may have mastered some things with difficulty, but he mastered nothing incompletely; and where he is not orthodox it is safest to conclude that orthodoxy is wrong. Had he lived for another ten years he would certainly have produced many choral works and many other great instrumental works in which this last

remaining element of conflict between texture and form would have dwindled away. But while this would doubtless result in such works being easier to follow, it would yet be no sound criterion by which to stigmatize as an immaturity the roughness of the polyphonic works that we know. That roughness is a necessary condition, without which Beethoven's extant material could have received only the academic handling of a dead language. And by it was created that permanent reconciliation of polyphony and form from which has arisen almost all that is true in "Romantic" music, all that is peculiar to the thematic technique of Wagnerian opera, and all the perfect smoothness of Brahms's polyphony.

Supreme Artistic Concentration.—The depth of thought and closeness of texture in Beethoven's later works are, of course, the embodiment of a no less profound emotional power. If we at times feel that the last quartets are more introspective than dramatic, that is only because Beethoven's dramatic sense is higher than ours. The subject is too large and too subtle for dogmatism to be profitable; and we cannot in Beethoven's case, as we can in Bach's, cite a complete series of illustrations of his musical ideas from his treatment in choral music of words which themselves interpret the intention of the composer. There is so little but the music itself by which one can express Beethoven's thought, that the utmost we can do here is to refer the reader, as before, to the articles on SONATA FORMS; HARMONY; INSTRUMENTATION; OPERA and MUSIC, where he will find further attempts to indicate in what sense pure music can be described as dramatic and expressive of emotion.

As our range of investigation widens, and thoroughness of analysis and study increases, so we shall surely find in ourselves an ever-deepening conviction that Beethoven, whether in range, depth and truth of thought, perfect sense of beauty, or absolute conscientiousness of execution, is the greatest musician, perhaps the greatest artist, that ever lived. There is no means of measuring Beethoven's influence upon subsequent music. Every composer of every school claims it. The immense changes which he brought about in the range of music have their most obvious effect in the possibilities of emotional expression; and so every outbreak of vulgarity or sentimentality can with impunity claim descent from Beethoven, though its ancestry may be no higher than Meyerbeer. Consider, again, that confusion of thought which regards a series of works markedly different in form as containing less form than any number of works all cast in the same mould. Hence the works of Beethoven's third period have been cited in defence of more than one "revolution," attempted in a form which never existed in any true classic, for the purpose of setting up something the revolutionist has not yet succeeded in inventing.

Immeasurable Influence.—To measure Beethoven's influence is like measuring Shakespeare's. It is an influence either too vague or too profound to define. Perhaps the truest account of it would be that which ignored its presence in the works of ill-balanced artists, or even in the works of those who profited merely by an increase of technical and harmonic resource which, though effected by Beethoven, would, after the French Revolution and the Napoleonic wars, almost certainly have to some extent arisen, from sheer necessity of finding expression for the new experience of humanity, if Beethoven had never existed. Setting aside, then, all instances of mere domination, and of a permanently established new world of musical thought, and omitting Schubert and Weber as contemporaries, the one attracted and the other partly repelled, we may, perhaps, take three later composers, Schumann, Wagner and Brahms, as the leading examples of the way in which Beethoven's influence is definitely traceable as a creative force.

The depth and solemnity of Beethoven's melody and later polyphonic richness are a leading source of Schumann's inspiration, though Schumann's artistic schemes exclude any high degree of organization on a large scale. Beethoven's late polyphony is carried on by Brahms to the point at which perfect smoothness of style is once more possible, and there is no aspect of his form which Brahms neglects or fails to realize with that complete originality which has nothing to fear from its ancestry. Wagner does not handle the same art-forms; his task is different; but Beethoven was the inspiring source, not only of his purely musical sense, but also of his whole sense of dramatic contrast and fitness. When he had shaken off the habits of second-rate operatic styles there remained to him, pre-eminently in his music and more imperfectly realized in his drama, a power of combining contrasted emotions found only in the greatest dramatists. Bach and Beethoven are the sources of the polyphonic means of expression by which he attains this achievement. Beethoven alone is the extraneous source of his knowledge that it was possible.

It is as certain as anything in the history of art that there will never be a time when Beethoven's work does not occupy the central place in a sound musical mind. When Beethoven is out of fashion, that is because people are afraid of drama and of sublime emotions. And that amounts merely to a fear of life.

CLASSIFIED SUMMARY OF BEETHOVEN'S WORKS

A. WORKS IN SONATA FORMS

Thirty-two pianoforte sonatas: 1 4-hand sonata; 10 violin sonatas; 5 violoncello sonatas; 1 horn sonata; 7 pianoforte trios (1 with clarinet); 5 string trios; 1 trio for flute, violin and viola; 1 trio for 2 oboes and cor anglais; 16 string quartets and a fugue originally intended for the finale of the quartet, op. 130; 1 quintet for pianoforte and wind instruments (also freely arranged as a quartet for pianoforte and strings); 2 string quintets and a quintet arrangement of the trio, op. 1, No. 3; 2 sextets, one for strings and 2 horns, the other for wind instruments; 1 septet; 1 octet for wind, arranged from the string quintet, op. 4 (not vice versa, as is usually believed); 9 symphonies (the 9th with a choral finale); 5 pianoforte concertos, 1 violin concerto, and 1 triple concerto for pianoforte, violin and violoncello.

B. CHORAL, DRAMATIC AND VOCAL WORKS

Two masses (C major, op. 89; *Missa Solemnis* in D, op. 123); oratorio, *Christus am Ölberge;* opera, *Fidelio* (first version entitled *Leonora*); overture and incidental music to Goethe's *Egmont;* ballet, *Die Geschöpfe des Prometheus;* 2 festival dramatic *pièces d'occasion, Die Ruinen von Athen* and *König Stephan;* 1 fantasia for pianoforte, chorus and orchestra; songs of which the *Liederkreis,* op. 98 (a continuous song-cycle), is important, while the 6 religious songs, op. 39, and the long aria *Adelaide* are the best known of the remaining works in this medium, which was not Beethoven's forte.

C. SMALLER WORKS AND WORKS WITHOUT OPUS NUMBERS

The pianoforte sets of variations include those on a Diabelli waltz, the greatest variation work since Bach's Goldberg variations; the *Prometheus* variations, op. 35 (foreshadowing the finale of the *Eroica* symphony); the 32 variations in C minor (a great *chaconne,* without opus number); and a wonderful early set of 24 on an air of Rhigini. Several smaller sets are worth study. The Andante in F originally belonged to the *Waldstein* sonata; and the fantasia, op. 77, foreshadows the choral fantasia and the finale to the 9th Symphony. Three sets of Bagatelles range from work revised from *Juvenilia* to Beethoven's last pieces for the pianoforte.

D. POSTHUMOUS WORKS

Two early cantatas are interesting as containing material afterwards used in *Fidelio.* An early symphony was published in 1912.

(D. F. T.)

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BEETLE, a name commonly applied to those insects which possess horny wing-cases; it is used to denote the cockroaches (*q.v.*) (black beetles), as well as the true beetles or Coleoptera (*q.v.*). From another word (O.E. *betel,* connected with "beat") comes "beetle" in the sense of a mallet, and the "beetling-machine," which subjects fabrics to a hammering process.

BEET LEAF MINER, the common name of *Pegomya hyoscyami,* of the family Muscidae of the order diptera (*q.v.*). The larvae live within the leaves of beets, spinach and other cultivated and wild plants, often doing enormous damage. The eggs are laid on the under surface of the leaves. There may be several generations each year. Spraying or dusting with rotenone or pyrethrum, aid in control. Crop remnants should be destroyed. Other species of *Pegomya* mine in the leaves of various plants.

BEET-LIFTER: *see* HARVESTING MACHINERY.

BEETS, NIKOLAAS (1814–1903), Dutch poet, was born at Haarlem, and constant references in his poems and sketches show how deeply the beauty of that town and its neighbourhood impressed his imagination. In his youth Beets was carried away on the tide of Byronism, which was then sweeping over Europe, and his early works *Jose* (1834), *Kuser* (1835) and *Guy de Vlaming* (1837) are of the most impassioned type. But he was beginning in prose the composite work of humour and observation which has made him famous, and which certainly had nothing in the least Byronic about it. This was the celebrated *Camera Obscura* (1839), the most successful imaginative work which any Dutchman of the 19th century produced. This work, published under the pseudonym of "Hildebrand," goes back in its earliest inception to the year 1835 and consists of complete short stories, descriptive sketches and studies of peasant life—filled with humour and pathos. In middle life he published collections of verse —*Cornflowers* (1853) and *New Poems* (1857).

BEET SUGAR: *see* SUGAR and BEET.

BEFANA (Ital., corrupted from *Epifania,* Epiphany), the Italian female counterpart of Santa Claus. On Epiphany, or Twelfth Night, she fills children's stockings with presents. Tradition relates that she was too busy to see the Three Wise Men of the east pass on their journey to pay adoration to the Saviour, saying that she could see them on their return. They went back another way, and Befana was punished by having to look for them forever. In spite of her Santa Claus character, her name is used by Italian mothers to frighten the babies.

BEFFROY DE REIGNY, LOUIS ABEL (1757–1811), French dramatist and man of letters, was born at Laon on Nov. 6, 1757. Under the name of "Cousin Jacques" he founded a periodical called *Les Lunes* (1785–1787). The *Courrier des planètes ou Correspondance du Cousin Jacques avec le firmament* (1788–1792) followed. In spite of his protests against the Revolution he escaped interference through the influence of his brother, Louis Étienne Beffroy, who was a member of the Convention. Of *La Petite Nanette* (1795) and several other operas he wrote both the words and the music. His *Dictionnaire néologique* (3 vols., 1795–1800) of the chief actors and events in the Revolution was interdicted by the police and remained incomplete. Beffroy died in Paris on Dec. 17, 1811.

BEGAS, KARL (1794–1854), German historical painter, was born in Heinsberg, near Aix-la-Chapelle, on Sept. 30, 1794, and died on Nov. 23, 1854, at Berlin. He studied in Paris under Gros. In 1814 his copy of the "Madonna della Sedia" was bought by the king of Prussia. He was engaged to paint several large biblical pictures, and in 1825, continued to produce paintings which were placed in the churches of Berlin and Potsdam. Begas was also celebrated as a portrait-painter. His son OSKAR (1828–1883) was also a painter and professor of painting at Berlin. He executed the pictures in the lunettes of the Berlin Rathaus.

BEGAS, REINHOLD (1831–1911), German sculptor, younger son of Karl Begas, the painter, was born at Berlin on July 15, 1831, and died there on Aug. 3, 1911. He received his early education (1846–51) in the ateliers of C. D. Rauch and L. Wichmann. During a period of study in Italy, from 1856 to 1858, he was strongly influenced by the study of Michelangelo and by his admiration for the art of the baroque period. After the execution of the group "Borussia," for the façade of the exchange in Berlin, he was for a few months in 1861, professor at the art school at Weimar. The statue of Schiller for the Gendarmen Markt in Berlin, was his work. From 1870 onward Begas dominated the plastic art in Prussia, especially in Berlin. Among his chief works during this period were the colossal statue of Borussia for the Hall of Glory; the Neptune fountain in bronze on the Schlossplatz; the statue of Alexander von Humboldt, all in Berlin; the sarcophagus of the Emperor Frederick III in the mausoleum of the Friedenskirche at Potsdam; and the national monument to the Emperor William (*see* BERLIN), the statue of Bismarck before the Reichstag building, and several of the statues in the Siegesallee. Begas was a most versatile artist. If his preference was for mythological and decorative subjects, of which his Mercury and Psyche (1874) is a good example, he was the most famous German sculptor of his time in portraiture, and executed portrait busts of many of his great contemporaries.

BEGGAR, one who begs, particularly one who gains his living by asking the charitable contributions of others. The word, with the verbal form "to beg," in M.E. *beggen,* is of obscure history. The words appear first in English in the 13th century, and were early connected with "bag," with reference to the receptacle for alms carried by the beggars. The most probable derivation of the word, and that now generally accepted, is that it is a corruption of the name of the lay communities known as Beguines and Beghards, which, shortly after their establishment, followed the friars in the practice of mendicancy. It has been suggested, however, that the origin of "beg" and "beggars" is to be found in a rare O.E. word, *bedecian,* of the same meaning, which is apparently connected with the Gothic *bidjan, cf.* German *betteln;* but between the occurrence of *bedecian* at the end of the 9th century and the appearance of "beggar" and "beg" in the 13th, there is a blank, and no explanation can be given of the great change in form. For the English law relating to begging and its history, *see* CHARITY; POOR LAW and VAGRANCY.

BEGGAR-MY-NEIGHBOUR, a simple card game. An ordinary pack is divided equally between two players, and the cards are held with the backs upward. The first player lays down his top card face up, and the opponent plays his top card on it and this goes on alternately as long as no court card appears, but if either player turns up a court card, his opponent has to play four ordinary cards to an ace, three to a king, two to a queen, one to a knave, and when he has done so the other player takes all the cards on the table and places them under his pack; if, however, in the course of this playing to a court card, another court card turns up, the adversary has in turn to play to this, and as long as neither has played a full number of ordinary cards to any court card the trick continues. The player who gets all the cards into his hand is the winner.

BEGONIA, a large genus (family Begoniaceae) of succulent herbs or undershrubs, with about 400 species in tropical moist climates, especially South America and India. Innumerable garden hybrids and varieties are grown chiefly in the greenhouse for their gorgeous coloured foliage; many are tuberous. The flowers are usually showy and large, white, rose, scarlet or yellow in colour; they are unisexual, the male containing numerous stamens, the female having a large inferior ovary and two to four branched or twisted stigmas. The rex begonia and *B. semperflorens* are the most common in cultivation, and are usually raised from cuttings.

BEGUINES, at the present time the name of the members of certain lay sisterhoods established in the Netherlands and Germany, the enclosed district within which they live being known as a beguinage (Lat. *beginagium*). The equivalent male communities, more usually called Beghards (Lat. *baghardi*), have long ceased to exist. The origin of the names Beguine and Beghard has been the subject of much controversy; but it is now universally admitted that both the institution and the name of the Beguines are derived from Lambert le Bègue, a priest of Liége, who died about the year 1187.

About the year 1170 Lambert, who had devoted his fortune to founding the hospital and church of St. Christopher for the

widows and children of crusaders, conceived the idea of establishing an association of women, who, without taking the monastic vows, should devote themselves to a life of religion. The effect of his preaching was immense, and large numbers of women, many of them left desolate by the loss of their husbands on crusade, came under the influence of a movement which was attended with all the manifestations of what is now called a "revival." About the year 1180 Lambert gathered some of these women, who had been ironically styled "Beguines" by his opponents, into a semi-conventual community, which he established in a quarter of the city belonging to him around his church of St. Christopher. The district was surrounded by a wall within which the Beguines lived in separate small houses, subject to no rule save the obligation of good works, and of chastity so long as they remained members of the community.

After Lambert's death the movement rapidly spread, first in the Netherlands and afterwards in France—where it was encouraged by the saintly Louis IX—Germany, Switzerland and the countries beyond. Everywhere the community was modelled on the type established at Liége. It constituted a little city within the city, with separate houses, and usually a church, hospital and guesthouse, the whole being under the government of a mistress (*magistra*). Women of all classes were admitted; and, though there was no rule of poverty, many wealthy women devoted their riches to the common cause. The Beguines did not beg; and, when the endowments of the community were not sufficient, the poorer members had to support themselves by manual work, sick nursing and the like.

The Beguine communities were fruitful soil for the missionary enterprise of the friars, and in the course of the 13th century the communities in France, Germany and upper Italy had fallen under the influence of the Dominicans and Franciscans to such an extent that in the Latin-speaking countries the tertiaries of these orders were commonly called *beguini* and *beguinae*.

The very looseness of their organization made it inevitable that the Beguine associations should follow very diverse developments. Some of them retained their original character; others fell completely under the dominion of the friars, and were ultimately converted into houses of Dominican, Franciscan or Augustinian tertiaries; others again fell under the influence of the mystic movements of the 13th century, turned in increasing numbers from work to mendicancy, practised the most cruel self-tortures, and lapsed into extravagant heresies that called down upon them the condemnation of popes and councils. All this tended to lower the reputation of the Beguines. During the 14th century, indeed, numerous new Beguinages were established; but ladies of rank and wealth ceased to enter them, and they tended to become more and more mere almshouses for poor women. By the 15th century in many cases they had utterly sunk in reputation and at the Reformation the communities were suppressed in Protestant countries. The beguinages in Germany became simply almshouses for poor spinsters, those in Holland (*e.g.*, at Amsterdam and Breda) and Belgium preserved more faithfully the characteristics of earlier days. The beguinage of St. Elizabeth at Ghent had some thousand sisters, and occupied quite a distinct quarter of the city, being surrounded by a wall and moat. The Beguines wear the old Flemish headdress and a dark costume, and are conspicuous for their kindness among the poor and their sick nursing.

It is uncertain whether the parallel communities of men originated also with Lambert le Bègue. The first records are of communities at Louvain in 1220 and at Antwerp in 1228. The history of the male communities is to a certain extent parallel with the female, but they were never so numerous and their degeneration was far more rapid. The earliest Flemish Beghard communities were associations mainly of artisans who earned their living by weaving and the like, and appear to have been in intimate connection with the craft guilds; but under the influence of the mendicant movement of the 13th century these tended to break up, and, though certain of the male beguinages survived or were incorporated as tertiaries in the orders of friars, the name of Beghard became associated with groups of wandering mendicants who made religion a cloak for living on charity; *beguigner* becoming in the French language of the time synonymous with "to beg," and *beghard* with "beggar," a word which, according to the latest authorities, was probably imported into England in the 13th century from this source (*see* BEGGAR). More serious still, from the point of view of the church, was the association of these wandering mendicants with the mystic heresies of the Fraticelli, the Apostolici and the pantheistic Brethren of the Free Spirit. The situation was embittered by the hatred of the secular clergy for the friars, with whom the Beguines were associated.

Restrictions were placed upon them by the synod of Fritzlar (1269), by that of Mainz (1281) and Eichstätt (1281); and by the synod of Béziers (1299) they were absolutely forbidden. They were again condemned by a synod held at Cologne in 1306; and at the synod of Trier in 1310 a decree was passed against those "who under a pretext of feigned religion call themselves Beghards . . . and, hating manual labour, go about begging, holding conventicles and posing among simple people as interpreters of the Scriptures."

Matters came to a climax at the council of Vienne in 1311 under Pope Clement V, where the "sect of Beguines and Beghards" were accused of being the main instruments of the spread of heresy, and decrees were passed suppressing their organization and demanding their severe punishment. The decrees were put into execution by Pope John XXII, and a persecution raged in which, though the pope expressly protected the female Beguine communities of the Netherlands, there was little discrimination between the orthodox and unorthodox Beguines. This led to the utmost confusion, the laity in many cases taking the part of the Beguine communities, and the church being thus brought into conflict with the secular authorities. In these circumstances the persecution died down; it was, however, again resumed between 1366 and 1378 by Popes Urban V and Gregory XI, and the Beguines were not formally reinstated until the pontificate of Eugenius IV (1431–47). The male communities did not survive the 14th century, even in the Netherlands, where they had maintained their original character least impaired.

See Herzog-Hauck, *Realencyklopädie* (3rd ed., 1897) *s.* "Beginen," by Herman Haupt, where numerous further authorities are cited; Gieseler, *Ecclesiastical History* (Eng. tr. vol. iii, Edinburgh, 1853); *Theologischer Jahresbericht*, 1902, page 495.

BEHAIM or **BEHEM, MARTIN** (1436?–1507), German navigator and geographer, was born at Nuremberg, according to one tradition, about 1436; according to Ghillany, as late as 1459. He was drawn to Portugal by participation in Flanders trade, and acquired a scientific reputation at the court of John II. He became (*c.* 1480) a member of a council appointed by King John for the furtherance of navigation and is said to have introduced into Portugal various improvements in nautical instruments. In 1484–85 he claimed to have accompanied Diogo Cão in his second expedition to West Africa, really undertaken in 1485–86, reaching Cabo Negro in 15° 40′ S. and Cabo Ledo still farther on. His pretensions have been disputed, and it is suggested that instead of sharing in this great voyage of discovery, the Nuremberger only sailed to the nearer coasts of Guinea, perhaps as far as the Bight of Benin, and possibly with José Visinho the astronomer and with Joãb Affonso d'Aveiro, in 1484–86. Martin's later history, as traditionally recorded, was as follows. On his return from his West African exploration to Lisbon he was knighted by King John, who afterwards employed him in various capacities; but, from the time of his marriage in 1486, he usually resided at Fayal in the Azores, where his father-in-law, Jobst van Huerter, was governor of a Flemish colony.

On a visit to his native city in 1492, he constructed his terrestrial globe, still preserved in Nuremberg, and often reproduced, in which the influence of Ptolemy is strongly apparent, but wherein some attempt is also made to incorporate the discoveries of the later middle ages (Marco Polo, etc.). As a scientific work it is unimportant, ranking far below the *portolani* charts of the 14th century. Its West Africa is marvellously incorrect; the Cape Verde archipelago lies hundreds of miles out of its proper place; and the Atlantic is filled with fabulous islands. Blunders of 16° are found in the localization of places the author claims to have

visited: contemporary maps, at least in regard to continental features, seldom went wrong beyond 1°. It is generally agreed that Behaim had no share in transatlantic discovery; and though Columbus and he were apparently in Portugal at the same time, no connection between the two has been established. He died at Lisbon on Aug. 8, 1507.

See A. von Humboldt, *Kritische Untersuchungen* (1836); F. W. Ghillany, *Geschichte des Seefahrers Martin Behaim* (1853); Eugen Gelcich in the *Mittheilungen* of the Vienna Geographical Society, vol. xxxvi, pp. 100, etc.; E. G. Ravenstein, *Martin de Bohemia* (Lisbon, 1900), *Martin Behaim, His Life and His Globe* (1909), and "Voyages of Diogo Cão and Bartholomeu Dias, 1482–88," in *Geographical Journal,* Dec. 1900. *See* also *Geog. Journal,* Aug. 1893, p. 175, Nov. 1901, p. 509; Jules Mees in *Bull. Soc. Geog.,* Antwerp, 1902, pp. 182–204; A. Ferreira de Serpa in *Bull. Soc. Geog.,* Lisbon, 1904, pp. 297–307.

BEHAR (BIHAR), an autonomous province of British India, formerly part of the province of Behar and Orissa. Bihar, extending across the valley of the Ganges from the frontier of Nepal to the province of Orissa, is composed of the four administrative divisions of Patna, Tirhut, Bhagalpur and Chota Nagpur, with a total area of 69,745 sq.mi.; and pop. (1941) of 36,340,151. The only large cities are Patna (pop. 1941) 175,706, Gaya 105,223, Jamshedpur 148,711 and Bhagalpur 93,254. Patna is the capital of the province. Aside from the mountainous region of Chota Nagpur, the general aspect of the country is flat, except in the north of Champaran, where the Sumeswar and Dun hills abut upon the plain, in Shahabad, where the Kaimur hills rise in a rocky plateau, and in the districts of Gaya, Monghyr and Bhagalpur, where outliers of the Chota Nagpur plateau are found. A densely populated tract, it was formerly liable to famine; but it is now well protected by railways and in some parts by canals. There were 698,392 ac. under irrigation in 1939–40.

The soil, particularly in the northern plain is extremely fertile and more than 80% of the population depends entirely upon agriculture. Rice is by far the most important crop, normally occupying more than half the area in crops or approximately 12,000,000 ac. In 1941–42 there were only 8,869,700 ac. given over to rice. Production averages between 4,000,000 and 5,000,000 tons annually. Cultivation is restricted mainly to the alluvial plain but in Chota Nagpur rice is grown on terraces cut in the plateau edge and in depressions between the ridges. Other crops with 1941–42 acreages are maize 1,461,200, wheat 1,300,000, barley 1,284,300, spring oilseeds 1,470,200, tobacco 111,200 and jute 250,000. Of the jute crop 95% is produced in the Purnea district bordering Bengal. Bihar ranks second only to the United Provinces in the production of white sugar and its 31 factories account for one-fourth of the total for India. Indigo was formerly an important crop but failed to survive in competition with synthetic dyestuffs. Opium is no longer produced, as a result of an agreement with the Chinese government and the closing of the factory at Patna. Tobacco cultivation increased after the Peninsular Tobacco company erected one of the largest cigarette factories in the world at Monghyr. There is one other tobacco factory in the province.

Coal mining is the leading mineral industry of Bihar, 17,207,768 short tons being produced in 1938. The coal fields in Manbhum district underwent the greatest development and new fields are being developed at Ramgarh, Rokaro and Karanpura in Hazaribagh. The latter district is the most important mica mining centre in the world. In 1938, 4,717 short tons of excellent quality were produced. The Jamshed district has some of the richest and most extensive iron mines in the world. In 1938, 1,591,621 short tons of ore were produced and supplied to iron and steel works in both Bengal and Bihar. The Tata Iron and Steel works at Jamshedpur are among the largest in the world and subsidiary industries chiefly for the production of tin-plate, wire, bars and cables are being established. Other mineral products of Bihar with 1938 production in short tons are: copper ore and matte 322,645, manganese ore 27,405 and chromite 5,817. These are chiefly from the Singhbhum district. Cement is produced from the limestone deposits of Palaman and Shahabad.

The production of lac and the manufacture of shellac is of importance in the districts of Manbhum, Palaman, Ranchi, the Santal Parganas and Gaya. There are 1,978 sq.mi. of forests in the province which produced 6,189,000 cu.ft. of timber and fuel in 1939–40.

Bihar derives its name from the town of Bihar, now a subdivisional headquarters in the Patna district, and the latter took its name from a great Buddhist *Vihara* or monastery established there in the 9th century A.D. Bihar was the capital of Magadha (South Bihar) under the Pala kings and continued to be the capital under Mohammedan governors until the 16th century, when the seat of government was transferred to Patna.

BEHAR (BIHAR) **AND ORISSA,** a former province of British India created in 1912 by separation from western Bengal, bounded on the north by Nepal and the Bengal district of Darjeeling, on the east by Bengal, on the south by the sea and the Madras Presidency, and on the west by the Central Provinces and the United Provinces. Behar and Orissa became separate provinces with the inception of the Government of India act of 1935. (*See* BEHAR; ORISSA.)

Geology and Physical Aspects.—This heterogeneous province comprised the northeast coign of the Deccan plateau with a lowland alluvial fringe round about it. The plateau has a basis of gneissic, schistose and granitic rocks which received a covering of lower Gondwana rocks, including coal-bearing strata, at the end of the Palaeozoic period. The plateau was subjected to heavy faulting and denudation before the upper Gondwana series was laid down, and in consequence the lower Gondwana layers, including coal measures, are found chiefly along east to west bands towards the northern edge of the plateau, where they have been faulted in and thus preserved. The Karharbari coal field and the Rajmahal hills have lavas traversing the beds in dykes in the former, but interbedded in the latter, though both are said to be of the same age.

The coign of the plateau is deeply dissected by streams fed by monsoon rains, mostly relatively short and running low in the dry season, but the Son, a tributary of the Ganges, has a catchment area of 21,000 sq.mi. The Rajmahal hills in the east and their outliers cover about 2,000 sq.mi. The northern part of the plateau includes parts of South Behar and Chota Nagpur with the peak of Parasnath (4,479 ft.) and numerous flat-topped hills, *e.g.,* Neturhat Pat (3,356 ft.), with a summit of 4 by 2½ miles. In Orissa are the peaks of Malayagiri (3,895 ft.) and Meghasani (3,824 ft.), the latter rich in iron ore.

The whole coign stands out into alluvial lowland, of the Ganges on the north, the Ganges delta on the east, and the coastal plain with the far spreading Mahanadi delta on the southeast. The province spread in a long tongue southwestwards in the valley of the Tel, a feeder of the Mahanadi, separated from the coast by a continuation of the eastern Ghats, mainly in the Madras Presidency but including Bankasamo (4,182 ft.), which is in Orissa.

The province thus included (a) the alluvial plain between Nepal and the Ganges (North Behar); (b) the Son valley and the northward slopes of the plateau (South Behar); (c) the plateau and forested valleys of Chota Nagpur; (d) and the inland forested hills of the feudatory states of Orissa as well as (e) the coastal alluvium of Orissa, with a teeming population but serious flood dangers due to the fact that deposit of silt has lifted the rivers above the general level of the land.

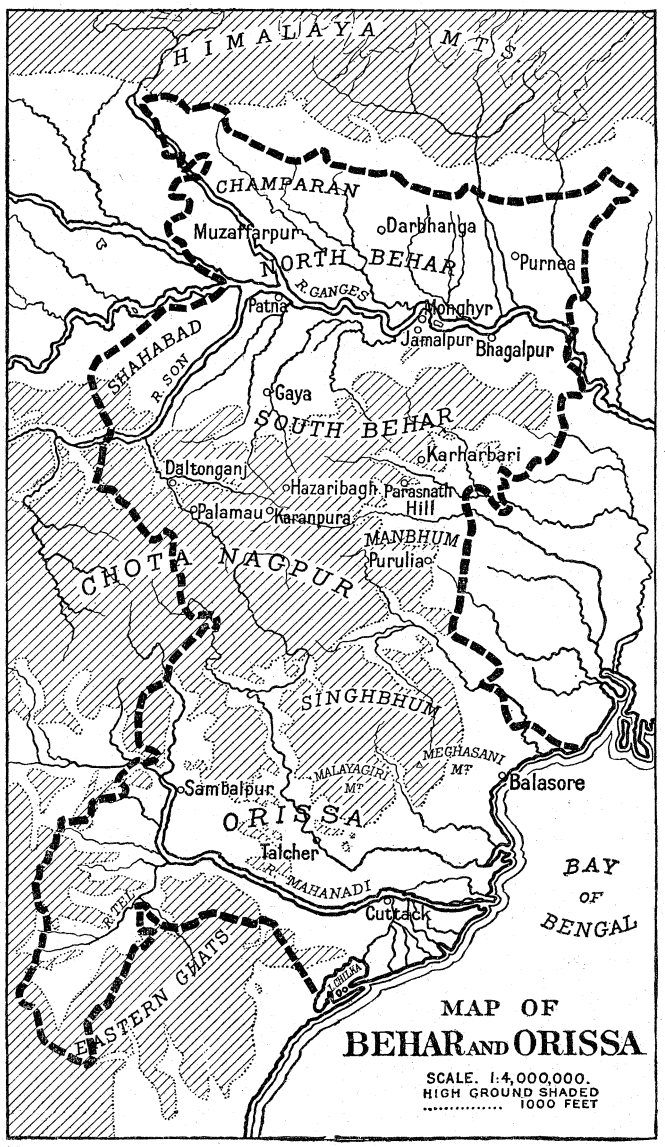
Climate.—The climate depends on the province's position on the western side of the head of the Bay of Bengal with the summer monsoon blowing in and turning up the Ganges valley. Sea breezes become important on the Orissa coast by May and the average temperature, though high, is less so than farther west in central India, altitude for altitude. The plateau and hills accumulate cloud in the day time and dissipate it at night, and this limits rises of temperature to some extent. Nine-tenths of the total rainfall comes from the summer monsoon between June and October, the cool dry season is delightful in Behar but much less marked in Orissa where, at Puri, the temperature ranges only from 77° to 86°, while in Behar, though in the hot season the temperature may rise to 118°, the average night temperature is 57° and the lowest recorded 34°. Total rainfall in Orissa is about 59 in., in Chota Nagpur 53 in., in South Behar (somewhat in a rain-shadow)

44 in., and at Purnea, northeast Behar, 68 inches. Chilka lake, in Orissa, the only one in the province, has an area of 344 sq.mi. in the dry, and 450 sq.mi. in the rainy season.

People.—The contrasts in peoples and civilizations are as marked as those in physical geography. The Khonds of the Khondmals (in Angul) offered human sacrifices till 1847 and after that time buffaloes were substituted for human victims, and the Khonds found the earth-goddess easily propitiated. In 1899–1900 the Mundas and Oraons rose under Birsa, believed to be an incarnation of the deity, whose followers alone would escape universal destruction by flood and in the meantime be proof against rifle fire. After that, Christianity spread owing to missionary efforts, and there were nearly 416,000 converts in this district. Again, in 1917 an act was passed establishing a university at Patna, and three years later another act prohibited a species of serfdom found in some areas. Behar contains a race of sturdy agriculturists with the same social organization as the people of the United Provinces. Their language is Bihari, which the Hindus call Hindi and the Mohammedans Urdu. In Orissa the distinct race of Oriyas is found, speaking the Oriya language, which is of an archaic type, both in form and vocabulary, and was written till little over a century ago on strips of palm leaves with an iron stylus. They are mainly Hindus and long isolation from the rest of India—railway communication was not established till 1899—has helped to preserve their cult and caste-system, and they are devout Vaishnavas, whose reverence is concentrated on Jagannath. The Chota Nagpur plateau, on the other hand, is the home of various groups of descendants of the earliest known inhabitants of India, many of whom still use bows and arrows. Physically they are distinguished by short stature, black skins, long heads and broad, almost negritic, noses. The chief peoples are the Santals, Oraons, Mundas, Hos, Khonds, Kharia, Bhumij and Maler or Sauria Paharids. They have retained very numerous tribal dialects, and the animistic beliefs and practices of their primitive ancestors are still prevalent among them. Of the total population 83% are Hindus; 9% are Mohammedans, of whom one-fourth are resident in Purnia; 6% are Animists, nearly all in the Chota Nagpur plateau, which also contained most of the 416,000 Christians found in the province. Nearly half (205,000) were Roman Catholics, 120,000 were Lutherans and 50,000 were converts to Anglican missions. Chota Nagpur is sparsely populated, but every available acre of land is under cultivation in Behar, while the deltaic portion of Orissa is also thickly populated. The density of the rural population rises in parts of Behar and in the central parts of Orissa to 1,000 to the square mile. As a result of pressure on the soil emigration is active. Excluding contiguous parts of other provinces, it was found at the census of 1921 that nearly 2,000,000 inhabitants of Behar and Orissa had left the province after the previous census. The great majority, however, are only temporary migrants, who go to earn the wages of labour in industrial and other centres when their corps are off the ground and return to their homes when active cultivation recommences.

Railways.—South Behar is served by the East Indian railway, which also traverses Chota Nagpur, and North Behar by the Bengal and North-Western railway, which at Katihar establishes connection with the Eastern Bengal State railway. The Bengal-Nagpur railway runs through Orissa, which is thus linked with Calcutta and Madras, and has also branches to Ranchi and the coal fields. These railways have Calcutta as the centre of their system and direct railway communication between Behar and Orissa has hitherto been lacking. Large schemes of railway extensions which centre on the coal fields have been undertaken and will do much to open up Chota Nagpur. The Talcher line, completed at the end of 1926, connects the Talcher field, and some of the Feudatory states, hitherto difficult of access, with the Bengal-Nagpur line from Calcutta to Madras. The Barkakhana-Chandil Chord line gives the Karanpura field an outlet to Jamshedpur and the south. The Central India coal fields railway opens up that field and the Bokharo field, providing an outlet on the west, where it connects with Daltonganj and by the East Indian Railway line with the whole railway system to Bombay.

Commerce.—Calcutta is the centre of both the import and export sea-borne trade. The province has no ports worthy of the name: Chandbali in Orissa is a place of call for small coasting steamers, but the trade is small and the imports all come from Calcutta. A chamber of commerce for the province was created in 1925–26, but there are no commercial centres of first-rate importance. Patna was formerly an entrepôt, but trade now passes through it on its way to and from Calcutta and it is no longer a large collecting and distributing centre. Similarly other towns



THE PROVINCE OF BEHAR (AFTER 1937 DIVIDED INTO BIHAR AND ORISSA) IS FAMOUS IN BOTH THE POLITICAL AND RELIGIOUS HISTORY OF INDIA. GAUTAMA, THE FOUNDER OF BUDDHISM, PREACHED IN MAGADHA IN THE REIGN OF BIMBISARA ABOUT 528 B.C. AND BUDDHIST MISSIONARIES SET OUT FROM BEHAR FOR THE CONVERSION OF CHINA, CEYLON, TIBET, AND TARTARY. BEHAR CAME INTO THE POSSESSION OF THE EAST INDIA COMPANY IN 1765 WHEN IT WAS UNITED WITH BENGAL

supply their rural surroundings with such articles as cloth, salt and kerosene oil and receive their surplus crops for transport by the railway.

Administration.—Under the terms of the new constitution, Behar became an autonomous province in 1937, with a governor and a bicameral legislature, consisting of the legislative council of 29 or 30 members, 3 or 4 of whom are nominated by the governor and the rest elected; and the legislative assembly, consisting of 152 elected members. The governor is also charged with the supervision of the Feudatory states, which are ruled directly by their chiefs. For administrative purposes the province is divided into 4 divisions covering 16 districts. The provisions of the act empowering the legislative council to make laws do not

apply to the district of Angul and apply only in a modified form to the Chota Nagpur division and the districts of Sambalpur and the Santal Parganas, which in this connection are known as "backward tracts." The want of uniformity which has been remarked elsewhere characterizes the revenue administration. Land revenue in Behar and Chota Nagpur is permanently settled, but in Orissa temporary settlements are made; and there are six Tenancy acts regulating the relations of landlord and tenant.

See *Bihar and Orissa: First Decennial Review*, 1912–22 (Patna, 1923); B. A. Collins, *Bihar and Orissa* in 1925–26 (Patna, 1927).

HISTORY

The province of Behar corresponds to the ancient kingdom of Magadha, which comprised the country now included in the districts of Patna, Gaya and Shahabad, south of the Ganges. The origin of this kingdom, famous alike in the political and religious history of India, is lost in antiquity. The first authentic dynasty is that of the Saisunaga, founded by Sisunaga (*c.* 600 B.C.), whose capital was at Rajagaha (Rajgir) in the hills near Gaya; and the first king of this dynasty of whom anything is known was Bimbisara (*c.* 528 B.C.). It was in the reign of Bimbisara that Vardhamana Mahavira, the founder of Jainism, and Gautama, the founder of Buddhism, preached in Magadha, and Buddhist missionaries issued thence to the conversion of China, Ceylon, Tibet and Tartary. To this day Behar remains a sacred spot in the eyes of Buddhist nations.

Bimbisara was murdered by his son Ajatasatru, who succeeded him, and whose bloodthirsty policy reduced the whole country between the Himalayas and the Ganges under the suzerainty of Magadha. The remaining history of the dynasty is obscure. A son of Mahapaoma Nanda, a usurper, was reigning at the time of the invasion of Alexander the Great (326 B.C.), who was informed that the king of Magadha could oppose him with a force of 20,000 cavalry, 200,000 infantry, 2,000 chariots, and 3,000 or 4,000 elephants. In 321 B.C. Chandragupta Maurya seized the throne, which his dynasty occupied for 137 years (*see* INDIA: *History*). After the death of the great Buddhist king, Asoka (*c.* 231), the Maurya empire began to break up, and it was finally destroyed about 50 years later by Pushyamitra Sunga. Descendants of Asoka continued, however, to subsist in Magadha as subordinate rajahs for many centuries. The reign of Pushyamitra, who held his own against Menander and succeeded in establishing his claim to be lord paramount of northern India, is chiefly notable as marking the beginning of the Brahmanical reaction and the decline of Buddhism. The Sunga dynasty, which lasted 112 years, was succeeded by the Kanva dynasty, which after 45 years was overthrown (*c.* 27 B.C.) by the Andhras or Satavahanas. In A.D. 236 the Andhras were overthrown, and, a century later (A.D. 320), Chandragupta I established his power at Pataliputra and founded the famous Gupta empire (*see* INDIA), which survived till it was overthrown by the Ephthalites (*q.v.*), or White Huns, at the close of the 5th century.

In Magadha itself the Guptas continued to rule as tributary princes for some centuries longer. About the middle of the 8th century Magadha was conquered by Gopala, who founded the imperial dynasty known as the Palas of Bengal. They were zealous Buddhists, and under their rule Magadha became once more an active centre of Buddhist influence. Gopala built a great monastery at Udandapura, or Otantapuri, which has been identified by Sir Alexander Cunningham with the city of Behar, where the later Pala kings established their capital. Under Mahipala (*c.* 1026), the ninth of his line, and his successor Nayapala, missionaries from Magadha succeeded in re-establishing Buddhism in Tibet.

In the 11th century the Pala empire was partly dismembered by the rise of the "Sena" dynasty in Bengal; and at the close of the 12th century both Palas and Senas were swept away by the Mohammedan conquerors, the city of Behar itself being captured in 1193 in a surprise attack by the Turki free-lance Mohammed-i-Bakhtyar Khilji, with a party of 200 horsemen. "It was discovered," says a contemporary Arab historian, "that the whole of the fortress and city was a college, and in the Hindi tongue they call a college Bihar." Most of the monks were massacred, and those who survived were scattered. Buddhism in Magadha never recovered: it lingered awhile in obscurity and then vanished completely. Behar then came under the rule of the Mohammedan governors of Bengal. About 1330 the southern part was annexed to Delhi, while north Behar remained for some time longer subject to Bengal. In 1397 the whole of Behar became part of the kingdom of Jaunpur; but 100 years later it was annexed by the Delhi emperors, by whom—save for a short period—it continued to be held. Behar came into the possession of the East India company in 1765, when the province was united with Bengal. In 1857 two zemīndārs, Umar Singh and Kumār Singh, rebelled against the British government, and for some months held the ruinous fort of Rohtās against the British.

See *Imperial Gazetteer of India* (1908), *s.v.* "Bihar" and "Bengal"; Aryangar, *Ancient India* (1911); V. A. Smith, *Early History of India* (revised by S. M. Edwardes, 1924), and *Oxford History of India* (1919).

BEHĀ UD-DĪN (ABŪ-L-MAḤĀSIN YŪSUF IBN RĀF T' IBN SHADDĀD BEHĀ UD DĪN) (1145–1234), Arabian writer and statesman. He was at first a teacher in the Nizāmiyya at Baghdad and then professor at Mosul. In 1187, after making the pilgrimage to Mecca, he visited Damascus. Saladin, who was at the time besieging Kaukab (a few miles south of Tiberias), sent for him and became his friend. Behā ud-Dīn observed that the monarch was engrossed by the war which he was then waging against the enemies of the faith, and sought his favour by urging him to its vigorous prosecution. With this in view he composed a treatise on *The Laws and Discipline of Sacred War*, which he presented to Saladin. From this time he remained constantly attached to the person of the sultan, and was employed on various embassies and in departments of the civil government. He was appointed judge of the army and judge of Jerusalem. After Saladin's death Behā ud-Dīn remained the friend of his son Malik uz-Zāhir, who appointed him judge of Aleppo. Here he employed some of his wealth in the foundation of colleges. When Malik uz-Zāhir died, his son Malik ul-'Aziz was a minor, and Behā ud-Dīn had the chief power in the regency, using it for the patronage of learning. He lived in retirement after the abdication of Malik ul-'Aziz. His chief work is his *Life of Saladin* (English trans. the Palestine Pilgrims' Text society, London, 1897).

For list of other extant works *see* C. Brockelmann, *Geschichte der arabischen Litteratur* (Weimar, 1898), vol. i, pp. 316 f.

BEHĀ UD-DĪN ZUHAIR (ABŪ-L FAḌL ZUHAIR IBN MOḤAMMED AL-MUHALLABĪ) (1186–1258), Arabian poet, became celebrated as the best writer of prose and verse and the best calligraphist of his time. His poetry consists mostly of panegyric and brilliant occasional verse distinguished for its elegance. It has been published with English metrical translation by E. H. Palmer (1877). His life was written by his contemporary Ibn Khallikān (*see* M'G. de Slane's trans. of his *Biographical Dictionary*, vol. i, pp. 542–545).

BEHAVIOURISM is a direct outgrowth of studies in animal behaviour during the first decade of the 20th century. C. Lloyd Morgan, the British psychologist, must be looked upon as the founder, virtually, of the American school of animal psychology. His books, *Introduction to Comparative Psychology* (1894) and *Animal Behaviour* (1900), broke away from the traditional anthropomorphic interpretations of animal acts. He first emphasized the necessity of tracing all the steps in any act we see the animal performing before the interpretation of that act becomes possible. His actual experiments upon the learning of animals were few in number but rich in interpretative value. His studies emphasized the trial and error nature of all animal learning. Morgan's work undoubtedly inspired the American animal psychologist, E. L. Thorndike, who first instigated systematic experimentation upon chicks, dogs, cats and monkeys in the United States. There soon followed in that country a host of experimentation upon mammalian learning. We mention in passing the work of Small, Yerkes, Kinnaman, Davis, Allen, Porter, Carr, Franz, Johnson, Ulrich, Richardson, Yoakum, Haggerty and Watson.

The rich results coming from the study of infra-human mam-

mals led to similar studies on man. During this same general period we find man studied for the first time as a member of the animal kingdom. We mention the work of E. J. Swift, W. F. Book, H. A. Ruger and K. S. Lashley. Acquisitions of skilful acts such as keeping three balls in the air, typewriting, solving mechanical puzzles, learning to shoot the English long bow, serve to illustrate the types of problems studied. The results of these human studies emphasized the *essential similarity between human and infra-human learning.*

Emergence of Behaviourism.—Up to the appearance of Watson's two papers, "Psychology as the Behaviourist Views It" (1913) and "Image and Affection in Behaviour" (1913), and his book *Behaviourism—An Introduction to Comparative Psychology* (1914), there was no crystallization of the behaviouristic trend. None of the workers in the field of animal behaviour made any attempt to escape the implications of consciousness in their interpretation of human or animal acts. In these three publications the terms "behaviourism," "behaviouristic" and "behaviourist" were first used. Prof. Washburn's book, *The Animal Mind* (1907), represents very well the tendency of the time. She felt the need of interpreting all animal behaviour in terms of consciousness as defined in the introspective systems of W. Wundt and E. B. Titchener.

"Behaviourism when first conceived was based largely upon the rather loose concept of habit formation. The work of Pawlow and his students on the conditioned reflex, while known to the behaviourists, played at first a relatively minor rôle in their formulations. This was due to the fact that his experiments were chiefly concerned with conditioned glandular reflexes, which at that time was a subject hardly touched upon by psychologists. Bechterew's work on the conditioned motor reflex, where human subjects were used, had from the first a very much greater influence upon behaviourism. The work of Lashley in conditioning the human salivary reflex and of Watson and Rayner on conditioning human emotional reaction (fear) showed the great range of application of the conditioned reflex methods to human behaviour. This work has led to an attempt to formulate all habit (organization) in terms of conditioned glandular and motor reaction. In spite of the fact that behaviourism did not at first utilize to any extent the conditioned reflex methods, Pawlow and Bechterew must be looked upon as furnishing the keystone to its arch. During the period of the general formulation of behaviourism as a system rather than as an approach to psychology, or as a specialised method in psychology, the writings of E. B. Holt, A. P. Weiss and K. S. Lashley are noteworthy."

THE FUNDAMENTAL VIEWPOINT

The behaviourist takes the position at the outset that the total behaviour of man from infancy to death is the subject-matter of (human) psychology. Behaviour can be observed like the phenomena of all other natural sciences; *e.g.,* chemistry, physics, physiology or biology. The same general types of methods used in the natural sciences can be used in behaviour psychology. So far in his objective study of man no behaviourist has observed anything that he can call consciousness, sensation, perception, imagery or will. Not finding these so-called mental processes in his observations, he has reached the conclusion that all such terms can be dropped out of the description of man's activity.

All behaviouristic observations apparently can be presented in the form of stimulus and response. The simple schema used is S→R. A behaviouristic problem is solved when both the stimulus and the response are known. For a very simple example, substitute in the above formula for S, contact on the cornea, and for R, blinking. The behaviourist's problem is solved when this has been done as a result of verified controlled experimentation. The neurologist has a problem to solve in this same phenomenon, namely, in determining the neural connections involved, their course, their numbers, the timing and spread of the neural impulse, etc. The behaviourist does not encroach upon it. The physical chemist has a problem to solve here also. His problem is not encroached upon either by the behaviourist or by the neurologist.

His problem is the determination of the physical and chemical nature of the neural impulses, the amount of work done in the reaction and the like. In every human reaction there is thus a behaviourist's problem; a neuro-physiological problem and a physico-chemical problem. When the phenomena of behaviour are once accurately formulated in terms of stimulus and response, the behaviourist achieves predictability with reference to his phenomena and control over them—the two essentials every science demands. One might put it in another way. Suppose the behaviourist were given the problem of how to cause a human being to blink, he solves it by touching the cornea with a hair (control). In more complicated reactions, especially those labelled "social" the S→R relationships are not so easy to solve. For example, present the stimulus prohibition (S) to any given nation, what will the response (R) be? It may take years to determine R completely. Many behaviouristic problems have to wait for their solution upon the slow experimentation of science as a whole. Regardless of how complicated the stimulus-response relationships may be, the behaviourist does not admit for a moment that any human reactions cannot be so described.

The general goal of behaviourism, then, is to so amass observations upon human behaviour that in any given case, given the stimulus (or better situation), the behaviourist can predict in advance what the response will be; or, given the response, he will be able to state what situation is calling out the reaction. Looked at in this broad way, it is easy to see that behaviourism is far away from its goal. But while its problems may be difficult, they are not insuperable. The one thing that makes the approach of the behaviourist difficult is the fact that stimuli not at first calling out any given response can come later to call out a specified type of response. We call this a process of *conditioning* (earlier called habit formation).

THE GENETIC METHOD

This difficulty forces the behaviourist to resort to the genetic method. He takes the infant at birth and surveys his so-called physiological system of reflexes or, better, embryological responses. Having taken this inventory of unconditioned, unlearned responses, he next begins to try to condition them. When this has been done, two striking facts seem to appear. First, the number of complicated unlearned responses appearing at birth or at intervals thereafter is relatively small. *This leads to the rejection of the whole concept of instinct.* Most of the complex responses that the older psychologists called instinctive, such as crawling, climbing, cleanliness, fighting (a long list), are now believed to be built in or conditioned. In other words, the behaviourist no longer finds support for hereditary patterns of behaviour nor for special abilities (musical, art, etc.) which are supposed to run in families. He believes that given the relatively simple list of embryological responses which are fairly uniform in infants, he can build (granting that both internal and external environment can be controlled) any infant along any specified line—into rich man, poor man, beggar man, thief.

How the Building Takes Place.—Suppose one assumes that there are present at birth only 100 unconditioned embryological responses—there are many more of course. These appear in the form of breathing, crying, movements of arms, legs, fingers, toes, trunk, defaecation, urination and the like. If we assume that all of these can be conditioned and integrated according to the law of permutation and combination, the total possible number of built-in responses would be factorial 100—many millions more than any adult, even the most versatile one, is ever called upon to make even in the most complex social environment.

These embryological responses do not appear haphazard—they are not "random." Some definite stimulus calls them out. Let us call all such stimuli unconditioned stimuli, (U)S. Let us call all such responses unconditioned responses (U)R. The formula could be expressed thus:—

$$\frac{\text{(U)S}}{\text{A}} \rightarrow \frac{\text{(U)R}}{\text{1}}$$

$$\text{After conditioning} \left.\begin{matrix} \text{B} \\ \text{C} \\ \text{D} \\ \text{E} \\ \text{Etc.} \end{matrix}\right\} \rightarrow \text{1}$$

In the schema A is such an unconditioned stimulus and 1 is such an unconditioned response. Now if the experimenter takes B—and B so far as is known may be any object in the universe—and lets it stimulate the organism simultaneously with A for a certain number of times (sometimes even once is enough) it thereafter will also arouse 1. In the same way one can make C, D, E call out 1; in other words, one can make any object at will call out 1 (stimulus substitution). This shows how the stimulus side of our life gets more and more complicated as life goes on. In a similar way reactions become complicated as soon as a simple stimulus through the process of conditioning comes to call out a chain of reflexes (integration). In this way the behaviourist tries to take the vague concept of habit formation and to give it a new and exact scientific formulation in terms of conditioned responses. On this basis the most complicated of our adult habits are explicable in terms of chains of simple conditioned responses.

The simplification in psychological theory which comes through the application of behaviouristic principles is best seen in the realm of the emotions. Take fear. The works of Watson and Rayner, Moss, Lecky, Jones and others have shown that the fundamental unconditioned stimulus (U)S calling out a fear reaction is a *loud sound* or *loss of support*. Every child with only one exception, of approximately 1,000 infants examined, was found to catch his breath, pucker his lips, cry or, if older, crawl away, when a loud sound was given behind his head or when the blanket on which he was lying was suddenly jerked. Nothing else so far observed will produce the fear response in early infancy. Now it is very easy to make the child fear any other object in the universe. All the experimenter has to do is to show the object and strike the steel bar behind his head and repeat the procedure for a few times. The schema of this situation follows:—

(U)S	(U)R
Loud sound Loss of support	"Start," crying, etc. (fear)
After conditioning:	
(C)S	(C)R
Rabbit, dog, furry objects	Fear

Conditioning of the emotions (fear, rage, love, etc.) takes place very much earlier in the life of the infant than has hitherto been supposed; it is a process that brings complexity in response at a rapid rate. This means that an infant two or three years of age is already shot through with thousands of responses built up by the environment in which it lives.

The Process of Unconditioning.—The experiments of the behaviourists have shown that there is not only a process of conditioning or building taking place constantly from birth to death, but that there is also a process of *unconditioning* taking place as well. A simple experiment of the type described below best illustrates it. A conditioned negative response was set up in a 1½ year-old child—that of drawing back from or running away from a bowl containing gold fish. We quote from a recent experiment:

"The child, the moment he sees the fish bowl, says 'bite.' No matter how rapid his walk, he checks his step the moment he comes within seven or eight feet of the fish bowl. If I lift him by force and place him in front of the bowl, he cries and tries to break away and run. No psychoanalyst, no matter how skilful, can remove this fear by analysis. No advocate of reasoning can remove it by telling the child all about beautiful fishes, how they move and live and have their being. As long as the fish is not present, you can by this verbal organization get the child to say 'Nice fish, fish won't bite'; but show him the fish and the old reaction returns. Try another method. Let his brother, aged four, who has no fear of fish, come up to the bowl and put his hands in the bowl and catch the fish. No amount of watching a fearless child play with these harmless animals will remove the fear from the toddler. Try shaming him, making a scapegoat of him. Your methods are equally futile. Let us try, however, this simple method. Get a table 10 or 12ft. long. At one end of the table place the child at meal time, move the fish bowl to the extreme other end of the table and cover it. Just as soon as the meal is placed in front of him, remove the cover from the bowl. If disturbance occurs, extend your table and put the bowl still farther away, so far away that no disturbance occurs. Eating takes place normally, nor is digestion interfered with. The next day repeat the procedure but move the bowl a little nearer. In four or five such sessions the bowl can be brought close to the food tray without causing the slightest bit of disturbance."

The behaviourist concludes that by his experiments upon the conditioning and unconditioning of the responses of infants and children he has obtained a clear view of the way human beings are built up by the environment in which they find themselves. Man is a biological unit that can be studied like any other animal.

Does Thinking Offer Any Problem?—Many introspective psychologists agree up to this point with the behaviourist (Bertrand Russell, for example), but the subjectivist claims that there is something new in thinking (and let us include "imagination" under this term). What has the behaviourist to offer on thinking? The behaviourist's formulation runs somewhat as follows:—

The increasing dominance of language habits in the behaviour of the developing child leads naturally over into the behaviourist's conception of thinking. The behaviourist makes no mystery of thinking. He holds that thinking is behaviour, is motor organization, just like tennis playing or golf or any other form of muscular activity. But what kind of muscular activity? The muscular activity that he uses in talking. Thinking is merely talking, but talking with concealed musculature.

"Take any child when he first begins to talk. Peep through the keyhole and watch him in the early morning. He will sit up in bed with his toys, talk aloud to his toys, talk about them. When a little older, he will plan out his day aloud, say aloud that his nurse is going to take him for a walk, that his daddy is going to bring him a car. In other words, he talks overtly when alone just as naturally as he works overtly with his hands. A social factor comes in. The father gets to the point where his own morning nap is disturbed. He yells out: 'Keep quiet.' The child begins then to mumble to himself—a great many individuals never pass this stage, and they mumble to themselves all through life whenever they try to think. The father does not like the child's mumbling any better than his talking aloud, and so he may slap him on the lips. Finally, the parents get the child to the point where he talks silently to himself. When his lips are closed, it is nobody's business what is going on below. Thus we come to behave as we please if we do not give any external motor sign of it—in other words, our thoughts are our own."

A further question comes up for serious consideration: Do we think only in terms of words?

"The behaviourist takes the position to-day that whenever the individual is thinking, the whole of his bodily organization is at work (implicitly)—even though the final solution shall be a spoken, written or subvocally expressed verbal formulation. In other words, from the moment the thinking problem is set for the individual (by the situation he is in) activity is aroused that may lead finally to adjustment. Sometimes the activity goes on (*a*) in terms of implicit manual organization; (*b*) more frequently in terms of implicit verbal organization; (*c*) sometimes in terms of implicit (or even overt) visceral organization. If (*a*) or (*c*) dominates, thinking takes place without words."

Words are thus the conditioned (C)S substitutes for the world of objects and acts. Thinking is a device for manipulating the world of objects when those objects are not present to the senses. Thinking more than doubles human efficiency. It enables the individual to carry his day world to bed with him and manipulate it at night or when it is a thousand miles away.

Strict behaviourism is making rapid progress in America. It, however, has not yet been universally accepted even here. The older subjective psychology is being profoundly modified by it. One sees very little of *introspection* and still less of *imagery* in the writings of the subjectivists.

See J. B. Watson, "Psychology as the Behaviourist Views It," *Psych. Rev.* xx. (1913); *Behaviourism* (1925); the articles by K. S. Lashley in the *Psych. Rev.* in 1925; A. P. Weiss, *A Theoretical Basis of Human Behaviour* (1925); George A. Dorsey, *Why We Behave Like Human Beings* (1925); Bertrand Russell, *Analysis of Mind;* C. D. Broad, *Mind and its Place in Nature* (1926). (J. B. W.)

BEHBEHAN, a town of Iran, 30° 35′ N., 50° 19′ E., in the western part of the province of Fars, pleasantly situated in the midst of a cultivated plain, some 150 mi. west-north-west of Shiraz and about 5 mi. south of the Marun or Kurdistan river. Formerly a very flourishing and important city, it is now greatly shrunken and decayed. The present population is about 15,000–20,000.

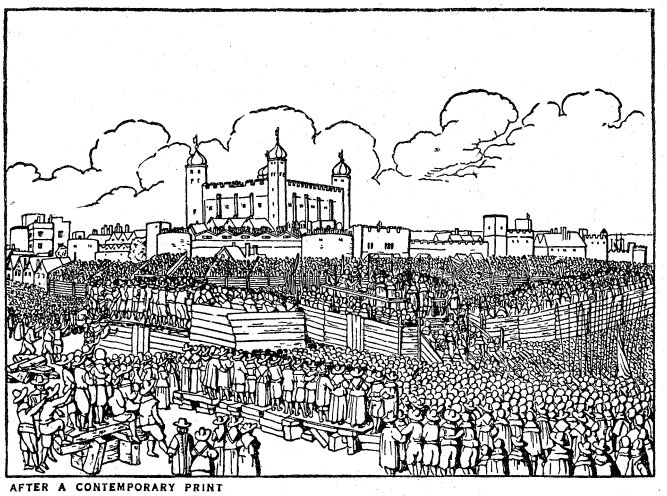
It is on the route from Bandar Dilam to Isfahan, which is shorter, and in summer, easier than any other route. A motor road connects Behbehan with Ahwaz.

Close to Behbehan lie the ruins of the ancient and famous city of Arrajan, and of two magnificent bridges, one of which consisted of a single arch 80 paces in span and of almost equal height. It is referred to in a contemporary chronicle of Ibn Batuta as the finest in the world. Several of the piers of the other bridge are still standing. Not far off are the ruins of an even older town, near which was one of the principal fire temples of the Persians.

BEHEADING, a mode of executing capital punishment. It was in use among the Greeks and Romans, and the former, as Xenophon says at the end of the second book of the *Anabasis,* regarded it as a most honourable form of death. So did the Romans, by whom it was known as *decollatio* or *capitis amputatio.*

The head was laid on a block placed in a pit dug for the purpose—in the case of a military offender, outside the entrenchments; in civil cases, outside the city walls, near the *porta decumana.* Before execution the criminal was tied to a stake and whipped with rods. In earlier years an axe was used; afterwards a sword, which was considered a more honourable instrument of death and was used in the case of citizens (*Dig.* 48, 19, 28). It was with a sword that Cicero's head was struck off by a common soldier.

Beheading is said to have been introduced into England from Normandy by William the Conqueror. The first person to suffer was Waltheof, earl of Northumberland, in 1076. An ancient ms. relating to the earls of Chester states that the serjeants or bailiffs of the earls had power to behead any malefactor or thief, and



AFTER A CONTEMPORARY PRINT

THE EXECUTION OF THE EARL OF STRAFFORD AT LONDON, MAY 12, 1641

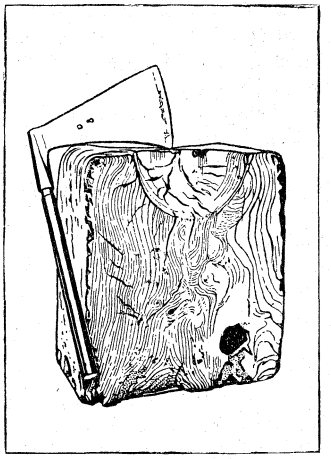
Large crowds assembled on Tower Hill to see the execution of Strafford, who behaved with great composure and refused even to have his eyes bandaged. On the scaffold with him were Dr. Ussher, Primate of Ireland, the city magistrates, and many of his friends

gives an account of the presenting of several heads of felons at the castle of Chester by the earl's serjeant. It appears that the custom also attached to the barony of Malpas. The liberty of Hardwick, in Yorkshire, was granted the privilege of beheading thieves. (*See* GUILLOTINE.)

But beheading was usually reserved for offenders of high rank. From the 15th century onward the victims of the axe include some of the highest personages in the kingdom. Simon, Lord Lovat was the last person beheaded in England (April 9, 1747). The execution of Anne Boleyn was carried out not with the axe, but with a sword, and by a French headsman specially brought over from Calais. In the case of the 4th Earl Ferrers (1760) his petition to be beheaded was refused and he was hanged.

Executions by beheading usually took place on Tower hill, London, where the scaffold stood permanently during the 15th and 16th centuries. In the case of certain State prisoners, *e.g.,* Anne Boleyn and Lady Jane Grey, the sentence was carried out within the Tower, on the green by St. Peter's chapel.

Beheading was only a part of the common-law method of punishing male traitors, which was ferocious in the extreme. According to Walcot's case (1696), I. *Eng. Rep.* 89, the proper sentence was "quod . . . per collum suspendatur et vivus ad terram prosternatur et quod secreta membra eius amputentur, et interiora sua intra ventrem suum capiantur et in ignem ponantur et *ipso vivente* comburantur, et quod caput eius amputetur, quodque corpus eius in quatuor partes dividatur et illo ponantur ubi dominus rex eas assignare voluit" (that he be hanged by the neck and dropped to the ground alive and that his private parts be cut off and that his bowels within his belly be taken and put upon a fire and burned while he lives and that his head be cut off and that his body be divided into four parts to be placed where it may please his majesty the king to assign them). There is a tradition that Harrison, the regicide, after being disembowelled, rose and boxed the ears of the executioner. In 1814 the king was empowered by royal warrant to substitute hanging as the ordinary mode of executing criminals; but as late as 1820 in the case of the Cato Street conspiracy (33 Howell, *State Trials,* 1,566), after the traitors had been hanged as directed by the act of 1814, their heads were cut off by a man in a mask, whose dexterity led to the belief that he was a surgeon. Drawing and quartering were not abolished till 1870.



BY COURTESY OF THE CONTROLLER OF HIS MAJESTY'S STATIONERY OFFICE

BLOCK AND AXE AT THE TOWER OF LONDON

The block dates from the 16th century. It was last used for the execution of Simon Fraser, Lord Lovat, in 1746. The axe dates from 1688

The block usually employed is believed to have been a low one, such as would be used for beheading a corpse. C. H. Firth and S. R. Gardiner incline to the view that such a block was the one used at Charles I.'s execution. The more general custom, however, seems to have been to have a high block over which the victim knelt. Such is the form of that preserved in the armoury of the Tower of London, which is undoubtedly the block upon which Lord Lovat suffered. The axe which stands beside it was used to behead him and the other Jacobite lords. On the ground floor of the King's House, at the Tower, is preserved the processional axe which figured in the journeys of State prisoners to and from their trials, the edge turned from them as they went, but almost invariably turned towards them as they returned to the Tower. The axe's head is 1ft. 8in. high by 10in. wide, and is fastened into a wooden handle 5ft. 4in. long. The handle is ornamented by four rows of burnished brass nails.

In Scotland they did not behead with the axe or with the sword, as under the Roman law and formerly in Holland and France, but with the maiden (*q.v.*).

Beheading is now very rare in European countries, most of which have abolished or abrogated by disuse capital punishment (*q.v.*), but it was practised very extensively by the Chinese warlords, especially by Sun Chuan-fang in Shanghai.

BEHEMOTH (the intensive plural of the Hebrew *b'hemah,* a beast), the animal mentioned in Job xl., probably the hippopotamus. The modern use expresses the idea of a very large and strong animal.

BEHISTUN or **BISITUN,** a village at the foot of a precipitous peak some 1,700ft. high, in the Zangers range in Persia, on the

right bank of the Samas-Ab, a tributary of the Kerkha. The original form of the name (Bagistana, "place of the gods," or, "of God") has been preserved by the Greek authors Stephanus of Byzantium, and Diodorus (ii. 13). At the foot of this scarp passes the old road which led from Babylon to Ecbatana, and here it was that Darius I., king of Persia, engraved his great inscription in three kinds of cuneiform writing, in which he recounts the way in which, after the death of Cambyses, he killed the usurper Gaumata (in Justin, Gometes, the pseudo-Smerdis), defeated the numerous rebels, and restored the kingdom of the Achaemenidae. This inscription he carved some 500ft. above the level of the spring which bubbles out at the foot of the mountain, and, although it is by no means inaccessible, to reach it demands a difficult climb up the precipitous rock-face. The lower part of the inscribed surface consists of three columns of Susian, and five of Persian, each about 11ft. high, while above these is the sloping overhang of the Babylonian (over the Susian), and the magnificent sculpture (over the Persian) of the king putting his foot on the prostrate body of Gaumata, followed by his two ministers. In front of him are nine rebel chiefs with their hands bound behind them and a rope round their necks, and above them is the winged figure of the god Auramazda.

In 1835 Henry Rawlinson, then a young officer, turned his attention to deciphering the Persian cuneiform characters of the inscriptions at Elwand, near Ecbatana, and, unconsciously following the method employed by the German Grotefend at the beginning of the century, he assigned correct values to about a third of the alphabet. With the knowledge thus obtained he attacked the great inscription of Behistun, and by 1846 he had not only overcome the difficulty of scaling the rock, but had also succeeded in the extraordinary exploit of translating the whole of the ancient Persian inscription by applying his knowledge of other dialects to the words of the inscription on which his decipherment of the characters had allowed him to transliterate correctly, thus laying the foundation of the science of Assyriology. It was now only a matter of time to elucidate the Susian and Babylonian, the former yielding to the investigations of Hincks, Westergaard, De Saulcy and Norris, the latter to Rawlinson, Hincks, Oppert and Fox Talbot.

At the foot of the rock is a bas-relief of Gotarzes, the Parthian king (A.D. 46–50), with a Greek inscription (C.I.G. III., No. 4674: *cf.* Geiger and Kuhn, *Grundriss d. Iranischen Philologie,* ii. 504) which has been partly destroyed by an Arabic inscription, and about a quarter of a mile away is a rude monolith sculptured with figures in low relief, perhaps of Sassanian workmanship (Mann, *Globus,* lxxxiii., No. 21, 1903, 328; Williams Jackson, *Persia, Past and Present,* 210; King and Thompson, *Inscr. of Darius the Great,* xxv.).

For the decipherment and description of these inscriptions of Darius, *see* Sir Henry Rawlinson, *Journ. R. Geog. Soc.* ix. (1839); *J. R. Asiatic Soc.* x. (1846), xiv. (1853), xv. (1855); *Archaeologia,* xxxiv. (1852); Weissbach and Bang, *Die altpersischen Keilinschriften* (1893); Weissbach, *Die Achaemenideninschriften zweiter Art* (1890); Bezold, *Die (babylonischen) Achaemenideninschriften* (1882); A. J. Booth, *The Discovery and Decipherment of the Trilingual Inscriptions* (1902); A. V. Williams Jackson, *J. Am. Or. Soc.* xxiv. (1903), and *Persia, Past and Present* (1906); L. W. King and R. C. Thompson, *The Inscription of Darius the Great at Behistun* (1907); and for an illustrated popular account, R. C. Thompson in Hammerton's *Wonders of the Past,* 555.

BEHN, APHRA (otherwise AFRA, APHARA or AYFARA) (1640–1689), British dramatist and novelist and the first Englishwoman to earn her living as a writer, was baptized at Wye, Kent, in 1640. Her father, John Johnson, was a barber. While still a child she was taken out to Surinam, then an English possession, from which she returned to England in 1658, when it was handed over to the Dutch. In Surinam Aphra learned the history, and acquired a personal knowledge of the African prince Oroonoko and his beloved Imoinda, whose adventures she has related in her novel, *Oroonoko.* She married a London merchant of Dutch extraction, named Behn. The wit and abilities of Mrs. Behn brought her into high estimation at court, and after her husband's death in 1666, Charles II. employed her on secret service in the Netherlands during the Dutch War. At Antwerp she successfully accomplished the objects of her mission; and in the latter end of 1666 she wormed out of one Van der Aalbert the design formed by De Ruyter, in conjunction with the De Witts, of sailing up the Thames and burning the English ships in their harbours. This she communicated to the English court, but although the event proved her intelligence to have been well founded, it was at the time disregarded and she received no reward. A period of the utmost poverty followed—she was imprisoned for debt for a short time—and this led to her writing as a means of supporting herself. In 1670 her first play, *The Forc'd Marriage,* was produced, and was followed by a succession of dramas which continued till her death. She was most successful as a writer of witty and vivacious comedies, of which *The Rover* (1677 and 1681) is an excellent example; but her versatility, like her output, was immense. She was well read, and often adapted the works of the older dramatists, *The City Heiress,* based upon Middleton's *A Mad World, My Masters,* being a case in point; but although she frequently borrowed, some of her most notable triumphs were absolutely original. *The City Heiress* is of further interest as displaying another of her many interests: together with *The Roundheads* (1682), which is an attack on the Puritans, it represents the part she played in the political battle of the time. Although the dramas comprise the bulk of her work, her prose works of fiction are of equal interest from the point of view of literary history. *Oroonoko* exerted unquestionable influence on the development of the novel, and Macaulay, admitted that, in spite of the coarseness which disfigures her work, the best of Defoe was not beyond her reach. Besides plays and tales, she published translations and poems. She attained great popularity, and had become the centre of much scandal before her death in 1689. *The Widow Ranter,* based on the story of the rebellion of Stanley Bacon in Virginia was produced posthumously in 1690. Among others of her plays may be mentioned *Sir Patient Fancy* (1678) which shows the influence of her French reading, and the *Feigned Courtezans* of 1679.

See The Works of Aphra Behn, edited by Montague Summers (1915). *Plays written by the Late Ingenious Mrs. Behn* (1702; reprinted, 1871); also "Aphra Behn's Gedichte und Prosawerke," by P. Siegel in *Anglia* (Halle, vol. xxv., pp. 86–128, 329–385, 1902); and A. C. Swinburne's essay on "Social Verse" in *Studies in Prose and Poetry* (1894); V. Sackville West, *Aphra Behn* (1927).

BEHRING, EMIL VON (1854–1917), German bacteriologist and founder of immunology as a science. He was born at Hausdorf in west Prussia on March 15, 1854, the day following the birth of Paul Ehrlich. After qualifying in medicine at Berlin he entered the army medical corps, becoming (1888) lecturer at the Army Medical college in Berlin.

Not until he was 35 years old did he become assistant at Koch's Institute for Infectious Diseases (1889) and later he became professor successively at Halle (1894) and Marburg (1895). In 1890, while working with the Japanese investigator Kitasato (*q.v.*) in the laboratory of Robert Koch at Berlin, he showed that it was possible to produce in an animal immunity against the disease known as tetanus, or lockjaw, by injecting into it the blood serum of another animal infected with tetanus. The immunity was efficient against 300 times the fatal dose of tetanus. The paper of Behring and Kitasato contains for the first time the word antitoxic. Soon after, Behring showed that immunity could also be obtained against diphtheria by injecting serum from an animal that had previously been injected with living cultures of the diphtheria bacillus. He extended Pasteur's theory of attenuated viruses to the science of toxins and antitoxins. This epoch-making discovery was soon given practical application. It was found possible to induce a degree of immunity even *after* the onset of the disease. The first human case was a child in a clinic at Berlin in 1891.

Diphtheria antitoxin was placed on the market in 1892. In a few years' time its administration had become a routine part of the treatment of the disease. For this work, he shared with Pierre Roux the 25,000 franc prize of the Paris Academy of Medicine and the 50,000 franc prize of the Institute of France.

In 1901 he was awarded the Nobel prize in medicine. Ill health forced him to give up the teaching function attached to the directorship of the Institute of Hygiene at Marburg. He became finan-

cially interested in the manufacture of antitoxic serum by the Farbwerke Höchst which built and equipped admirable laboratories for him, in which he conducted researches involving, it is stated, 7,000,000 oz. of cultures of the bacillus of tuberculosis. He devised a bovo-vaccine for immunization of calves against tuberculosis. This was used largely in Russia, Sweden and the United States, but the results did not survive the test of time and experience in providing immunity against this disease. He died from pneumonia on March 31, 1917.

He wrote, among other works, *Die Blutserumtherapie* (1892); *Ätiologie des Tetanus* (1904); *Einführung in die Lehre von der Bekämpfung der Infektionskrankheiten* (1912).

BEHRING, VITUS: *see* BERING, VITUS JONASSEN.

BEIRA, an ancient principality and province of northern and central Portugal; bounded on the north by Entre Minho e Douro and by Traz os Montes, east by the Spanish provinces of Leon and Estremadura, south by Alentejo and Portuguese Estremadura, and west by the Atlantic ocean. Pop. (1940) 1,900,946; area 9,216 sq.mi. Beira is administratively divided into the districts of Aveiro, Coimbra, Vizeu, Guarda and Castello Branco, while it is popularly regarded as consisting of the three sections—Beira Alta or Upper Beira (Vizeu), north and west of the Serra da Estrella; Beira Baixa or Lower Beira (Guarda and Castello Branco), south and east of that range; and Beira Mar or Maritime Beira (Aveiro and Coimbra). The coast, about 72 mi. long, is uniformly flat, with long stretches of sandy pine forest, heath, or marsh land bordered by a wide and fertile plain. Its most conspicuous features are the lagoon of Aveiro (*q.v.*) and the bold headland of Cape Mondego. Except along the coast, the surface is for the most part mountainous, the highest point in the Serra da Estrella, which extends from northeast to southwest through the centre of the province, being 6,532 ft. The northern and southeastern frontiers are respectively marked by the two great rivers, Douro and Tagus, which rise in Spain and flow to the Atlantic. The Agueda and Côa, tributaries of the Douro, drain the eastern plateaux of Beira; the Vouga rises in the Serra da Lapa, and forms the lagoon of Aveiro at its mouth; the Mondego springs from the Serra da Estrella, passes through Coimbra, and enters the sea at Figueira da Foz; and the Zezere, a tributary of the Tagus, rises north-northeast of Covilhã and flows southwest and south.

Beira has a warm and equable climate, except in the mountains, where the snowfall is often heavy. The soil, except in the valleys, is dry and rocky, and large stretches are covered with heath. The principal agricultural products are maize, wheat, garden vegetables and fruit. The olive is largely cultivated and the oil exported; good wine is also produced. In the flat country between Coimbra and Aveiro the marshy land is laid out in rice-fields or in pastures for cattle and horses. Sheep farming is important in the highlands of Upper Beira, while near Lamego swine furnish the well-known Lisbon hams. Iron, lead, copper, coal and marble are worked to a small extent, and millstones are quarried in some places. Lagoons along the coast yield salt.

BEIRA, a seaport of Mozambique in Portuguese East Africa, at the mouth of the Pungwe and Busi rivers, 19° 50′ S., 34° 50′ E., 528 mi. N. of Lourenço Marques, in communication by railway with Capetown (2,037 mi.) via Umtali, Salisbury (374 mi.) and Buluwayo (675 mi.). Pop. (1937 est.): 2,670 whites, 1,402 Asiatics, 1,022 halfcastes and 6,245 natives. Beira is the chief port for Rhodesia and Katanga, communication being made by the Beira and Mashonaland and Rhodesian railway (212 mi.) under concession from the Mozambique company. In 1922 the completion of a railway to the Zambezi made Beira the port for Nyasaland. The port is being increasingly used for transshipment of cargo for the smaller coast ports. In addition to the very important transit trade to Rhodesia, Katanga and Nyasaland, Beira also handles an increasing volume of traffic for the Mozambique company's territories (*see* article on PORTUGUESE EAST AFRICA), of which it is the capital.

The town is built on a tongue of sand extending into the river, and is comparatively healthful. The average annual rainfall is 37 in., and the average annual temperature 75.58°. It is increasingly popular as a holiday resort for Rhodesians. The town is connected with the port by light railway lines. There are good golf links just outside the town. There is a lighthouse at the river mouth, with a 16 mi. radius, and the channel leading to the port is well buoyed and lighted. Vessels drawing 24 ft. of water can enter the port at high tide. There is good anchorage (the bottom is of soft mud, but safe in fine weather) in 5 fathoms (18–27 ft. at lowest tides), 135 yd. from the shore. The maximum depth in the harbour is 32 ft., minimum 12 ft. The depth at the customs wharf varies from 20 ft. to nil. On the bar, and in Rambler channel, there is 12 ft. at lowest spring tides and 18 ft. at low tide (neap). The sea front is protected by a masonry wall. Ships are loaded and unloaded from anchorage by lighters towed by small steam-boats, and there is adequate wharf accommodation for large lighters. A deep-water wharf on the Pungwe river above Chiveve Creek now accommodates three large vessels. There are 10-ton cranes on the customs wharf, and 20-ton cranes on the railway wharf. It is possible to handle 450 tons daily per steamer. There is an excellent stone and cement passenger pier. Between the customs house and the railway terminus is the mouth of the Chiveve river, crossed by a steel bridge, the centre span revolving and giving two passages each of 40 ft. The Chiveve embankment scheme reclaimed 20 ac. of land.

The Mozambique company administered the Beira district under a charter granted in 1891 for a term of 50 years, renewable on its expiration in 1941. The Portuguese authorities refused to renew this charter in 1941, however, and the Beira district is now administered by the Portuguese. The Mozambique company continues in existence, but without its administrative function. It enjoys certain concessions and maintains its establishments. There is a considerable business community, largely British. Of the three banks, two are British. The town has a wireless station, and is in telegraphic communication with Salisbury in Mashonaland. Beira occupies the site of a forgotten Arab settlement. The present port owes its being to a clause in the Anglo-Portuguese agreement of 1891 providing for the construction of a railway between Rhodesia and the navigable waters of the Pungwe. (The Pungwe is navigable for small steamers for 40 mi., and the Busi for 25 mi. Both rivers are subject to serious floods which cause damage to the railway lines to Rhodesia and Nyasaland.) The railway at first began at Fontesvilla, about 50 mi. by river above Beira, but was subsequently brought down to that port. The completion in 1902 of the line connecting Salisbury with Capetown adversely affected the port, the long railway route from the Cape being increasingly employed by travellers to and from Mashonaland. Moreover, the high freights on goods by the Beira route enabled Port Elizabeth to compete successfully for Rhodesian trade. In Oct. 1905 a considerable reduction was made in railway rates and in port dues and customs, with the object of re-attracting to the port the transit trade of the interior; and in 1907 a branch of the Rhodesian customs was opened in the town, following the precedent of Lourenço Marques. These steps were successful.

The principal exports are maize, rubber, cotton, sugar, groundnuts and oil-seeds, beeswax, chromite (from Rhodesia), and gold (from Manica). The imports are chiefly rice (from India), cotton goods for local use, and food stuffs, machinery, hardware and manufactured goods for Rhodesia. Direct steamship communication with Europe is maintained by British, Portuguese and German ships, the former constituting by far the greater part of the tonnage using the port.

See PORTUGUESE EAST AFRICA; also the reports issued yearly by the British Foreign Office on the trade of Beira. (R. J. BE.)

BEIRUT, the chief seaport and capital of Lebanon, is situated on a triangular promontory roughly 6 mi. by 5 mi., backed by the Lebanon range. The bay thus formed to the north is known as St. George's bay, for it was here, according to legend, that he slew the dragon.

Pop. (est. 1943) 234,000, Mohammedans, Maronites and Greek Orthodox elements forming the majority.

History.—Beirut appears first in history in a list of Thotmes III (early 15th century B.C.). In the epoch of the Amarna letters (1400 B.C.) its ruler was Ammunira, who contributed to the correspondence and was apparently a loyal vassal of the pharaohs.

At any rate, the pro-Egyptian Rib-Addu of Byblos, a notable figure in the despatches, repaired to Beirut when forced to vacate Byblos. Beirut is mentioned, but no more, in the satiric Papyrus Anastasi I of the time of Ramses II (early 13th century B.C.). No mention is made apparently of Beirut in the Old Testament. The context does not admit of its identification either with Berothai (2 Sam. viii 8) or with Berothah (Ezek. xlvii 16). According to Strabo (xvi 735) Beirut was taken and destroyed by Tryphon in his struggle with Demetrius II (Antiochus VII) for the Seleucid throne (140 B.C.). Marcus Agrippa, a lieutenant of Augustus, captured the city in 15 B.C. and made it a military colony with the title *Colonia Julia Augusta Felix Berytus* (*Corp. Inscr. Lat.* iii 161, etc.), with the added privilege of the *jus Italicum*. Herod the Great showed it favour by erecting many fine buildings and in Beirut was held the dramatic assembly before which Herod in person arraigned his two sons, Alexander and Aristobulus, and secured a majority sentence of death (Josephus, *Antiq.* xvi 11.2). Agrippa I (A.D. 37–44) and his son Agrippa II added to its attractions a theatre and an amphitheatre. It was here Titus celebrated the fall of Jerusalem and his father's birthday with gladiatorial contests. In Roman times the city of Beirut was famous as a home of learning. It was sought by many desirous of Greek learning, among them Appian the martyr. Its school of Roman law was recognized as one of the official law schools of the empire, until a disastrous earthquake (551) compelled its removal to Sidon. Gregory Thaumaturgus (A.D. 185–254), the wonder-working pupil of Origen, was a student here, and two of the professors of the law school, Anatolius and Dorotheus, drew up at Justinian's behest the third part of Justinian law, known as the Second Code (529–531). After the earthquakes Beirut was never restored to its former splendour and in A.D. 600 the great public buildings lay strewn where they had fallen. In 635 it passed under the blighting influence of the Arab occupation of Syria. The period of Frank domination was one of great military activity. The crusaders in their first progress along the coast from Antioch to Jerusalem (1099) passed within hail of the walls, but made no effort to attack. Baldwin I captured the city in 1110 and in 1151 it was pillaged by the Egyptian fleet. From 1177 until its capture by Saladin (1187) it was the scene of incessant fighting. Saladin dismantled its defenses (1190), dreading its reoccupation by the Franks. John of Brienne (d. 1237) restored castle and ramparts and the new defenses in size and magnificence excelled any that had been before. Frederick II, having quarrelled with John, took the city by a night surprise, but the castle resisted till the siege was raised by the arrival of help from Cyprus (1232). The surrender of the city to the Mohammedans in 1291 marked the end of the kingdom of Jerusalem. Thereafter it was dominated in turn by Mameluke sultans of Egypt, Druse emirs of the Lebanon, and the Turks (from 1517). The most famous of the Druse emirs was Fakhr-ed-Dīn (1584–1635) who made himself independent of the Turks, chose Beirut as his residence, fortified it, and by an alliance with Venice did much to foster and develop its trade. The Turks forced their way into the city in 1763 and in 1789 the city was finally freed from Druse interference. Ahmad el-Jezzār of Acre (1775–1804) re-established the defenses, built a new castle on the site of the old and completed the circle of the walls, but his building was not substantial. Beirut was occupied by the forces of Mohammed Ali of Egypt in 1830–31. He made the city his quarantine station for the Syrian coast and all ships were obliged to come to its port to the benefit of its trade. In 1840 the Egyptians were dislodged—Beirut in the process being bombarded by the allied fleets (Britain, Austria, Turkey)—and the city restored to Turkish possession. During the massacres in the Lebanons (1860) large numbers of Christian refugees took shelter in Beirut and settled there. In the course of the war between Turkey and Italy a Turkish gunboat was sunk in the harbour by the Italian fleet (1912). In World War I the Allies occupied Beirut on Oct. 8, 1918. In 1920 it became the capital of the new state of Lebanon under French mandate. In 1941 it was held by Fighting French and British and the independence of the Lebanon was proclaimed.

Antiquities.—The buildings shattered by the earthquakes of the 6th century were never apparently rebuilt. Fakhr-ed-Dīn is said to have used a large number of columns to block the harbour and Mahmud Bey, governor in 1839–40, built a breakwater entirely of columns, only to have it swept away by a violent storm the following year. In 1852 Robinson speaks of the city wall (Jezzār's) then almost entire, columns of a temple, an aqueduct leading under the city, ancient walls and foundations on the rocks on the seashore, where was a small harbour. The great aqueduct, probably of the period of Herod the Great, which led water from the Lebanon to the city across the plain on an immense wall, was still fairly complete about 1840. Later it became a quarry for building stones. In the 20th century French savants decided to proceed with investigations and excavations on promising sites in the city. At the corner of the streets Allenby and Weygand there were discovered two bases for statues with Latin inscriptions commemorating a certain Sentius Proculus who held important military and civil posts under the Romans in first century A.D.

Modern.—Under French mandatory control Beirut, possessing itself municipal autonomy, is also the capital of the autonomous state of Great Lebanon (Grand Liban), and the residence of the French high commissioner for Syria. It is the see for archbishops or bishops of several communions, and a famous centre of learning. Higher education is provided by the American and Jesuit colleges and the list of Christian mission schools and seminaries, both Protestant and Catholic, is long and imposing. The city has been equipped with a good water supply (1875) and gas installation (1888), now amalgamated (1925) with the Electric Tramway company to provide an electric supply. Beirut has some fine squares but the bazaars are poor. Some of the meaner parts were demolished by Jemal Pasha in 1916 to widen the main streets. Beirut is connected by rail with Damascus (1895) and with Aleppo via Rayāk (1907). Railways coastwise to Tripoli (there is a steam tramway as far as Ma'āmaltein) and Acre were opened to military use in 1942. A harbour was constructed in 1889, but only vessels of light draught can range alongside the quays and most of the unloading is by lighters. Port charges are heavy. During 1935 there entered the port of Beirut 1,060 vessels of 2,713,381 tons, mostly steamers.

Beirut has long been famous for its export trade. As early as the first century A.D. its sweet wine, linen and silk stuffs penetrated to all parts of the known world. Under Turkish rule Beirut was a distributing centre for a large block of territory stretching from Hama to Jaffa and extending to Damascus and the Hauran. The erection of a frontier between Syria and Palestine has tended to restrict its sphere of economic influence in spite of the relief afforded by the customs agreement between Syria and Palestine in 1921. Yet trade has continued to make steady recovery since 1918. Comparisons of annual values of trade expressed in francs are apt to be misleading because Syrian currency is now based on French and has fluctuated correspondingly in value. The chief imports through Beirut were building materials (cement, wood, iron) cotton manufactures, flour, rice, motor spirit, salt; and the chief exports, fruits and seeds, native foodstuffs, hides, manufactured goods, textiles, metal work, woodwork, cocoons, wool, live animals. Beirut was connected in 1923 with Baghdad via Damascus by regular motor car service across the desert. Later on it was connected by air service with France and with Baghdad and the east, the planes using Tripoli and Damascus as landing places.

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BEISA (*Oryx beisa*): *see* ORYX; ANTELOPE.

BEISAN (Hebrew Beth-Shĕān [Shān], "house of Tranquillity"; in classical times bore the name of Scythopolis and on coins Nys[s]a), a town of Palestine on a low tableland where the vale of Esdraelon stoops down to the Jordan valley; pop. (1931) 3,101 (2,699 Muslim). The area of the ancient town enclosed within walls was extensive and at some time was subdivided into walled quarters. The modern town occupies the southern quarter only. A mound, mainly artificial, rising 250 ft. above the bed of the river Jalud and now known as Tell Husn formed the acropolis of the

early city. Under British mandate (1922) Beisan is in the Nazareth area of the northern district of Palestine.

History.—Thutmose III. crushed a confederacy of tribes in the plain of Esdraelon in 1479 B.C. and the name of Beth-shan appears in a list of his conquests. From the time of Seti I. (1314 B.C.) to that of Ramses III (1198 B.C.) Egypt controlled its destinies. Reference is made to the city in the Papyrus Anastasi of the period of Ramses II. It sustained a Canaanite enclave in Israelite territory long after the occupation (Judg. i. 27, Josh. xvii, 11), and it was possibly not till the time of David (*c.* 1,000 B.C.) that this stronghold fell into the hands of the Israelites. After the battle of Gilboa (*c.* 1020 B.C.) the bodies of Saul and his sons were exhibited on its walls (I. Sam. xxxi, 12). Sheshonk of Egypt returned to plunder it in 926 B.C. and from then till the last quarter of the 7th century it was in the hands of Assyria. The name Scythopolis suggests that the Scythian invasion (626 B.C.) in its ebb had left here a settlement, although other derivations have been suggested. From 301–198 B.C. Beisan was tributary to the Ptolemies, thereafter coming under Seleucid rule as a result of the conquests of Antiochus III. It fell into the hands of John Hyrcanus (107 B.C.). Pompey dispossessed the Jews in 65 B.C. and Scythopolis became eventually autonomous and the chief city of Decapolis. Greatly extended at this time it was equipped with temples, theatre, hippodrome, aqueducts, colonnaded streets, etc., and surpassed Jerusalem in population and commerce. The seat of a bishop it became also a centre of monasticism in the 4th century. When the Muslims overran Syria (A.D. 636) one of the decisive battles of the campaign was fought in its neighbourhood. The crusaders found in it a city far advanced in decay. They made no effort to refortify it, and it was taken at the second attempt by Saladin, who consigned it to the flames (A.D. 1187). With the rest of the land it came under the power of the Ottoman Turks (A.D. 1517). Beisan was occupied by the 4th Cavalry Division of the Egyptian Expeditionary Force on Sept. 20, 1918, with little resistance.

Excavations.—In the year 1921 the University Museum of Philadelphia began excavations on an extensive scale on the Tell, and have obtained results of great interest and value. The initial cutting to test stratifications showed that the levels descended beyond the 16th century B.C. without reaching virgin soil. Eight levels have been distinguished ranging from the 19th century A.D. back to the 16th century B.C. and beyond. Two churches and four brick temples have been discovered. Two of the latter are referred to in the Old Testament, *viz.*, the House of Ashtaroth (I. Sam. xxxi., 10) and the Temple of Dagon (I. Chron. x., 10). Both were in use until at least 1000 B.C. Amongst the discoveries are stelae of Seti I. and Ramses II. (the stele of Ramses contains a reference to the town of Ramses in Egypt) (Ex. i, 11), a magnificent Hittite battle-axe, Syro-Hittite cylinder seals, the model of a throne of Minoan type, pots of gold and silver ingots and jewellery, and a wide variety of cult objects. The cemeteries to the north of the mound have also been investigated and have yielded a number of large anthropoid sarcophagi of the 12th century B.C. and also the sarcophagus of Antiochus, cousin of Herod the Great. From tombs of the Hellenistic, Roman and Byzantine periods have come alabaster, glass, pottery and bronze objects in astonishing wealth and variety. A find of special interest has been a cubical pottery die marked like our modern dice with points from one to six.

See G. A. Smith, *Historical Geography of the Holy Land* (1897, etc.); G. J. H. Ovenden, "Notes on Excavations at Beisan," *Palestine Exploration Fund Quarterly Stat.*, 147 *sqq.*, 1923; A. Rowe, "The New Discoveries at *Beth-Shan*," *Palestine Exploration Fund Quarterly Stat.* 67 *sqq.*, 1927.

BEIT, ALFRED (1853–1906), British South African financier, was the son of a well-to-do merchant of Hamburg, Germany, and in 1875 went to Kimberley, South Africa. In conjunction with Mr. (afterwards Sir) Julius Wernher (1850–1912) he rapidly acquired a leading position on the diamond fields, and became closely allied with the ideals of Cecil Rhodes (*q.v.*). In 1889 Rhodes and Beit effected the amalgamation of various interests in the De Beers Consolidated Mines, Limited. By his exceptional gifts Beit amassed enormous wealth, and he utilized it lavishly in pursuit of Rhodes's South African policy. He was one of the original directors of the British South Africa company, and was included with Rhodes in the censure passed by the House of Commons Commission of Inquiry on the Jameson Raid (1896). He was one of Rhodes's trustees. He endowed the professorship of colonial history at Oxford (1905), gave £100,000 to establish a university in his native city of Hamburg and £200,000 for a university in Johannesburg. He died, unmarried, on July 16, 1906.

BEITH, town and parish, Ayrshire, Scotland, 18¾ mi. S.W. of Glasgow, by the L.M.S.R. Pop. of parish (1931), 5,977. The town stands high, overlooking Kilbirnie loch, but in a district disfigured by manufacturing and mining industries. Coal, iron and limestone are worked and there are manufactures of linen thread, netting and furniture, leather works and silk printing works. The ruins of Hesselhead castle are at Giffen, near Beith. It was the birthplace of Alexander Montgomerie, Scottish poet.

BEJA. Beja extends from the Egyptian frontier in the north to the latitude of Kassala in the south. The tribes do not come west of the Atbara river in any strength, so that roughly speaking it may be considered their western limit from near its mouth up to the point where it emerges from Abyssinia. The tribes inhabiting this area may be divided into three groups:

(1) The Bisharin, extending from Upper Egypt into the Sudan and across the lower Atbara river.

(2) The Hadendoa-Amarar group stretching from the Red sea-coast south of the Bisharin at Halaib across the hills into the Atbai desert and south to the Gash delta and the upper Atbara river. This group includes the Nurab, Ashraf and Artega, most of whom are now attached to either the Hadendoa or the Amarar (*q.v.*), and the Halenga of Kassala whom the Hadendoa defeated and would probably have absorbed had not settled government intervened. The Hadendoa confederacy seems only to have become powerful during the 19th century, and earned a world-wide reputation under the dervish leader Osman Digna in the fighting around Suakin in the '80s.

(3) The Beni Amer (*q.v.*), whose country extends on both sides of the Sudan-Eritrean boundary from Tokar up the Baraka river to the neighbourhood of Kassala. In spite of a difference in language the habits of the Beni Amer and Hadendoa are largely identical. The Hadendoa are fiercer and wilder, though between 1940 and 1944 gangs of Beni Amer armed with Italian weapons and led by ex-soldiers of the Italian native army successfully raided the Hadendoa along the frontier.

Languages.—The Bisharin and Hadendoa (and allied tribes) speak a Hamitic language called To Bedawi; the Beni Amer speak a Semitic language known as Tigre.

Physical Characteristics.—As Seligman has pointed out ("Some Aspects of the Hamitic Problem in the Anglo-Egyptian Sudan," *Jour. Roy. Anthrop. Inst.*, vol. xliii, 1913), the Beni Amer, their purest representatives, reproduce with astounding fidelity the physical characteristics of those early Hamites, the predynastic Egyptians, the earliest known inhabitants of the Nile valley. In stature (about 64 in.) the two people are identical, as are the measurements and character of their skulls. Northward the skull becomes progressively broader, its length remaining approximately unaltered, so that the Hadendoa skull is rounder than that of the Beni Amer and the Bisharin skull is almost brachycephalic. This applies to the riverain Bisharin. G. W. Murray ("The Northern Beja," *Jour. Roy. Anthrop. Inst.*, vol. lvii, 1927) has shown that the Bisharin of the Red sea coast are dolichocephalic, with a cephalic index of 74.73. There is little difference in height between Beni Amer and Bisharin, but the Hadendoa are distinctly taller and often darker. The fact that the Hadendoa unlike the Beni Amer often have typically Armenoid (so-called "Jewish") noses is no doubt to be explained by an infusion of foreign blood from beyond the Red sea. Apart from minor differences, the Beja are moderately short, slightly built men, with reddish-brown or brown skins. The face is usually long and oval, or approaching the oval in shape, the jaw is often lightly built, which, with the presence of a rather pointed chin, may tend to make the upper part of the face appear broader than it really is. The nose is well shaped and thoroughly Caucasian in

type and form, except where Negro blood may be suspected. The hair is usually curly, in some cases it might be described as wavy, but the method of hairdressing adopted tends to make difficult an exact description of its condition. The hair on the face is sparse; slight side whiskers, moustache and chin-tuft beard are the rule, leaving the area between the lower lip and the chin bare, while there is also some considerable space between the whiskers and the moustache. Not uncommonly, especially in the younger men, the whole face is shaved.

Mode of Life.—The Beja are essentially nomad pastoralists though many of them are now growing cotton in the Gash delta. The relative accessibility of water, and the distribution of pasture and cultivable land in small areas divided by mountain ridges, prevent the amalgamation of the small family groups even in the dry season and encourage the native independence of mind and intolerance of change which are their chief characteristics. The Mohammedanism of the Beja, though fervid in some tribes such as the Hadendoa, is relatively recent, for Makrizi (1346–1442) wrote of them as heathen for the most part, and even the little that is known of them at the present day indicates the persistence of a great number of non-Islamic beliefs.

See references in text, H. A. MacMichael's *History of the Arabs in the Sudan* (1922); *Sudan Notes and Records 1930* (C. G. Seligman), 1933 (Sandars), 1935 (Sandars), 1937 (Owen, Cumming), 1938 (Clark), 1940 (Cumming) and the article by D. Newbold in the *Anglo-Egyptian Sudan from Within* (1935).

(C. G. S.; K. D. D. H.)

BEJA, town in Portugal, 95 mi. S.S.E. of Lisbon by railway; it is probably the ancient *Pax Julia.* Pop. (1940) 12,516. Beja is an episcopal city on an isolated hill, and partly enclosed by walls of Roman origin with fine Roman south gateway. The citadel, with its beautiful Gothic tower of white marble, was founded by King Dinis (1279–1325). Grain and fruit are grown and cattle and pigs are bred on the Campo de Beja, plains around the city; copper, iron and manganese are mined to a small extent, and Beja is the central market for all these products. Cloth, pottery and olive oil are manufactured in the city.

The administrative district of Beja coincides with the southern part of Alentejo (*q.v.*); pop. (1935 est.) 260,390; (1940) 275,441; area, 3,968 square miles.

BEJAN, a term for freshmen, or undergraduates of the first year, in the Scottish universities (Fr. *béjaune,* from *bec jaune,* "yellow beak," in allusion to unfledged birds). The phrase was introduced from the French universities, where the levying of *bejaunium,* "footing-money," had been prohibited by the statutes of the University of Orleans in 1365 and by those of Toulouse in 1401.

BÉJART, the name of several French actors, children of Marie Hervé and Joseph Béjart (d. 1643), the holder of a small government post. One of the sons, JOSEPH BÉJART (*c.* 1617–59), was a strolling player and later a member of Molière's first company (l'Illustre Théâtre), accompanied him in his theatrical wanderings, and was with him when he returned permanently to Paris, dying soon after. He created the parts of Lélie in *L'Étourdie,* and Eraste in *Le Dépit amoureux.* His brother LOUIS BÉJART (*c.* 1630–78) was also in Molière's company during the last years of its travels. He created many parts in his brother-in-law's plays—Valère in *Le Dépit amoureux,* Dubois in *Le Misanthrope,* Alcantor in *Le Mariage forcé,* and Don Luis in *Le Festin de Pierre.* He was lamed in a brawl, and retired with a pension—the first ever granted by the company to a comedian—in 1670.

The more famous members of the family were two sisters; MADELEINE BÉJART (1618–72) was at the head of the travelling company to which her sister Geneviève (1631–75)—who played as Mlle. Hervé—and her brothers belonged, before they joined Molière in forming l'Illustre Théâtre (1643). With Molière she remained until her death on Feb. 17, 1672. She was an excellent actress, particularly in soubrette parts, a number of which Molière wrote for her. Among her creations were Marotte in *Les Précieuses ridicules,* Lisette in *L'École des maris,* Dorine in *Tartuffe.*

Her sister, ARMANDE GRÉSINDE CLAIRE ELIZABETH BÉJART (1645–1700), seems first to have joined the company at Lyons in 1653. In 1662 Molière married her, he being then 40 and she 17. Neither was happy; the wife was a flirt, the husband jealous. They separated after the birth of a daughter in 1665 and met only at the theatre until 1671. But Molière could not resist her charm and they were reconciled. Her portrait is given in Act iii., sc. 9 of *Le Bourgeois gentilhomme.* Mme. Molière's first appearance on the stage was in 1663, as Élise in the *Critique de l'école des femmes.* She was out of the cast for a short time in 1664, when she bore Molière a son—Louis XIV and Henrietta of England standing sponsors. But in the spring, beginning with the fêtes given at Versailles by the king to Anne of Austria and Maria Theresa, she started her long list of important rôles. She was at her best as Celimène—really her own highly finished portrait—in *Le Misanthrope* and hardly less admirable as Angélique in *Le Malade imaginaire.* She was the Elmire at the first performance of *Tartuffe,* and the Lucile of *Le Bourgeois gentilhomme.* After Molière's death Armande leased the Théâtre Guénégaud, and by royal ordinance the residue of her company were combined with the players from the Théâtre du Marais, the fortunes of which were at low ebb. The combination, known as the *troupe du roi,* at first was unfortunate, but in 1679 they secured Mlle. du Champmeslé and absorbed the company of the Hôtel de Bourgogne. Mme. Molière in 1677 had married Eustache François Guérin (1636–1728), an actor, and by him she had one son (1678–1708). She retired in 1694, and died on Nov. 30, 1700.

BEK, ANTONY, bishop of Durham from 1283 to 1311. Edward I employed him on diplomatic errands to Scotland in 1285, and to the German king in 1294. He took part in Edward's campaigns in Scotland, received the surrender of John de Baliol at Brechin in 1296, and led one division of the English army at the battle of Falkirk in 1298. He became involved in a quarrel with Richard de Hoton, prior of Durham, whom he excommunicated. In 1302 he visited Rome on this matter, and during his absence the king seized and administered his lands, which, however, he recovered when he submitted to Edward. He died at Eltham on March 3, 1311. A man of great courage and energy, chaste and generous, Bek was remarkable for his haughtiness and ostentation. He was a soldier and a hunter rather than a bishop, and built castles at Eltham and elsewhere.

Bek's elder brother, THOMAS BEK (d. 1293), was treasurer of England in 1279, and became bishop of St. David's in 1280. Another THOMAS BEK (1282–1347) was bishop of Lincoln from 1341 until 1347.

Antony Bek must not be confused with his kinsman and namesake, ANTONY BEK (1279–1343), who was chancellor and dean of Lincoln cathedral, and became bishop of Norwich after a disputed election in 1337. He was a quarrelsome man and had a turbulent episcopate.

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BEK-BUDI KENIMEKH (formerly Karshi), a town in the Uzbek S.S.R., at the junction of the two main tributaries of the Kashka-Darya. Lat. 38° 52′ N., long. 65° 56′ E. Population 14,150. It is the centre of a fertile oasis growing grain, poppies, tobacco and fruit: mulberry, poplar and apricot trees are features of its gardens. It was the favourite residence of Timur and its fine Biki mosque, inlaid with blue and white tiles, is famous. A branch railway links it to Shehri-Sebz (the Green City), the birthplace of Timur (Tamerlane). Roads from Samarkand, Bukhara, Hissar, Balkh and Maimana meet here, and there are railway lines to Bukhara and Termez. The city is an exchange mart for carpets, knives, firearms and the noted work of its coppersmiths; it is also an educational centre with three colleges. Its water supply is stagnant and water-borne diseases are prevalent.

BEKE, CHARLES TILSTONE (1800–1874), English geographer and Biblical critic. From 1838 till his death he was principally engaged on geographical studies of the Nile valley. He visited Abyssinia in connection with the mission to Shoa, and was the first scientifically to determine the course of the Blue Nile (see *Journal* of the Royal Geographical Society). In 1848

he planned an expedition to discover the sources of the Nile, but nothing of importance was accomplished. In 1861–62 he travelled in Syria and Palestine, then going to Egypt in an attempt to promote trade with Central Africa, and to urge the growing of cotton in the Sudan. In 1865 he went again to Abyssinia to obtain from King Theodore the release of the British captives. In the year of his death he made a journey to Egypt to determine the real position of Mount Sinai. He wrote *An Essay on the Nile and its Tributaries* (1847), *The Sources of the Nile* (1860), and *The British Captives in Abyssinia* (1865).

See *Summary of the late Dr. Beke's published works and . . . public services,* by his widow (Tunbridge Wells, 1876).

BÉKÉSCSABA, a busy regional market town in Hungary, 123 mi. southeast of Budapest. Situated near the White Körös, with which it is connected by canal, it is an important railway junction with an active trade in the characteristic products of the Hungarian plain, viz., cereals and cattle. There are milling and hemp industries. Pop. (1939) 49,973, largely Slovak. The town contains the largest Lutheran community in Hungary.

BEKHTEREV, VLADIMIR MIKHAILOVICH (1857–1927), Russian neuropathologist, was born in the province of Viatka. He studied medicine in the medico-surgical academy at St. Petersburg (now Leningrad). In 1884 he went abroad to do research work under Du Bois-Reymond, Wundt and Charcot, and was appointed professor at the University of Kazan, where he started clinical research of mental diseases and promoted the first psycho-physiological laboratory. In 1893 he became professor of the Military Medical Academy in St. Petersburg and was elected director in 1905–6. To foster psycho-physiological research, he founded in 1907 in St. Petersburg a psycho-neurological institute, which existed on private donations up to 1917, when an additional brain institute was formed and both were taken over by the government. He published more than 500 scientific papers on pathology and anatomy of the nervous system and founded a society of neuropathologists and the periodical *Nevrologitcheski Vestnik.* Bekhterev died on Dec. 24, 1927, at Moscow. On the celebration of his 70th birthday he received the title of "Scientist Emeritus." His work on *The Nerve Currents in Brain and Spinal Cord* appeared first in Russia in 1882; the second edition in 1896 has been translated into French and German (1894). *The Functions of the Nervous Centres* appeared in Russia in 1909; his *Psychology Objectively Demonstrated* was published in 1910 (Fr. trans. by N. Kotyleff, 1913); and his *General Diagnosis of the Nervous System Diseases* in 1911; *General Basis of the Reflex Action of Man; a Treatise of Objective Biological Study of Personality* (3rd ed. 1926).

BEKKER, AUGUST IMMANUEL (1785–1871), German philologist and critic. He studied classics at Halle under F. A. Wolf. In 1810 he was appointed professor of philosophy at Berlin. For several years, between 1810 and 1821, he travelled in France, Italy, England and parts of Germany, examining classical manuscripts and gathering materials for his editorial labours. He died at Berlin on June 7, 1871. Some detached fruits of his researches were given in the *Anecdota Graeca,* 1814–21; but the full result is to be found in the enormous array of classical authors edited by him. His industry extended to nearly the whole of Greek literature, except tragedy and lyric. His best-known editions are: *Plato* (1816–23), *Oratores Attica* (1823–24), *Aristotle* (1831–36), *Aristophanes* (1829), and 25 volumes of the *Corpus Scriptorum Historiae Byzantinae.* The only Latin authors edited by him were Livy (1829–30) and Tacitus (1831). Bekker confined himself to textual recension and criticism, in which he relied solely upon the mss., and contributed little to the extension of general scholarship.

See Sauppe, *Zur Erinnerung an Meineke und Bekker* (1872); Haupt, "Gedächtnisrede auf Meineke und Bekker," in his *Opuscula,* iii.; E. I. Bekker, "Zur Erinnerung an meinen Vater," in the *Preussisches Jahrbuch,* xxix; Sandys, *Hist. of Classical Scholarship,* iii. p. 85 ff. (1908).

BEKKER, BALTHASAR (1634–1698), Dutch divine, was born at Metslauier, in Friesland, March 30, 1634. He was pastor at Franeker, and from 1679 at Amsterdam. His best known work was *Die Betooverde Wereld* (1691), or *The World Bewitched* (1695) (one vol. of an English trans. from a French copy); in which he attacked the belief in sorcery and "possession" by the devil. The book led to Bekker's deposition from the ministry. He died at Amsterdam on July 11, 1698.

BEKKER (or WOLFF), **ELIZABETH** (1738–1804), Dutch novelist, was married to Adrian Wolff, a Reformed clergyman. After the death of her husband in 1777, she resided for some time in France with her close friend, Agatha Deken. In 1795 she returned to Holland, and resided at The Hague till her death. Her novels were written in conjunction with Agatha Deken, and it is somewhat difficult to determine the exact qualities contributed by each. The *Historie van William Levend* (1785), *Historie van Sara Burgerhart* (1790), *Abraham Blankaart* (1787), *Cornelie Wildschut* (1793–96), were extremely popular.

BÊL, the Accadian word for "lord," the counterpart of the Phoenician Baal (*q.v.*), Sumerian *en.* It is, therefore, a title given to a deity at the head of a pantheon. It may have been first applied *as a divine name* to En-lil, of which the first element again has the force of "lord" and the second "wind." En-lil is associated with the ancient city of Nippur. The designation of En-lil as "Bêl" or the "lord" reverts to a very early period—prior to 3000 B.C. when Nippur had become the centre of a political district of considerable extent. Inscriptions found at Nippur, during 1888–1900 show that En-lil of Nippur was in fact regarded as the head of an extensive pantheon. Among the titles accorded to him are "king of lands," "king of heaven and earth" and "father of the gods." His chief temple at Nippur was known as E-Kur, signifying "mountain house," and such was the sanctity acquired by this edifice that Babylonian and Assyrian rulers, to the latest days, embellished and restored Bêl's seat of worship, and the name itself became the designation of a temple in general. Grouped around the main sanctuary there arose temples and chapels to the gods and goddesses who formed his court, so that E-Kur became the name for an entire sacred precinct in the city of Nippur. The tower, however, also had its special designation of "E-Im-Khur-sag," meaning "House of the wind of the mountain," *i.e.,* wind of the earth mountain, the Sumerians believing that the winds emerge from caverns of the lower world, hence the titles of the earth god En-lil, Imkhursag.

With the rise of Babylon as the centre of a great empire, Nippur yielded its prerogatives to the city over which Marduk presided; the attributes and the titles of En-lil were transferred to Marduk, who becomes the "lord" or Bêl of later days. The older Bêl did not, however, entirely lose his standing. Nippur continued to be a sacred city after it ceased to have any considerable political importance. When the Greek writers refer to the Babylonian deity Bêlos, they invariably mean Marduk of Babylon, especially in his rôle as Tammuz the dying god. It is most uncertain that the Babylonians ever referred to En-lil and Nin-lil of Nippur as the deities Bêl and Bêlit.

See also BÊLIT and BAAL. For the apocryphal book of the Bible, *Bêl and the Dragon, see* DANIEL: *Bêl and the Dragon.*

BELA III. (d. 1196), king of Hungary, was the second son of King Geza II. Educated at the Byzantine court, he married Agnes of Châtillon, duchess of Antioch, and in 1173 was placed by the emperor Manuel by force of arms on the Hungarian throne. Bela began by adopting Catholicism and seeking the assistance of Rome. He then made what had hitherto been an elective a hereditary throne by crowning his infant son Emerich his successor. The attempt to recover Dalmatia, which involved Bela in two bloody wars with Venice (1181–88 and 1190–91), was only partially successful. But he assisted the Rascians or Serbs (*see* HUNGARY: *History*) to throw off the Greek yoke and establish a native dynasty, and attempted to make Galicia an appanage of his younger son Andrew. It was in Bela's reign that the emperor Frederick I., in the spring of 1189, traversed Hungary with 100,000 crusaders. In his last years Bela assisted the Greek emperor Isaac II. Angelus against the Bulgarians. His first wife bore Bela two sons, Emerich and Andrew. On her death he married Margaret of France, sister of King Philip Augustus. Bela was in every sense of the word a great statesman, and his court was accounted one of the most brilliant in Europe. The Hungarian dramatist, Ede Szigliger, immortalized his memory in a play.

BELA IV. (1206–1270), king of Hungary, was the son of Andrew II., whom he succeeded in 1235. During his father's lifetime he colonized and christianized Transylvania. The salient event of Bela's reign was the terrible Tatar invasion which reduced three-quarters of Hungary to ashes. The terror of their name had long preceded them, and Bela, in 1235 or 1236, sent the Dominican monk Julian, by way of Constantinople, to Russia, to collect information about them from the "ancient Magyars" settled in the country east of the Volga. He returned to Hungary with the tidings that the Tatars contemplated the immediate conquest of Europe. Bela appealed to the pope, the duke of Austria and the emperor for assistance; but in February and March 1241 the Tatars burst through the Carpathian passes; in April Bela himself, after a gallant stand, was routed on the banks of the Sajó and fled to the islands of Dalmatia; and for the next twelve months the kingdom of Hungary was merely a geographical expression. The last 28 years of Bela's reign were mainly devoted to the reconstruction of his realm, which he accomplished with a single-minded thoroughness which has covered his name with glory. (*See* HUNGARY: *History.*)

Perhaps the most difficult part of his task was the recovery of the western portions of the kingdom (which had suffered least) from the hands of Frederick of Austria, who had seized them as the price of assistance which had been promised but never given. Bela crossed the Leitha on June 15, 1246, and routed Frederick, who was killed in the battle. With him was extinguished the male line of the house of Babenberg. In the south Bela was obliged, in 1243, to cede to Venice, Zara, a perpetual apple of discord between the two states; but he kept his hold upon Spalato and his other Dalmatian possessions, and his wise policy of religious tolerance in Bosnia enabled Hungary to rule that province peaceably for many years. The new Serb kingdom of the Nemanides, on the other hand, gave him much trouble and was the occasion of many bloody wars. In 1261 the Tatars under Nogai Khan invaded Hungary for the second time, but were defeated by Bela. For a time Bela was equally fortunate in the north-west, where the ambitious and enterprising Přemyslidae had erected a new Bohemian empire which absorbed the territories of the old Babenbergers and was very menacing to Hungary. With Ottakar II. in particular, Bela was almost constantly at war for the possession of Styria, which ultimately fell to the Bohemians. In his later years his son Stephen compelled him to divide the kingdom with him, the younger prince setting up a capital of his own at Sárospatak. Bela died on May 3, 1270. He married, while still crown prince, Maria, daughter of the Nicaean emperor, Theodore Lascaris. She bore him, besides his two sons Stephen and Bela, seven daughters, of whom St. Margaret was the most famous.

No special monograph for the whole reign exists. For the Tatar invasion *see* the contemporary Rogerius, *Epistolae super destructione Regni Hungariae per Tartaros facta* (1885). A vivid but somewhat chauvinistic history of Bela's reign will be found in Acsády's *History of the Hungarian Realm* (Hung.), i, 2 (1903). (R. N. B.)

BELA, LAS BELA or **LUS BEYLA,** India, a town in 26° 27′ 30″ N. lat. and 60° 45′ 0″ E. long., 350 ft. above sea level, the capital of Las Bela state under suzerainty of Kalat in Baluchistan agency, ruled by the Jam (or Cham), who occupies the position of a protected chief under the British Raj. From time immemorial the trade route between Sind and Persia has passed through Las Bela and Makrān. The area of the state is 7,043 sq.mi., and population (1941) 69,067, 61,365 being Muslim. Two rivers from the north, the Purāli and the Kud, unite to provide water to irrigate the fertile, alluvial, hot and malarial plains of Las Bela on the north-east corner of the Arabian Sea. The hill-ranges to the east, parting the plains from Sind (generally known locally as the Mor and the Kirthar), between which lies the long narrow line of the Hab valley, strike nearly north and south, diminishing in height as they approach the sea and allowing of a route skirting the coast between Karachi and Bela. To the west they are broken into an infinity of minor ridges massing themselves in parallel formation with a strike which curves from south to west till they form the coast barrier of Makrān. The Persian route from India, curving somewhat to the north, was important in the mediaeval days of Arab ascendency in Sind, and it is to this route that Bela owes a place in history. Bela is itself rather prettily situated and about four miles to the south are the well-kept gardens which surround the tomb of Sir Robert Sandeman. The population of the town numbers (1941) 3,436. The Jam's retinue consists of about 300 infantry, 50 cavalry and 4 guns. Liability to assist on active service is the only acknowledgment of the suzerainty which is paid by the Jam to the Khan of Kalat.

There are traces of ancient Arab (possibly Himyaritic) occupation to be found in certain stone ruins at Gondakeha on the Kud river, 10 mi. to the north-west of Bela, whilst the Greek name "Arabis" for the Purāli is itself indicative of prehistoric connection with races of Asiatic Ethiopians referred to by Herodotus. On the coast, near the village of Sonmiani may be traced the indentation which once formed the bay of Morontobara, noted in the voyage of Nearchus; and it was on the borders of Makrān that the Turanian town of Rhambakia was situated, which was once the centre of the trade in "bdellium." In the 7th century A.D. Las Bela was governed by a Buddhist priest, at which time all the province of Gandava was Buddhist, and Sind was ruled by the Brahman, Chach. With the influx of Arabs into Makrān, Bela, under the name of Armel (or Armabel), rose to importance as a link in the great chain of trading towns between Persia and Sind; and then there existed in the delta important towns each with its citadel, its caravanserai and bazaar, which are not only recorded but actually mapped by one of the mediaeval Arab geographers, Ibn Haukal, and many old sites can be traced. The Lumris, or Lasis, who originate the name Las as a prefix to that of Bela, are the dominant tribe in the province. They are comparatively recent arrivals who displaced the earlier Tajik and Brahui occupants. It is probable that this influx of Rajput population was coincident with the displacement of the Arab dynasties in Sind by the Mohammedan Rajputs in the 11th century A.D. Some authorities connect the Lumris with the Sumras.

BELASCO, DAVID (1854–1931), American playwright and theatrical manager, was born at San Francisco (Cal.), on July 25, 1854, the son of adventurous Hebrew parents lured there by the gold rush. He spent part of his boyhood in Victoria, Texas, and gained much of his education in various schools and a monastery there. By heritage he was drawn to the stage and early played juvenile parts. When he was a mere child, too, he did his first dramatic writing. After a boyhood of varied experiences and hard work, he became a theatrical vagabond, serving as call-boy, actor, stage manager, adapter and writer of plays. When at 29 he definitely left San Francisco after having been established there for a number of years, he had acted more than 170 parts, had altered or written more than 100 plays and had been the responsible director in the production of more than three times that number. After similar work in the Madison Square theatre and with Daniel Frohman he became a successful independent dramatist and producer with *The Heart of Maryland* (1895). Among his later outstanding successes were the oriental romances *Madame Butterfly* (with J. L. Long, 1900) and *The Darling of the Gods* (with J. L. Long, 1902); *The Girl of the Golden West* (1905) and *The Rose of the Rancho* (with R. W. Tully, 1906), which reflected his western experience; and *The Return of Peter Grimm* (1911). In addition to his work as an extremely successful adapter and composer of plays, Belasco was for many years one of the foremost American managers and producers. Under his direction appeared such distinguished actors as Blanche Bates, Lenore Ulric and David Warfield. Belasco's productions were noted for the sumptuousness of their stage effects. Belasco wrote *The Theatre through the Stage Door* (ed. by L. V. Defoe, 1919). Belasco died May 14, 1931.

See also Belasco's reminiscences, which appeared in *Hearst's Magazine* (1914–15) and the authoritative *Life of David Belasco* (1918) by William Winter.

BELAWAN (DELI), N. Sumatra, Netherlands Indies, on Pulau Belawan, an island of mud and mangroves, at the estuary of the Deli and Belawan rivers. It is the port for Medan, serves the trade of the east coast of Sumatra, and is the most important port in N. Sumatra. The hinterland grows tobacco, rubber, tea,

oil palm and sisal fibre in Deli, Langkat and Serdang, and Belawan is the port of shipment for these commodities. Imports consist of manufactured goods and foodstuffs. The port has about 6,000 ft. of wharfage space, with the necessary warehouse accommodation. The harbour is greatly handicapped by the bar of the deep Belawan river, and powerful dredgers are kept at work continually to keep open the deep channel, and make it deeper. There is a minimum depth of 25 ft. at low tide over a width of 60 metres in the channel, so that ships drawing 23 ft. can enter at all times, while vessels drawing 26 ft. can enter at high tide. The tonnage of the port (1939) was 1,937,000. It is unhealthful, and Europeans usually reside at Labuan Deli, a few miles up the river. Belawan has constant communication in normal times with Singapore and Penang, and Sumatran and Javanese ports. It is 12 miles distant from Medan with which it is connected by a good motor road, and it is also the terminus of the Deli railway, which crosses the channel south of the island by a bridge; it has cable connections which link it with Java and with Singapore. The island was occupied by Japan in 1942.

BELCHER, SIR EDWARD (1799–1877), British naval officer, entered the navy in 1812. In 1825 he accompanied Frederick William Beechey's expedition to the Pacific and Bering strait, as a surveyor. He subsequently commanded a surveying ship on the north and west coasts of Africa and in the British seas, and in 1836 took up the work which Beechey left unfinished on the Pacific coast of South America. In 1852 he was given command of the Government Arctic expedition in search of Sir John Franklin. This, which proved an unsuitable appointment, was his last commission; he became K.C.B. in 1867 and an admiral in 1872. He published, *Narrative of a Voyage round the World performed in H.M.S. "Sulphur," 1836–1842* (1843), *Narrative of the Voyage of H.M.S "Samarang" during 1843–1846* (1848; the *Zoology of the Voyage* was separately dealt with by some of his colleagues, 1850), and *The Last of the Arctic Voyages* (1855), besides minor works. He died in London on March 18, 1877.

BELCHER, JOHN (1841–1913), English architect, son of an architect of the same name, was born in London on July 10, 1841. His first important commission—the Royal Insurance offices in Lombard street—was a French Renaissance building (since pulled down), in which he introduced much sculptured work from the hand of Thomas Thornycroft. He designed the block at the corner of Poultry and Queen Victoria street, a building showing how strongly he was influenced at that period by the Gothic movement of which Street and Burges were the prominent exponents. After his father's retirement in 1875, Belcher was in partnership at various times with J. W. James, Beresford Pite and J. J. Joass. His admiration for Norman Shaw was a great factor in his artistic evolution, but even a more powerful one was due to the preparation and study involved in his production, with Mervyn Macartney of the *Later Renaissance in England*. His Electra house, Finsbury, and Whiteley's vast store, Bayswater, are admirable examples of business premises practically conceived, and possessing a fine and dignified architectural treatment. Belcher's ecclesiastical work included Holy Trinity church, Kingsway (1909), an interesting essay in the classic manner, and the Catholic Apostolic church in Maida Vale. He was elected royal academician in 1909, and was president of the Royal Institute of British Architects in 1908. He died in London on Nov. 8, 1913.

BELDAM, a grandmother or remote ancestress, and so an old woman. Generally used contemptuously as meaning an old hag.

BELÉM: *see* PARÁ.

BELEMNITES, a representative of a group of extinct cephalopod molluscs allied to the squids and cuttlefish (*qq.v.*). The shell comprised a straight cone divided internally into chambers and known as the phragmocone, the whole enclosed in a horny or calcareous plate. It was probably internal as in most modern Decapoda. *See* MOLLUSCA; CEPHALOPODA.

BELESME, ROBERT OF (*c.* 1100), earl of Shrewsbury. From his mother Mabel Talvas he inherited the fief of Belesme, and from his father, the Conqueror's companion, that of Shrewsbury. Both were march-fiefs, the one guarding Normandy from Maine and the other England from the Welsh; consequently their lord was peculiarly powerful and independent.

Robert was the typical feudal noble of the time, circumspect and politic, persuasive and eloquent, impetuous and daring in battle, and an able military engineer; in person, tall and strong; greedy for land, an oppressor of the weak, a systematic rebel and traitor, and savagely cruel. He first appeared as a supporter of Robert's rebellion against the Conqueror (1077); then as an accomplice in the English conspiracy of 1088 against Rufus. Later he served Rufus in Normandy, and was allowed to succeed his brother Hugh in the earldom of Shrewsbury (1098). But at the height of his power he revolted against Henry I. (1102). He was banished and deprived of his English estate; for some time after he remained at large in Normandy, defying the authority of Robert and Henry alike. He betrayed Robert's cause at Tinchebrai; but in 1112 was imprisoned for life by Henry I.

BIBLIOGRAPHY.—*See* E. A. Freeman's *William Rufus,* and his *Norman Conquest,* vol. iv.

BELFAST, city, county and parliamentary borough and capital of Northern Ireland. Pop. (1937) 438,086. Area, 25.9 sq.mi., of which 2 sq.mi. are water. It is a seaport of the first rank, at the entrance of the river Lagan into Belfast Lough, 112¾ mi. north of Dublin by rail.

The early history of the site is scanty and vague. In 1177 a castle was built by John de Courcy commanding a ford over the Lagan near its mouth, and from this date begins the real history of Belfast as a settlement. The next outstanding date is 1316, when the town and castle were destroyed by Edward Bruce. In the early 16th century, Belfast is described as a town and a fortress but was in reality a fishing village in the hands of the house of O'Neill. The town and fortress were obtained in 1571 by Sir Thomas Smith, a favourite of Queen Elizabeth. It was later forfeited by him to the lord deputy, Sir Arthur Chichester, who in 1612 was created Baron Chichester of Belfast. At this time it was only a town of about 120 houses and a castle in poor condition. In 1611 Chichester built another castle, which was burned in 1708. A charter was granted to the town by James I in 1613, constituting it a corporation with right of sending two members to parliament. Two years after the rebellion of 1641, a rampart was raised round the town, pierced by four gates on the land side. It will thus be seen that Belfast still retained many of the characteristics of a fortress during the period of its early commercial development, and this dualism in its history is of great significance and importance. The old charter was annulled by James II and a new one issued in 1688, but the old one was restored in 1690 by William III. Letterpress printing was introduced by James Blow and company in 1696 and about this time strategic considerations sank into the background and commercial factors became of outstanding importance.

Belfast became a city in 1888 and a county borough ten years later.

Shipbuilding at Belfast really began with the enterprises of William Ritchie of Ayrshire, dating from 1791. The earliest records of shipbuilding, however, date back to 1636, when the "Eagle Wing" (150 tons register), was built on the shore of Belfast Lough by a number of Presbyterians of Belfast who wished to seek refuge in the new world. Continuous progress was made after the early 19th century, and Belfast became one of the world's chief shipbuilding centres. The harbour contains 11 docks and basins, the largest dock, York dock (1897), having a water area of over 7 ac. The Pollock basin (1933), area 9 ac., has 1,774 ft. of quayage.

Of the five graving docks, the Thompson dock (1911) is one of the largest in the world, measuring 887 ft. in length. There are in all over six miles of quayage. The airport, opened in 1938, is under the harbour commissioners; it is situated in the harbour on 365 ac. of reclaimed land.

The linen industry was much encouraged by the Huguenots, who came to Ulster after the revocation of the Edict of Nantes. Modern Belfast profited by proximity to Scottish coal and iron, and became the centre of the industry. The activities connected with the manufacture of linen range from the making of sewing

thread to the production of handkerchiefs, tea-cloths and other finished goods. Loss of markets due to World War I caused a sharp decline from which the industry only slowly recovered. The manufacture of tobacco and rope-making are other leading industries, Belfast claiming to have the largest shipbuilding plant, linen mills, tobacco factory and rope works in the world. Whisky distilling, the making of aerated waters and aircraft manufacturing are additional industries.

It was not until 1789 that the town obtained regular communication with Dublin by stage coach, but now the Lagan valley has been utilized as an important railway route. The residential areas on Belfast Lough are also connected with the city by rail. There is regular sea communication with Liverpool, Heysham, Glasgow and other ports and air communication with London, Liverpool, Glasgow and the Midlands.

Architecturally, the city inevitably retains signs of its rapid growth. There are, however, some buildings worthy of notice, of which may be mentioned Queen's university (1849), city hall, the cathedral, the law courts (1933), the telephone building (1934) and the parliament buildings (1932), in the suburb of Stormont. These last are finely situated on a hillside and are approached by a straight avenue $\frac{3}{4}$ mi. long. The city hall stands in a small park. The best known monument is the Albert memorial clock tower (1869). There are 724 ac. of parks and grounds.

Large areas in the city were laid waste by air raids in 1941, the city hall receiving some damage, and many churches were destroyed. In all, 56,622 houses were hit, including 3,200 completely demolished.

Belfast is divided into five parliamentary constituencies, one of which is Queen's university, each returning four members to the parliament of Northern Ireland and one member to the United Kingdom parliament.

Queen's university dates from 1909; previously it was Queen's college, a constituent college of the Royal University of Ireland. The municipal college of technology is connected with it. Since its foundation the university has had many extensions. Schools include the Royal academy (1785), the Academical institution (1810) and Campbell college (1894), one of the principal Irish public schools. The Methodist college (1868) is a mixed school. There is a teachers' training college (1929) and a Presbyterian theological college (1853).

BELFAST, a city of Maine, U.S.A., on the northwest shore of Penobscot bay, 30 mi. from the sea and 85 mi. northeast of Portland; a port of entry and the county seat of Waldo county. It is served by coasting steamers; and by the Belfast and Moosehead Lake railroad, which connects with the Maine Central at Burnham Junction, 33 mi. northwest. The population in 1920 was 5,083, 92% of native parentage; 1940, 5,540. The city lies on an undulating hillside, commanding extensive views of islands, headlands and mountains. It has a considerable domestic commerce, is a summer resort, and manufactures a variety of commodities. The first settlers (1769) were Scotch-Irish; hence the name. It was incorporated in 1773. Almost destroyed by the British in 1779, it was again in British hands for five days in 1814. It was chartered as a city in 1850.

BELFORT, TERRITORY OF, an administrative division of eastern France, formed from the southern portion of the department of Haut-Rhin, the rest of which was ceded to Germany by the treaty of Frankfort (1871), but recovered by France in 1919. It is bounded on the northeast and east by Haut-Rhin, on the south by Switzerland, on the southwest by the department of Doubs, on the west by that of Haute-Saône, on the north by that of Vosges. Pop. (1936) 99,497.

With an area of 235 sq.mi., it is one of the smallest departments of France. The northern part is occupied by the southern offshoots of the Vosges, the southern part by the northern outposts of the Jura. Between these two highlands stretches the Trouée (depression) de Belfort, 15–20 mi. broad, joining the basins of the Rhine and the Rhône, traversed by the canal between these rivers, by the Eastern and the Paris-Lyon-Méditerranée railways and from earliest times an important route from north to south. The northern part rises to 4,126 ft. in the Ballon d'Alsace, to 3,773 ft. in the Planche des Belles-Filles, to 3,579 ft. in the Signal des Plaines and to 3,534 ft. in the Bärenkopf. South of the Trouée de Belfort, there are near Delle limestone hills, partly wooded, attaining 1,680 ft. in the Forêt de Florimont. The line of lowest altitude follows the river St. Nicolas and the Rhône-Rhine canal. To the north of the town of Belfort the rainfall is retained by an impervious subsoil; farther south it is quickly absorbed by the soil or evaporated by the sun. About one-third of the total area is arable land; wheat, oats, rye and potatoes are the chief crops. Forest covers another third of the surface; the chief trees are firs, pines, oak and beech; cherries are largely grown for the distillation of kirsch. Pasture and forage crops cover the remaining third of the territory; only horned cattle are raised to any extent. There are copper, silver and lead at Giromagny, and there are also quarries of stone. The chief industries are the spinning and weaving of cotton and wool, and the production of iron and iron-goods and machinery. Belfort has important locomotive and engineering works. Hosiery is made at Delle, watches, clocks, agricultural machinery, petrol (gasoline) motors, ironware and electrical apparatus are manufactured at Beaucourt, and there are numerous sawmills, tile and brick works and breweries.

Belfort is the capital of the territory, which comprises one arrondissement, 5 cantons and 106 communes, and is in the archbishopric, the court of appeal and the académie (educational division) of Besançon. It forms the 7th subdivision of the VII Army Corps.

BELFORT, town of France, capital of the department of Belfort, 275 mi. E.S.E. of Paris on the main line of the Eastern railway. Pop. (1936) 45,622. The town commands an important structural gap known as the Trouée de Belfort between the Vosges and the Jura and is one of the main ways from the Rhine country into France. Gallo-Roman remains are found in the vicinity though the place is first heard of in the 13th century as the possession of the counts of Montbéliard. It passed by marriage to the counts of Ferrette and afterwards to the archdukes of Austria. By the treaty of Westphalia (1648) the town was ceded to Louis XIV who gave it to Cardinal Mazarin.

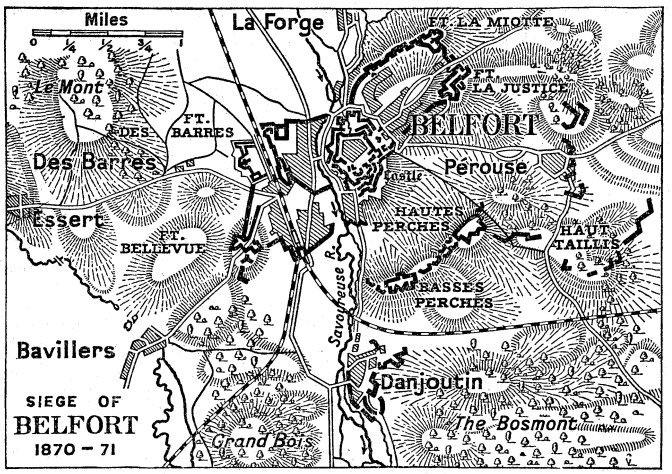
In the Thirty Years' War Belfort was twice besieged. The fortifications of Vauban were begun in 1686. Belfort was besieged in 1814 by the troops of the Allies and in 1815 by the Austrians. The most famous episode of the town's history is its successful defense in the war of 1870–71. The town is divided by the river Savoureuse into a new quarter on the right bank, and the old fortified quarter, with the castle and public buildings, on the left bank. The church of St. Denis, in the classical style (1727–50) and the *hôtel de ville* (1721–24) stand opposite the castle. "The Lion of Belfort," a colossal figure 78 ft. long and 52 ft. high, the work of Bartholdi, is carved on the rock in front of the castle.

The construction of locomotives and machinery, carried on by the Société Alsacienne, wire-drawing, and the spinning and weaving of cotton are included among its industries. Its trade is in the wines of Alsace, brandy and cereals. Belfort is the seat of a prefect. It has tribunals of first instance and of commerce and a chamber of commerce.

Siege of Belfort.—The events before the siege are described under FRANCO-GERMAN WAR. Even before the investment Belfort was cut off from the interior of France, and the German corps of Werder was, throughout the siege, between the fortress and the forces which might attempt its relief. The siege corps was commanded by General von Tresckow and numbered at first 10,000 men with 24 field guns—a force which appeared adequate for the reduction of the antiquated works of Vauban. Colonel Denfert-Rochereau was, however, a scientific engineer of advanced ideas as well as a veteran soldier of the Crimea and Algeria, and he had been stationed at Belfort for six years. He had as a nucleus but few regular troops, but the energy of the military and civil authorities enabled his force to be augmented by national guards, etc., to 17,600 men. The artillery was numerous, but skilled gunners were not available in any great strength and ammunition was scarce. Perhaps the most

favourable circumstance from a technical point of view was the bomb-proof accommodation of the enceinte.

The old fortress consisted of the town enceinte, the castle and the entrenched camp, a hollow enclosed by continuous lines, the salients of which were the castle, Fort La Justice and Fort La Miotte. These were planned in the days of short-range guns, but Denfert-Rochereau understood better than other engineers of the day the power of modern artillery, and his plan was to utilize the old works as a keep and an artillery position. The Perches ridge, whence the town and suburbs could be bombarded, he fortified



MAP OF BELFORT CITY AND THE OUTER FORTS AS THEY WERE IN 1870
Invested and besieged from Nov. 3, 1870, to the Armistice of Feb. 15, 1871, Belfort, under Denfert-Rochereau, resisted the Prussian onslaught. It was afterwards surrendered formally. The French commander made the best possible use of the terrain, strengthening the forts of La Miotte and La Justice and constructing new forts at Des Barres and Bellevue. The Prussians lost heavily

with all possible speed. On the right bank of the Savoureuse he constructed two new forts, Bellevue and Des Barres. His general plan was to maintain as advanced a line as possible, to manoeuvre against the investing troops, and to support his own by the long range fire of his rifled guns. With this object he fortified the outlying villages, and when the Germans (chiefly Landwehr) began the investment on Nov. 3, 1870, they met sturdy resistance. The first attack of the siege artillery opened, Dec. 3, on the west bank between Essert and Bavillers. As more guns arrived, it was extended from left to right, and on Dec. 13 the Bosmont was captured. The formal siege of the Perches redoubts was then decided upon, and as an essential preliminary, Danjoutin, now isolated was stormed by the Landwehr on the night of Jan. 7–8. In the meanwhile typhus and smallpox had broken out amongst the French, many of the national guards were impatient of control, and the German trenches made steady progress towards the Perches. A week after the fall of Danjoutin the victory of Werder at the Lisaine put an end to the attempt to relieve Belfort, and the siege corps was promptly increased to a strength of 17,600 infantry, 4,700 artillery and 1,100 engineers, with 34 field-guns, besides the guns and howitzers of the siege train. The investment was now more strictly maintained and on the night of Jan. 20 the French lines about Pérouse were carried by assault, and, the early morning of the 27th a determined but premature attempt was made to storm the Perches redoubts, which cost the besiegers nearly 500 men. After this failure Tresckow once more resorted to the regular method of siege approaches, and henceforward the besiegers fired 1,500 shells a day into the works of the French. But the besiegers were still weak in numbers and their labours were very exhausting. Still, the guns of the attack were now steadily gaining the upper hand, and at last, on Feb. 8, the Germans entered the two Perches redoubts. This success, and the arrival of German reinforcements, decided the siege. The attack on the castle now opened, but operations were soon suspended by the news that Belfort was now included in the general armistice (Feb. 15). A little later Denfert-Rochereau received a direct order from his own government to surrender the fortress, and the garrison, being granted free withdrawal, marched out with its arms and trains. Moltke says "The town had suffered terribly . . . nearly all the buildings were damaged. The garrison . . . had lost 4,750, besides 336 citizens." Nevertheless, "the defence was by no means at its last stage" at the time of the formal surrender (British Text-Book of Fortifications, 1893). The total loss of the besiegers was about 2,000 men.

See J. Liblin, *Belfort et son territoire* (Mülhausen, 1887).

BELFRY, originally a word used for a movable wooden tower employed in sieges for attacking and scaling city or castle walls; also a watch tower, particularly one that had an alarm bell. In modern usage the word signifies any bell tower, especially if detached, and also the tower chamber in which the bells are placed.

BELGAE, a Celtic people first mentioned by Caesar, who states that they formed the third part of Gaul, and were separated from the Celtae by the Sequana (Seine) and Matrona (Marne). On the east and north their boundary was the lower Rhine, on the west the ocean. Caesar's statement (*B.C.* i. 1) that the Belgae differed from the Celtae in language, institutions and laws, is too sweeping, at least as regards language, for many words and names are common to both. Only the eastern districts would have been affected by invaders from over the Rhine, the chief seat of the Belgae proper being in the west. T. R. Holmes comes to the conclusion that "when the Roman delegates told Caesar (*Bell. Gall.* ii. 4) that the Belgae were descended from the Germans, they probably meant that the ancestors of the Belgic conquerors had formerly dwelt in Germany, and this is equally true of the Celtae; but it is quite possible that in the veins of some of the Belgae flowed the blood of genuine German forefathers." W. Ridgeway (*Early Age of Greece,* 1901) considers that the Belgic tribes were Cimbri, "who had moved directly across the Rhine into north-eastern Gaul." The Belgae had made their way over to Britain in Caesar's time, and settled in some of the southern counties. Among their towns were Magnus Portus (Portsmouth) and Venta Belgarum (Winchester).

In 57 B.C., after the defeat of Ariovistus, the Belgae formed a coalition against Caesar, and in 52 took part in the general rising under Vercingetorix. After their final subjugation, Caesar combined the territory of the Belgae, Celtae and Aquitani into a single province (Gallia Comata). Augustus, however, finding it too unwieldy, again divided it into three provinces, one of which was Belgica, bounded on the west by the Seine and the Arar (Saône); on the north by the North Sea; on the east by the Rhine from its mouth to the Lacus Brigantinus (Lake Constance). Its southernmost district embraced the west of Switzerland. The capital and residence of the governor of the province was Durocortorum Remorum (Reims).

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BELGARD, a town and railway junction in the district of Köslin, in the province of Pomerania, Germany, 18 mi. S.W. of Köslin. Pop. (1939) 16,459. It is an agricultural centre.

BELGAUM, a town and district of British India, in the Southern Division of Bombay. It is situated nearly 2,500 ft. above sea level, 245 mi. S. of Poona by rail, and has a civil and military cantonment. An ancient fortress, dating apparently from 1519, and covering about 100 ac. and surrounded by a ditch, has within it two interesting Jain temples. Belgaum is a considerable centre of trade and of cotton weaving, and has a cotton mill, clay, soap and pottery works, and a tannery. Pop. (1941) 58,319.

The district of Belgaum has an area of 4,527 square miles. To the north and east the country is open and well cultivated, but to the south is intersected by spurs of the Sahyadri range, thickly covered in some places with forest. Pop. (1941) 1,225,428. The principal crops are millet, rice and cotton. There are considerable manufactures of cotton cloth. The West Deccan line of the Southern Mahratta railway traverses the district from north to south.

The ancient name of the town of Belgaum was Venugrama, which is said to be derived from the bamboos that are character-

istic of its neighbourhood. The most ancient place in the district is Halsi, which, according to inscriptions on copper plates discovered in its neighbourhood, was once the capital of a dynasty of nine Kadamba kings. It appears that from the middle of the 6th century A.D. to about 760 the country was held by the Chalukyas. It, or a part of it, was then held successively by the Rashtrakutas, the Rattas, the Kadambas of Goa, the Yadavas of Devagiri, the emperor of Delhi, the rajahs of Vijayanaga, the Bahmani dynasty and the Moguls. In 1776 the country was overrun by Hyder Ali, but was retaken by the Peshwa with British assistance. In 1818 it was handed over to the East India company and was made part of the district of Dharwar. In 1836 this was divided into two parts, the southern district continuing to be known as Dharwar, the northern as Belgaum.

BELGIAN COAST OPERATIONS. The operations on the Belgian coast carried out during World War I by British naval forces, with the assistance of local French torpedo and auxiliary craft, deserve a special place in history, in view of their important bearing on the Allied effort in general and the British situation throughout that period in particular. The functions of these forces may be summarized as follows: (1) They safeguarded the left flank of the whole Allied line on the Western Front. (2) They materially assisted to prevent the German occupation of the Channel ports to the westward of Nieuport. (3) They formed the outer rampart of the defenses of the Dover straits, thereby assisting to protect Channel shipping and to safeguard communication between England and France. Their protection also extended, in some degree, to the examination service and shipping anchored in the Downs. (4) They made possible the laying and maintenance of barrages off the Belgian coast and in the Dover straits, without the latter of which Britain must have succumbed to the submarine attacks on shipping. (5) In conjunction with the left flank of the Allied army, they enabled Franco-British aerodromes to be established in an advanced position, where Allied aircraft could counter German air bases used as jumping off places for air attacks on England and French coast ports. (6) They constituted a constant challenge and reproach to the German navy throughout the war.

The course of the operations may be traced from Oct. 17, 1914, when large German forces, released by the fall of Antwerp, pushed westward towards the coast. Rear-Admiral the Hon. Horace Hood, who was then in command of the Dover patrol, left at once for Nieuport in the small cruiser "Attentive," followed by three shallow-draught monitors.

By the following day the Belgian army had been forced back to a line on the left bank of the river Yser from Nieuport to Dixmude, but still had advance posts in Lombardsyde, Rattevalle and Mannenskevere.

From now onwards the British flotilla was actively engaged and effectively prevented German troops being landed behind this line, while it embarrassed the enemy considerably during the time he was establishing himself on the coast. Middelkerke and Westende were bombarded frequently, as were the coastal roads and such inshore positions as were within range of the ships' guns. Within a week the flotilla was augmented by the arrival of three old sloops, three gunboats and three French destroyers.

Oct. 21 (Trafalgar day), 1914, was a particularly critical one and the naval forces were engaged almost continually throughout the hours of daylight, directing their fire against German troops in movement and in covering the ground over which the enemy was attempting to advance. From time to time ships fell out with injuries sustained from shore batteries which engaged them from the cover of the sand dunes. On Oct. 28 the fierce fighting between Ypres and Armentières was felt up to the coast, and the British naval forces were heavily engaged.

At this time the Belgian army was so hard pressed that, in all probability, only the support and encouragement given by the ships enabled them to hold out. The enemy was continually bringing up more and heavier guns and mounting them under cover of the shore where the ships' guns could not reach them. Nevertheless, the flotilla continued in action during the daylight hours, with little intermission, until Nov. 4.

In the early part of Dec. 1914, a scheme was afoot to retake the occupied part of the coast. Among other naval preparations an old battleship was fitted up for bombarding purposes, and made a short appearance, only to retire damaged on Dec. 16 by an 8-in. shell from an enemy shore battery. Meanwhile, the position on the extreme flank of the Allied line had been stabilized and a French division had moved up and relieved the much-battered Belgian forces.

A system of observation of fire for the ships from positions ashore was organized in readiness for further naval bombardments. Some naval armed barges on the inland waterways and naval armoured trains also co-operated with the shore forces, while the early part of 1915 saw the beginning of the establishment of a number of heavy British naval guns ashore, to make good, in some measure, the serious lack of heavy, long-range artillery.

Early in April of that year, Vice-Admiral Sir Reginald Bacon relieved Rear-Admiral the Hon. Horace Hood in command of the Dover patrol, as this command was designated. Capt. C. B. Johnson was appointed commodore at Dunkirk. The Dover command had to embrace such varied matters as the patrolling of the straits, the routing of merchant ships and cross-channel traffic within the command area, the safeguarding of shipping in the Downs, the netting and mining of enemy submarines, the local defense of the approaches to Dover and Folkestone harbours, mine-sweeping and mine-laying and local airwork, as well as the direction of major operations off the Belgian coast.

In the course of the year 1915 the Dover command was being continually augmented by various classes of ships. Those more particularly engaged in the Belgian coast operations included two monitors, each armed with a pair of 15-in. guns—six monitors, each armed with a pair of 12-in. guns—a number of smaller monitors armed with 9.2-in. guns—and an array of auxiliary craft, mine-sweepers, trawlers, drifters, coastal motor-boats and motor-launches.

At a later period, in 1916, the monitor squadron was augmented by the arrival of two new ships. These were of an improved type armed with 15-in. guns, but capable of steaming about 12 knots as against approximately half that speed, which was all that the older monitors, armed with 15-in. or 12-in. guns, could claim.

It is of interest to note that although the German torpedo flotillas made an occasional raid on the light craft patrolling the Dover straits, and in one instance on vessels anchored in the roadstead off Dunkirk, no serious attempt was ever made by the enemy naval forces against the British flotillas, which were constantly patrolling and frequently attacking the German positions on the Belgian coast. So completely did the French and Belgian military commands rely on the presence of the British navy in those waters that only the most meagre coast defenses existed behind the left flank of their armies, whereas behind the opposing right flank the Germans created an intensive system of batteries, including an array of over 300 guns of 6-in. calibre and above, between Westende and the Dutch frontier. It was a striking example of the value of sea power and of naval co-operation in support of land forces with a flank resting on the sea.

From 1915 onwards many technical improvements were made in naval bombarding and the salient points at Zeebrugge and Ostend were attacked from the sea on several occasions. One of the most important of these developments was the system of observing and signalling the result of the ships' fire from the air. This system changed the whole character of the ships' bombardments and converted what was practically blind shooting into scientific gunnery.

From time to time during the ensuing years schemes were mooted for a general advance along the coast, or for landings from seaward in the occupied territory, but it was generally recognized that the coast was not the place for a main attack, but rather that any efforts there should be made in conjunction with a serious advance by the Allied armies further inland.

As the submarine menace grew, so increasing efforts were called for in the Dover command to waylay enemy under-water craft passing the straits and emerging from and returning to their bases at Zeebrugge and Ostend.

In the early part of 1916 an elaborate barrage of mine and mine nets was started off the Belgian coast. From then onwards to the latter part of the war this was developed, the work being mostly carried on just outside the range of the heavy batteries, while the small craft engaged in working on the barrage were protected by the guns of the monitors and presence of the attendant destroyers. Day by day a regular procession, consisting of one or more large monitors, sometimes a couple of small ones, half a dozen destroyers and two pairs of mine-sweepers would patrol just to seaward of this barrage, in clear weather well within sight of the whole of the German coast defenses.

In practice it is very doubtful whether this barrage was effective in sinking submarines, for weather and other conditions made a continuous patrol impossible and the enemy therefore had frequent opportunities for clearing a passage through it. Much more successful were the joint efforts of the monitors and bombing aircraft to render the bases at Zeebrugge and Ostend untenable as resting places for submarines, and eventually the latter retreated up the canal, some of them as far as Bruges.

In Jan. 1918 Vice-Admiral Sir Reginald Bacon was relieved in command of the Dover Patrol by Vice-Admiral Roger Keyes. Commodore Johnson had already been relieved at Dunkirk by Commodore Hubert Lynes in June of the previous year.

Zeebrugge and Ostend Operations.—Early in 1918 it was decided to take still more drastic measures to try to counter the submarine menace, and an elaborate operation was planned, with the object of blocking the canal entrances at Zeebrugge and Ostend and so completely close the Bruges canal to the Flanders flotilla of submarines. Both these entrances were formed by piers projecting seawards with a deep water channel, about 300 ft. wide, between them. At Zeebrugge a formidable stone mole, extending over a quarter-circle, embraced the western approach to the canal entrance. This mole was connected to the mainland by a viaduct mounted on piles. It was defended by a battery of three 5.9-in. and six 4-in. guns. The attacking force was organized in two squadrons—one to operate against Zeebrugge, and the other against Ostend. The attacks were to be launched simultaneously.

The Zeebrugge force consisted of three block-ships, the old cruisers "Thetis" (Com. R. S. Sneyd), "Intrepid" (Lieut. S. Bonham-Carter) and "Iphigenia" (Lieut. E. W. Billyard-Leake), another old and larger cruiser, the "Vindictive" (Capt. A. B. Carpenter) and two specially fitted Liverpool ferry-boats, the "Iris II" (Com. V. Gibbs) and "Daffodil" (Lieut. H. G. Campbell). Attached to this inshore squadron were 18 coastal motor-boats under Lieut. A. Welman, and 33 motor launches for making smoke screens and for rescue work; also submarine C3 (Lieut. R. Sandford). Behind this force were 13 destroyers under Capt. W. Tomkinson, and the two big monitors "Terror" (Capt. C. W. Bruton) and "Erebus" (Capt. C. S. Wills), while, in general command, was Vice-Admiral Roger Keyes, with his flag in the destroyer "Warwick."

The Ostend force consisted of the two old cruisers "Brilliant" (Com. A. E. Godsal) and "Syrius" (Lieut.-Com. H. N. Hardy), supported by 18 motor launches under Com. I. Hamilton Benn, ten British and seven French destroyers, four large monitors, the "Marshal Soult" (Capt. G. R. B. Blount), "Lord Clive" (Com. R. J. M. Watson), "Prince Eugene" (Capt. E. Wigram), "General Craufurd" (Com. E. Altham) and four small ones, the whole under the command of Commodore H. Lynes.

Attack on Zeebrugge.—On the night of April 22–23, the attack was duly launched. At 11.20 P.M. a long-range bombardment was opened by the monitors and continued for over half an hour. It was found afterwards that this had been most effective in making a large proportion of the garrison take cover, which must have facilitated in no small degree the subsequent work of the inshore squadrons. At 11.40 P.M. the smoke screen was started and at midnight the "Vindictive" reached her assigned position on the seaward side of the Mole. Her mission was to land a storming party, with the object of destroying or capturing the batteries on the Mole and diverting fire from the block-ships. Owing to the strong current and the swell, accentuated by the moving ships, the "Vindictive" had the greatest difficulty in getting close enough to land her men, but the little "Daffodil" came up and saved the situation by "butting" the cruiser amidships, and thereby pressing her against the sea-wall. The storming party, drawn up ready to rush ashore, suffered heavily meanwhile, and lost both its leaders—Com. H. C. Halahan, R. N., and Lt.-Col. B. H. Eliot, R.M.L.I. Eventually, however, the majority got ashore, only to find many difficulties in locating their objectives, including a mass of barbed wire. Meanwhile, Lieut. Sandford had rammed his submarine, "C3" between the piles of the viaduct. The vessel was filled with $7\frac{1}{2}$ tons of amatol, which he successfully exploded, the small crew escaping in a collapsible boat.

The three blocking ships, running the gauntlet of a hail of shell-fire, made for the canal entrance. The "Thetis" fouled a net and ran aground just clear of the piers, but was able to do useful service in guiding her consorts by signal. The "Intrepid" ran into the canal entrance, and Lieut. Bonham-Carter, having swung his ship across the channel, blew out her bottom with explosive charges, and then, with six others, escaped in a Carley raft. The "Iphigenia" followed soon after and endeavoured to fill the gap left by the "Intrepid" near the eastern bank. She, too, was effectively sunk, her crew being saved by the motor launches.

By 12.50 P.M. the blocking ships were in position and a siren gave the order for the storming party to retire on board the "Vindictive." This they did, in good order, bringing some of their wounded with them. Others were unable to return and the casualties were high. Among these was Capt. T. M. Palmers, R.M., who waited for missing men and refused to leave the shore.

By 1.30 A.M. the attack was all over; the "Vindictive" and her small consorts had cleared the Mole and had withdrawn, sorely battered, into the night, reaching Dover safely in the early morning. The destroyer "Morning Star" came under a heavy fire and had to be abandoned and sunk. The remainder of Admiral Keyes' gallant command returned safely to their bases.

Operations at Ostend.—Simultaneously with the launching of the assault on Zeebrugge, an endeavour was made to block the Ostend entrance to the canal. The 12-in. monitors engaged the heavy land batteries and enabled the block-ships to run close inshore, but here things went astray. The enemy had moved the position of the mark-buoy off the harbour entrance: this buoy had been relied on, to some extent, to guide the block-ships; moreover, the smoke screen was blown back towards them. They missed the piers and both ships ran ashore three-quarters of a mile to the eastward of the entrance. The crews were, however, taken off by the attendant motor launches.

So bitterly did they and their officers feel the failure of their enterprise, that a large proportion begged to be given another chance, and on the night of May 9–10 the "Vindictive," with Com. Godsal in charge, ran in under a very heavy fire and sighted the harbour. The captain was killed, but Lieut. Victor Crutchly was just able to make the entrance to the canal, where the ship grounded and was sunk. The crew were most gallantly saved by two motor launches, commanded by Lieut. G. Drummond and Lieut. R. Bourke, R.N.V.R. The casualties in these two attempts were heavy, amounting in all to 637, including 197 killed, 413 wounded and 27 missing.

Zeebrugge was partially closed for a time and the operations of the Flanders submarines were appreciably hampered thereby. The daring of the achievement had a most disconcerting effect on the German morale, while the continued activities of the naval forces on the coast under the new regime, resulted in the enemy keeping a large number of troops on that flank which might otherwise have been used against the Allies in another and more critical sphere of action. No further attempts were, however, made at raiding the coast, while the efforts against submarines centred more and more in making the Dover–Gris Nez mine barrage effective.

With the general collapse of the German army, the Belgian coast was eventually evacuated. On Oct. 16, 1918, Ostend fell to the Allies. By the 20th of the month the active work of the naval forces was virtually at an end.

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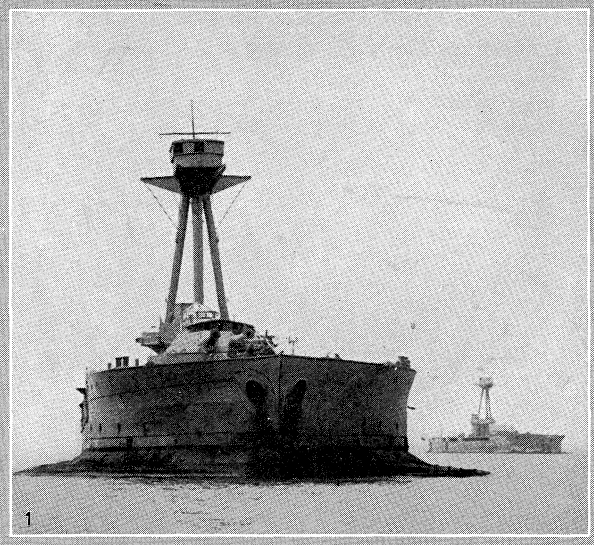
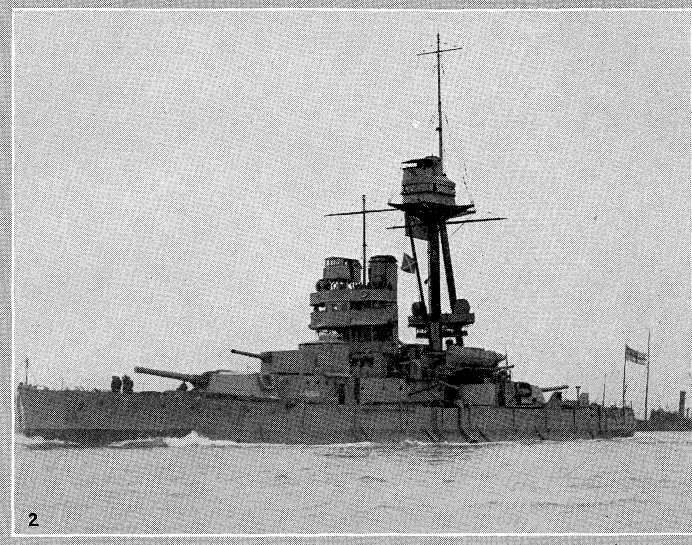
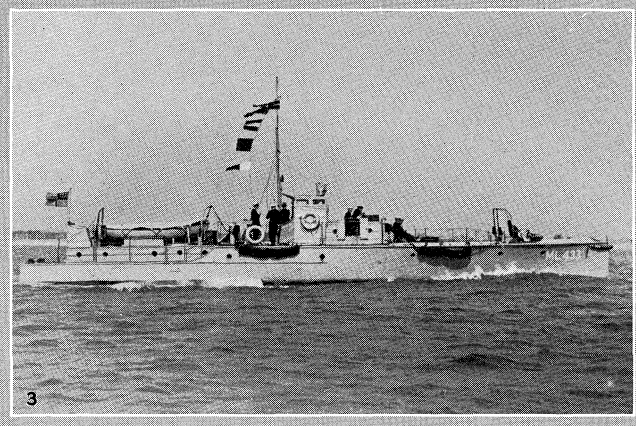
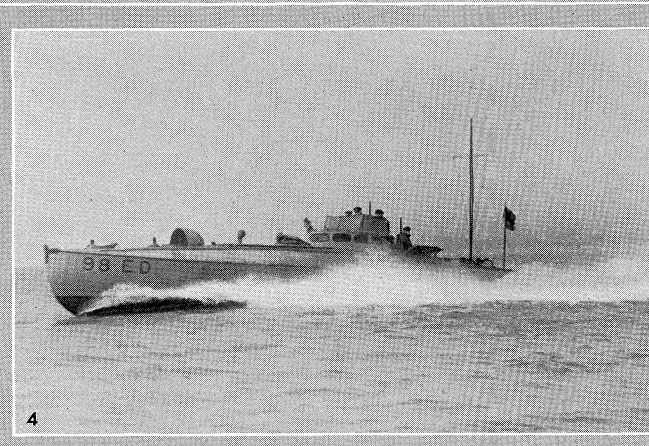
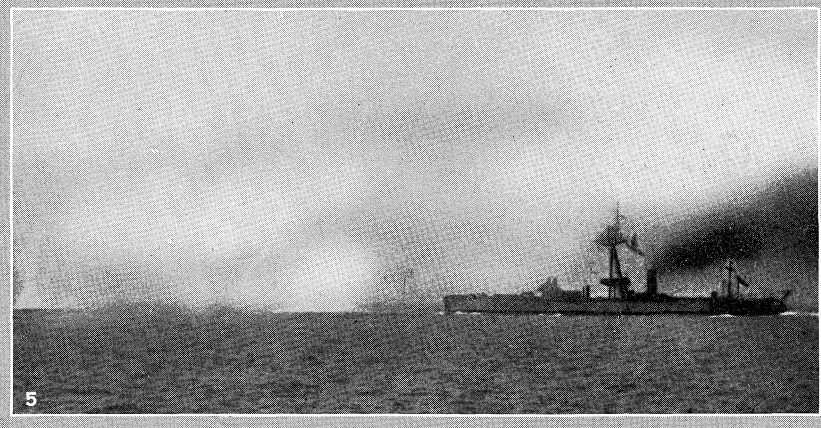
BELGIAN COAST OPERATIONS

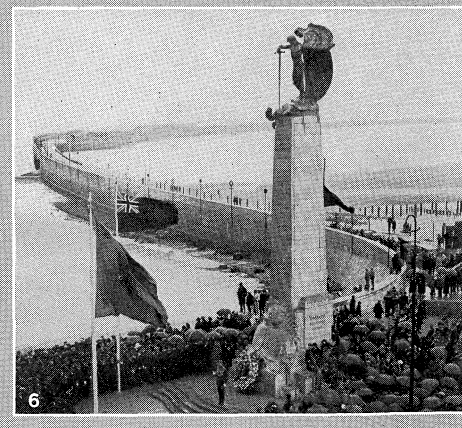










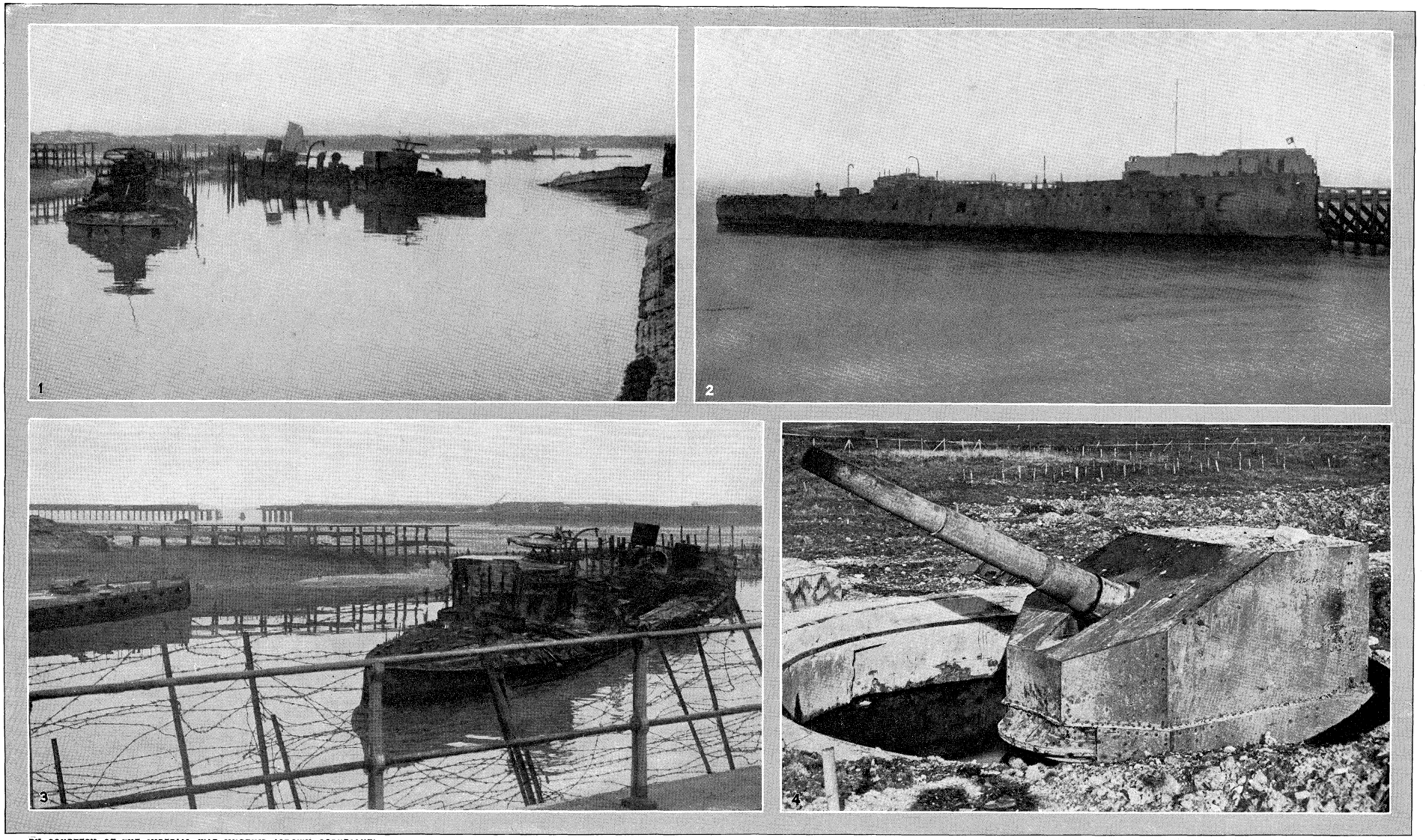


PHOTOGRAPHS, (1-4) STEPHEN CRIBB, (5) ABRAHAMS AND SONS

CRAFT USED IN BELGIAN COAST OPERATIONS AND A VIEW OF THE ZEEBRUGGE MONUMENT

1. Typical heavy-gun monitors. These shallow-draft vessels, each mounting a turret armament and protected against torpedo attack by "bulges," continually threatened and frequently shelled the occupied territory of the Belgian coast, thus greatly lessening its value to Germany as a naval base while also threatening the right flank of the German army
2. H.M.S. "Gorgon," originally the Norwegian coast defence vessel "Nidoros," converted into monitor service toward the close of 1918. It was fitted with bulge protection and supplied with two 9·2-in. and six 6-in. guns together with several smaller guns
3. A typical "M.L." (special motor launch). These launches were used for anti-submarine work, making smoke screens, and for a number of other auxiliary purposes. They also performed gallant service in rescuing the crews from block ships after the Zeebrugge and Ostend operations in 1918
4. Coastal motor boat at high speed. These were very fast light torpedo craft, used for attacking the enemy's warships and harbours on the Belgian coast
5. A bombardment at Ostend in 1915, showing the monitors under fire from the German forts
6. Zeebrugge: Unveiling of the memorial to officers and men of the British navy. The monument was unveiled by King Albert of the Belgians on St. George's day, April 23, 1925, the seventh anniversary of the Zeebrugge raid

BELGIAN COAST OPERATIONS



BY COURTESY OF THE IMPERIAL WAR MUSEUM (CROWN COPYRIGHT)

THE BLOCKING OF THE ZEEBRUGGE AND OSTEND HARBOURS BY THE BRITISH NAVY

1. H.M.S. "Intrepid" and "Iphigenia" blocking the canal at Zeebrugge. The attack on the submarine bases at Zeebrugge and Ostend took place on the 22nd and 23rd of April, 1918
2. H.M.S. "Vindictive" in the entrance to Ostend harbour. The ship made a successful attempt on the port on May 9th and 10th, after the attack in April failed
3. Another view of H.M.S. "Intrepid" and "Iphigenia" blocking the canal at Zeebrugge. In the distance is shown the gap in the mole
4. German defences on the Belgian coast. An 11-in. gun of the Tirpitz battery; behind it, a defence of barbed wire fences is shown

Supplement No. 31189 of Feb. 19, 1919; Admiral Sir R. Bacon, *The Dover Patrol;* A. F. B. Carpenter, *The Blocking of Zeebrugge* (1921).
(E. A.; W. B. Ck.)

BELGIAN CONGO (formerly the Congo Free State, *q.v.*), a Belgian colony in equatorial Africa. It occupies the major part of the basin of the Congo and a small part of the basin of the Upper Nile. The area is approximately 902,040 square miles.

The colony is among the most sparsely populated of the African territories, with an average population density of only 11.4 per sq.mi. At the beginning of 1944 the population totalled 10,521,179 of whom 34,888 were white. Of the whites, 22,668 were Belgians. Of the non-Belgian whites, the Greeks and Portuguese were most numerous.

Bounded on the west by the Atlantic and by Angola, it has a coastline of 25 mi. only, extending north from the mouth of the Congo, but the northern bank of the Congo estuary is also part of the colony; the southern bank is Portuguese territory. On the north the colony is bounded by French Equatorial Africa; northeast by the Anglo-Egyptian Sudan; east by Uganda and Tanganyika Territory; southeast by Northern Rhodesia; southwest by Angola. East and northeast of Tanganyika are the territories of Ruanda-Urundi (*q.v.*) administered by Belgium under mandate.

Physical Features.—The Congo basin is a relatively low plateau, at its lowest point by Lake Leopold II being only some 1,109 ft. above sea level. This plateau is bordered by much higher ground which east and west forms mountain chains. On the west the Congo breaks through the Crystal mountains in a succession of rapids and cataracts on its way to the sea; the small coast zone of the colony includes the hill country of Mayumbe. Southwest is the northern escarpment of the Angolan plateau where rise the headstreams of the Kasai; southeast is another high, rugged plateau, that of Katanga (*q.v.*), famous for its copper deposits. Here are the head waters of the main Congo. On the east, beginning south of Lake Tanganyika and going north to Lake Albert (Albert Nyanza), the Mitumba mountains—a range with many local names—mark the limit of the Congo basin. This range, which has heights of 10,000 ft., forms the western edge of the eastern or Albertine Rift valley, in which lie Lakes Tanganyika, Kivu, Edward and Albert. On the northeast is a plateau-like stretch of country 3,000 to 4,000 ft. above sea level, namely the Congo-Nile divide. Only in the north does the Congo basin extend beyond the limits of Belgian Congo; there the colony is for the most part separated from French territory by the river Congo itself and by its affluent, the Ubangi (*q.v.*).

The great central zone of the Congo, bordered as described, is a country of alluvial plains, with few marked elevations, abundantly watered by the Congo river and its effluents and in large part covered with forests both "primitive" and "secondary." The forests occupy the river valleys and are densest in the east and northeast. The forests are, however, exceeded in area by wooded savannas, which have often a park-like appearance. In these equatorial forests the vegetation is excessively rank; passage has to be forced through thick underwood and creeping plants, between giant trees, whose foliage shuts out the sun's rays; and the land teems with animal and insect life of every form and colour. Describing the forests of the Manyema country, west of Lake Tanganyika, David Livingstone wrote: "Into these primaeval forests the sun, though vertical, cannot penetrate, excepting by sending down at mid-day a thin pencil of rays into the gloom. The rain water stands for months in stagnant pools made by the feet of elephants. The climbing plants, from the size of a whipcord to that of a man-of-war hawser, are so numerous, that the ancient path is the only passage. When one of the giant trees falls across the road it forms a wall breast high to be climbed over, and the mass of tangled ropes brought down makes cutting a path round it a work of time which travellers never undertake." This description holds good to-day save that the administration has cut a highway or two through the forests. With the same reservation the description applies equally to the forest eastward from the mouth of the Aruwimi almost to Albert Nyanza. This forest covers some 25,000 sq.mi., and into a great part of it the sunshine never enters. It is known variously as the Pygmy forest (from the races inhabiting it), the Aruwimi or Ituri forest (from the rivers traversing it), the Stanley forest (from its discoverer), or the Great Congo forest. By the banks of the rivers occur the "gallery" formations; *i.e.*, in what appears an impenetrable forest are found avenues of trees "like the colonnades of an Egyptian temple," veiled in leafy shade, and opening "into aisles and corridors musical with many a murmuring fount" (Schweinfurth).

The part of the colony within the Nile basin includes some of the volcanic peaks which, north of Lake Kivu, stretch across the rift-valley, Lake Edward, the western shore of Lake Albert, and part of the Semliki river; also part of Ruwenzori (*q.v.*), the so-called "Mountains of the Moon," with snow-clad heights exceeding 16,500 feet. The colony also includes the western shores of Lakes Tanganyika and Kivu.

The chief geological formation is that known as the Lubilash. It consists, with few exceptions, of red or white sandstone and soft schists. It covers the greater part of the Congo basin or central zone and in places extends into the higher region of older rocks which surround that zone. The Lubilash formation has a thickness of 1,000 or more feet and is believed to have been deposited in a rather shallow sea. In the Kasai region there are underlying rocks of pre-Cambrian and Palaeozoic age; these last-named rocks also form the Crystal mountains. The Mayumbe region (north of the lower Congo) is mainly granite. Only in the coastal zone are there rocks of the Cretaceous and Tertiary ages. Katanga presents a more varied structure than other parts of the colony. Granites form the southern part of the Mitumba range. The other rocks of Katanga range from pre-Cambrian to permo-carboniferous. In the dolomite rocks of the Kambove series which consist of dolomites, sandstones and shales, are the extensive copper deposits for which the Katanga is chiefly noted. The Kundelungu beds, which cover a large area, are formed mainly of coarse arkose sandstones and compact felspathic quartzites with bands of shale interspersed. In the higher parts of the Kundelungu and Biano plateau these beds are overlain unconformably by the Lubilash formation.

On and about the equator the temperature varies little from day to day and the mean annual figure at Eala (0° 5′ N.) is 76° F., the hottest month being February. Northward the temperature increases in range and average. The rainfall maxima are in April-May and in October-November, and the precipitation at Eala is 65–70 in.; farther north the double maximum is very strongly marked, December is very dry, and the total rainfall is slightly less. In the coast region and the east highlands there is a marked dry season, July-October. July and August are the coolest months. The climate is quite unsuitable for Europeans in most parts and it clearly has bad effects on the natives as well. Farther south on the Katanga plateau there is a wider range (16° F.) of temperature and a somewhat lower actual temperature (mean 68° F.); the total rainfall may be 55 in.; little falls between May and September, but the double maximum is not well marked. The Katanga can be inhabited by Europeans.

Flora and Fauna.—The vegetation of this area is still but partially known. The rubber tree (*Funtumia elastica*) and rubber vines (*Landolphia*) of several species are abundant; in the Kasai region are found aberrant landolphias which creep a few inches below the soil for 80 ft. to 100 ft. and throw up tufts above ground in the rainy season. Of several species *L. thollonii* is the most valuable. Of plantation rubber, Ceara (*Manihot*) and *Hevea brasiliensis* are now cultivated to a small extent. The oil palm is common in many districts as are also the raphia palm and copal tree. There are many timber trees such as mahogany, ebony, teak, lignum vitae, African cedars and planes, redwood and camwood. Gum and resin-yielding trees and plants (such as the acacia) are numerous. Euphorbias attain great size and orchillas are characteristic forest weeds. There are innumerable kinds of moss and lichens, and ferns with leaves 12 ft. in length. Of the creepers, a crimson-berried variety is known as the pepper climber. Orchids and aloes are common. In the savannas are gigantic baobab trees. In the densest forests the trees struggling through the tangle of underwood to the light are often 150 ft.

and sometimes 200 ft. in height. The undergrowth itself rises fully 15 ft. above the ground. In many districts the coffee and cotton plants are indigenous and luxuriant. Of fruit trees the banana and plantain are plentiful and of unusual size. Of grasses the *Imperata cylindrica,* which grows to a height of 6 ft., is widely distributed. Peculiar to the maritime zone are mangoes and the coco-nut palm. Papyrus is found by the river banks; the banks of the lower Congo are often fringed with mangroves.

A broad distinction may be made between the animals of the forests and those of the savannas, but the elephant is found in both regions, as is the leopard, though one variety of leopard is confined to the forests. Like the elephant, the lion inhabits both the open and the wooded country, though rarely found in the dense forests. The forests are particularly the home of anthropoid apes and of many kinds of monkeys. The chimpanzee is fairly widely distributed in the northern and eastern parts of the country; the gorilla is found in the Kivu region and some other forest districts. In the forests also, but not confined to them, are the wild hog, wolf, lemur and jackal, the python, tree-cobra, tree-viper and many other snakes. Among animals peculiar to the forest regions are the rare okapi, a tiger-cat about the size of a leopard, the honey-badger (or black Ituri ratel) and the elephant shrew. The rhinoceros is widely distributed, except in the south. Hippopotami and crocodiles are common in the rivers; otters make their home by the river banks. The rivers are well stocked with fish, including varieties resembling perch and bream. The manati is confined to the lower Congo.

The savannas are the special home of many kinds of antelope and other large ungulates, such as the buffalo, giraffe, zebra and wild ass. Some of the antelopes, including the bongo, are, however, dwellers in the forests. The red dwarf buffalo (*Bos nanus*) is found in the Ituri forest as well as in the savannas. The spotted hyena, often of large size and very fierce, is also an inhabitant of the savannahs. Wild cats are very common.

Insects, including bees and wasps, beetles, butterflies and dragon-flies (of gorgeous colouring) are innumerable, also centipedes and spiders. Termites and ants, including the driver ant, are common, and the "ant-hills" of the termites are a characteristic feature of many parts of the country. Mosquitoes are plentiful and include the disseminator of malaria; tsetse-fly is also widely distributed, including *Glossina palpalis,* the carrier of sleeping sickness.

Bird life is abundant, though few of the birds are peculiar to the Congo. Flamingoes and pelicans frequent the larger rivers; herons, hawks, tern, Egyptian geese, fishing vultures (*Gypohierax*), the weaver and the whydak bird are more or less common, as are also starlings, cuckoos, eagle-owls and hoopoes. The spur-winged plover is the companion of the crocodile. There are over 20 species of sunbirds and three or four species of parrots, the gray parrots being extremely common.

Administration.—The affairs of the colony are directly under the control of the Belgian minister of colonies, whose authority was greatly enhanced during World War II. He possesses unrestricted executive and legislative powers with respect to the colony, which has no representative institutions of its own. Neither the European nor the native population has any constitutional voice in the conduct of the colony's government. The representative of the Belgian government in the colony and the officer responsible for the conduct of its government is the governor-general, who is directly responsible to the minister of colonies. He is assisted by a vice-governor-general, a secretary-general, and state inspectors who are responsible for the general supervision of administration in the six provinces of the colony, and by an advisory council (*conseil de gouvernement*) consisting of top officials in the administration and any private citizens whom the governor-general may designate. Each province is governed by a provincial commissioner who is responsible to the governor-general, and who is assisted by a purely advisory provincial council of officials and appointed citizens. The provinces are divided into districts under a district commissioner, and the districts into territories under a territorial administrator. The territorial administrations maintain direct contact with the native chiefs, whose prestige and traditional authority they strive to uphold. The tribal chiefs, who are in charge of the *circonscriptions,* are subject to the advice and the veto of the Belgian officials. The chiefs exercise a considerable authority under customary native law, but otherwise may issue orders only with respect to public health and order. The government holds the natives responsible for local hygiene, road-building, schools, hospitals and dispensaries. Able-bodied male natives are liable to 60 days of compulsory labour on public works each year, and natives can be compelled to cultivate crops on order of the government. Since the chiefs are the agents of the government in gaining native compliance with such measures, they receive government salaries and are graded in accordance with their efficiency.

Education.—The three main characteristics of the educational system in the colony are its almost complete reliance upon Roman Catholic and Protestant missions, its almost exclusively primary character and its inadequacy. In 1939 in the Congo there were only seven schools which depended entirely on government support. All of the approximately 20,000 other schools in that year were supported and directed by Christian missions. This reliance upon missionary teaching is justified by the government on the grounds that the missionary is best suited to teach the native those habits of industry and traits of character which are considered essential to his development. Government subsidies have been granted to those mission schools which are directed by "national" missions, *i.e.,* missions with headquarters in Belgium, whose governing bodies are Belgian, and which include a stated percentage of Belgians on their staffs. Belgium being a Catholic country, the subsidized mission schools have been exclusively Catholic, although there is a present tendency to liberalize this policy. Emphasis in the schools, which are overwhelmingly at the primary level, is on the native vernacular and on the simple training for agricultural and manual work. The objective is to make of the native a more efficient worker. In some few trade-schools on a higher level, natives are trained to be artisans, and not a few have demonstrated a considerable ability. A school for medical assistants at Leopoldville gives a six-year course for natives, and there are a number of seminars run by the missionaries which train natives for the clergy. Although in 1937 some 800,000 natives (or roughly 40% of the children of school age) were enrolled in all types of schools, the overwhelming majority of these school children were exposed to only two years of extremely rudimentary education in the primary schools. Of these 800,000, some 600,000 attended non-subsidized mission schools which were not subject to government inspection and which were not bound to any requirements as to quality of staff, length of school year and day, or the nature of the curriculum. Only a few native boys and virtually no native girls ever advance to the intermediate schools, whose main function is to train clerks. Some normal schools exist for the training of teachers. There are no institutions of higher learning. As a result, native intellectuals are practically unknown in the Congo. There are no native newspapers or other publications, and illiteracy is high.

European children in the towns of the colony attend primary and intermediate schools run by Catholic missions.

Towns.—Just within the mouth of the Congo is Banana, with a fine harbour. It is the oldest trading station in the Congo, European merchants having been established there since the 16th century. On the north bank of the estuary is Boma, formerly the administrative capital. It is the port of the Mayumbe country, with which it is connected by railway. Further up and 93 mi. from Banana is Matadi (close to H. M. Stanley's old station of Vivi). Matadi is the furthest point reached by ocean-going ships and is the port for the greater part of the colony. From it a railway runs past the cataract region to Stanley Pool, where is Leopoldville-Kinshasa, the capital, with a white pop. (1942) of some 4,500. About 1,000 mi. up river from Leopoldville is Stanleyville, chief town of the eastern province; roughly midway between Leopoldville and Stanleyville is Coquilhatville (at the Ruki-Congo confluence), chief town of the equatorial province. The European sections of the principal towns of the colony have many of the conveniences of modern cities, including electricity, sanitary fa-

cilities, public water systems and running water, ice plants, well-built houses, good food supply, newspapers, hotels, cafés, social and sports clubs, and movies. The European section of Leopoldville, especially, is a product of good town planning, with its broad avenues and fine public buildings, sewage system, an excellent hospital for Europeans, a medical research centre, modern business structures and well-stocked stores.

Communications.—The Congo and its affluents have more than 5,000 mi. of navigable waters, and there were, in 1942, some 3,000 mi. of public lines and about 120 mi. of roads owned and operated by private companies. The railroad system of the colony has been designed as supplementary to the network of navigable waterways which is often interrupted by cataracts and rapids, and is not, therefore, a self-sufficient transportation system. In 1942 there were six public lines. Two of these serve the coastal areas: the Matadi Leopoldville railway, and the Chemin de Fer du Mayumbé. The Matadi-Leopoldville line, in by-passing the rapids of the Lower Congo, affords the colony its sole outlet to the Atlantic through Belgian territory. This line was completed in 1898 for the purpose of opening up trade. Its construction was difficult, particularly in crossing the Crystal mountains, and it took nine years to cover the 248 miles. With the growth of trade and increase in traffic the railway became inadequate and a new line of wider gauge, lighter gradients, shorter track and more moderate curvatures was begun in 1927 and completed in 1932. Branch lines of this road connect Matadi with the oil port of Ango-Ango, Leopoldville East with Leopoldville West, and there is a spur to the repair shops at Thysville. The Chemin de Fer du Mayumbé, covering 87 mi., connects Boma on the Lower Congo with the forest region to the north. This line, begun in 1899 and completed in 1913, was under reconstruction after 1930. Other lines connect navigable stretches of the Upper Congo, and since 1918 it has been possible to travel by steamer or rail from the mouth of the Congo to Capetown. The copper mines of the Katanga district are served by 1,557 mi. of road (between Port Francqui, on the Kasai river, to the borders of Northern Rhodesia and Angola) which was constructed between 1910 and 1931. Starting at Port Francqui the line runs for 698 mi. to Bukama on the Lualaba river, and thence for another 134 mi. to Tenke, the junction for Angola. Some 66 mi. beyond, the copper mining district is reached and branches of the road reach the mines at Kambone, Panda, Jadotville and Lueshia. The line carries on another 85 mi. to Elizabethville and from there for 158 mi. farther to Sakania on the Rhodesian frontier. A branch of 324 mi., Tenke to Dilolo, connects this line with the Benguela railroad. In the Lake Tanganyika and Lualaba river district, as a means of by-passing the rapids on the otherwise navigable Lualaba between Stanleyville and Ponthierville, Kindu and Kibomo, and Kasongo and Kongolo, rail services operate between Stanleyville and Ponthierville and between Kindu and Kabalo, a distance of 221 mi. Kabalo is connected with Albertville on Lake Tanganyika by a branch line of 170 mi. In the northeastern territories a line runs from Aketi, the terminal point of navigation on the Itimbiri river, to Mungbere, 426 mi. due west. A 76-mi. branch line connects Komba with Bondo to the north on the Uelé river, and another branch connects Lienart with Titule. At the northern end of Lake Tanganyika a line runs from the lake port of Uvira to Kamaniola, which is connected by highway with Costermansville and Lake Kivu.

The years 1932–39 saw a great program of road development in the colony, which by 1939 enjoyed a road network, to supplement its rivers and railways, of 47,584 mi., of which, however, only about one-fifth were all-season. The roads are most extensive in the northern section where navigable waterways and railways are scarce. In the east, roads have been built to the Sudan and to Stanleyville. The Route Royale of 693 mi., running from Bumba on the Congo river to Aba on the Sudanese frontier, is the chief route to Juba on the White Nile. There is also a 203-mi. road from Stanleyville to Buta via Banalia and Kole, linking up with the Route Royale. A road of 461 mi. from Stanleyville to Kasenyi on Lake Albert via Nia Nia and Irumu, connects at Kasenyi with the Kenya and Uganda railways for Mombasa. In the eastern Congo an all-weather road of 579 mi. runs from Irumu south to Uvira, via Costermansville, whence another all-season road runs west to the railway and steamer terminal of Kindu on the Lualaba river. In the south an important road runs from Sakania through Elizabethville, Jadotville and Kamina, to Luluabourg.

The colony has four ports which are accessible to ocean steamers: Banana, Boma, Ango-Ango and Matadi, of which only Banana is on the ocean. By far the most of the colony's ocean-going traffic is handled at Boma and Matadi, which are Congo River ports, 50 and 83 mi. respectively from its mouth. Matadi, the most important port, is accessible during all seasons, and has rail connection with Leopoldville. In addition to its ocean ports the colony enjoys a vast system of inland navigable water routes. The more important of these navigable waterways are the middle Congo river from Leopoldville to Stanleyville, a water highway of 1,073 mi.; the major tributaries of the middle Congo extending into the northern and central provinces; the upper Congo (Lualaba) from Ponthierville to Kindu, and from Kongolo to Bukama; and the lakes traffic in the eastern provinces, where Lake Tanganyika, especially, provides a link with the British territories to the south and east. Lake Albert, in the north, provides a water route to the Anglo-Egyptian Sudan.

The Belgian Congo enjoyed regular air service from 1920, when the Leopoldville-Stanleyville route was inaugurated. In addition, regular services with intervening stops have been established between Boma and Leopoldville and Leopoldville and Lusambo, Stanleyville to Elizabethville, and Stanleyville to Usumbura. In 1935 a weekly air mail service between Elizabethville and Leopoldville and Brussels was instituted. Mail service has also been established between Coquilhatville and Capetown, South Africa.

Local telephone systems were found in 25 towns of the colony in 1941, together with a number of other public telephone stations outside of the settlements. Long distance service is available between Leopoldville, Matadi, Stanleyville, and most of the other principal centres, while Leopoldville has a direct wire to Brazzaville in French Equatorial Africa.

More than 3,000 mi. of telegraph lines were in existence in 1938, and international telegraphic connections existed between the colony and Capetown, Durban, Uganda (Fort Portal) and Angola. Radio service supplements telegraphic communications in the colony; the powerful short-wave transmitter in Leopoldville transmits directly to Brussels. Three broadcasting stations, all in Leopoldville, existed in 1941. Cable service connects Banana with Portuguese Angola, and thence with Europe. The postal service of the colony, which in 1939 had 134 post offices, is well developed with deliveries by air, water and automobile. The colony is affiliated with the International Postal union and the African Postal union.

Economic Conditions.—Under the Free State rule no distinction was made between the state as administrator and as trader and landlord, whether working estates directly or through concessionaires. Great efforts were made to obtain the maximum output of the two products most easily available, namely, rubber and ivory. (*See* CONGO FREE STATE.) At the same time the needs of transport and the task of bringing the country under control entailed the raising of large loans. During this period 75% of the revenue was derived from the exploitation of rubber, and much of the remainder from ivory. In 1910, the country having meanwhile been annexed to Belgium, the Free State methods of exploitation were abandoned. In 1908, the last year of the Free State administration, the value of exports, which besides rubber and ivory included palm-nuts, palm-oil, copal and cocoa, was some £4,000,000 and the value of imports £2,300,000. The more rational policy adopted by Belgium on its acquisition of the country led to a great amelioration of the condition of the natives, but, not unnaturally in view of their previous experience, did not for some time tend to increase production. It happened that the abandonment of the compulsory collection of wild rubber by the natives coincided with a fall in prices in Europe, and later on plantation rubber from Malaya and the Dutch East Indies

very largely supplanted wild rubber. Thus the Belgian authorities were forced to look to other sources for the development of commerce. While wild rubber continued to be collected to a diminishing extent, rubber plantations were started, with fairly good results. Cotton cultivation was tried, but after 10 or 12 years was still in the experimental stage; cocoa, mainly produced in Mayemba, was disappointing; sugar cane planting began in 1926 in the region between Matadi and Stanley Pool and gave good promise; coffee cultivation began about 1920 in the Kivu and Uele (Welle) districts and proved a success. Rice became an important crop, mainly for home consumption by the natives. The gum-copal industry declined, the natives becoming increasingly unwilling to remain in the swamps for the long period essential for the gathering of the copal.

All these were minor undertakings in place of rubber, but the oil-palm became the most important commercial asset of the colony, mining excepted. The quantity and value of palm-nuts and palm-oil exported grew steadily. While still obtained chiefly from wild trees and in the wasteful native manner, better methods have been introduced by a company using large British capital.

In 1940 some 60,000 short tons of palm-oil and 47,000 short tons of palm-kernels were exported. Cotton culture also developed profitably after 1921, and in 1939, 44,643 short tons of ginned cotton and 98,214 short tons of cottonseed were produced, mainly by native cultivators. The ginneries and export companies, however, are European-owned. Of animal products ivory alone was of importance for many years. Elephants continued plentiful—they were still in some districts so numerous as to be a pest—good tusks were obtained, and as a rule the ivory fetched high prices on the Antwerp market. But by 1925 cattle rearing, undertaken first by some settlers in Katanga, had passed the experimental stage and the industry rapidly grew, there being large areas free from tsetse-fly in Katanga, in the region of the great lakes, the Lomani and in eastern Kasai. The colony passed through very trying times in the years of re-organization which followed the annexation by Belgium, and suffered also by the dislocation caused by World War I, but it emerged successfully. Commercial prosperity came with the development of the mineral wealth of Katanga. That province produces large quantities of tin, has both gold and diamonds, controls the world's supply of radium, and has ore sufficient to control the world's supply of cobalt (it produced 750 short tons of copper-cobalt alloy in 1925). But it is chiefly famous for its copper. In 1911 the production of copper by the Union Minière, the company which controls the richest fields, was 998 tons; in 1914, with the railway available, the output was over 10,000 short tons, and in 1940 it had grown to 165,345 short tons—with the capacity, given more and improved machinery, of producing 200,000 short tons annually for many years. Besides the mineral wealth of Katanga, gold is worked at Kilo and Moti (which lie towards the Uganda border) and diamonds are obtained from the Upper Kasai region. Diamonds were discovered in 1907; the stones are alluvial, small but of good quality. The colony has become the world's principal source of industrial diamonds. In 1923 the output was 500,000 carats; in 1939 it was 8,344,765 carats. Prior to the outbreak of World War II minerals constituted 65% of the colony's exports. Currency in the Congo is that of Belgium.

The colony in recent years has maintained a consistently favourable annual trade balance, with exports exceeding imports. In 1938 exports were valued at $64,000,000, of which minerals comprised 65% and agricultural products 35%. Of the total value of the exports, copper accounted for about 25%, gold 22%, unprocessed cotton and palm products 12%, tin 8%, diamonds 7% and coffee 5%. In the same year, imports attained a value of $34,000,000, of which machinery and foodstuffs comprised the bulk. Import trade is of a general character, cotton, clothing, provisions, fuel and machinery predominating. Over half the total trade is with Belgium; but Great Britain—which takes the copper output—has over 40% of the exports from the colony, and the British empire as a whole over 50%. Of the imports taken by the colony the share of Great Britain is some 15%; of the British empire about 25%. Germany, France and the United States are all considerable exporters to the colony, but take little of its produce, at least directly. Shipping using the colony's ports is largely Belgian; next in tonnage come the French ships. An accurate survey of state finances has been rendered very difficult by the defective system of accounting adopted; complete budget figures for 1918 had not appeared by 1926; the following are, however, given as the estimates for the 1939 budget—revenue 675,453,000 francs; expenditure 730,379,500 francs. At the close of 1939 the public debt was 5,841,941,679 francs. Practically the whole of the consolidated debt is a burden taken over from the Congo Free State. Revenue is derived mainly from direct taxation (including income tax and a poll tax on male adult natives), customs, royalties on minerals, and the sale or lease of lands. By the terms of the Brussels act of 1910, import duties must not exceed 10% *ad valorem;* they are in some cases specific. The main expenditure is on administration proper, native affairs, the postal, public debt, educational and medical services and the defense force.

HISTORY

On Nov. 15, 1908, the Independent State of the Congo (CONGO FREE STATE, *q.v.*) of which Leopold II, king of the Belgians, was sovereign, was annexed to Belgium and the personal rule of Leopold gave place to control by the Belgian parliament, exercised through a colonial minister. The Belgian government took measures to remedy the abuses which had grown up on the Congo, its task being rendered easier by the death of Leopold and the accession of Albert I in 1909. The restrictions on freedom of trade were removed and most of the monopolies held by Leopold were abandoned. The native administration was thoroughly reorganized. The ancient right of user of the land was restored to the natives and the principle of freedom of labour recognized. The chiefs were granted, with necessary safeguards, much of their traditional authority, and judicial reforms were carried through. Missionary efforts were encouraged, further restrictions placed on the liquor traffic, and strenuous efforts were made to combat disease. The thoroughness of the reforms was cordially recognized by Great Britain, the United States and other interested parties. During World War I, Congo troops aided the French in the Cameroons; they helped in the defense of Northern Rhodesia, and in 1916 they conquered a considerable area of German East Africa. In 1919 by agreement with Great Britain the mandate over Ruanda and Urundi, part of the region conquered by the Congolese, was assigned to Belgium (*see* RUANDA-URUNDI). By an earlier agreement (1910) Great Britain had ceded to Belgium the western shores of Lake Albert, thus securing to the colony access to the Nile system, which would otherwise have been lost through the retrocession of the Lado Enclave (*q.v.*).

Apart from an enlightened native policy the efforts of the administration were largely devoted to the development of means of communication and of local government. In 1910 the province of Katanga (*q.v.*) was placed under a vice-governor-general with extensive powers. In 1926 the title was changed to governor. In 1928 a special committee was formed to develop the Kivu region. To the governor-general of the whole colony was left, however, financial control and matters affecting the colony as a whole. The depression following the war had its effect on the Congo and in 1920 there was a partial strike in the civil service and unrest among several native tribes. These troubles passed with the development of commerce and careful attention to the needs of the natives. By a convention with Portugal, signed in Sept. 1927, Belgium ceded to Angola some 480 sq.mi. in the south-west of the Congo colony (an area known as the Dilolo Boot), receiving in exchange something over 1 sq.mi. of territory near Matadi. This strip of land was of much value as it was needed in the rebuilding of the Matadi-Stanley Pool railway—the principal means of communication between the interior and the coast. The extension of the Benguella railway begun in 1928 opened up another route to the sea for the southern part of the colony (*see* ANGOLA). In June 1928 King Albert I visited the colony for the opening of the completed Bas Congo-Katanga line, 695 mi. long, which now connects Katanga with Leopoldville by the Kasai river. (F. R. C.; R. J. BE.)

BELGIAN LITERATURE. The literature of Belgium falls naturally into two divisions, Flemish and French. In the early 19th century (*c.* 1830) was established the "Flemish movement" with the object of setting up Low German as the literary and official language. Before this time Flemish literature was one with that of Holland (*See* DUTCH LANGUAGE AND LITERA-

TURE). Through many vicissitudes the national movement struggled on, from the recognition by the Academy of Brussels (1772), to the work of Willems (1818 and 1836) and David, founder of the review *De Middalaer*. Several writers set forth their seasoned opinions on the value of Flemish as a natural literary vehicle, dwelling particularly on its historical development. Texts of earlier times were reprinted and edited with care and literary men set on foot an active propaganda in favour of a national tongue.

FLEMISH

At some period near the closing years of the 16th century, the literature of Flanders began to decline, and this was still more noticeable during the 18th century. Flemish sank to the level of a patois. It was not until between 1815 and 1830, when the Belgian provinces were once more united to the kingdom of the Netherlands, that slight signs of a renaissance appeared. It might have been thought that the revolution of 1830 and the régime which was set up after it would have destroyed the movement in its early stages, but the contrary was the case. The Government, aiming at centralization, declared French the only official language of the country and adopted a policy hostile to the use of Flemish or Dutch (for in their literary form the two languages are one and the same). Its policy, however, created a reaction, and this gave rise to the "Flemish movement," which aimed at restoring the language of the people to honour and making it the foundation of a truly national culture.

The movement drew its chief inspiration from J. F. Willems (1793–1846), who, in collaboration with certain scholars of his acquaintance, founded a magazine by means of which he drew the attention of the public to the great classics of Flemish literature, *Reinaert de Vos,* the mediaeval songs, etc. The enthusiasm for the Flemish language which was thus aroused led more imaginative minds to wish to create literary works in Flemish.

The first name which must be mentioned in this connection is that of Hendrik Conscience (1812–83) (*q.v.*). This author was the real father of the new Flemish literature, to which he gave a great impetus by the publication of one of his earlier novels, *The Lion of Flanders* (1838), a heroic and romantic story of the struggle of the Flemish communes against the French monarchy at the beginning of the 14th century. Side by side with him there sprang up a whole school of poets whose work still shows traces of the rhetorical manner of the Dutch poets of the preceding period. They include Karel Ledeganck (1805–47), who raised Flemish poetry to greater dignity by improving and refining its form. In his poem *The Three Sister Cities* (Ghent, Bruges and Antwerp) he helped to reawaken the Flemish spirit by reminding his compatriots of the greatness of their past and showing that their national characteristics were worthy of respect. He expressed the aspirations of his nation in a sufficiently definite form to impress them on the heart of the people. Another poet of this period was Prudens van Duyse (1804–59), whose numerous works show more fertility of imagination and stronger feeling than Ledeganck's, but less artistic feeling and uniformity of level. Theodoor van Ryswyck (1811–49) wrote in a more popular vein.

The period 1850–75 is less deeply imbued with romanticism. Literature aimed more at realism and stylistic merit. Conscience continued to be the most popular novelist; it has been said of him with justice that "he taught his nation to read." His fertility was inexhaustible, and he supplied the masses of the population with the intellectual and moral nourishment which they required, in the form of novels which are somewhat too conventional in their psychology, but give a pleasing account of the simple ways of life in small towns and villages. More vigorous realism is to be found in the works of Domien Sleeckx (1818–1901), whose view of life is less indulgent. Among the poets, special attention was devoted to artistic form by Dautzenberg (1808–69), a man belonging to the previous generation, whose work is nevertheless best mentioned here. Jan van Beers (1821–88) wrote tales in verse describing the life of the poor. He combines a pure style with realism and strong feeling.

There was, however, at this time another poet who united all the tendencies which have been mentioned—love of nature, sincere feeling and a characteristic style—but raised them to the plane of pure poetry. This was Guido Gezelle (1830–99), a priest of West Flanders. He treated the language in an entirely new way, incorporated elements from his own dialect, and transformed it into a far more supple and expressive medium than it had been before. His ardent religious feeling and his love for every aspect of his native land are expressed in his work with such wealth and originality of imagery and such subtlety of rhythm that Guido Gezelle is still regarded as the greatest and most original poet of Flemish literature. His first verses were published in 1858, but a crisis in his spiritual development then kept him silent for 20 years. For long his work was recognized only by a small circle, and he did not attain fame until the publication of his last volumes in the 'nineties.

During the period 1875–90 another native of West Flanders, Albrecht Rodenbach (1856–80), a poet of real talent, published poems and a verse drama, *Gudrun,* which showed the greatest promise. In his work the reawakening of Flemish national consciousness is expressed with a passion which aroused the enthusiasm of the younger generation. Unfortunately he died at the age of 24. The leadership of the poetic movement then passed to Pol de Mont (1857–1931), whose work, though more brilliant than profound, was lively and spontaneous and helped to enrich Flemish literature with new subjects. In prose, the novels and short stories of Virginie Loveling (1836–1919) and Reimond Stÿns (1850–1905) prepared the way for realism emancipated from all literary conventions.

The tendencies outlined above inaugurated a period of general literary revival, from which critics are agreed in dating the modern Flemish literary movement. The principal organ of the new movement was the review *Van Nu en Straks* (*To-day and To-morrow*), which was founded in 1893. It played the same part in the development of Flemish literature as *La Jeune Belgique* had played ten years earlier in the French literary movement of Belgium. Its contributors included men of the older generation such as Cyriel Buysse (1859–1932), Prosper van Langendonck (1862–1920) and Alfred Hegenscheidt (b. 1866), and also a group of younger writers born in the '70s, who opened up new fields, completed the process of artistic emancipation and struck out boldly in fresh directions. Then opened a period of abundant literary production which continues at the present day. It coincided with the return of Guido Gezelle to literature. The poems which he published during the last years of his life won him recognition as the greatest master of the day, who united the most consummate artistry with freshness and spontaneity.

The poetry of Prosper van Langendonck is imbued with profound human feeling. Alfred Hegenscheidt is the author of *Starkadd* (1899), the finest poetic drama of Flemish literature. Of modern poets, the most distinguished is undoubtedly Karel van den Woestijne (1878–1929), who, from his first volume in 1903 on, preserved a consistently high level of production. It is safe to say that his complex and sibylline personality has struck a new note in European literature. Jan van Nÿlen (b. 1879) and Firmin van Hecke (b. 1884) by their rare purity of style, are closer to him than any other contemporary poets.

The masters of narrative prose, Cyriel Buysse and Stÿn Streuvels (b. 1871), are dealt with in separate articles; the former, as an objective realist, has delineated most truthfully Flemish popular life; the latter, by his poetical treatment, idealizes it. August Vermeylen (b. 1872) has written essays and a philosophical novel, *The Wandering Jew* (1906), that was translated into French, German and Czech. Maurits Sabbe (b. 1873) with his warm sensitive semi-tones, best reproduces the atmosphere of Bruges. Lode Baekelmans (b. 1879), whose humour is broader, brings to life the dock quarter and the picturesque characters of the Antwerp streets. The tales of Fernand Toussaint (b. 1875) are distinguished by a delicate *nuance* of technique. The novels of Herman Teirlinck (b. 1879) depart from strict realism; they are imbued with an individual fantasy, which delights in exquisite arabesques. In Van de Waestyne, who has also written several volumes of prose on symbolic themes, the creative imagination reigns alone, remote from reality.

New tendencies, however, are visible in the younger writers of the post-war era. Wies Moens (b. 1898) and Marnix Gijsen (b. 1899) completely break with all tradition and proclaim absolute liberty of rhythm and image; while Paul van Ostayen (1896–1928), discarding all logical phrases and even all idea of "subject," endeavoured to express himself by sound values alone.

Ernest Claes (b. 1885) may be mentioned among the vivid narrators of the present, and Maurice Roelants (b. 1895) among the most ingenuous psychological analysts. But the novelist Felix Timmermans (b. 1886) achieved the greatest popularity, and at the same time won the appreciation of literary critics. His bright, spontaneous style, full of unexpected images which surprise by their very aptness, is combined with delicacy of perception and the true tang of nature. His *Pallieter* (1916) expresses an exuberant *joie de vivre,* the equal of which would be hard to find. His other works also are essentially Flemish in their mixture of frank sensuality and mystical tenderness.

In the theatre, Herman Teirlinck made, in his later years, the most serious attempt toward a dramatic renaissance: drawing his inspiration simultaneously from the mediaeval moralities and the cinema, he released the drama from the confines of the unities and of immediate reality. His characters are types and mainly allegorical, and thus present all the spiritual elements of action moving in visible form.

See J. Persÿn, *A Glance at the Soul of the Low Countries* (1916); Jethro Bithell, *Contemporary Flemish Poetry* (1917); G. L. van Roosbroeck, *Guido Gezelle, the Mystic Poet of Flanders* (Vinton, Ia., 1919); P. Hamelius, *Introduction à la littérature française et flamande de Belgique* (1921); A. de Ridder, *La littérature flamande contemporaine* (1923); A. de Ridder and W. Zimmermans, *Anthologie des écrivains flamands contemporains* (1926). (A. V.)

FRENCH

Belgian writers were commonly charged with provincialism, but the prejudice against them has been destroyed by the brilliant writers of more recent years. It was also asserted that Belgian French literature lacked a national basis, and was merely a reflection of Parisian models. The most important section of it, however, has a distinctive quality of its own. Many of its most distinguished exponents are Flemings by birth, and their writings reflect the characteristic Flemish scenery; they have the sensuousness, the colour and the realism of Flemish art; and on the other hand the tendency to mysticism, to abstraction, is far removed from the lucidity and definiteness associated with French literature properly so-called.

The events of 1830–31 gave a great stimulus to Belgian letters, but the country possessed writers of considerable merit before that date. For four years before the revolution André van Hasselt (*q.v.*) had been publishing his verses in the *Sentinelle des Pays-Bas,* and from 1829 onwards he was an ardent romanticist. A burst of literary and artistic activity followed the revolution; and van Hasselt's house became a centre of poets, artists and musicians of the romantic school. The best work of the Belgian romanticists is in the rich and picturesque prose of the 16th century romance of Charles de Coster (*q.v.*), and in the melancholy and semi-philosophical writings of the moralist Octave Pirmez. Charles Potvin (1818–1902), a poet and a dramatist, is best known by a patriotic *Histoire des lettres en Belgique,* forming vol. iv. of the Belgian compilation, *Cinquante ans de liberté* (1882), and by his essays in literary history. Eugène van Bemmel (1824–80) established an excellent historical tradition in his *Histoire de la Belgique* (1880), reproducing textually the original authorities, and also edited a Belgian encyclopaedia (1873–75), the *Patria Belgica.* Baron E. C. de Gerlache (1785–1871) wrote the history of the Netherlands from the ultramontane standpoint.

The whole of this literature derived more or less from foreign sources, and, with the exception of Charles de Coster and Octave Pirmez, produced no striking figures. De Coster died in 1879, and Pirmez in 1883, and the new movement in Belgian literature dates from the banquet given in the latter year to Camille Lemonnier (*q.v.*), whose powerful personality did much to turn "Young Belgium" into a national channel. Lemonnier himself cannot be exclusively claimed by any of the conflicting schools of young writers. He was by turns naturalist, lyrist and symbolist; and it has been claimed that the germs of all the later developments in Belgian letters may be traced in his work. The quinquennial prize of literature had been refused to his *Un mâle,* and the younger generation of artists and men of letters gave him a banquet which was recognized as a protest against the official literature, represented by Louis Hymans (1829–84), Gustave Frédérix (1834–1894), the literary critic of *L'Indépendance belge,* and others. The centres around which the young writers were grouped were two reviews, *L'Art moderne* and *La Jeune Belgique. L'Art moderne* was founded in 1882 by Edmond Picard, who had as his chief supporters Victor Arnould and Octave Maus. The first editor of *La Jeune Belgique* was M. Warlomont (1860–89), known under the pen-name of "Max Waller." This review, which owed much of its success to Waller's energy, defended the intense preoccupation of the new writers with questions of style, and became the depository of the Parnassian tradition in Belgium. It had among its early contributors Georges Eekhoud, Albert Giraud, Iwan Gilkin and Georges Rodenbach. Edmond Picard (1836–1924) was one of the foremost in the battle. He was well known as an advocate in Brussels, and made a considerable contribution to jurisprudence as the chief writer of the *Pandectes belges* (1886–90). His *Pro arte* (1886) was a kind of literary code for the young Belgian writers.

Georges Eekhoud (1854–1927) was in some ways the most passionately Flemish of the whole group. He described the life of the peasants of his native Flanders with a bold realism, making himself the apologist of the vagabond and the outcast in a series of tragic stories: *Kees Doorik* (1883), *Kermesses* (1883), *Nouvelles Kermesses* (1887), *Le Cycle patibulaire* (1892), *Mes Communions* (1895), *Escal Vigor* (1899) and *La Faneuse d'amour* (1900), etc. *Nouvelle Carthage* (1888) deals with modern Antwerp. In 1892 he produced a striking book on English literature entitled *Au siècle de Shakespeare,* and has written French versions of Beaumont and Fletcher's *Philaster* (1895) and of Marlowe's *Edward II.* (1896).

The earlier work of "Young Belgium" in poetry was experimental in character and provoked much hostile criticism. The young writers of 1870 to 1880 had not long to wait, however, for recognition both at home and in Paris, where many of them found hospitality in the pages of the *Mercure de France* from 1890 onwards. They divided their allegiance between the leaders of the French Parnassus and the Symbolists.

The most powerful of the Belgian poets, Émile Verhaeren (*q.v.*), was the most daring in his technical methods of expressing bizarre sensation, and has been called the "poet of paroxysm." His reputation extends far beyond the limits of his own country.

Many of the Belgian poets adhere to the classical form. Albert Giraud (b. Louvain, 1860, d. 1929) was faithful to the Parnassian tradition in his *Pierrot lunaire* (1884), *Pierrot narcisse* (1891) and *Hors du siècle* (1886). In the earlier works of Iwan Gilkin (1858–1924) the influence of Charles Baudelaire is predominant. He wrote *Damnation de l'artiste* (1890), *Ténèbres* (1892), *Stances dorées* (1893), *La Nuit* (1897) and *Prométhée* (1899). The poems of Valère Gille (born at Brussels in 1867), whose *Cithare* was crowned by the French Academy in 1898, belong to the same group. Émile van Arenberghe (born in Louvain in 1854) is the author of some exquisite sonnets. Fernand Séverin (1867–1931), in his *Poèmes ingénus* (1900), aimed at simplicity of form and with Séverin was closely associated Georges Marlow (1872–), author of *L'Âme en exil* (1895).

Georges Rodenbach (1855–98), author of *Bruges la Morte* (1892), spent most of his life in Paris and was an intimate of Edmond de Goncourt. The best part of his production is the outcome of a passionate idealism of the quiet Flemish towns in which he had passed his childhood and early youth.

The most famous of all modern Belgian writers, Maurice Maeterlinck (*q.v.*) made his début in a Parisian journal, the *Pléiade,* in 1886. He succeeded more nearly than any of his predecessors in expressing or suggesting in his poems, and more particularly in his early plays, ideas and emotions which might have been supposed to be capable of translation only in terms of

music. Maeterlinck was a native of Ghent, and the first poems of two of his fellow-townsmen also appeared in the *Pléiade*. These were Grégoire le Roy (b. 1862), author of *La Chanson d'un soir* (1886) and *Mon Coeur pleure d'autrefois* (1889), and Charles van Lerberghe (1861–1907), author of a play, *Les Flaireurs* (1890), a collection of *Poèmes* (1897) and *La Chanson d'Eve*, one of the finest of Belgian poems.

Max Elskamp (1862–1931) was the author of some volumes of religious poetry—*Dominical* (1892), *Salutations, dont d'angéliques* (1893), *En symbole vers l'apostolat* (1895)— for which he devised as background an imaginary city. Eugène Demolder (1862–1919) also created a mythical city as a setting for his prose *contes* in the *Légende d'Yperdamme* (1897).

(E. G.; X.)

Belgian literary activity extends also to historical research. Baron Kervyn de Lettenhove (1817–91) wrote a *Histoire de Flandre* (1847–55), and a number of monographs on separate points in Flemish and English history. Though an accurate historian, he allowed himself to be prejudiced by his extreme Catholic views. He was a vehement defender of Mary Stuart. Louis Gachard (1800–85) wrote many valuable works on 16th century history; Mgr. Namèche (1810–93) completed the 29th volume of his *Cours d'histoire nationale* before his death. Among modern Belgian historians, the names of Godefroid Kurth and Henri Pirenne, author of the well-known *Histoire de Belgique*, are pre-eminent. One of the most masterly writers of French in Belgium was the economist Émile de Laveleye (*q.v.*).

Belgian literature, which was so flourishing at the beginning of the 20th century, suffered some severe losses during the next two decades. Charles van Lerberghe, the greatest Belgian poet after Verhaeren, died prematurely in 1907. The powerful novelist, Camille Lemonnier, died in 1913, his last works being a tragedy, *Edénie* (1912), and a symbolic story *Au Coeur Frais de la Forêt* (1913). Émile Verhaeren died in 1916. Somewhat later Edmond Picard, a well-known lawyer and critic, who exerted a considerable influence on the younger generation, Iwan Gilkin, one of the founders of *La Jeune Belgique*, and Georges Eekhoud were lost to Belgian letters. To these names should be added those of several writers of great talent and promise who were killed fighting for their country. Some of their writings have been collected in *Les Écrivains belges morts à la guerre*, an anthology published in 1923.

War Literature.—World War I itself inspired a great amount of literature both inside and outside Belgium. Most of these productions have only an historical interest, others deserve to be considered as contributions to Belgian letters. Among the latter must of course be included all the writings of Maeterlinck and Verhaeren. A soldier poet, disciple of Verhaeren, Maurice Gauchez came to the fore with *Les Rafales* (1917), and Émile Cammaerts published in London a series of poems, *Belgian Poems* (1915), *New Belgian Poems* (1916) and *Messines and other Poems* (1918), which attracted a great deal of attention.

The most interesting productions of War literature are, however, those which were written during the four years of German occupation (1914–18) or immediately after the deliverance of the country. A. Giraud and Max Elskamp published two notable books, *Le Laurier* (1919) and *Sous les tentes de l'exil* (1923), and the historian, H. Pirenne, *Souvenirs de captivité en Allemagne*. Among other prose works were the anonymous *Lettres d'un provincial ou les propos du conseiller Eudoxe*, a satire on German administration after the style of Pascal, *L'oeil sur les Ostrogoths* by E. Verlant, the war memories of M. Lekeux, a Franciscan monk who fought as an officer of artillery, *Mes cloîtres sous la tempête*, and a collection of War impressions by two young writers, Lucien Christophe, *Aux lueurs du brasier*, and R. Vivier, *La plaine étrange*.

While, in former days, literature was practically ignored by the State, several institutions were founded in order to stimulate its activity. In 1920, a Belgian academy of French language was established by royal decree which published critical studies on Belgian literature and awarded prizes for essays on set questions or for any book of verse or prose worthy of encouragement. Certain endowments were entrusted to it, such as that of the French Société des Auteurs et Compositeurs of a biennial prize for dramatic literature. The academy passed resolutions which were acted upon by the Government and undertook an enquiry into the situation of the French language throughout the world.

Most of the 14 original members of the academy formerly belonged to the group of *La Jeune Belgique*, and at the end of this period were already looked upon as writers of the older generation. Among them were: G. Eekhoud, a story writer of Flemish peasant life, and the author of several translations and criticisms on the Elizabethan drama whose work *Perkin Warbeck* appeared in 1914; the Parnassian poet, Albert Giraud, who, besides *Le Laurier* mentioned above, published *Éros et Psyche* in 1920 and *Le concert dans un musée;* F. Séverin, who was particularly successful in his descriptions of Walloon countryside (*La source au fond des bois*); the poet essayist A. Mockel (*La flamme immortelle*, 1924), and two accomplished novelists and story-writers of Walloon extraction: H. Krains (*Mes amis*, 1921) and L. Delattre (*Du côté de l'ombre*, 1924).

The influence of art, so powerful on Belgian literature, re-asserted itself in later years owing to the constant interest shown by the Belgian public in modern and ancient painting. Among the poets and playwrights who devoted part of their time to art criticism were: G. Le Roy in *James Ensor* (1922); A. Goffin in *L'Art religieux en Belgique* (1924); and G. Vanzype in *L'Art Belge du 19ème siècle* (1923), *Henri de Braekeleer* and *Rubens*.

It has often been noticed that the delight they take in description had somewhat hampered the talent of Belgian novelists. This may account for the fact that, in the writers of this period, as in the former generation, poems and dramatic works were generally above the level reached by novels, though writers of Walloon extraction were less inclined than their Flemish colleagues to mistake their pen for the brush. Among the most distinguished works of the latter after World War I were H. Stiernet's *Le roman d'un tonnelier*, H. Davignon's series of novels dealing with Anglo-Belgian relationship, L. Piérard's *Les trois borains*, G. Garnir's *La Chanson de la rivière*, E. Glesener's *Les dytiques* and R. Dupierreux's *La certitude amoureuse;* among the former, H. van Offel (*Les deux ingénus*), F. Hellens (*En écoutant le bruit de mes talons*), and A. t'Serstevens (*Le vagabond sentimental*) may be mentioned as the most original writers.

Poetry and the Drama.—It is almost impossible to classify the various tendencies which inspired the work of the modern poets. On the one hand there is a remarkable group of religious poets such as V. Kinon (*L'âme des saisons*), P. Nothomb (*Portes du ciel*), Th. Braun (*Le beau temps*), P. Fierens and G. Raemaekers who illustrate the mystical side of the Belgian temperament; on the other, the group of "La Renaissance d'Occident," headed by M. Gauchez (*Hymne à la vie*) who exalt the joy of life, following the realistic tendencies of Verhaeren. A certain number of poets, like Marie Gevers (*Missembourg-Antoinette*) and E. Cammaerts, *Poèmes intimes* (1922), insist on the intimacy of home life; others, like E. Marcuse and L. Kochnitzky (*Elégies bruxelloises*), follow impressionist and humoristic tendencies. R. Verboom, M. Thiry and N. Ruet may be mentioned among the most promising poets of the younger generation.

In dramatic literature the loss of Verhaeren must again be deplored; his last tragedy, *Hélène de Sparte*, was given in Paris in 1912. Maurice Maeterlinck has given: *The Burgomaster of Stilemonde* (1918), produced in England by Sir J. Martin Harvey; *The Betrothal* (1918), a sequel to *The Blue Bird* (1910), played in London in 1921; and two plays in modern setting: *The Cloud that Lifted* and *The Power of the Dead* (1923). Maeterlinck's amazing success in Paris, 30 years ago, was almost repeated, in 1920, by a young Belgian playwright, F. Crommelynck, whose semi-grotesque, semi-tragic play, *Le cocu magnifique* (1921), created a sensation at the Théâtre de l'Oeuvre. This author, who appears to be strongly influenced by the biting humour of Pieter Breughel, published two other plays: *Les amants puérils* and *Tripes d'or*. G. Vanzype, a writer of problem plays who remained steadfastly faithful to his high standard, added three more, *Les*

semailles, Les visages, Les autres, to his already lengthy list of works. The dramatic power of Belgian writers can also be seen in P. Spaak's *Malgré ceux qui tombent* and G. Rency's *La dernière victoire,* while such works as H. Soumagne's *L'autre messie* (1924) and P. Demasy's *La tragédie de Faust* and *Jésus de Nazareth* (1924) showed that this power was by no means exhausted among the younger generation. There are few essayists in Belgium, but certain criticisms such as those of J. Destrée, L. Dumont-Wilden, G. Charlier, F. Ansel and C. Bernard are of real and permanent interest.

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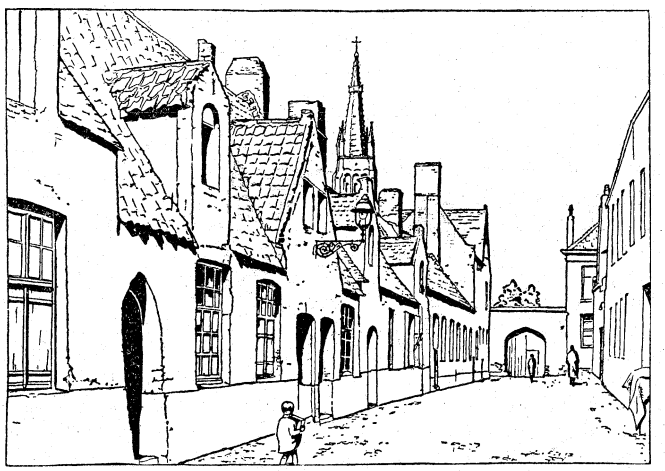
BELGIUM (Fr. *Belgique;* Flem. *België*), a country in north-west Europe. Its neutrality was guaranteed by the treaties of 1831 and 1839, but was abolished by the Treaty of Versailles (1919), when Belgium was given full freedom in directing her foreign policy. In 1940 Belgium was invaded and wholly occupied by the German army. It was formerly part of the Low Countries. The name Belgium came into general use only with the foundation of the modern kingdom in 1830, but its derivation from ancient times is evident. The first Belgic tribes, considered to have been Celtic, reached the area from the region between Elbe and Rhine about the 4th century B.C.; but at the time of the Roman conquest they were considerably mixed with Germanic elements. From the Roman use of Gallia Belgica, the adjective came to distinguish the inhabitants of the south Netherlands.



STREET OF WORKMEN'S COTTAGES IN THE ANCIENT BELGIAN CITY OF BRUGES
Even in its obscurer streets Bruges retains much of its mediaeval character. Much of its building dates from the 14th century. The spire in the background is that of the church of Notre Dame

During the crusades and throughout the middle ages the term *Belgicae Principes* frequently occurs, and when in 1790 the Brabançons rose against Austria, their leaders proposed to give the country the name of "États-Belgiques unis." In 1814, too, on the expulsion of the French, the creation of an independent State under that name was suggested. It was not until 1830, on the collapse of the united kingdom of the Netherlands, that the proposal was given effect. The lack of linguistic unity in Belgium reflects the complex origins of the people. Flemish, a Germanic tongue, is spoken in the two Flanders (West and East), in the provinces of Antwerp and Limburg and in the northern half of Brabant, *i.e.,* in the area corresponding to the territory invaded by the Franks in the 4th century A.D. French and its "Wallon" *patois* are spoken throughout the south of the country. Dating from the Roman occupation, this language has maintained itself here owing to the broken and forested nature of the country.

From 1830 until shortly before the war of 1914, French was the sole official language of the country. The two languages have (1940) equal rights. Belgium, lying between 49° 30′ and 51° 30′ N., and 2° 32′ and 6° 24′ E., was bounded, May 1, 1940, by Holland on the north and north-east, by Germany and the grand duchy of Luxembourg on the east and south-east, by France on the south and west, and by the North sea on the north-west. Its frontiers measured 1444·5km., divided as follows: Holland (449·5); Germany (161·5); Luxembourg (148·0); France (620·0); North sea (65·5).

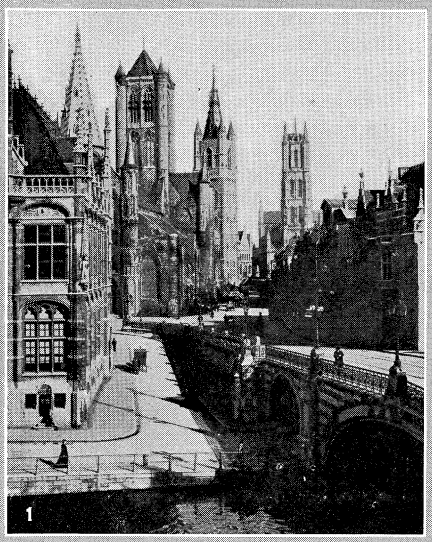
Geology.—Belgium lies upon the northern side of an ancient mountain chain which has long been worn down to a low level and the remnants of which rise to the surface in the Ardennes, and extend eastward into Germany, forming the Eifel and Westerwald, the Hunsrück and the Taunus. Westward the chain lies buried beneath the mesozoic and tertiary beds of Belgium and the north of France, but it reappears in the west of England and Ireland. It is known as the "Hercynian chain," and is composed entirely of palaeozoic rocks. Upon its northern margin lie the nearly undisturbed cretaceous and tertiary beds which cover the greater part of Belgium. The latest beds involved in this mountain folding belong to the coal measures, and the final elevation must have taken place towards the close of the Carboniferous period. The fact that in Belgium jurassic beds are found upon the southern and not upon the northern margin indicates that in this region the chain was still a ridge in Jurassic times. In the Ardennes the rocks which constitute the ancient mountain chain belong chiefly to the Devonian system, but Cambrian beds rise through the Devonian strata, forming the masses of Rocroi, Serpont, Stavelot, etc. These outcrops correspond to transverse folds. The Ordovician and Silurian are absent here, and the Devonian rests unconformably upon the Cambrian; but along the northern margin of the palaeozoic area, Ordovician and Silurian rocks appear, and beds of similar age are also exposed further north in consequence of successive denudations which have worn down the Hercynian folds and swept away the tertiary deposits. Carboniferous beds occur in the north of the palaeozoic area. Near Dinant they are folded amongst the Devonian beds in secondary synclines, but the most important band runs along the northern border of the Ardennes. Here are the coalfields of Liége, Charleroi and Mons, in a long narrow trough which is separated from the older rocks of the Ardennes by a great reversed fault, the *faille du midi.* Tangential movements along a thrust plane inclined to the south have resulted in the northward thrust of a large portion of the Devonian beds of the Ardennes, which thus rest on younger formations, notably on the coal beds in the middle of the trough. Borings at Pepinster have reached coal at a depth of 700 metres. The coal beds to the north of the great fault have therefore a different structure from those to the south.

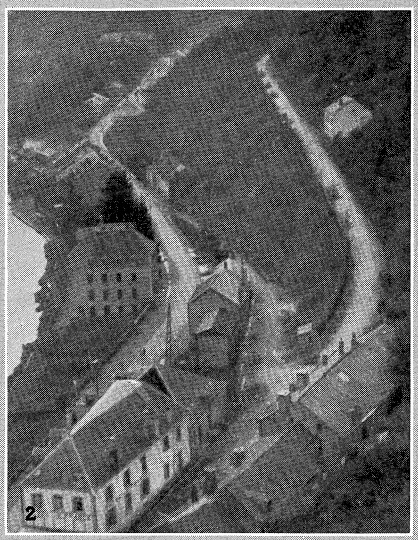
Another consequence of tectonic movements was the transverse anticlinal dome of Samson, which, in lifting the lower beds, brings the carboniferous limestone to the surface, interrupting between Namur and Andenne the coal deposits of central Belgium.

Soundings carried out in the Campine (north-east Belgium), a few years before 1914, revealed the existence, at a depth of several hundred metres, of coal deposits thought to be of very great importance. During the World War the pits of Winterslag produced the first coal, extracted from a depth of between 450 and 800 metres. Except along the southern border of the Ardennes, and at one or two points in the middle of the palaeozoic *massif,* triassic and jurassic beds are unknown in Belgium, and the palaeozoic rocks are directly and unconformably overlaid by cretaceous and tertiary deposits. The cretaceous beds are not extensive, but the wealden deposits of Bernissart, with their numerous remains of iguanodon, and the chalk of the district about the Dutch frontier near Maastricht, with its very late cretaceous fauna, are of special interest.

Exclusive of the Ardennes the greater part of Belgium is cov-

BELGIUM











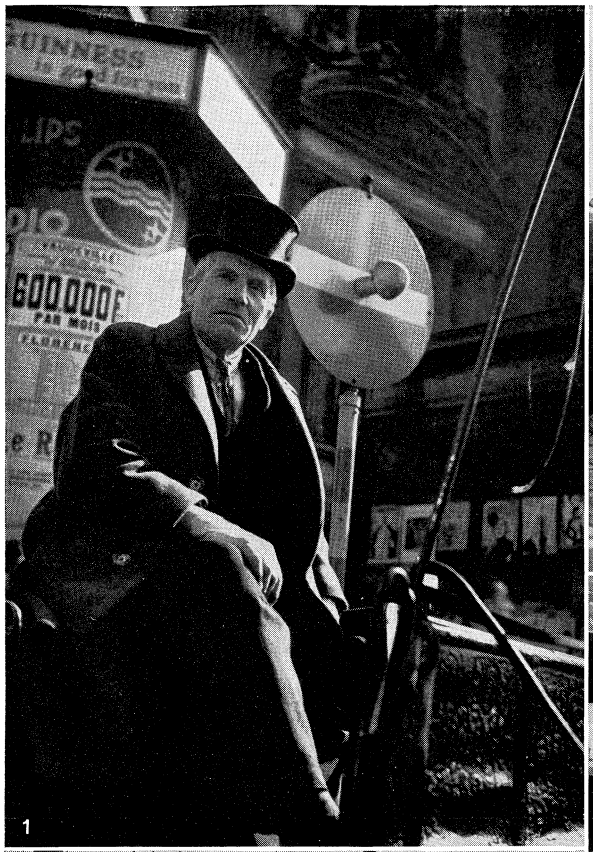


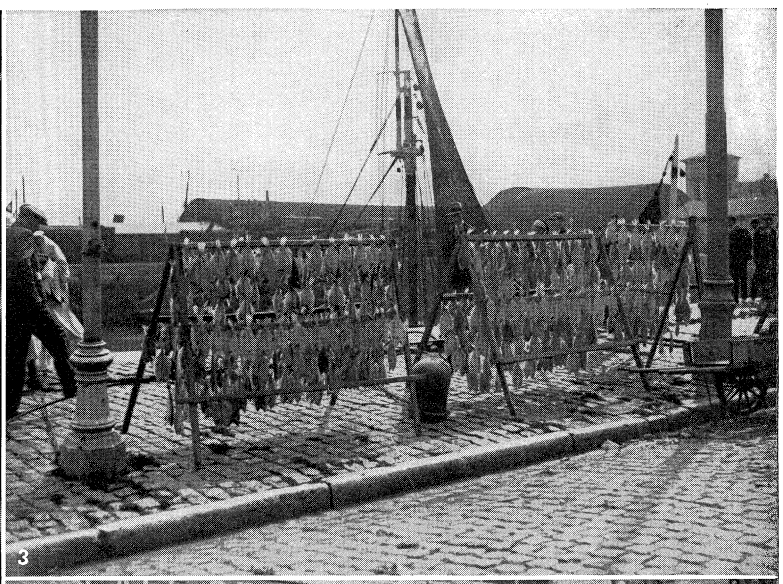


BY COURTESY OF (2, 3, 7) THE RED STAR LINE; PHOTOGRAPHS, (1, 4, 6) EWING GALLOWAY, (5) BURTON HOLMES FROM EWING GALLOWAY

1. A street in Ghent showing the Belfry, with its square tower, and, behind it, the Cathedral of St. Bavon
2. The hilly regions of the Ardennes. Winding up the hill, are the hairpin curves which characterise this region
3. Antwerp. The cathedral of Notre-Dame seen from the quais
4. A flower market of Brussels in the centre of the Grand' Place
5. The Grand' Place, Bruges, the heart of the city, showing Government buildings, in the Gothic style, adjoining the Post Office, a turret of which appears at the right. This picture is taken from Les Halles, on the south side of the square, of which the belfry is a conspicuous feature
6. A general view of Brussels, looking over the house-tops
7. Another view of the Grand' Place flower market in Brussels, looking toward one of the municipal buildings which surround the square

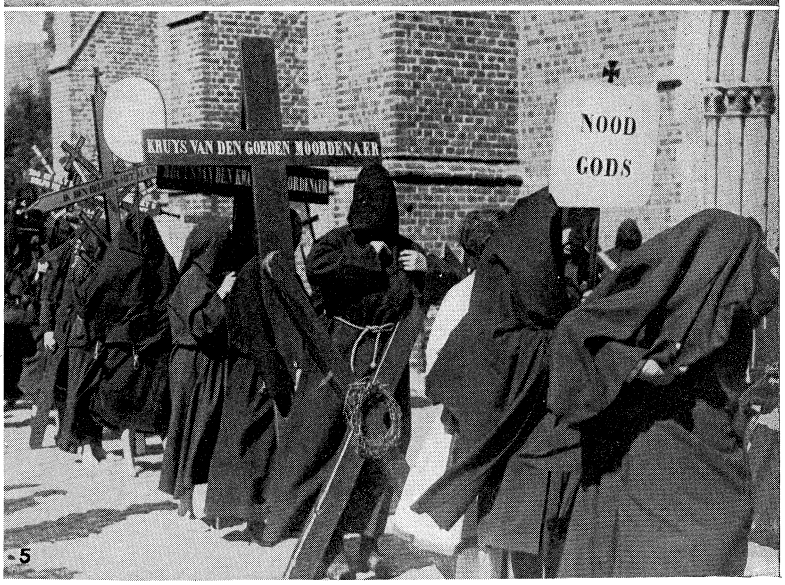
BELGIUM











PHOTOGRAPHS, (1, 2) SCHALL-PIX FROM PUBLIX, (3, 5) PAUL'S PHOTOS, (4) POMMERANZ-LIEDTKE-PIX FROM PUBLIX

SCENES IN THE LIFE OF THE BELGIAN PEOPLE

1. Horse-cab driver in Brussels with the typical high hat of his trade
2. Workers on the Quai aux Herbes at Ghent
3. The fish market at Ostend
4. Sidewalk cafés in Bruges
5. Masked penitents in the religious procession of Calvary and the Crucifixion, held annually in July by the Flemish citizens of Furnes

ered by tertiary deposits. The eocene, consisting chiefly of sands and marls, occupies the whole of the west of the country. The oligocene forms a band stretching from Antwerp to Maastricht, and this is followed towards the north by a discontinuous strip of miocene and a fairly extensive area of pliocene. The tertiary deposits are similar in general character to those of the north of France and the south of England. Coal and iron are by far the most important mineral productions of Belgium. Zinc, lead and copper are also extensively worked in the palaeozoic rocks of the Ardennes.

Physiography.—Weakness of relief is the characteristic of the general physiography of Belgium. The railway which traverses the country diagonally from Ostend to Arlon appears, to the traveller, to follow a horizontal floor, varied here and there by wooded or grass-grown hills, and cut superficially into shallow furrows, with winding rivers. Heights of 700 metres are attained in the east, but erosion has levelled the ancient structural relief so that the aspect of a plain is dominant. Topographically the country is usually divided into three regions: lower, middle and upper Belgium. The first division has marked individuality; it comprises the northern plain and is approximately one-third of the total area of the country. The two remaining regions constitute a continuous plateau, the old mountain-remnant referred to under *Geology* (*see* above), rising above the long trench of the Sambre and the Meuse, which is often taken as the orographical boundary between the two divisions.

(1) The Northern Plain. From the sea-coast to the parallel of Brussels and Louvain the average height of the land does not exceed 20 metres. It consists of a plain of erosion swept by watercourses which run from south-east to north-west. The rivers wind in large curves, several of which have been cut off, at a level higher than that of the surrounding country. A few lines stand out in relief: such as the hills of Flanders, south of Ypres and Courtrai, owing their conservation to a capping of marly pliocene sandstone which has retarded the effects of erosion. One of the knolls is Mont Kemmel (151 metres) which acquired fame through attacks by the German armies in 1918. Other hills include the plateau of Waes, a remnant of the tertiary surface on the left bank of the Schelde, the Campine, a fragment of the alluvial cone of the Meuse on the left bank of this river, and finally, scattered throughout the eastern area, the relics of sandy hills which represent quaternary dunes of Continental origin.

(2) The Plateau. This is divided into two parts: the low plateau north of the Sambre-Meuse, and the high plateau south of this hydrographic trough. The low plateau, which in places falls abruptly to the northern plain, rises from 80 to 200 metres in a distance of 55km. The surface is only slightly varied in the east (Hesbaye), where the underlying chalky rocks and the covering of permeable marl do not favour the development of a drainage system. In the west, on the other hand, in the provinces of Brabant and Hainaut, the sandy and gritty tertiary formations have been worn into peculiarly shaped little valleys by a dense network of streams.

The high plateau begins at a height of 200 metres on the right bank of the Meuse and rises gradually to 500 metres about the headwaters of the Ourthe and the Lesse. Thence it slopes southwards to regain a height of from 200 to 300 metres at the frontier. The Ardennes plateau is thus an immense roof-like structure, with its slopes regularly inclined to north and south. Along the crest rise several isolated domes of greater altitude, aligned from south-west to north-east, notably: the *massif* of Libramont-Saint-Hubert (587 metres), Baraque Fraiture (651 metres), Baraque Michel (675 metres), and the plateau of Botrange (692 metres). These residual cores have escaped the general denudation of the rest of the plateau; their conservation is due not to the resistance of the outcrops (in fact composed of easily-decomposed Cambrian schists) but to the tectonic arrangement of the region. The great Armorico-Variscan folds are affected by transverse folds which have exposed the deeper layers of rock. These schists have suffered little erosion because of the resistant crust of phyllites and quartzo-phyllites of Silurian and Gedinnian (Lower Devonian) date which has long covered them. A compact impermeable clay results from the decomposition of the Cambrian schists. Since, moreover, the absence of slope impedes the running-off of rainwater, the flat surfaces develop large pools of stagnant water which give rise to the peat-bogs called "Hautes Fagnes."

The high plateau does not present a uniform aspect in all parts. Varying tectonic influences and different soils have given several "natural regions" of marked individuality. The chief are, from north to south: the Condroz, the Famenne, the Ardennes and Belgian Lorraine.

The Condroz is characterized by features such as occur typically in the Appalachians or the Jura, with ridges of grits alternating with valleys carved out of the limestone. Phenomena of *karst* (*causse*) type—depressions, grottoes, subterranean streams—are well developed.

The Meuse, which winds in a deep slot across the limestone scarps, has given this region many picturesque sites, and the tourist industry is well developed. The Famenne, an extended depression lying west-east among Devonian schists, is an area of natural woodlands, largely cleared and transformed into meadowland. The Ardennes plateau constitutes the oldest surface of the country, with streams flowing in wide open valleys having very little slope. The climate is fairly rigorous and natural resources poor, and population is here sparsest. Next to the south comes Belgian Lorraine, a land of alternating layers of soft and resistant secondary rocks, with a relief of *cuestas,* for the most part much weathered.

The tourist industry in the lower parts of Belgium, where the scenery is for the most part monotonous, takes a different turn, for here are the old cities with their relics of mediaeval greatness: Bruges, Antwerp, Louvain, Brussels, Ghent, Coutrai, Tournai, Oudenarde and Liége. Ypres and Furnes, almost entirely destroyed during the World War of 1914–18, have been rebuilt in mediaeval style.

Climate and Hydrography.—The climate of Belgium is temperate: regional differences are due to the neighbourhood of the sea and to the influence of relief. At Ostend the mean annual temperature is 49·3°, while at Baraque Michel (670 metres above sea-level) the figure is 43·2°. The average number of days with frost is 50 on the coast, as against 134 in the Ardennes. The Campine, despite its low-lying position, has 94 days with frost, owing to distance from the sea. The rainfall increases towards the interior; the average on the coast is 27·5in.; at Baraque Michel it rises to 59·5 in. The greatest amount of snow falls in the Ardennes where depths of 27in. have been recorded.

The hydrographic system is very well developed, and is maintained throughout the year by the abundant rains. The general direction of flow, following the slope of the plateau, is towards the north; and the Meuse, as far as Namur, the Houyoux and the Ourthe all flow northwards until they reach the west to east corridor of the Sambre-Meuse. This feature appears to be the result of successive "captures" of consequent streams made by subsequent valleys. The tributaries of the Schelde: Lys, Dendre, Senne, Dyle, Gette and the Schelde itself from Tournai to Ghent, also flow in northwards following the slope of the low plateau. All these rivers, like those of the Ardennes, are superimposed, *i.e.,* they lay originally on a different surface from that in which their beds are now cut.

The lower courses of the rivers have very little slope, and consequently disastrous floods were formerly common. Artificial regulation has been introduced in many cases, but the rivers break their banks occasionally. Regulation of the watercourses frequently went hand in hand with their canalization. Belgium possesses about 1,000km. of natural navigable water, *i.e.,* over half the total length of the navigable system. There are, in addition, five canals with a total length of 155km., and 740km. of canals "à petite section," for the use of barges. In proportion to area, Belgium stands next to Holland among European countries for the density of its navigable water system. Commerce derives a great advantage from this fact, for the rates of transport are cheaper than for rail-traffic.

The shallowness of the North sea (the five-fathom line runs at

a distance of 10km. from the coast) and the complete absence of coastal indentations are unfavourable to the establishment of good seaports. Moreover, the existence of sandbanks near the shore seriously impedes navigation. The port of Antwerp compensates, in part, for the disadvantages of the coast; but sore limitations are imposed by the fact that the approach to the port is through foreign territory.

Area and Population.—The area comprises 30,506 square kilometres, or *c.* 11,775 English square miles; and the total population in Dec. 1939 was estimated at 8,396,276, giving an average of 713 per square mile.

Provinces	Area in English sq. m.	Population at end of 1939	Population per sq. m. 1939
Antwerp	1,104	1,260,504	1,142
Brabant	1,267	1,769,516	1,397
East Flanders	1,147	1,196,209	778
West Flanders	1,248	970,695	1,043
Hainaut	1,436	1,234,390	860
Liége	1,525	969,948	636
Limburg	930	420,817	452
Luxembourg	1,705	218,643	128
Namur	1,413	355,554	252
Total	11,775	8,396,276	713

In 1939 there were 4,144,832 males and 4,251,444 females. The annual rate of increase has varied as follows: 1876, 1.05%; 1890, .99%; 1900, 1.03%; 1910, 1.09%; 1920, .06%; 1930, .84%; 1937, .45%; 1939, 1.12%. In 1831 the population of Belgium was 3,785,814; and in 1876, 5,336,185.

In 1938, 16,110 emigrants left Belgium, chiefly for other European countries; and 14,491 immigrants entered. Over 250,000 Belgians live in France, 30,000 in Holland, and 16,000 in the Belgian Congo. The number of foreigners resident in Belgium greatly increased after World War I, and in 1938 was as follows: French, 71,322; Dutch 68,014; Polish 61,809; Italian 37,134; German 14,472; British 9,161. Total, all nationalities, 339,799 (1920; 149,677).

Until after World War I, French was the official language although the number of Belgians speaking only Flemish always exceeded the number of those speaking only French. Census figures show that French is slowly gaining ground in spite of the recognition of Flemish as a second official language; and, as is to be expected, the number of people speaking both has grown from 400,000 in 1880 to over 1 million in 1930. The number of people speaking German only greatly declined after 1918, despite the addition of the formerly German cantons of Eupen and Malmédy. Events have shown that the Flemish question is of fundamental importance in the national existence of Belgium.

Belgium is a densely populated land. In the middle ages, cultivable spaces failed to suffice the constantly increasing population; cultivation spread at the expense of wooded areas. Whole forests have thus been cleared, such as the great coalfield forest which extended from the sources of the Senne and the Dyle to Brussels and Louvain, and of which the forest of Soignes is a remnant.

Along the coast, a strip of land was reclaimed from the sea by means of dykes, and these polders still form one of the most fertile regions in the country. In the eastern districts, the sandy, waste *landes* have been fertilized, and have yielded harvests for many centuries. These great enterprises are in large measure due to the monks who erected monasteries from the 12th century onwards.

In West Flanders, the small rural houses are freely disseminated. Farther east and in central Belgium they cluster along the roads or on the rivers, or are grouped into hamlets. In the pastoral "Fagnes" the agglomerated type similarly predominates. Finally, in Hesbaye and the Condroz, regions of large farming, and in the Ardennes, with less favourable climate and more varied surface, the habitations are concentrated into compact nuclei.

The occupation of the inhabitants, pastoral, agricultural, semi-agricultural, semi-industrial, accounts for these regional varieties. The large farms include interesting types, notably the Flemish farms with numerous buildings quite separate from each other. Nearly all the farms of the polders are surrounded by a wide, deep moat, filled with water. In south Belgium the farms are built in a large closed quadrilateral or *cense*. The dwelling-house and farm buildings surround an interior court. In the villages of the Hesbaye, four or five such farms cluster around a common pool. Intermediary in type is a class of farm in which the buildings are separate from each other but united by walls or palisades which create a closed court similar in type to that of the *cense*.

The small dwellings of the rural labourer have regional distinctiveness from their building materials. Thatch and whitewashed clay were in general use, until the 19th century, in every part where hard stone was lacking: *i.e.*, over all the northern part of the country and, in the south, in the Famenne, with Devonian schists, and on the outcrops of Cambrian schists. The relation of the dwelling to the *milieu* is most striking on the high plateau, where stone houses alternate with dwellings of earth.

GOVERNMENT AND ADMINISTRATION

Education is free and universal for children from six to 14 and is under State control in three divisions: primary, intermediate and higher.

Primary education is given by communal schools and by unofficial schools which may, or may not, be adopted by the commune. In 1937 there were 8,657 primary schools with 960,191 pupils apart from unofficial schools. The school population is declining with the decline of the birth-rate. The normal duration of primary school life is eight years and the work is in four grades: lower, intermediate, higher and pre-professional. Primary schools are subject to inspectors who are either cantonal or principal (over a number of cantons). Bishops appoint inspectors for religious instruction in communal or subsidized schools. Some of the unofficial schools are maintained by the Church and the bishops appoint inspectors for these. These are administered with primary education schools for children maintained by the State and various schools for adults. The "Écoles Normales" have charge of the preparation of teachers through a five-years' course, the two first years being purely preparatory. One may not enter an École Normale before the age of fourteen. It is possible, however, to become a recognized teacher without passing through this training by successful performances of tests administered by a special jury. In 1937 there were 87 *écoles normales*, official or approved, and they had 13,711 pupils.



BELGIAN WOMAN WEARING THE NATIONAL DRESS
The large cap is commonly made of the famous Belgian lace

Intermediate education comprises 154 official schools, 17 communal or unofficial schools, 26 athenaea, 18 communal or unofficial colleges. The first are officially inspected, the others have special inspectors. The Namur cadet school serves the sons of officers. Intermediate "sections normales" prepare pupils for the qualifying examination for teachers in the lower sections of the intermediate schools.

Higher education is given in universities, official at Ghent and Liége, unofficial at Brussels and Louvain; there are also other institutions. Each university has faculties of letters and philosophy, science, law and medicine and also a faculty of technology; Louvain has a faculty of theology. In 1937–38 there were 10,775 students (Ghent, 1,324; Liége, 2,145; Brussels, 3,036; Louvain, 4,270). Each university has a commercial school and special commercial schools of this grade have been created at Antwerp, Liége, and Mons. Mons also has an engineering school, Verviers one of textile engineering, Gembloux, Ghent and Louvain (the university) have schools of agricultural engineering. Curegham has a veterinary school and Brussels has a preparatory school for officers, and

an "École de guerre," which trains the general staff of the army. There are schools of navigation at Antwerp, Nieuport and Ostend. In 1923 the Colonial School and the School of Tropical Medicine at Antwerp were constituted a Colonial University; and in 1930 Ghent University became Flemish. Industrial schools are increasing in number every year, and there are special schools of architecture, painting and music. The Royal Academy of Fine Arts at Antwerp, the royal conservatories at Brussels, Antwerp, Ghent, Liége and Louvain, are the chief of numerous institutions for the arts.

The Royal Academy of Belgium was founded in 1769 and revived in 1818 and the prizes awarded through it for literature and science are keenly contested.

Administration and Justice.—Executive authority vested in the king is delegated to his ministers whom he appoints and dismisses, the practice being that he follows the parliamentary majority in making, and changing, the executive. The kingdom has nine provinces each with *arrondissements* subdivided into communes. Only the province and the commune are recognized officially; they have maintained some measure of autonomy and have their own budgets, under royal control. Each province has a governor appointed by the king and a provincial council popularly elected. The commune has its popularly elected council under a *bourgemestre,* appointed by the king usually from the majority party on the council.

The *Cour de Cassation* at Brussels has a first president, sectional president and 15 councillors divided into two sections for civil and for criminal cases respectively. This court is not called upon to judge facts save in a case involving a minister of State, such cases being reserved to it. Its duty is to annul judgments of other courts and tribunals if procedure has not been proper or if they contain a contravention of the text of the law. It confirms judgments that are found correct on these grounds and may act on appeal by a party to the judgment or on its own initiative. There are appeal courts at Brussels, Ghent and Liége, with civil and criminal sections in each.

Civil tribunals of first instance and correctional tribunals in the capitals of *arrondissements* judge cases of a certain importance. Criminal, political and press cases are judged by the assize courts partly composed of professional judges and partly of citizens without legal training. The tribunals in the capitals of judicial *arrondissements* hear appeals from the civil and police tribunals of the communes. The two sections in the communes, save at Brussels and Antwerp, have the same personnel. There are 230 judicial communes, including those of Eupen, Malmedy and St. Vith recently added. The number of magistrates has recently been reduced on grounds of economy and some communal tribunals have been found unnecessary. Capital punishment is legal but is never carried out. The number of prisons needed is diminishing.

Since 1921 the senate includes (1) members elected by universal suffrage of all adult citizens over 21 with six months' residence in the commune in which they vote; (2) members elected by provincial councils; (3) members elected by the senate itself. To be a member of either chamber one must be a citizen with political and civil rights, resident in Belgium. The age limit for membership of the chamber of representatives is 25, for membership of the senate 40. Senators directly elected must have some diploma or must practise one or other of a number of intellectual functions named in the constitution. The senate is renewed completely every four years and senators receive no honorarium, but have an allowance of approximately £190 (28,000 francs) for expenses. The king's sons, or, if there are none, the heir presumptive and the princes of his branch, become senators at the age of 18. The members of the chamber of representatives are elected for four years and have an allowance of about £280 (42,000 francs) and free travel on State railways. Voting is obligatory and secret. The electors have to choose between lists put forward by political parties and may not vote for persons from two lists. Seats are divided among the candidates on the various lists according to the votes cast for these different lists. Complications in the system allow a small group to add together votes received in various districts. In this way Flemish Nationalists obtained 17, the Communists 9 and the Rexistes 4 seats in a chamber with three principal parties (1939): Catholics (73), Socialists (64), Liberals (33).

(F. Mt.; X.)

FINANCE

All expenditure during the War of 1914–18 was incurred without legislature control. During the occupation the Germans levied war contributions on Belgium amounting to 2,620,000,000 gold fr.; in addition they exacted 68,000,000fr. from the communes. Belgian indebtedness to the Allies amounted to 5,600,000,000 gold marks.

This was placed to German account by the Treaty of Versailles, but the United States was not a signatory of the treaty. The Treaty of Versailles further allotted to Belgium a priority of two milliard gold marks on Repatriation account.

Upon the German evacuation the Belgian Government decided to redeem the marks in circulation on the basis of 1.25fr., as German currency had been imposed upon the people. A sum of 7,592,000,000fr. was required to effect this redemption and this was the beginning of Belgian inflation. The government did not print notes, save in the crisis of 1926, to cover the Budget deficit; it even repaid 600,000,000fr. of the advances received from the National bank for the exchange of marks. The Allies did not agree to place to German account the cost incurred for the redemption of German marks circulated during the occupation, but Belgium did not lose all hope of, at any rate, a partial indemnification for her losses.

In 1919 the fiscal system, which had been in force for a century, was recast. The previous direct taxes were replaced by an income-tax modelled on the English income-tax. It comprised three direct taxes—the tax on land, the tax on investments and the tax on salaries and earnings—together with a supertax.

After the war Belgian finance passed through a period of exceptional gravity, lasting throughout 1919 and 1920. Then a vigorous effort towards improvement was made, ending in 1925 with what might be described as complete recovery. In 1926 a new crisis occurred.

The situation in 1919 was due to the German invasion and to necessary expenditure on making good the destruction caused by the War. The material restoration of the country was practically completed by 1924; up to June 30 of that year the State had spent about 21,000,000,000fr. on damage done by Germany, not counting the cost of buying in the marks.

In view of the incompleteness of the public accounts, the best means of judging Belgian finance from 1919 to 1925 is to follow the progress of the public debt, external debt being calculated at the same rate of exchange. The figures for the financial years, beginning in September of each year are as follow:—

	Increase (Milliard frs.)
1919–20	5.5
1920–21	6.0
1921–22	2.5
1922–23	1.0
1923–24	0.2
1924–25	1.0

These figures exclude the American debt, reinstated in the Belgian National Debt in accordance with the agreement of 1925.

At the beginning of 1939 the public debt was 57,334,571,000 francs, of which 37,641,979,000 francs represented internal debt, and 19,692,592,000 francs foreign debt.

Through 1930, Belgium's budget was in regular balance; during the next decade, except for small estimated surpluses in 1935 and 1938, annual expenditures exceeded annual receipts, despite the fact that the nation had stopped payment on its War debt (*see* below).

For 1939 the estimated ordinary revenue was 11,488,700,000fr. and estimated expenditure 11,583,000,000 francs.

On Aug. 18, 1925, Belgium concluded with the United States an agreement on the American debt. This was to be repaid by the year 1987, by means of annuities reaching the sum of $12,700,000 from 1936 onwards. The War debt was not subject to interest, while the debt incurred after the War bore a rate of interest.

Belgium defaulted Dec. 15, 1932 on her debt to the U.S.A. By an agreement made with Great Britain, Dec. 31, 1925, the total debt of Belgium and of the Belgian Congo to that country (£12,600,000) was to be paid within 30 years, the interest being 5%.

The weak point of the financial situation in 1925 was the floating debt, which was composed of 5,500,000,000 francs of Treasury bonds at six months, to which might be added 1,800,000,000 bonds at five years, falling due Dec. 1, 1926. The elections of April 5, 1925, which were a victory for the Socialists, shook public confidence; immediately capital began to flow out, Treasury bonds were withdrawn, and the franc fell.

In view of this situation, M. Janssen, the Minister of Finance in Poullet's "Democrat" cabinet, attempted to stabilize the Belgian franc. He drew up a plan, and from Oct. 1925 to March 1926 kept the rate of the pound sterling on Brussels provisionally at 107fr., by means of temporary foreign credits, pending a loan of 150,000,000 dollars. Unfortunately confidence was not restored and capital continued to withdraw. M. Janssen was obliged to utilize £25,000,000 in keeping the franc at the level determined on; at the same time, the floating debt was being gradually called in. The foreign bankers, dissatisfied with the state of opinion in Belgium, and loth to float a loan on the New York market, withdrew their offers. On March 15, 1926, the franc was left to its own devices. A panic followed; in April it became necessary to print further notes to meet the demands for repayment of Treasury bonds. The franc fell steadily. M. Janssen resigned, and on May 20, 1926, the Jaspar-Franqui ministry was formed, which immediately imposed new taxation, the yield of which was earmarked for a sinking fund. When the pound sterling reached a rate of 240fr. (July 12), the government brought forward an Act granting the King "emergency powers" for six months to grapple with the crisis.

On July 31 the compulsory consolidation of the floating debt and the exchange of Treasury bonds against railway shares was decreed.

On Oct. 25, 1926, the government ordered the second stabilization at a rate of 175 to the pound sterling, or one-seventh of par.

On March 31, 1936 the unit of currency was stabilized at 72% of its former gold content.

Financial Situation in 1939.—Though the nation, in common with most countries of the world, had experienced consistent deficits in the period 1930–39, the latter were not abnormally large and the increase in the national debt was relatively small. The estimated budget for 1940 carried the following items of revenue and expenditures (this budget was necessarily thrown out of line by Germany's invasion in May 1940, but it is typical of the years immediately preceding the war):

Estimated Revenue, 1940 (thousands of francs)

Direct taxation	3,572,500
Customs and excise taxes	3,077,200
Stamp duties	3,459,700
Miscellaneous receipts	1,233,600
Total revenue	11,343,000

Estimated Expenditure, 1940 (thousands of francs)

Pensions	2,352,600
Service on the public debt	2,501,900
Education	1,308,000
National defence	1,329,300
Social insurance	701,800
Justice	334,000
Public works	286,400
Other expenditure	2,819,000
Total expenditure	11,633,000

Notes in circulation April 30, 1940 were 29,401,000,000 francs.

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(F. BA.; X.)

DEFENCE

Historical.—The history of defence forces in what is now Belgium can be traced back to the feudal states of the 13th and 14th centuries; through the period of unification of the Netherlands (1363–1477), the Habsburg rule (1477–1555), the Spanish rule and the revolt (1555–1609), the Spanish Netherlands (1609–1714), the Austrian rule (1714–90), the French rule (1792–1814), the junction with Holland (1814–30), and through an independent period (1830–39) until it was formally, in 1839, created the Kingdom of Belgium. Under the provisions of treaties signed in London on Nov. 15, 1831, and April 19, 1839, the frontiers of Belgium were established, and Great Britain, France, Prussia and Russia prescribed that Belgium should "form an independent and perpetually neutral state. It shall be bound to observe such neutrality towards all other States." The Powers mentioned guaranteed to the king of the Belgians the execution of this and of other articles of the Treaty.

In 1868 the active army was divided from the reserve. In 1870 a Militia Act was substituted for all previous legislation affecting military service. From 1896 voluntary military service was established, and in 1902 certain privileges were granted to add to the attractions of the army. In 1909 the principle of compulsory service for one son in each family was adopted, service with the active army being reduced to 15 to 24 months, according to the arm of the service. The peace strength of the army was 42,800. In 1912 an Army Act was passed to increase the military strength of Belgium, and in 1913 compulsory service was made universal, with certain exemptions, the object being to produce a field army of 150,000, 130,000 garrison troops and a reserve of 60,000. The World War broke out before these reforms could take effect, and found the Belgian army unprepared.

Nevertheless Belgium did her best, with the reserves available, to maintain the neutrality enforced upon her by treaty obligations, placing one division facing Germany, one facing France, one facing England, one holding Antwerp, and one, with a cavalry division, in reserve. The heroic but inadequate defence of Belgium and the portion of Belgian territory that remained against the German invasion of 1914 belongs to the story of World War I (*q.v.*). (*See* also ANTWERP, SIEGE OF; BELGIUM, INVASION OF [1914]; YSER, BATTLE OF THE.) At its conclusion, certain territories were ceded by Germany, and the independence of Belgium was again recognized in the Versailles Treaty of 1919.

The Army, 1918–40; Recruitment and Service.—Every Belgian was liable to military service, exemptions only being granted for physical disability. The ranks of the army were filled by an annual contingent of conscripts, supplemented by voluntary enlistments and by re-enlistments. Obligation for military service began in the year of the 20th birthday. This could be anticipated by a year, and certain arrangements were made for suspension of service. Service was for 15 years in the regular army and its reserve, followed by 10 years in the territorial army—25 years in all. The regular army was divided into a first-line, comprising the regular units on a peace footing, and a second-line, including reserve units. There was a second reserve, common to both armies, and also auxiliary troops. In the event of war or of threatened invasion, the territorial army could be embodied in the regular army, but married men with four children were exempt from this obligation.

Service with the colours for training lasted for 10 months excepting in anti-aircraft artillery and engineers (12 months) and in cavalry, artillery and horse transport (13 months). Militiamen, fit only for auxiliary service, served for 12 months. After serving with the colours, the men proceeded on permanent furlough, but the Government had the power to recall one or more contingents to the colours. Parliament had to be notified of such action. The men on furlough could be called out annually for inspection, and, under normal conditions, conscripts of both armies were recalled twice for periods of six weeks on each occasion. Voluntary enlistment was permitted from the age of 16 years, for periods varying from two to four years, followed by voluntary re-engagement for a period of six months after service with the colours, or, alternatively, for longer periods up to a total of four years.

Strength and Organization.—The budget effective strength of the army in Sept. 1939 was 91,000, including 4,600 officers. The active army numbered about 600,000, and the trained reserves 242,000. The military organization provided for army troops, including a light division, an army artillery division, military air force, a tank regiment, signals, torpedo-boat and naval corps, and the usual transport and auxiliary services. There were four army corps, each comprising corps troops and four infantry divisions. There were nine regiments of cavalry, of which five were embodied in the light division.

Colonial Troops.—In addition to the army in Belgium, Colonial native troops were maintained in the Congo Territory. These varied in number around 15,000, including about 350 officers and non-commissioned officers. The officers and senior non-commissioned officers were Europeans. Six battalions of infantry, five batteries of artillery, five companies of engineers, and two cyclist companies were kept in cantonments for defence; companies varying in strength were distributed about the districts to maintain order. A colonel, under the direction of the governor-general, commanded the Congo forces.

Higher Command.—The king commanded the Belgian army in time of war, the minister of defence in peace. There was a general staff for the army, inspectors general for each arm of the service, a Council of National Defence, presided over by the chief of the general staff, an army committee, under the defence minister, and various technical commissions and committees.

Distribution of Troops.—Belgium was divided into four territorial military areas: No. I. West and East Flanders and Hainaut; No. II. Antwerp and Limburg; No. III. Liége, Namur and Luxembourg; No. IV. Brabant. Territorial groups were arranged for each group to provide proportionate numbers of Flemings and Walloons and of townsmen and countrymen, for specified infantry divisions and other formations. To these the men were distributed without regard to race or to place of origin.

Education and Training.—The military educational and training establishments in Belgium included (1) the staff college; (2) a military school for training regimental officers; both at Brussels; (3) a cadet school with (4) a central school of science attached thereto; both at Namur; (5) *Ecoles de Pupilles,* which bore their share in preparing non-commissioned officer candidates for the army. Of these there were two of primary grade at Bouillon (French) and at St. Trond (Flemish), and two of intermediate grade at Marnette (French) and Alost (Flemish). For the various arms, schools of instruction were provided at Beverloo (infantry), at Brasschaet (cavalry and artillery) and at Antwerp (engineers). There was a physical training institute at Brussels, one special non-commissioned officers school for infantry in each army corps area, schools for artillery non-commissioned officers at Malines and Borsbeek with cavalry and engineer schools attached thereto. There were also special schools for medical and administrative service, for motor, aviation and railway work, signals and torpedo and naval work.

Special Armament and Training Doctrine.—The Ministry of Defence contained a department to deal with gas warfare service. Military training was dealt with by Section A. of the second deputy chief of the general staff.

Each infantry division contained a machine-gun battalion. The light division (army troops) contained two light brigades, one cyclist regiment, one group of machine-gun armoured cars, one regiment of horse artillery, one battalion of cyclist engineers and a light division depot.

Permanent Fortifications.—The permanent defences of Antwerp, Liége, and Namur proved inadequate in 1914 and again (with the modern fort of Eben Emael 15mi. north of Liége) in 1940. As the French constructed the Maginot line, the Belgians built a line of permanent fortifications from the French border at Longwy, north along the Luxembourg and German borders to Eupen, then west to a juncture with the Albert canal at Liége. This "little Maginot line" failed to withstand the onslaught of German mechanized divisions and infantry in May 1940.

Army Air Forces.—The military air service was commanded by an officer of divisional rank, reporting direct to the minister of defence.

The service included a headquarters staff, three air regiments and a depot. One regiment contained four groups of three or four flights, the other three groups of three flights, with a "park flight" in each group. The air force at the end of 1939 included something over 200 planes; the personnel numbered about 3,000.

There was also a Department of Civil Aviation, which in Feb. 1925 became attached to the Ministry of Railways. The arrangements for the military air-service were largely provisional and experimental.

See also League of Nations, *Armaments Yearbook* (1928); *Annuaire officiel de l'armée belge; Annuaire statistique de la Belgique et du Congo Belge* (official); *Manual of Belgium and adjoining Territories.* Admiralty (H. M. Stationery Office). (G. G. A.; X.)

ECONOMIC DEVELOPMENT

Belgium is more highly industrialized than any country on the continent of Europe with the exception of Saxony. In the second half of the 19th century, *i.e.,* between the two great censuses of 1846 and 1900, the industry of the country underwent a fundamental change through the immense increases which took place in the numbers of the working class, and, more especially in the amount of motive power employed. Leaving the transport industries out of account, the total steam power increased more than tenfold in this period, namely from 40,000 to 430,000 horse-power.

Moreover, the industrialization of Belgium has not taken place at the expense of her agriculture, as has been the case in some other countries. Belgian economy has a dual basis, and the close connection between agriculture and industry is one of the features of the country.

Working hours and transport are in many instances so arranged that the factory hand can engage in cultivation.

Since 1910 Belgian industry has continued to advance. The World War and military occupation adversely affected production for some time, but it is now recognized that industry as a whole gained by the destruction of plant, which was replaced by new and improved kinds. It is significant that between 1910 and 1926 the quantity of power used in the coal, metallurgical, glass, textile and electrical industries more than doubled: while the increase in the aggregate motive power of industry during the same period is estimated at 65%.

With such a high degree of industrialization, the commerce of Belgium is very large in proportion to the population; and her trade is further increased by a transit trade (to Greater Germany and Switzerland) which passes chiefly through Antwerp.

The figures for 1913 and 1938 are as follows:

Special Imports into Belgium in Million Francs

Year	
1913	5,050
1938	23,166

Special Exports from Belgium in Million Francs

Year	
1913	3,716
1938	21,724

The special commerce takes into account only the consumption and produce of Belgium itself.

Mining.—Belgium possesses two coalfields, one in the south, extending into France, and the other in the north-east (Campine field). Production in the former is now tending to decrease, owing to the exhaustion of deposits which have in some cases been worked for many years. The Campine field, of more recent development, offers great potentialities, and both fields lend themselves to the use of machinery, which is increasingly employed.

Output of Coal in Belgium

Year	Metric Tons	Index (1913=100)
1913	22,841,590	100.0
1919	12,482,880	54.8
1920	22,388,770	98.0
1926	25,319,570	110.8
1938	29,575,400	129.5

Iron and Steel.—Iron and steel production suffered severely owing to the destruction due to the World War (1914–18); but the advantages derived from the installation of modern machinery since that time have been correspondingly great (*v.sup*); in 1939 the metallurgical industry employed the greatest number of industrial workers in Belgium.

Belgian Production (Tons)

	1913	1925	1935	1938
Pig Iron	2,484,690	2,542,507	3,029,600	2,464,800
Crude Steel . . .	2,404,780	2,480,000	2,965,390	2,212,540

Associated with iron and steel production is a considerable engineering industry. Shipbuilding is carried on at Antwerp, and machinery, railway stock, etc., are manufactured at Brussels, Charleroi, and Liége. There have been important developments in the electro-technical industry, due in part to the electrification of certain railway lines.

Other Metals.—The development of the mineral resources of the Belgian Congo has given rise to new industries. The mineral ores are treated at Oolen, on the Campine coalfields, a centre possessing good rail and water communications, and come mainly from the Katanga province of the Belgian Congo. In 1936 production was as follows: Lead 65,000 tons; Copper 79,000 tons; Zinc 195,000 tons.

In addition, tin, cobalt and uranium are also worked; the deposits of uranium being so large as to have given Belgium a preponderance in the world production of radium until the discovery of Canadian deposits in 1930.

Textile Industries.—Belgium, and especially Flanders, has a tradition of textile production which dates from the early middle ages. The raw material first used was wool, but this was later supplanted by flax, and later still cotton made its appearance.

Textile production was formerly a cottage industry, but after about 1910 there was a rapid change-over to large scale methods, and many factories were built, although the old system has not as yet completely disappeared.

The linen industry is centred round Courtrai, in the valley of the Lys, the waters of which offer special advantages for the retting of the flax. The raw material comes from the Baltic states, and for a time the industry suffered very greatly owing to the interruption of supplies during and after the World War. The cotton industry has a wider distribution but is located chiefly in the south-west of the country. Until the War, Belgium's artificial silk industry was the most important in the world. Although outdistanced by those of the United States, Japan, England, Italy and Germany, the industry still occupies an important place.

Diamond Cutting.—This industry is carried on at Antwerp, which rivals Amsterdam as the leading city of the world in respect of diamond cutting. Antwerp handles the greater part of the output of the mines of the Congo and Portuguese Angola, which together account for over 55% of the total world production.

Other Industries.—Belgium also produces large quantities of matches and glassware. There are, moreover, important industries directly dependent upon agriculture, such as breweries (1,274 in 1936), sugar factories and refineries dealing with beet-sugar (1936: 46), distilleries of potable and industrial alcohol, and various food factories.

Summary.—According to the industrial census of 1930, there were 1,938,000 people engaged in industry, and of these 185,000 were clerks and 1,481,000 operatives. The industries employing the greatest number of workers were: metallurgical and engineering 292,200; textiles 225,650; mining 160,964; building 159,957; transport 109,658; woodworking 101,362. There were 564,577 people engaged in commerce, and of these 106,855 were in the hotel industry. The chief features in the development of Belgian industry, regarded as a whole, are as follows: (1) Concentration and integration, especially in the iron and steel, machine construction, quarrying, cement, ceramic (tile-making), chemical, sugar and cotton industries; (2) development of mechanical processes in the coal, iron and steel, ceramic and glass industries; (3) the Belgianization of certain undertakings—iron and steel, zinc, metallurgy and chemical products—through the liquidation of the foreign, and especially the German, interests; (4) the introduction of new kinds of manufacture, machinery, chemical products, artificial silk (acetate process), radium, etc.; (5) a considerable increase in the interest of the Banque Belge in the national industries, and, as a result of its influence, a tendency towards concentration and combination, both vertical and horizontal; (6) an extended use of electrical motive power.

Internal Communications.—There were in 1936 6,482 miles of roads, the majority of which were paved, generally with stone. Macadamization is in progress, especially in the south-east. Control of the railways (total length 1938, 6,291 miles) was made over to a private company in 1926, and it is proposed to electrify the whole system. Although financial and political difficulties have hindered progress, electrification of the line between Brussels and Antwerp was completed in 1935. The low relief of Belgium has favoured the construction of canals, which, with a total length of 1,030 miles (inclusive of navigable rivers but exclusive of drainage canals), are an important feature in the life of the country.

Labour.—Before the World War, Belgium was essentially the land of low wages. After the War wages and working conditions were greatly improved, partly as a result of the increased power of the Trade Unions; and Albert Thomas, director of the International Labour Office, stated in 1925 that Belgium was probably the country where working-class status had been most conspicuously raised since the War. One result of this is that owners of industrial undertakings can no longer make up for inferior equipment by low wages; and this is one of the most important factors in the technical progress indicated by the facts and figures set out in this article. Reference must be made to the large numbers of Belgians who, although living in Belgium, cross the frontier daily or weekly to work in the French industrial area round Lille and Roubaix. Other Belgians find seasonal work in France as farm labourers. The mobility of Belgian labour is a remarkable feature, for in addition to the instances cited a recent survey showed that many work people travel as much as 60 km. each day to their work, and that industry draws its labour not only from urban, but also from rural areas. (E. VA.; X.)

HISTORY[1]

Separation of the Northern and Southern Netherlands.—The conclusion of the Union of Arras (Jan. 6, 1579) by the Catholic provinces of Artois and Hainaut enabled Alexander Farnese (*q.v.*) to resume the war against the Protestants of the Netherlands. William of Orange was supported by the Union of Utrecht (Jan. 29, 1579), which combined the northern provinces in their opposition to the king of Spain. William of Orange at first tried to set up the duke of Anjou, the brother of the king of France, in opposition to the king of Spain; but the assistance of the ambitious duke proved to be useless. He arrived in Antwerp early in 1582, and in the following year he attempted to gain possession of the city by force (Jan. 17, 1583). This act of treachery put an end to his pretensions, and promoted the success of Farnese. On Nov. 30, 1581, the latter had captured Tournai. After a series of sieges he made himself master of Ypres, Dunkirk, Bruges, Ghent, Brussels and finally Antwerp, which capitulated on Aug. 17, 1585, after a heroic resistance.

BELGIUM UNDER SPANISH RULE

From this time onwards the whole of the southern part of the Netherlands once more recognized Philip II. as its sovereign. The system set up by the peace of Arras (May 19, 1579) in all the reconquered provinces was not one of Spanish domination, but simply of dynastic union with Spain. The country recognized Philip II. as its legitimate sovereign, but retained its autonomy. The king was represented by a governor-general at Brussels. The council of State, the privy council and the council of finance

[1]For earlier history *see* NETHERLANDS; FLANDERS; BRABANT; LIÉGE.

which acted with him were, however, composed entirely of natives of the country. All the provinces were confirmed in their constitutions and privileges. The only departments in which the king had sole control were the command of the army and foreign policy. Taxes could not be levied without the consent of the provinces. This was the principal safeguard of national autonomy; Philip II. and his successors dared not withdraw it for fear of causing a fresh revolution.

Although the peace of Arras represented the capitulation of the king of Spain in the political sphere, it gave him complete victory on the religious question. In all the provinces which Farnese reconquered the Protestants were obliged either to become reconciled to the Catholic Church or to emigrate, and Belgium, or the Spanish Netherlands, as it was then called to distinguish it from the United Provinces, henceforth became an exclusively Catholic country.

The reconquest of Belgium by Farnese was intended to be merely the prelude to that of the 17 provinces of the Netherlands. The United Provinces were supported, however, by France and England, and under Maurice and Frederick Henry, the sons of William of Orange, they successfully repelled all the efforts of Philip II.'s generals. The destruction of the Spanish Armada in Aug. 1588 and the fact that Farnese was obliged to go to France to make war on Henry IV. gave them opportunities of which they were not slow to take advantage.

Albert and Isabella.—The able Farnese died, worn out, on Dec. 3, 1592, and was succeeded as governor by the Archduke Ernest, after whose death (Feb. 1595) Philip II. decided to try a new method: The government was entrusted to the Archduke Albert (Feb. 1596), and he was instructed to conclude peace with France (peace of Vervins, May 2, 1598) so as to have his hands free for the reconquest of the United Provinces. Hoping that the Provinces would be less recalcitrant to an independent sovereign than to the Spanish crown, the king married Albert to his daughter Isabella, and on May 6, 1598, handed over the whole of the Netherlands to the newly married couple as a sovereign State. Its independence was, however, more apparent than real, and the stipulation that Catholicism was to be the only religion tolerated destroyed any prospect of winning over the United Provinces, which clung more passionately than ever to their Calvinism.

The war therefore continued. Albert was an unskilful general, and was defeated at Nieuport by Maurice of Nassau. Ambrose Spinola then took charge of military operations, and this enabled Albert to obtain possession of Ostend in 1604; but no decisive success was achieved in the north. In 1609 Albert had to conclude a twelve years' truce with the United Provinces.

The archdukes made use of the twelve years' truce to consolidate their position in the Spanish Netherlands and to reorganize Catholicism in the country on a firm basis with the aid of the Jesuits, who from that time onwards exercised a predominant influence over the religious and intellectual life of the country. They impressed themselves upon it so strongly that the results may be traced even down to the present day. The reign of Albert and Isabella was the last period of brilliance which Belgian civilization enjoyed until the 19th century. It was at this time that the school of Rubens (1577–1640) flourished at Antwerp, Justus Lipsius enhanced the reputation of the University of Louvain, and the Jesuits, who produced a brilliant group of scholars in Belgium, began the monumental work of the *Acta Sanctorum* (*q.v.; see* also BOLLANDISTS).

As Albert and Isabella had no children, it was clear that after their death Belgium would revert to the king of Spain. Albert died in 1621, and Isabella henceforth acted merely as governor for Philip IV. On the expiry of the twelve years' truce, war was resumed, with unfortunate results for Spain. Frederick Henry of Nassau captured Bois-le-Duc (1629) and Maestricht on Aug. 22, 1632. A conspiracy formed by the nobility in the same year bore significant witness to the discontented state of the country.

The situation became still more critical when, a few months after the death of Isabella (Dec. 1, 1633), France concluded an alliance with the United Provinces. The new governor, Cardinal Infante Don Ferdinand, was at first successful in resisting the double attack of the French and the Dutch. On Oct. 10, 1637, however, Frederick Henry entered Breda, and Arras surrendered to the king of France on Aug. 9, 1640. The Cardinal Infante's successor, Don Francisco de Melo, was beaten by the prince de Condé at Rocroi on May 19, 1643. In 1644 the Dutch obtained possession of Dalhem, Rolduc and Fauquemont, and in 1645 the capture of Hulst put them in complete possession of the left bank of the estuary of the Scheldt.

The Peace of Munster.—It was now clear that Spain could not continue to fight on two fronts. In order to have his hands free for the war with France, Philip IV. resigned himself to concluding peace finally with the United Provinces at Munster on Jan. 30, 1648. The independence of the United Provinces was at last recognized, and all the districts which they had conquered in Flanders, Brabant and Limburg were ceded to them. Philip IV. also granted their request for the perpetual closing of the Scheldt, thus sacrificing Antwerp to Amsterdam and the prosperity of Belgium to that of Holland.

Louis XIV.—Even this surrender to the rebel republic did not enable the king of Spain to wage war successfully on France. He suffered a series of defeats, alternating with treaties, each one of which represented a further cession of territory to the enemy. The Spanish governors who succeeded the Archduke Leopold (1647–1656): Don Juan, the son of Philip IV., the marquis of Caracena, the marquis of Castel Rodrigo, the grand commander of Castille, the count of Monterey, the duke of Villa Hermosa, Alexander Farnese, the marquis of Grana and the marquis of Gastanaga, did not receive from the exhausted Spanish monarchy sufficient money or troops to enable them to fight successfully against the king of France with his unexhausted resources. After the defeats of Lens (1648), and the Dunes (1658) the peace of the Pyrenees was concluded on Nov. 7, 1659. This treaty gave Louis XIV. the greater part of Artois and a number of fortresses along the southern frontier of Belgium. Under the Peace of Aix-la-Chapelle (May 2, 1668) he also received Charleroi, Binche, Ath, Douai, Tournai, Lille and Courtrai. Spain recovered Courtrai, Binche and Charleroi by the peace of Nijmwegen (Aug. 10, 1678), but lost in exchange Valenciennes, Maubeuge, Cambrai, Saint-Omer, Poperinghe, Cassel, Bailleul and Ypres. The *"chambres de réunion"* created by Louis XIV. made further annexations even though the two countries were at peace. Some of the annexed districts were restored under the Peace of Ryswick (Sept. 20, 1697), when Louis XIV. was for the first time compelled to give way before the general European coalition against him.

Less than three years later, on Nov. 1, 1700, Charles II., the last remaining descendant of Philip II., died at Madrid without issue. In his will he left the whole of the Spanish monarchy, including the Catholic Netherlands, to Philip of Anjou, Louis XIV.'s grandson, who took the title of Philip V.

War of the Spanish Succession.—It was obvious that Louis XIV. would not fail to take the opportunity offered by Charles II.'s will to make himself master of Belgium. From the beginning of his reign he had been constantly endeavouring to make that country an outpost of France. England and the republic of the United Provinces were equally determined to prevent him from acquiring a position so likely to be dangerous to them. In Feb. 1701, Louis XIV. caused his grandson to hand over to him the government of the Netherlands, with the complicity of the governor, Maximilian Emmanuel of Bavaria. Thenceforward war was inevitable. William III., in his dual capacity as stadtholder of Holland and king of England, had a double reason to fear French expansion, and he was at once the initiator of the war and the one who carried it on most actively.

Marlborough's victory at Ramillies (May 23, 1706) compelled the French to evacuate Belgium, and all their efforts to return were unsuccessful. The country was provisionally administered by a "Conference" composed of English and Dutch until such time as Europe should have decided on its future. This was done by the Peace of Utrecht (April 11, 1713), when Belgium received as its sovereign the emperor Charles VI., the head of the Austrian branch of the House of Habsburg.

BELGIUM UNDER AUSTRIAN RULE

The change of dynasty did not involve any change in the political system established in 1579 by the Peace of Arras. Just as there had been no Spanish domination, there was now no Austrian domination. National autonomy was maintained; the traditional institutions were preserved; the provinces continued to vote their own taxes. The only connection between Belgium and Austria was that they had the same sovereign. The Austrian emperors were represented by a governor at Brussels, just as the kings of Spain had been. The emperor also appointed a "minister plenipotentiary" at Brussels, with whom his chancellery corresponded directly, to keep watch over the conduct of the governor.

The Barrier Treaty.—In order to prevent any further attempt at annexation on the part of France, England and the United Provinces required the emperor to sign the Barrier Treaty (Nov. 15, 1715). This treaty gave the United Provinces the right to maintain garrisons at Namur, Tournai, Menin, Furnes, Warneton, Ypres and Termonde. Belgium was thus for a second time sacrificed to its northern neighbour, for whose safety it was made a bulwark. The frontier between Belgium and France, now that Louis XIV. had made restitution of the last towns he had taken (Tournai, Ypres, Dixmude, etc.), was drawn almost exactly as it stood in 1929.

The country, which had been the cockpit of Europe since the middle of the 17th century, was now exhausted. The population was profoundly discontented. Disturbances broke out at Brussels in 1717, under the administration of the marquis de Prié, minister plenipotentiary of the Governor Eugene of Savoy, who never established himself in Brussels and was governor only in name. The marquis de Prié earned the detestation of the people by ordering the execution of François Anneessens, who had tried to oppose the vote of the taxes by the Brussels municipality (1719). He was equally disliked by the nobility. The emperor recalled him in 1724, and the Archduchess Marie Elizabeth became governor.

The Ostend Company.—Peace having been restored, an attempt was made to improve the economic situation of the country. There was no hope of reviving the prosperity of the port of Antwerp, since the closing of the Scheldt had been ratified by the Treaty of Utrecht. Certain schemes which had been considered first in the time of Maximilian Emmanuel of Bavaria were, however, taken up once more. The proposal was to develop the maritime trade of Ostend and to connect it by means of canals with the Scheldt, the Meuse and the Rhine. On Dec. 19, 1722, the emperor Charles VI. founded an India company in Ostend with a capital of six million florins. England and the United Provinces were, however, alarmed at the prospect of a rival of this kind. It would have been necessary to go to war to make them agree to it, and as the emperor could not undertake this, he had to resign himself. On May 31, 1727, the Ostend company (*q.v.*) was sacrificed to "the welfare of Europe."

The Jansenist controversy, which during the past fifty years had raged with great bitterness, was a source of uneasiness to the Government. It was concluded under the governorship of Marie Elizabeth, who imposed the Bull *Unigenitus* as a rule for religion and for the State. This was a fresh victory for the Jesuits, who now ceased to have any opponents in the country.

Maria Theresa.—On the death of Charles VI., on Oct. 20, 1740, the Belgian provinces recognized Maria Theresa without opposition. The War of the Austrian Succession, however, soon spread to Belgium which, in 1744, was invaded by the French under Maurice de Saxe. The Dutch garrisons of the Barrier capitulated at once without attempting any resistance. The defeat of the English at Fontenoy on May 11, 1745 gave Louis XV. the possession of Belgium, for which Louis XIV. had striven in vain. He only occupied it as a pledge, however, and it was restored to Maria Theresa by the peace of Aix-la-Chapelle (Oct. 18, 1748).

Maria Theresa is the only foreign ruler of Belgium whose memory has remained in the affections of the nation. Her reign was a period of recovery for the country, and the population attributed the credit of this to her. As a matter of fact, Maria Theresa cared nothing for the retention of the Netherlands, which she was constantly trying to exchange for Bavaria. She only kept her Belgian provinces because she could not do otherwise. At the same time, she tried to make the best possible use of them, and in her own interest she administered them in such a way as to be able to benefit by their resources.

The alliance which she concluded with France in 1757 secured a period of peace for Belgium which lasted 35 years. The time of rest thus provided after a century of almost incessant war was utilized to the best advantage. Private individuals and the authorities of the provinces worked together in restoring the prosperity of the country and developing industry and agriculture. Roads and canals were constructed; Flemish agriculture reached such a degree of prosperity that it was regarded as a model. The old linen and lace industries were revived. In Hainaut, coal-mining and the glass industry were actively developed. The population increased with the national wealth.

The Government assisted the efforts of the people judiciously. Maria Theresa entrusted the administration in 1744 to her brother-in-law Charles of Lorraine, who became extremely popular in the country. She provided him with able ministers plenipotentiary, who adjusted customs tariffs in such a way as to protect national industries, established depots to facilitate transport, and introduced new industries.

Other reforms were introduced in order to rouse the population from the intellectual apathy into which it had fallen since the middle of the 17th century as an inevitable consequence of the misfortunes of the country. An Academy, which still exists, was founded at Brussels in 1772. When the Society of Jesus was suppressed in 1773, the Government was able to set up "Royal Colleges" in several of the towns. These were the first lay educational establishments to be created in Belgium.

Maria Theresa's innovations were inspired by the doctrine of "enlightened despotism" which the majority of European states, following the example of Prussia, were adopting as a feature of their policy. She obtained acceptance for them because of the benefits conferred by her government, and because of the skill with which she managed to avoid offending the conservatism of her Belgian subjects. Her successor Joseph II. (1780–90) acted in an entirely different manner.

Joseph II.—Joseph II. was sincerely anxious to promote the public welfare, but he was full of self-conceit, and firmly believed that progress must be imposed from above. He made up his mind to recast the institutions of Belgium according to the principles of rational and centralized absolutism. Before he succeeded his mother he had made a hurried tour through the country and had come back full of contempt for the antiquated state of affairs which he found there. His first object was to obtain the abolition of the stipulations imposed on Belgium by the Munster and the Barrier treaties, which he regarded as equally incompatible with the principles of equity and with his sovereign rights. Maria Theresa had already refused to pay the sums due for the upkeep of the Dutch garrisons. In 1781 Joseph informed the States-General of the United Provinces that he had decided to dismantle the Belgian fortresses, and that they should therefore recall their troops. They accepted the situation so readily that he thought he would also be able to reopen the Scheldt. Much to his surprise, the Dutch fired on the vessels which he had ordered to sail up and down the river. The outbreak of war was prevented by French intervention, and the Treaty of Fontainebleau (Nov. 8, 1785) confirmed the *status quo*.

Joseph II. might have won popularity by the above actions, but the internal reforms which he introduced aroused both religious and political opposition. His first measures were aimed at the Church. The Edict of Tolerance (Oct. 1781), which recognized religious freedom in Belgium for the first time since the peace of Arras, deeply offended the clergy and the Catholic sentiments of the population. The suppression of the "unnecessary" convents (1783), of the religious confraternities, and of pilgrimages, the closing of the episcopal seminaries and their replacement by two seminaries founded by the State at Louvain and Luxembourg (1786) aroused intensely bitter feeling.

Still greater hostility was aroused by Joseph II.'s attempt to modify the traditional institutions of the country. He refused to listen to the counsels of prudence given him by his sister Marie Christine, the governor, and by the ministers plenipotentiary; and insisted on introducing innovations which, although in accordance with the spirit of the age, were most objectionable to Belgian conservatism: abolition of the gilds, abolition of torture, reorganization of the administration of the finances and of public works, and free trade in corn. Finally, in 1787, the whole administration was remodelled. The country was divided into nine districts (*cercles*) with "intendants" at their head, attached to a council of Government meeting at Brussels. Justice was to be administered by two supreme councils at Brussels and Luxembourg, and by 63 courts of first instance.

Thus, by nothing less than a *coup d'état,* the traditional autonomy of the Belgian provinces, which had been respected by all their rulers from Philip II. onwards, was destroyed and replaced by a centralized system working by the emperor's orders. Even men of advanced opinions, who realized that the constitution stood in need of improvement, were as angry as those of conservative views at seeing the emperor dispose of their country without consulting them. A formidable movement of opposition broke out in all the provinces. Marie Christine, the Governor, dared not enforce the edicts. The emperor however persisted. He sent a new minister plenipotentiary, the count of Trauttmannsdorff, to Brussels, and entrusted the command of the troops to Gen. d'Alton, who had orders to enforce the reforms and repress disturbances.

The Brabançon Revolt.—If the emperor was obstinate, the country was equally so. The States of Hainault and Brabant refused to pay taxes. The infraction of the privilege of the *Joyeuse Entrée* (*q.v.*) brought popular exasperation to a head. The events then taking place in France, and especially the news of the taking of the Bastille, encouraged the inhabitants of Belgium in their resistance. The conservatives, whose leader was the lawyer van der Noot, combined with the partisans of national reform, the chief of whom was another lawyer, Vonck. They fled to Holland, where they formed a corps of volunteers. On Oct. 24, 1789, under the leadership of Col. van der Mersch, they invaded Campine, and contrary to all expectation defeated the Austrian troops at Turnhout. This was the signal for a general rising. The garrison of Ghent capitulated on Nov. 16, and that of Mons on Nov. 21. Brussels rose in revolt on Dec. 10. Two days later the Government and the troops hurriedly evacuated the city. All Belgium, with the exception of Luxembourg, where the army was concentrated, was in a state of revolt.

The various parties were, however, very far from unanimity in their political views. The various provinces constituted themselves into the Belgian United States on Jan. 11, 1790, and entrusted executive power to a sovereign congress. Two opposing parties at once appeared in the congress. The democrats or Vonckists wished to adopt a constitution based on the principles laid down by the French National Assembly; the aristocrats or van der Nootists simply desired to restore the position which had previously existed. The latter were supported by the clergy and by the majority of the public. Riots broke out; Vonck's partisans were terrorized, and left the field clear for their opponents. Van der Noot, who hoped to obtain the support of the United Provinces and of Prussia, was quite unable to control events. The Belgian republic, torn by internal disputes, soon fell into a state of anarchy and was unable to prepare its resistance.

Joseph II. died on Feb. 20, 1790, and was succeeded by Leopold II. Leopold first attempted to win over the Belgians by conciliatory means, but his proposals were rejected. After his reconciliation with the king of Prussia at the Convention of Reichenbach (July 27, 1790) he had recourse to arms. The Belgian army was driven back without difficulty, and on Dec. 2 the Austrian troops under Gen. Bender entered Brussels. A few days later the subjection of the country was complete. The revolution inaccurately known in history as the Brabançon Revolt was at an end.

Leopold, who did not wish to provoke further disturbances, made no attempt to reintroduce Joseph's reforms. Government was restored in the form in which it had existed under Maria Theresa. In spite of this, the restoration continued to be exceedingly unpopular. The course which the French revolution was taking revived the hope of Belgian independence. Thus, when war broke out between France and Austria, and Dumouriez won the battle of Jemappes (Nov. 6, 1792) and occupied Belgium, his victory was at first welcomed by the population. Dumouriez would have liked to make Belgium into a republic and to make use of it to further his plans for a restoration of the monarchy in France. He relied on the Vonckists for support, and by doing so at once excited the hostility of the conservatives. The French convention, however, thwarted his plans, and was obviously preparing the way for the annexation of the country. The enthusiasm with which he had at first been greeted soon gave place to unconcealed dislike. When the Austrians resumed the offensive, and defeated Dumouriez at Neerwinden (March 18, 1793) and once more took possession of Belgium, the Belgians resigned themselves without difficulty.

ANNEXATION OF BELGIUM BY FRANCE

The restored regime was of short duration. Jourdan's victory at Fleurus (June 26, 1794) resulted in a fresh conquest of the Netherlands by France. The rule of the Austrian sovereigns was abolished in fact, and the position received legal sanction by the treaties of Campo Formio (1797) and Lunéville (1801), under which Francis II. recognized the annexation of Belgium by the French republic.

The battle of Fleurus enabled France to accomplish what Louis XIV. had planned. After a period of occupation and military rule, the Convention on Oct. 1, 1795, voted the annexation of Belgium and the principality of Liége (*q.v.*) which was thenceforth amalgamated with it.

France accomplished, but in a far more radical manner, what had been attempted by Joseph II. A modern State was built up on the ruins of the past. All branches of the administration were centralized and systematized. All privileges were abolished. The Church, which had formerly been so powerful and so deeply respected, was persecuted. It is not surprising that the Belgians detested the new regime. Their hostility was the greater for the terrible economic crisis which accompanied the change of rule. The introduction of military conscription led in Oct. 1798 to a revolt of the peasants in the Flemish districts of the country which was repressed without mercy.

Napoleon's *coup d'état* in Nov. 1799 was the starting point of a new era. Under the consulate and the empire Belgium became accustomed to the new system which was introduced, and which still constitutes the basis of its administration. The country was divided into nine departments, each under a prefect. Courts of first instance and courts of appeal were created, and had to administer the French code of laws. A metric system of weights and measures and currency was introduced. The clergy were reconciled with the Government by the *Concordat.* With the vast markets of the empire now open to Belgian industry a period of unprecedented activity succeeded. The manufacture of cotton and beet sugar was introduced and made rapid progress.

The Napoleonic regime nevertheless remained unpopular. The complete lack of political liberty, the exigencies of conscription and the abuses of the Continental System (*q.v.*) led to a spirit of disaffection which, by the time of the fall of the empire, had become general. The occupation of Belgium by the allies in 1814 was hailed with relief.

THE KINGDOM OF THE NETHERLANDS

The Powers were determined not to leave France in possession of Belgium. It could not be given back to the Austrian emperor, who in any case did not desire it. Under the influence of England it was decided to unite it in a single State with the old Republic of the United Provinces, and thus to constitute a new barrier better capable of resisting future French expansion than that of 1715. The Kingdom of the Netherlands, the existence of which was confirmed by the Treaty of Vienna (June 1815), was thus established for the convenience of Europe, regardless of the

wishes of the Belgians and the Dutch who would have to live side by side in one country. Prince William of Orange ascended the throne on March 16, 1815, under the title of William I.

William I.—The new ruler was faced with the task of assimilating two peoples which for the last 200 years had had strikingly contrasted customs, economic interests, ideas and above all religions, the one being Catholic and the other Protestant. The Fundamental Law (*Grondwet*) of the new kingdom gave the Belgians and Dutch an equal number of representatives in the States-General, although the population of Belgium was three and a half millions and that of Holland only two millions. It also recognized religious liberty, and this was obnoxious to the Catholic Church. Finally, it gave extremely wide powers to the king, who was Dutch and Protestant. All these provisions were offensive to the Belgians. The king laid the Constitution before the "notables" for adoption; they rejected it, but it was nevertheless promulgated. During the first few years, however, the situation appeared to be not unsatisfactory. Belgium began to assume the industrial character which has distinguished it ever since. Antwerp once more became an important port. The cotton spinning industry at Ghent, the manufacture of linen at Verviers, and the coal-mining industry in the Liége and Hainault districts attained even greater prosperity than during the French occupation. The Dutch colonies provided new markets for export.

The king also endeavoured to promote education, which, with the support of the opponents of the old régime, who were apprehensive of the influence of the Church, he organized under the auspices of the State. Universities were founded at Ghent, Liége and Louvain; *"Athénées"* were created; the independent, *i.e.*, ecclesiastical, schools were subjected to inspection. On June 14, 1825, a "Philosophical College" was set up at Louvain, and seminarists were required to attend it. These measures revived the hostility of the clergy. The substitution of Dutch for French as the official language irritated the middle classes, which had been affected by French influence. Finally, there grew up a liberal party which attacked the king's prerogatives in the name of parliamentarianism.

William, who was naturally obstinate, persisted in his plans. The opposition journals were prosecuted, but this only increased the strength of the movement. It became irresistible when, in 1828, the Liberals and the Catholics, who up till then had opposed one another, concluded the "union of parties." A general petition for the redress of grievances was organized, and by Nov. 1829 had obtained over 300,000 signatures. The king's refusal to yield was bound to lead to a revolution. All foreign observers were united in expecting such a development as early as 1829. The Paris revolution of July 1830 was thus not the cause of that which broke out in Brussels a few weeks later; but it fired the train.

The Belgian Revolution.—The disturbances broke out on Aug. 25, after a performance of *La Muette,* an opera abounding in appeals to liberty. The authorities were taken by surprise and lost their heads; the troops retired, without resistance, on the royal palace. On the following day a citizens' guard was organized under the command of Emmanuel d'Hoogvorst, and took over the duties of the lawful authorities. Disturbances at once broke out in the provinces in sympathy with those in the capital, and the red, yellow and black flag which had been the sign of the Brabançon Revolt began to be shown. No one, however, yet contemplated the overthrow of the dynasty. All that was demanded was the administrative separation of Belgium and Holland.

The king failed to realize the importance of the movement, and still thought that it could be suppressed. He hurriedly sent his sons to Brussels at the head of a small body of troops. They found the town prepared for resistance, and as they did not dare to risk a fight, the prince of Orange, the heir to the throne, consented to parley with the rebels. He was unsuccessful, and on Sept. 3 he left Brussels, taking the garrison with him.

While the king was summoning the States-General at The Hague, volunteers were flocking into Brussels. Charles Rogier (*q.v.*) arrived at the head of a troop of Liégeois. French republicans came to foment the revolt. All regularly constituted authority was abolished. William, who hoped to obtain the support of the moderates, sent his second son, Prince Frederick, to occupy the town. His troops entered Brussels on Sept. 23, but were received by the population with a fusillade which checked their advance. After three days' fighting they retreated, and the volunteers and the citizens' guard, whose numbers were swollen by contingents from all parts of the country, victoriously pursued them to Antwerp.

The Provisional Government.—On the evening of Sept. 23 there had been constituted an "administrative committee" which took the title of provisional Government. It included Rogier, d'Hoogvorst, Joly, F. de Mérode, Gendebien, Van de Weyer, and after the 28th, L. de Potter. This revolutionary Government took no further notice of the States-General, which on the 29th voted in favour of the separation of the two parts of the kingdom. It also refused to negotiate with the prince of Orange, whom the king had sent to Antwerp, and who, exceeding his instructions, went so far as to recognize the Belgians as an "independent nation." On Oct. 4, the provisional Government had itself proclaimed national independence, paying no attention either to the king or to the Powers which had set up the kingdom of the Netherlands. The revolt was thus not merely against William, but also against Europe. On the same day as it proclaimed national independence, the provisional Government summoned a congress to draw up the constitution of the country. The congress met on Nov. 10.

In the meantime, the Belgians had captured Antwerp. Gen. Chassé maintained his position in the citadel, and bombarded the town from there. The only result was to exacerbate the hatred felt for the king and the dynasty. On Nov. 24 the congress voted the perpetual exclusion of the house of Orange from the throne of Belgium.

The London Conference.—William had already appealed to the Powers to intervene, and in November, at the proposal of Great Britain, a conference of ambassadors was called in London. The main object was to avert a European war, which would have been the inevitable consequence if France had intervened in Belgium. Under the influence of France and Great Britain, Russia (which was paralysed by the Polish rising), Prussia and Austria consented to give up the principle of legitimacy. On Dec. 20, the conference imposed an armistice on William and the Belgians, invited the provisional Government to send a deputation, and declared the dissolution of the Kingdom of the Netherlands. A month later, on Jan. 20, 1831, it decided that Belgium should be an independent and perpetually neutral State, not guaranteed by the Powers.

BELGIUM INDEPENDENT

The Powers wished the congress to give the crown to the prince of Orange, but instead of doing so it elected the duke of Nemours, the son of Louis Philippe (Feb. 3, 1831). For the sake of preserving peace, the king of France refused his consent. The congress then set up a regency. The office of regent was entrusted to the president of the congress, Surlet de Chokier. There ensued a period of anarchy, and France tried to take advantage of it to bring about the partition of Belgium between itself and Holland. Lord Palmerston took a firm stand in favour of the decisions which had been adopted. The election of Prince Leopold of Saxe-Coburg as king put an end to the crisis. The conference drew up a treaty of Eighteen Articles (June 26, 1831) regulating the separation between Belgium and Holland. It was accepted by the congress, and on July 21 Leopold, who had made his consent conditional on the acceptance of the treaty, arrived in Brussels and took the oath of allegiance to the constitution.

The Treaty of Twenty-four Articles.—Some days later, William invaded Belgium (Aug. 2, 1831). His troops easily defeated the Belgians, who had not been able to organize an army. Leopold appealed to France, and with the consent of the conference, Louis Philippe sent Marshal Gérard to restore the position. The Dutch retreated before him without an action.

The conference then replaced the treaty of Eighteen Articles by a much less favourable treaty of Twenty-four Articles (Oct.

14, 1831). Leopold accepted it, but William protested against the forcible measures used against him, and refused to sign the treaty. His resistance was not broken down even when France and Great Britain blockaded the Dutch ports and when the citadel of Antwerp was bombarded by the French, who captured it on Dec. 23. On May 21, 1833, however, William agreed to conclude a provisional convention with Palmerston and Talleyrand for the maintenance of the *status quo*. This was all in favour of the Belgians, who not only continued to occupy Limburg and Luxemburg, which they would have had to hand back under the Twenty-four Articles, but contributed nothing to the debt of the kingdom of the Netherlands, for which Holland remained exclusively responsible.

William was thus obliged to accept the Twenty-four Articles on March 14, 1838. Belgium attempted to obtain their revision, but only received certain financial concessions. Parliament decided to accept the provisions which constitute the treaties of April 19, 1839. Peace was thus restored between Holland and Belgium, and Holland recognized the new kingdom. Part of Luxemburg was allotted to Belgium, and the rest became a Grand Duchy which was a member of the German confederation under the sovereignty of William. Limburg and Maestricht remained in the possession of Holland. In return, Belgium was recognized as an "independent and perpetually neutral State" under the guarantee of the Powers.

The Belgian Constitution.—The Belgian constitution adopted by the congress on Feb. 7, 1831, to which Leopold had taken the oath of allegiance on his accession, was the most liberal in Europe. It established a strictly parliamentary monarchy based on the principle of national sovereignty. The rights of the subject were more far-reaching than in any other country except England. Under the influence of the reaction against William's absolutism, the executive powers allotted to the king were reduced to the minimum.

Leopold I.—During the first years of Leopold I.'s reign, the general impression was that the new kingdom could not last. The revolution had resulted in a terrible economic crisis, and the discontented manufacturers formed a small but exceedingly energetic Orangist party which was encouraged by the king of Holland. It was thought that the constitution would make it impossible for the king to govern. Thanks, however, to Leopold's wisdom and devotion, and thanks also to the energy of the nation, all the difficulties were overcome. In order to give the country fresh markets, an act was passed in 1834 for the construction of railways. These were some of the first railways to be built on the Continent. Laws regulating the administration of the provinces and the municipalities were passed in 1836. The army was established on a sound basis. After 1839 the Orangist agitation declined and soon died away altogether.

Up to this point the Catholic and Liberal Parties, whose joint action had made the success of the revolution possible, had worked together in parliament. They began to diverge soon after the existence of the State had been guaranteed by the treaties of 1839. The system of coalition ministries was gradually replaced by that of ministries representing the party which had a majority in the chambers. After the disturbances of 1856 which led to the resignation of the Catholic ministry of de Decker and brought Rogier's Liberal ministry into power, the new system was regularly applied.

The Crisis of 1848.—The king guided the foreign policy of the country firmly in the spirit of neutrality required by the international undertakings which it had assumed. He gave proof of this in the crisis of 1848. Thanks to the liberal character of its institutions and to the electoral reform measure unanimously adopted by the chambers, Belgium, alone among the countries of the Continent, escaped the disturbances which then prevailed throughout Europe. From that time onwards its political system was regarded as a model. The Belgian constitution was imitated more or less exactly by all the Continental countries which adopted the Parliamentary régime in the 19th century.

The fall of Louis Philippe, whose daughter, Louise Marie, Leopold had married on Aug. 9, 1832, and subsequently the *coup d'état* of 1852 by which Napoleon III. became emperor of the French, placed Belgium in a difficult position. The freedom of the press which prevailed in Belgium made it possible for French refugees in that country to carry on republican propaganda against Napoleon III., and this gave rise to unpleasant incidents which gave some show of justification for the annexation schemes which the emperor was thought to cherish. As early as 1853 the king made efforts to induce parliament to grant funds by means of which Antwerp was surrounded with a ring of forts to serve as a stronghold for the army in case of war.

Admirable measures were taken to assist the economic development of the country. After 1849 a policy of free trade was gradually substituted for protectionism. A national bank was founded in 1850; the local *octrois* (dues on foodstuffs brought into towns) were abolished in 1860; in 1863 the dues payable by ships sailing up the Scheldt to Antwerp were redeemed. Between 1861 and 1863, commercial treaties were concluded with a large number of countries.

Leopold II.—The grief displayed by the nation at the death of Leopold I. (Dec. 10 1865), and the loyalty with which the accession of Leopold II. was welcomed, proved that the new régime was firmly established. The international situation was critical. Napoleon III. was anxious to seek compensation for the triumph of Prussia at Sadowa. The tone of the Paris press towards Belgium was threatening. The attempts which the emperor made in 1867 to acquire the Grand Duchy of Luxemburg were a disquieting symptom, in spite of their failure. In the following year the French railway company of the *Est* negotiated for the purchase of the railways of the province of Luxembourg. The Chambers on Feb. 23, 1869, adopted emergency legislation prohibiting the sale of the railways, and a rupture was only averted by the energy and skill with which negotiations were conducted by the minister Frère-Orban, who was supported by the British cabinet. The war of 1870 provided fresh proof of the Government's determination to preserve neutrality. The army was mobilized and sent to the frontier with orders to repulse any troops which attempted to cross it. The victory of Prussia completely altered the position of Belgium. The increased strength of Germany on the one hand and the possibility of a French *revanche* on the other greatly complicated its duties as a neutral State. In order to provide for future eventualities, the king induced parliament in 1887 to grant credits for the fortification of the positions of Liége and Namur on the Meuse.

Revision of the Constitution.—In the meantime the conflict of parties was growing more acute. The Education Act adopted in 1879 under the Frère-Orban cabinet met with strong resistance from the Catholics. The Government broke off diplomatic relations with the pope. The Liberal Party, however, was weakened by the dissension in its ranks between the moderate or "doctrinaire" elements and the "progressives"; and it was defeated at the 1884 elections. From that time onwards there was always a Catholic ministry in power until 1914.

At this time the working classes did not have the right to vote, and the long-standing discontent to which this gave rise facilitated the spread of socialist opinions amongst them. In March 1886 there was a riot at Liége which was followed by very serious outbreaks in all the industrial districts. They were repressed with much bloodshed. The Beernaert ministry ordered an enquiry into the position of the workers, and it was found that social reforms were long overdue and must be undertaken without delay. From 1889 onwards a series of laws were adopted on workers' housing, the employment of women and children, factory inspection, workmen's compensation for accidents, and so on.

The constitution restricted the suffrage to a minority of the nation, and its extension was demanded with increasing vigour by the progressives and socialists. In 1890 the chambers voted in favour of the principle of the revision of the constitution. The delays which occurred in carrying out the revision gave rise to dangerous agitation, but the revised constitution at last received the royal assent in Sept. 1893. Universal suffrage was established, but the system was tempered by plural voting, which gave more than one vote to electors fulfilling certain conditions as regards income, age, education and family. The reform of the electoral

system was completed by the adoption of proportional representation in 1899.

The Flemish Question.—The progress of democracy gave increasing scope to the Flemish movement. Although freedom to use either language is one of the principles of the Belgian constitution, French alone was used for legislative and administrative purposes in the years which followed the revolution. French was as a matter of fact the language of the enfranchised middle classes both in the Flemish and the Walloon provinces. Between 1840 and 1850, however, there began to be protests against a state of affairs which placed the Flemish language in a position of inferiority and was injurious to the rights of those who used it. In 1856 the Government set up a commission to study the question of linguistic grievances. It was, however, some time before parliament began to adopt a series of laws intended to redress those grievances. The Government set up a Flemish Academy in 1886. In 1898 an act was adopted establishing the equality of the two national languages; laws were thenceforward adopted both in French and in Flemish. In 1912 a private bill proposing to transform the University of Ghent into a Flemish university was laid before parliament. In 1914 it was laid down that in the Flemish-speaking districts of the country, elementary education must be given in Flemish. The *flamingants* did not form themselves into a separate party, and it should be noted that their demands were not directed against their Walloon compatriots, towards whom they felt no national hostility. They simply desired that the State should give the Flemish-speaking Belgian the same treatment as the French-speaking Belgian, and that not merely in law but in fact. The French language nevertheless continued to spread. In 1910 there were in Belgium 2,833,334 persons speaking French only, 3,220,662 Flemish only, and 871,288 bilingual.

The system of military service based on selection by lot, with the possibility of providing a substitute, meant that in practice the well-to-do classes were exempt. This constituted a social injustice and a danger to which the king for a long time drew attention without success. The revision of the constitution strengthened the position of the partisans of personal service, and that system was adopted in Dec. 1909. A few days later, on Dec. 17, Leopold II. died at Laeken after a reign of 43 years.

The Congo.—From the beginning of his reign, Leopold endeavoured to develop the colonial policy of Belgium. His personal interest in the exploration and commercial development of the equatorial regions of Africa led, in the creation of the Congo Free State, to results which had originally not been anticipated. The *Comité des Études du Haut Congo,* formed in 1878 at the instance of the king and mainly financed by him, had developed into the International Association of the Congo, of which a Belgian officer, Col. M. Strauch, was president. Through the efforts in Africa of H. M. Stanley a rudimentary State was created, and through the efforts of King Leopold in Europe the International Association was recognized during 1884–85 by the Powers as an independent State. Declarations to this effect were exchanged between the Belgian Government and the association on Feb. 23, 1885. In April of the same year the Belgian chambers authorized the king to be the chief of the State founded by the association, which had already taken the name of *État Indépendant du Congo.* The union between Belgium and the new State was declared to be purely personal, but its European headquarters were in Brussels, its officials, in the course of time, became almost exclusively Belgian, and financially and commercially the connection between the two countries became increasingly close. In 1889, King Leopold announced that he had by his will bequeathed the Congo State to Belgium, and in 1890 the Belgian Government, in return for financial help, acquired the right of annexing the country under certain conditions. It was not until terrible reports of misgovernment created a strong agitation for reform in Great Britain, America and other countries responsible for having aided in the creation of the State, that public opinion in Belgium seriously concerned itself with the subject. The bill for annexation was finally passed in Sept. 1908. The full story of the Congo enterprise will be found under AFRICA; CONGO FREE STATE and BELGIAN CONGO.

Albert I.—As Leopold II. had no son, the crown passed to his nephew Albert, who had married princess Elizabeth of Bavaria on Oct. 2, 1900. He took the oath of allegiance to the constitution on Dec. 23, 1909. The early days of his reign were marked by a violent agitation by the Socialist Party in favour of universal suffrage without qualification. There was a general strike in 1913, but no disturbances took place.

In the same year the anxiety to which the international situation gave rise led the Broqueville ministry to pass a measure for the general reorganization of the army on the basis of universal military service, the reform to be completed in five years.

THE WAR PERIOD, 1914–18

The international crisis which came to a head in July 1914 found Belgium unprepared for war, in spite of her recent military laws. The neutrality of Belgium and Luxemburg had been guaranteed by the five Great Powers (Great Britain, France, Prussia, Russia and Austria) in the treaties of 1839, which bound the guaranteeing Powers to intervene if either party to a war violated that neutrality. On July 30, following the precedent in 1870, Sir Edward (Viscount) Grey addressed a message to the French and German Governments, drawing their attention to this point and asking for an assurance that Belgian neutrality would be respected. The German Government declared itself unable to answer this question; and on Aug. 2 invaded Luxemburg and sent Belgium an ultimatum calling on her to allow the German troops free passage across Belgian territory. If the request was refused, Germany would treat Belgium as an enemy. To this note Belgium, which had mobilized 15 classes of militia on July 31, replied by a formal refusal on Aug. 3. Parliament accepted war unanimously, and the Socialist Party assured the Government of its unreserved support. The leaders of the Liberal and Socialist Parties, MM. Goblet d'Aviella and Hymans and M. Vandervelde, joined the Government as ministers without portfolio.

The German Invasion and Occupation.—In the night of Aug. 3–4 the German army invaded the country. Liége fell on Aug. 7 and Namur on Aug. 23. It is estimated that in the province of Namur 1,949 civilians were killed and 3,000 houses destroyed. After their entry into Louvain the Germans set fire to the centre of the city, when the cathedral of St. Pierre, the famous library and 1,120 houses were destroyed. Seventy-nine of the inhabitants were shot. The town of Aerschot was almost destroyed. The Germans entered Brussels on Aug. 20. In the course of the occupation of Brabant 594 inhabitants were shot and in the Antwerp and Hainault provinces 665 persons. Antwerp was evacuated by the Belgians on Oct. 6, and with the withdrawal of the Belgian army to the Yser under the direction of King Albert, the whole country, with the exception of the south-western districts of Flanders, was under German occupation. (*See* WORLD WAR I.)

Germany sent Gen. von der Goltz, Baron von Bissing, and Gen. von Falkenhausen as successive governors-general. The governor-general, assisted by a central staff, exercised executive power. He legislated by promulgation of orders, except in the two Flanders, Hainaut and South Luxembourg, where all power rested with the highest local military authorities. Provinces and districts were administered by German officials, with military commandants of arrondissements. The powers of the Belgian provincial councils were finally suppressed on July 6, 1918. Many Belgian burgomasters were deported. The occupied territories paid a tribute, amounting finally to 60,000,000fr. per month, for the maintenance of the German army in Belgium. The legislative measures instituted by the German military tribunals were numerous and repressive. Von Bissing also instituted, Feb. 5, 1915, a new judicial system, with two courts of instance, that of the provincial governors and of the heads of arrondissements and of commandants. The executive and judicial powers were not separated. On April 3, 1917, the governors were empowered to pronounce total or partial confiscation of property. The Belgian judicial powers were suppressed by a decree of April 7, 1918. German *Kaiserliche Bezirksgerichte* replaced the Belgian *tribunaux répressifs.* The family was pronounced responsible for faults committed by a single

member of it. A sentence pronounced on an absentee could be served by a third person; general confiscation of all property, forbidden by the Hague Convention and the Belgian constitution, was introduced, as was deportation for refusal to work for the German authorities, or even for simple "undesirability." On April 7, 1918, German tribunals of first instance and appeal (in Brussels and Namur) replaced all civil Belgian jurisdiction. The Belgian magistrates, bench of judges and court of appeal made frequent protests. Three presidents of the last-named were deported in 1918 in consequence of a conflict arising out of the arrest of certain "activist" leaders.

In order to disorganize the country, Germany sought to exploit the linguistic differences between Belgium's northern and southern provinces with the help of the so-called *parti activiste*. The "activists" consisted of a small minority of persons who expected Germany to be victorious. The Flemish party energetically disavowed them; and to the last the nation maintained its anti-German attitude, encouraged by exhortations of Cardinal Mercier (d. Jan. 1926). From 1916 on, various decrees abolished the French language in the previous bilingual administration of Flanders. On March 21, 1917, a decree was issued dividing Belgium into two distinct linguistic regions, with administrative centres at Brussels and Namur. All ministries were doubled, the Flemish remaining in Brussels, the Walloon moving to Namur. French became the only official language in the Walloon district, Flemish in the west. The use of German and Flemish was, however, authorized in Walloon territory. The *activistes* attempted to organize a new independent Flemish State under German protection. On Feb. 11, 1918, an enormous demonstration was held in Brussels against separation. German troops dispersed the crowds, but, in face of the unanimous protests of the Belgian authorities, Germany did not dare recognize a legislative authority for the *Raad van Vlaanderen*. With ceaseless energy, however, she continued her efforts to foster linguistic differences, notably by flemicizing the University of Ghent (1916).

Industrial Distress.—Industry suffered severely from the occupation. Raw materials were requisitioned, foreign enterprises put under sequester on Feb. 17, 1915, together with all industrial concerns which might be useful or dangerous to Germany, especially great metallurgical businesses, quarries, mines, electricity works, etc. In 1915 central offices were set up for the coal, oil and grease, water, gas and electrical industries.

The stoppage of overseas exports ruined Belgian industry. Unemployment increased enormously, reaching 650,000 in 1916. Germany desired to recruit these workmen for her own use, but met with obstinate refusals. On Aug. 14 and 15, 1915, the first decrees appeared ordering severe penalties for persons who refused to work for Germany. At the same time, commissions were sent from Germany to take out of the Belgian workshops everything which could be used beyond the Rhine, and to destroy systematically all machinery which could not be transported to Germany. By June 30, 1918, 167 factories had been completely destroyed, and 161 were on a list of the governor-general's for immediate destruction. Of the 57 blast furnaces, 26 had been razed to the ground, 20 put completely out of action. Only the mines necessary for Germany were spared.

On Feb. 18 and July 21, 1917, work was forbidden in all factories and workshops except by special permission. At this moment Germany ordered the stoppage of all public works undertaken by the provinces and communes for the relief of unemployment. These steps were preliminary to the plan of deporting the Belgian working population. In November the military authorities requisitioned able-bodied men between the ages of 17 and 60 throughout the whole country. Inhabitants on the lines of communication were mostly sent to the Yser or North French fronts, to construct railways, prepare routes and dig trenches, often within the range of artillery. The other workmen were concentrated in great camps in Germany, whence they were dispatched to German factories or labour battalions; 57,718 were transported to Germany, 57,541 to the front; 2,531 died in consequence of ill-treatment.

Foodstuffs began to grow short in Nov. 1914. Immediately on occupation, the German Government had repealed all measures taken by the Belgian Government to ensure rationing. Public authority had now no further power to intervene, and private initiative stepped in. Committees sprang up everywhere. A central committee was founded at Brussels under the title, *Comité Central de Secours et d'Alimentation,* under Ernest Solvay. The committee desired to import foodstuffs from England, but the British Government refused. Finally, von der Goltz having promised to exempt all imported foodstuffs from requisitioning, the British Government consented to allow their import under supervision of the embassies of Spain and the United States. The "Commission for Relief in Belgium" was set up to organize the supervision. The activity of the Comité Central acquired enormous importance, and extended throughout the country. It then changed its name to *Comité National de Secours et d'Alimentation.* By Dec. 31, 1918, it had distributed foodstuffs to provincial committees to the value of over 3½ milliard francs (2½ milliards for Belgium, 1 milliard for France). The profit made on the sale of foodstuffs was used to organize charitable works at an expenditure of 1,300,000 francs. After America's entry into the war H. C. Hoover resigned his post as president of the commission for relief, and a Spanish-Dutch committee took over the work.

The Belgian Government.—The German occupation forced the Government to retire, first to Antwerp, then to Ostend, then to Havre. At the same time, over 1,000,000 Belgians left the country, 200,000 fleeing to France, 100,000 to England and 700,000 to Holland. The Government in Havre immediately set about reorganizing the army, which had never left the front. On March 1, 1915, the Government called to the colours all Belgians from 18 to 25; numerous volunteers joined the forces; and the Government was able to maintain an army in the field with a mean effective strength of 150,000.

PEACE AND RECONSTRUCTION

Belgium was represented by Hymans, Vandervelde and Van den Heuvel at the Peace Conference, but was not admitted to the deliberations of the Council of Ten. At the second plenary session of the Peace Conference the Belgian, Canadian and certain other delegates protested against the control assumed by the "Big Five"; and from that time more scope was given to the representatives of nations other than the principal allied and associated Powers. Hymans played an important part in drafting the Covenant and Vandervelde in framing the constitution of the International Labour Office. By the Treaty of Versailles Belgian neutrality was abolished. Germany renounced in her favour her rights over Moresnet and the Walloon cantons of Eupen and Malmédy (*q.v.*). Belgium was confirmed in the possession of these two cantons by the League of Nations. The Grand Duchy of Luxembourg, on July 25, 1921, entered into a customs, railway and consular union with Belgium. In Africa, Belgium received the mandate for the Urundi and the Ruanda, representing part of the territories conquered by the Belgian army, which was operating with the forces of the British empire during the war. (*See* RUANDA-URUNDI.)

After the war the problem of Belgium's international status took on a new form. Belgium was anxious to free herself of the restrictions on her right as a sovereign state to form defensive alliances, especially as the guarantee of neutrality which had been substituted for this right had proved ineffectual. The Treaties of Versailles, Saint-Germain and Neuilly accordingly contained the provision that Germany, Austria and Hungary recognized that the treaties of 1839 no longer conformed to the requirements of the situation, consented to their abrogation and accepted in advance whatever arrangements might be made to replace these treaties by the principal allied and associated Powers, or by any of them in concert with the governments of Belgium and of the Netherlands.

The logical consequence of the new position was a military convention concluded in Aug. 1920 between Belgium and France, after full consultation between the respective general staffs. In Nov. 1920 the two governments informed the League of Nations that the military alliance had been concluded, and that it was of purely defensive character. Belgium offered to conclude a similar agreement with Great Britain; indeed, her ardent hope was to see a

Belgo-Franco-British entente established. This could not be achieved; but the Belgian foreign policy endeavoured to maintain the traditions of the entente and to reconcile the British and French points of view. In the Locarno Pact (*q.v.*) Oct. 16, 1925, Germany, Belgium, France, Great Britain and Italy took note of the abrogation of the treaties for the neutralization of Belgium. A treaty signed in Paris May 22, 1926, by Great Britain, France and Belgium confirmed the abrogation of these treaties.

Belgium's policy had naturally been mainly influenced by the two problems of security and reparations (*see* the articles under those headings). Under the influence of the latter problem she joined the French in their occupation of the Ruhr (*q.v.*). In order to arrive at a practicable settlement of the reparations question, Belgium repeatedly sacrificed her rights of priority for the benefit of her Allies (*e.g.*, July 1920, Aug. 1921, July 1922). Belgium became a non-permanent member of the Council of the League of Nations on its formation. Paul Hymans was elected the first president of the League.

The Treaty of Versailles guaranteed Belgium priority for the sum of 2,000,000 gold marks on reparations account. In addition her allies declared themselves ready to transfer Belgium's war debt (5,600,000,000fr.) to the German reparations account. In 1925 the United States required from Belgium recognition of her war debt, although the remission of this debt had been foreseen by the treaty, and an arrangement was concluded Aug. 18, 1925. On Dec. 15, 1932 Belgium ceased these payments, however.

The question of the Schelde was not solved by the Treaty of Versailles. Belgium attempted to reach a *modus vivendi* on this subject with Holland; but no arrangement could be reached, as Holland laid claim not only to the sovereignty of the waters of the Schelde, but also to the sovereignty of the Wielingen channel which would have made possible the complete isolation of Belgium from the sea. On April 3, 1925, a new treaty was signed settling the relationship between the two countries. In 1927 a general treaty was drafted by the Belgian and Dutch Governments, which was accepted by the Belgian parliament but rejected by the parliament of the Netherlands.

Reconstruction.—After the conclusion of peace the Government was chiefly occupied with the problem of feeding the country, which necessitated various measures prohibiting export and authorizing the requisitioning of home-grown foodstuffs. In consequence of the destruction of industry, there were 800,000 unemployed in the country, and 2,400,000 persons, or one-third of the population, were dependent on public assistance. The State was obliged to create relief works immediately. The number of persons organized in trade unions rose from 200,000 in 1914 to 600,000 in 1919. By the end of 1919 the 2,000km. of railway which had been destroyed were reconstructed. Thanks to the recovery of the 24,000 Belgian machines brought back from Germany and to the huge orders for material placed in England and America (which were made possible by the credits granted to industry by the banks, these having enlarged their capital considerably for this purpose), industry recovered rapidly.

The reconstruction of the devastated regions, valued at over 35 milliard francs, called for very great sums; military pensions, indemnities for damage caused by war, unemployment doles swelled the budget disproportionately. In 1919 the public debt had risen from four milliard francs before the war to 13 milliards, and passed 30 milliards in 1921. At the same time the fall of the exchange continually increased the cost of living, necessitating a great increase of salaries and readjustment of wages. The demand for social legislation increased greatly. On Dec. 1, 1919, the working day was reduced to eight hours. To prevent or diminish conflicts, national councils, formed by delegates of the masters and the workmen in equal numbers, with an official as president, were set up after the Armistice. The action, although devoid of any legislative backing, was often successful. Similarly in the mining industry, especially in the basins of the Centre and Borinage, a whole system of arbitration was set up, freely organized by the masters and workmen. The financial measures of the Government were also democratic in tendency, including income tax, super-tax and an increase in succession duties.

The fall of the exchange impoverished the middle classes, holders of state papers and mortgages and small house owners. This was further accentuated by the housing law, permitting tenants to continue to occupy their dwellings, limiting the rent to a sum not exceeding 125% of the pre-war rents, while building costs had increased by 700%. On the other hand, the quick recovery of industry contributed to enrich the industrial and commercial classes. The high price of living also improved the conditions of the peasants, who spent enormous sums on acquiring land. Thus the middle classes were in a difficult situation between the rich capitalists on one side and the workmen and peasants on the other. The activity of the banks drained out all the free money in the country, and gave real power to the great financial establishments.

The considerable improvement in the condition of the working classes increased the power of the trades unions. The Socialist party formed the *Banque Belge du Travail,* while the increased wealth of the peasants gave the *Banque des Boerenbonden* very great financial and political power. The political result was the weakening of the Liberal Party, which was recruited from the middle classes, an access of strength for the Socialist and Catholic Parties, and an increase of the democratic element. The passing of a law which re-established the legal personality of associations not aiming at profits (June 27, 1921) also deserves mention. This law met a real demand, and the country became covered everywhere with charitable, scientific or social associations. The religious establishments all came under this form.

The intellectual life of Belgium revived. The *Association Internationale des Académies* chose Brussels for its centre. On Aug. 19, 1920, an *Académie de Langue et de Littérature Française* was formed at Brussels. The status of legal personality benefited the free universities of Louvain and Brussels and the universities of Ghent and Liége. The profits realized by the Commission for Relief in Belgium went to constitute a university fund, with a capital of 80,000,000fr., for the development of the sciences in Belgium. Each university was further endowed with a capital of 20,000,000 francs. A war archives department was established to collect all documents bearing on the history of the war between 1914 and 1918. The period of restoration was blessed with a truce in the political struggle; unlimited universal suffrage from the age of 21 was introduced at the demand of the Socialist Party; female suffrage, which was claimed by the Catholic Party, was granted for communal elections.

The elections of Nov. 16, 1919, under the new franchise, resulted in the Catholic Party's losing the majority which it had held since 1884. At first the country was ruled by a "concentration" Government, under Delacroix and later by Carton de Wiart; afterwards by a coalition between Catholics and Liberals under Theunis; then after the elections of April 1925, in which the Socialists obtained 818,852 votes, Catholics 751,011, and Liberals 305,032, by a democratic Catholic-Socialist coalition under Poullet and Vandervelde.

Restoration of the Currency.—In May 1926 Henri Jaspar formed a coalition ministry consisting of representatives of the three great parties of Belgium. He made a vigorous effort towards financial stabilization, with the help of E. Franqui, who was principally responsible for the currency reform. He obtained from parliament legislation to carry out the necessary measures. On June 7 parliament agreed to impose fresh taxation yielding one and a half milliards. On the same day there was set up an amortization fund intended to give the creditors of the State an assurance that the taxes voted for the amortization of the debt would actually be used for that purpose. On July 23 the State handed over the management of its railways to a national railway company. A royal decree was issued on July 31 converting the internal debt; the creditors of the State were given bonds, the rate of which was guaranteed. Under these measures, the franc rose to an exchange rate of 175, and it was stabilized at this rate by law. In order to make the Belgian franc completely independent, a new currency was created, the Belga, which was equivalent to five Belgian francs. Later, in 1936, the Belga (a theoretical currency unit) was devalued to 72% of its prior gold content.

Flemish Question.—The Flemish question became more acute after the introduction of universal suffrage. The demand, however, was still for nothing more than linguistic reforms within the Belgian State. An act adopted in 1921 made Flemish the administrative language of the Flemish-speaking districts of the country. French might, however, be used as well as Flemish in all communications to the public wherever a request to this effect was made by one-fifth of the municipal electors.

The Years 1928–39.—The Jaspar ministry, which had resigned in Nov. 1927 only to return in reconstituted form, ended in June 1931. Under it the currency was stabilized, the railway system was reorganized, and plans were adopted to improve Belgian ports. Successive cabinets were formed by de Broqueville (Oct. 1932), Theunis (Nov. 1934), van Zeeland (Mar. 1935), Janson (Nov. 1937), Spaak (May 1938) and Pierlot (Feb. 1939). Deep and genuine national mourning followed the accidental death of King Albert I on Feb. 17, 1934 near Namur. He was succeeded by his son Leopold III, whose queen, the former Princess Astrid of Sweden, was killed in a motor accident the next year.

Questions of financial distress, internal unrest and national security occupied the first years of the reign of Leopold III. The pro-Fascist party—the Rexists—under Léon Degrelle, had made considerable headway by denouncing the alleged corruption of national parties and by making a pact with the Flemish nationalists. But this movement was arrested by severance of the Flemish pact and by defeat in the municipal elections of Oct. 1938.

Germany's reoccupation of the Rhineland in 1936 sent a wave of apprehension through the little State, which immediately began to strengthen its defences. On Oct. 14, 1936 Leopold announced that Belgium would reshape its foreign policy to conform roughly with its pre-World War I isolation and would shun military alliances even of a defensive type. In this manner he hoped to immunize the nation against aggression from any quarter. During the next three years Belgium rearmed rapidly and reinforced its chain of fortifications from Longwy to Eupen and Liége and along the Albert canal. But all was in vain.

Invasion by Germany, 1940.—Belgium clung to its tenuous neutrality for eight months after war began in 1939. Then, without prior warning, Germany struck simultaneously at Belgium, The Netherlands and Luxembourg on the morning of May 10, 1940. The next day Eben Emael, key fort of the Liége defences, fell. The Meuse was crossed, and within a week Louvain, Brussels and Namur were in German hands. Antwerp was captured May 18, then the Germans struck westward toward the English channel, which they reached May 21 and thereby entrapped the whole Belgian army, as well as large numbers of French troops and the British Expeditionary Force. Ghent fell May 25, and on May 28 King Leopold ordered his army to capitulate. This action was branded by Premier Pierlot as illegal, and the refugee Belgian parliament in Paris voted to dethrone the king. On June 4, the same day that Dunkirk fell, the last bit of Belgian territory was occupied by German troops. By a proclamation of Adolf Hitler, May 18, the districts of Eupen, Malmédy and Moresnet, which had been awarded to Belgium by the Treaty of Versailles, were returned to the German Reich. (*See* WORLD WAR II.)

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BELGIUM, INVASION OF (1914). The military rôle of Belgium in 1914 was determined by two factors of fundamental importance: the geographical situation of the country, which, seated astride the direct road from Berlin to Paris and Calais, had become the cockpit of Europe, and her international political situation as defined by the guarantee of perpetual neutrality.

THE STRATEGICAL SITUATION

In Article 7 of the treaty with Holland of 1839 it is laid down that "Belgium, within its territorial limits, shall form an independent and permanently neutral state, and is required to observe this same neutrality with regard to all other states." Of this treaty "all articles are drawn up under the guarantee of Austria, France, Great Britain, Prussia and Russia." This neutrality clearly implied that Belgium was under an obligation to use her military forces, not to repulse an aggressor at all costs—a task beyond her means and one for which there could be no justification—but in such a manner as to prevent that aggressor from obtaining any anticipated advantage in his operations against a third party, *i.e.,* to suspend for an adequate period free passage along the great international strategic highway of which the axis is defined by the Meuse, the Sambre and the Oise. The mission of the Belgian army was to gain time and delay the enemy.

To this end the foremost and best position to occupy, supposing the enemy to come from the east, was the Meuse, with its steep scarped slopes and its two road and railway junctions, Namur and Liége. These two towns had been encircled by a ring of detached forts by Brialmont in Leopold II.'s reign so that they might act both as bridgeheads and as "points d'appui" from which, with the support of their guns, the field army could easily hold up enemy forces of equal strength. If the enemy brought up very superior forces facing the Meuse the Belgian army would avoid being engaged in a battle which it was foredoomed to lose. It would retire fighting, step by step on Antwerp—its base of operations and the national citadel—holding itself in readiness to move out again for the counter-offensive in co-operation with any relief force the Powers guaranteeing Belgium's neutrality should send to its assistance.

Such was the plan of campaign drawn up by King Albert; but unfortunately Belgium was in the throes of military reorganization when the World War broke out. The country had been slow in realizing that the rivalry between its powerful neighbours constituted a menace to itself. In 1913 parliament had voted a compulsory military service system which was to produce 340,000 men in ten years' time. Actually, on mobilization, only 117,000 men were available for the field army and 60,000 for the fortress troops. The field army, grouped in six army divisions and one cavalry division, was without any reserve drafts whatever; the fortress troops, composed of men aged 28–35 years were weak in cadres and poor in quality. The plan of concentration had been revised, but there had not been time to make out the time-table for rail transport.

Belgian Preparations.—On the evening of July 31 mobilization was ordered. On Aug. 2 it became known that the Germans had invaded the Grand Duchy of Luxemburg, and at 7 P.M. the ultimatum was presented to the Belgian minister of foreign affairs by the German ambassador in Brussels. "If Belgium behaves in a hostile manner to German troops, and particularly if she impedes their march forward by resistance on the part of the Meuse fortifications, or by the destruction of roads, railways, tunnels or other works, then Germany will be compelled to regard Belgium as an enemy." Belgium's reply to this injunction was the categorical refusal which her sense of honour and of her duties toward Europe demanded.

As it was definitely from the east that danger threatened, and as France had officially declared that she would respect the integrity of Belgian soil, the place of concentration indicated for the army was on the Meuse between Maastricht and Namur. But, as has been said, transport arrangements were still incomplete and a modification had to be adopted. The king ordered that the 3rd and 4th Divisions mobilized at Liége and Namur should remain in those fortresses with instructions to defend them to the last man. The remaining four divisions and the cavalry division were concentrated—the former by rail, the latter by road—in the zone Tirlemont-Perwez-Louvain, whence they were to proceed toward the Meuse with all possible speed.

THE ATTACK ON LIÉGE

As already stated, Liége and Namur were not designed to withstand a regular siege, but consisted of a ring of forts (12 at Liége, nine at Namur) which controlled the free use of the Meuse bridges and marked a favourable line of battle. Constructed about 1890, these forts, of triangular or rectangular design, had vaulted casemates of 2m. 50-cm. concrete and were completely out of date; they were armed with two 15-cm. guns in cupolas, two 12-cm. guns and two 21-cm. howitzers, besides some pompons in "éclipse" cupolas, all firing black powder.

Strength of Liége.—With the help of the 3rd Division the Liége garrison was brought up to about 30,000 men; Gen. Leman



THE FORTRESS OF LIÉGE SHOWING THE RING OF 12 FORTS, 9 MILES IN DIAMETER, AROUND THE CITY AND THE LINES OF THE GERMAN ADVANCE TO THE MEUSE. THE CITY WAS TAKEN ON AUG. 6, 1914 BUT THE FORTS HELD OUT UNTIL AUG. 16, AND WERE ONLY SILENCED AFTER THE GERMANS HAD BROUGHT UP LARGE HOWITZERS. THE DELAY CAUSED BY THE UNEXPECTED STUBBORNESS OF THE BELGIAN RESISTANCE WAS OF GREAT VALUE TO THE ALLIES

was in command. While he hastened to have trenches dug between the forts, his main concern after Aug. 3 was to blow up the railway tunnels and barricade the roads leading from Germany. It was well that he did so, for on the 4th, at 8 A.M., six German columns crossed the frontier on the line Aix-la-Chapelle-St. Vith, and at noon gun and rifle fire were heard at Visé.

The importance of the fortress lay in the fact that it controlled the lines of march of the German 1st and 2nd Armies. Now the success of the plan of campaign conceived by the general staff in Berlin depended upon the rapid crossing of the Belgian plains by these armies, and Gen. von Moltke, to avoid being held up in any way by Liége, had planned to carry the position during the concentration period (while troops were being carried up by rail) with a special army composed of six brigades at peace strength and the three divisions of Gen. von der Marwitz's cavalry corps. Accordingly, Gen. von Emmich, with his "Army of the Meuse" (consisting of 25,000 riflemen, 10,000 cavalrymen and 124 guns) was ordered to carry the place by a *coup de main*. The forts were to be masked by a few companies and their artillery neutralized by his batteries while six brigade columns would penetrate the intervals. This assault was to take place by night, and the columns were to make their way independently toward the town and storm this at daybreak. The aim of the whole enterprise was to secure the bridges before they could be destroyed. As regards the temerity of this scheme, it is only fair to say that von Moltke expected to find merely the normal garrison of 6,000 men in Liége.

German Advance.—On the morning of Aug. 4 the 4th Division followed by cyclists and chasseurs conveyed by motors, made its way rapidly along the Dutch frontiers to Visé. The roads had been barricaded with felled trees, and it was noon before the cavalry reached the Meuse, only to find the bridge submerged and the opposite bank lined with riflemen. On Aug. 5 a *coup de main* aimed at Ft. Barchon was severely punished by the short-range fire from the fortress guns. At 10 P.M. the various brigades having completed their reconnaissances and the installation of their batteries, moved concentrically to the attack.

The battle opened to the fitting natural accompaniment of heavy thunder showers. Of the five brigades which attacked on the right bank, four were completely repulsed. In the south the 38th and 43rd in particular suffered severe losses round about Boncelles; they retreated over five miles the next day. The 34th Brigade, which attacked alone on the left bank after crossing the Meuse near to the Dutch frontier, was held up for several hours near the northern outskirts of Liége by street fighting, and left 400 prisoners in the hands of the Belgians at the end of the encounter.

By a strange chance a half-company of Jägers, detached as a flank guard, made their way quite unopposed into the town, reaching the Rue Sainte Foi about 7 A.M., where the garrison headquarters were situated. An aide-de-camp of Leman and the captain of the company killed each other on the spot, and the escort, snatching up their rifles, put the Jägers to flight. This extraordinary incident led the commander of the defence to believe that the enemy had brought over considerable forces to the left bank. Fearing that the troops defending the right bank might be cut off, he at once sent them an order to recross the river, a decision by which the last of the German brigades was to benefit considerably. This brigade, the 14th, marching from east to west, was entrusted with the attack between Forts Fléron and Evegnée, but had been stopped short by rifle and gun fire in the intervening village, its advanced guard being decimated, its general and one colonel killed. It would probably have come to a definite standstill but for the arrival at this critical moment, by another stroke of fortune, of Gen. Ludendorff, who as von Emmich's deputy chief of the staff was watching the operations on behalf of the German 2nd Army and, as head of the operations section of the German general staff, had been the author of the plan of attack.

Attack Under Ludendorff.—Taking over the command he ordered a renewal of the attack and, as Leman had sent all his reserves to Boncelles, succeeded in pushing back the three weak battalions opposed to him in an all-night street battle. Toward 10 A.M. he arrived on the heights over Liége with his brigade reduced by half and almost without ammunition, uneasy rather than proud of his success, for there was no sign of the other attacking troops. A few small columns were visible in the distance turning westward; these were the victorious Belgian troops, recalled to the other bank by the order to retreat. They were, however, so exhausted that once they had left the trenches they were incapable of engaging in a fresh battle. Leman, acting on the belief that the whole of the German 7th and 10th Corps were against him, gave orders to the 3rd Division to rejoin the field army. He himself would continue to hold off the enemy with forts alone.

Thus Ludendorff was able to enter the town of Liége without further opposition on the morning of Aug. 8. Most of the bridges had been destroyed. The forts, all of which were still intact, kept watching roads and railways, their guns making the use of either impossible. Urged by Ludendorff's energetic representations, the German general staff now formed a new siege army, under Gen. von Eimen, which comprised, in addition to von Emmich's group, all the troops of the 7th, 9th and 10th Corps—taken as they detrained—and some powerful heavy artillery, including several battalions of 21-cm. mortars and four 42-cm. howitzers. A new mode of attack was tried. One by one the forts were isolated, closely invested and bombarded with concentrated fire, which destroyed their gun emplacements and magazines and at the same time threatened to asphyxiate the garrisons.

Fall of the Forts.—The defenders came through their ordeal with honour, and would certainly have held out longer but for the irresistible effect of the 42-cm. shells. Pontisse, Fléron and Chaudfontaine only gave in when they had reached the limit of human endurance. On Aug. 15 at 5 P.M., the fort of Loncin blew up through the explosion of a powder magazine hit by a 42-cm. shell, 350 men being buried under the débris. By a stroke of luck Leman was picked up, unconscious, on the rim of this enormous crater by the Germans, who were themselves horrified by the spectacle. The last of the forts surrendered on the 16th, leaving the way clear, at last, for the Germans to whom the passage meant so much.

While these events were taking place at Liége, the 1st and 2nd, 3rd and 6th Divisions, and the Cavalry Division were assembling in the region Tirlemont-Perwez-Louvain. The plan of marching towards the Meuse was perforce abandoned on the information that the Liége position was broken and the 3rd Division in retreat.

CONSEQUENCES OF THE FALL OF LIÉGE

Belgian Position Outlined.—On the morning of Aug. 4, when the crossing of the frontier by German troops had become an established fact, King Albert had sent a note to the British, French and Russian Governments announcing the violation of Belgian neutrality, and proposing "a concerted and common action by the guaranteeing powers in order to resist Germany." In reply Gen. Joffre sent one of his staff officers to say that the French troops, amounting to four army corps, could not reach the region of Namur before about the 15th. Help from England would necessarily take still longer to come. Under these conditions the king decided that the army should remain in its positions, which were: (1) the forts of Liége, acting as isolated works, under Leman; (2) the fortress of Namur, reinforced by the 4th Division; (3) the entrenched camp of Antwerp, guarded by about 40,000 fortress troops; and (4) the field army, 90,000 strong, entrenched behind the river Gette, forming a link between Antwerp and Namur, covering Brussels and excellent railway lines which could be used by any French or British troops that came to the rescue.

Unfortunately, the Allies were not to profit by these arrangements. The French would not think of anything except their attack in Lorraine and the Ardennes; the British did not arrive at Mons before Aug. 22. As fast as the Liége forts fell to the superguns the Germans commenced to push their troops across the Meuse without intermittence. As early as Aug. 10 Marwitz's cavalry corps had thrown itself on the Belgium front at Tirlemont. On the 12th he tried to turn that front through Haelen, near Diest. Here he met the small Belgian cavalry division, supported by four battalions, and was completely routed, leaving 500 killed and wounded and 1,000 horses on the field. On the evening of Aug. 17, the German 1st and 2nd Armies having reached the front Hasselt-St. Trond-Huy, the kaiser ordered the general advance. The next day, at 9 o'clock, Gen. von Kluck attacked the Belgians on the Gette between Tirlemont and Diest with seven divisions of the 9th, 4th, 3rd and 2nd Corps, while one division of the 2nd Corps and the 2nd Cav. Div. turned the left flank on the north to cut off the retreat on Antwerp.

Retreat to Antwerp.—This attack was no surprise to the king. For several days reports had been coming through that greatly superior forces of at least 200,000 men were approaching. Gen. Lanrezac's French troops had got only as far as Philippeville and the British Expeditionary Force as far as Le Cateau. To avoid useless and complete destruction, the Belgian army began to retire slowly on Antwerp, fighting rearguard actions at Tirlemont on the 18th and at Aerschot on the 19th, and taking up its position on the line of the Antwerp forts on the 20th. On this day the Germans entered Brussels.

THE SIEGE OF NAMUR

The Belgium 4th Division remained at Namur. The moment it lost touch with the bulk of the Belgian army, it became part of the fighting system of the Franco-British forces.

German Plan of Attack.—On the morning of Aug. 18 Joffre issued a succession of orders in which it was laid down that the French 3rd and 4th Armies should advance into the Ardennes and the French 5th Army and the British Expeditionary Corps take the offensive west of the Meuse in the direction of Gembloux-Nivelles. Meanwhile, the Germans having discovered—through the reconnaissances of their airmen—the French columns marching northwards between Maubeuge and Dinant, gave von Bülow—already in command of the 1st and 2nd Armies—authority over the 3rd Army, which was to strike the Meuse between Namur and Givet, and made up their minds to overwhelm the Allied left by a converging attack delivered by 15 corps. It was essential to the scheme that the fortress of Namur should be carried with the least possible delay.

The task was entrusted to a special army detachment under von Gallwitz. It included the Guards Reserve Corps, the 11th Corps, three pioneer regiments, five battalions of 21-cm. howitzers, two battalions of heavy guns, one battery of 42-cm. howitzers and four of 30·5 Austrian howitzers. These troops came into position north-east of the fortress. To complete the investment the 3rd Army detached the 24th Reserve Division north of Dinant and the 2nd Army the 14th Reserve Division south of Gembloux. Thus during the two days of the battle of Charleroi the 30,000 men of the Namur garrison drew upon themselves six enemy divisions and 500 guns.

Bombardment of Namur.—The attack on Namur was quite different from that on Liége. There was no longer any question of a surprise. Von Gallwitz, who in peace time was inspector-general of artillery, aimed at an artillery preparation so devastating as to render the defence incapable of resistance to the assault. All his batteries concentrated their fire upon three forts, Maizeret, Marchovelette and Cognelée, and on the interval between the two last named, where he intended to make a breach. The bombardment commenced at 10 A.M. on Aug. 21, continued throughout the night and the whole of the following day, and reached its height on the morning of the 23rd. The trenches and the wire—at that time very slight—had disappeared. The forts were reduced to shapeless ruins; all their cupolas were put out of action.

Surrender of Namur.—Three French battalions had arrived in the fortress. A counter-attack, half Belgian, half French, attempted to repulse the enemy artillery, but failed. The defending troops suffered steady extermination without being able to fire a shot. Finally at 11 A.M. the German infantry masses made a sudden onrush—three divisions of them to a front of 4½kilo.—held by what remained of nine battalions of 700 men. The defenders were swept off their feet. At many points, although enveloped, they put up a desperate resistance; and, as a result, it was not until evening that the assailant reached the outskirts of the town.

Gen. Michel, commanding the fortress, had disposed a brigade facing north-west to co-operate in the French offensive which he was impatiently expecting. At about 1·30 P.M. he heard, however, on the one hand that the French on his left had been driven back southward instead of advancing to the north; on the other that the Germans, far behind his right, had crossed the Meuse between Namur and Dinant. With their front broken the garrison ran the risk of being enveloped and surrounded. Michel therefore expedited the order for an immediate retreat toward the south-east.

By dint of 48 hours of forced marches—coming after three days' battle—the greater part of the garrison succeeded in rejoining the French troops and a fortnight later in reinforcing the Belgian army at Antwerp. Five or six thousand men of the rearguard were trapped between the flank corps of the German 2nd and 3rd Armies, and after several skirmishes, were forced to surrender. The six forts which were still active at Namur were able to hold up von Gallwitz's forces two days longer. Suarlée and Andoy only surrendered on the evening of Aug. 25 after having offered a memorable resistance to the enemy's mortars, which bombarded them simultaneously from all sides. (*See* also ANTWERP, SIEGE OF; FRONTIER, BATTLES OF THE.)

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(R. VAN O.)

BELGRADE (Serbian *Beograd, i.e.,* "White Castle"), the capital of Yugoslavia. Population 238,775. Belgrade occupies a triangular foreland at the confluence of Sava and Danube; at the base stands Avala hill, the last outpost of the Rudnik mountains, and at the apex a cliff 200ft. high, crowned by the citadel, once white, but now maroon with age, used as prison and barracks. Behind the citadel are the beautiful gardens of Kalmegdan, with a famous river view, and behind them the city of white houses. It was formerly divided into the old town, the Russian town (*Sava Makhala* or Sava district), and the Turkish town (*Dorčol* or cross-road). Changes in the 19th century made the old divisions less clear and there grew the Tirazia, a suburb along the aqueduct or *Tirazi*. A few old plaster Turkish houses, with red-tiled roofs, are left among the insanitary riverside districts, but after 1869 Belgrade was rapidly transformed into a modern European town, with wide streets, electric tramways, electric lighting, telegraphs and telephones; while in the beginning of the 20th century, wireless was installed. Belgrade is the seat of the metropolitan of Serbia, with a cathedral. In addition to the university (with four faculties), educational facilities are afforded by a military academy, a theological seminary, a commercial academy and several secondary schools. The court of cassation sits at Belgrade, and also a court of appeal and a commercial tribunal.

There is a fine monument of Prince Michael (1860–68); a royal palace, much enlarged in 1925; an interesting national museum; a national library with a wealth of old Serbian mss.; a national theatre; a botanical garden, rich in Balkan flora, and a parliament house. Commercial institutions include a chamber of commerce and many trade associations, and a national bank, privileged to issue notes.

The bulk of the foreign trade of Serbia finds its way through Belgrade, and the town itself is engaged in brewing, iron-founding, and the manufacture of cloth, woollen goods, boots, glue, sugar, soap, pottery, preserved meat, and confectionery. Belgrade is near good coal supplies, and in the neighbourhood are lead mines and quarries with excellent building stone and beautiful marbles. The main railway line of Yugoslavia runs north to meet the Hungarian line to Budapest, and south through Nish and Skoplje, to join the Greek line to Salonica. It has many branches and is connected with the Adriatic ports Split and Sibenik. The only high roads are one going north to Smederevo, and one south to Cattaro, all the others being merely country roads. South of the town is the park of Topchider, with an old Turkish kiosk built for Prince Milosh (1818–39). In the adjoining forest of lime trees, called *Koshnutyak* or the "deer park," Prince Michael was assassinated in 1868. Opposite the citadel, across the Danube, lies the town of Zemun (*Semlin*) which was Hungarian until 1918. For administrative purposes Belgrade forms a separate department of the kingdom.

The first fortification was made by Celts in the 3rd century B.C., with the name *Singidunum,* by which it was known until the 7th century A.D. The Romans took it from the Celts and replaced their fort by a regular Roman *castrum*. Between the 4th and 6th centuries A.D. it often changed masters (Huns, Sarmatians, Goths, Gepids); then the emperor Justinian made it Roman once more. Towards the end of the 8th century it was taken by the Franks of Charlemagne; in the 9th century by the Bulgarians, who held it till the beginning of the 11th century, when the Byzantine emperor Basil II. reconquered it for the Greek empire. The Hungarians, under King Stephen, took it from the Greeks in 1124. From that time it was again constantly changing hands—Greeks, Bulgarians, Hungarians replacing each other in turn. The city was considered to be the key of Hungary and of Serbia also, besides giving command of the traffic between the Upper and Lower Danube. It has, in consequence, seen more battles under its walls than most fortresses in Europe. The Turks used to call it *Darol-i-Jehad,* the home of wars of the faith. During the 14th century it was in the hands of the Serbian kings, and was made the capital of Serbia in 1403 by Stephen, grandson of Prince Lazar. His successor, George Brankovich, ceded it to the Hungarians in 1427. From 1521 to 1688 it was in Turkish hands and again from 1739 to 1789 when the Austrians carried it by assault, and lost it again in 1792. In 1807 the Serbians having risen for their independence, took the town and held it until the end of Sept. 1813.

Up to 1862 the fortress and the Danubian slope of the town were inhabited by Turks, living under a special Turkish administration, while the modern part of the town (the plateau of the ridge and the western slope) was inhabited by Serbians living under their own authorities. This dual government was a constant cause of friction between the Serbians and the Turks, and on the occasion of one conflict between the two parties the Turkish commander of the fortress bombarded the Serbian part of the town (June 1862), which indirectly led, in 1866, to the withdrawal of the Turkish garrison from the citadel and its delivery to the Serbians. In 1878, by the treaty of Berlin, Belgrade became the capital of a Serbia freed at last from the Turkish suzerainty. World War I began with the bombardment of Belgrade by the Austrians on July 29, 1914. In November it was taken by the Austro-Germans, but the Serbs made a brilliant return, and in December King Peter made a triumphant entry into his capital. In Sept. 1915 a general attack was made by Austrians and Germans on the river frontier, and on Oct. 9 the town fell. It remained in the enemy's hands until the end of the war, when the kingdom of Yugoslavia came into existence. In April 1941, when the axis invaded Yugoslavia, Belgrade was heavily bombed and was occupied by the Germans.

BELHAVEN AND STENTON, JOHN HAMILTON, 2ND BARON (1656–1708), eldest son of Robert Hamilton, Lord Presmennan (d. 1696), was born on July 5, 1656. He succeeded to the title of Belhaven and Stenton in virtue of his wife in 1679. In 1681 he was imprisoned for opposing the government and for speaking slightingly of James, duke of York, in parliament, and in 1689 he was among those who asked William of Orange to undertake the government of Scotland. Belhaven was at the battle of Killiecrankie; he was a member of the Scottish privy council, and he was a director of the Scottish Trading Company, which was formed in 1695 and was responsible for the Darien expedition. He opposed the union of the English and Scottish parliaments, a speech which he delivered against this proposal in Nov. 1706 attracting much notice and a certain amount of ridicule. Later he was imprisoned, ostensibly for favouring a projected French invasion, and died in London on June 21, 1708. Two of his speeches, one of them the famous one of Nov. 1706, were printed by D. Defoe in an appendix to his *History of the Union* (1786).

BELIEF is acquiescence in the reality of an object or assent to the truth of a proposition. The meaning of the term varies somewhat in different contexts. It is sometimes applied to the content of a belief, but more usually to the act or experience of believing. Somewhat more serious are the differences in the meaning of the term belief which arise from different contrasts. The principal contrasts are those (*a*) between *belief* and *knowledge,* (*b*) between *belief* and *disbelief,* (*c*) between *belief* and *doubt,* (*d*) between *belief* and *mere apprehension.* An explanation of these antitheses will help to clear up the nature of belief.

(a) Belief and Knowledge.—If anyone is asked whether he knows that man is immortal, he may reply, "I don't *know* but I *believe* that he is." Or again, if asked whether he believes that he has to pay income tax, he may reply, "I don't *believe* it, I *know* it." In these and similar cases the term belief is used for the act of assenting to something, accepting it as real or true, when the grounds of our assent are not strong enough to justify our calling it *knowledge.* It may be a more or less probable surmise, it may be prompted by "reasons of the heart," but it is not knowledge. It is rather like an act of faith—it is believed merely. To confine "belief" to this meaning is unsatisfactory. It may be said with obvious truth that if one can believe even what he does not know,

he certainly believes what he does know. It is therefore better to use the expression "mere (or bare) belief" for what has just been called "belief" when contrasted with knowledge. Strictly speaking all knowledge is belief, though not all belief is knowledge.

(b) Belief and Disbelief.—It clearly makes a difference whether the reality of something or the truth of a proposition is believed or disbelieved. The difference, however, is essentially a difference in the content or object of the belief, not a difference in the attitude or experience of believing. He who disbelieves that man is immortal really believes that man is mortal. And so generally to disbelieve a given proposition is to believe its contradictory. So that *quâ* experiences or attitudes belief and disbelief are essentially similar experiences directed towards contradictory contents or propositions, or simply to affirmative and negative propositions respectively.

(c) Belief and Doubt.—The difference between the assurance, conviction, mental rest or equilibrium characteristic of belief, and the unrest and vacillation characteristic of doubt, is palpable. Doubt in its extreme form becomes doubting mania and ends in the asylum. As a matter of mental economy people naturally tend toward belief. In the early stages of life, the stage of innocence or inexperience, every appearance is accepted as real and every suggestion as true. Doubt is the fruit of disappointment and of conflict of rival beliefs or suggestions. When practised reasonably it is an important factor in the make-up of a man of science, as Huxley rightly insisted. Such reasonable doubt is what is meant by a critical attitude of mind. But unreasonable doubt is as fruitless in science as is unreasonable belief, that is, credulity.

(d) Belief and Mere Apprehension.—Psychologically this is the most important distinction. Merely to imagine something, or to understand a suggestion, is one thing; to accept it as real or true is quite another thing. The former is mere apprehension, the latter is belief. One cannot, of course, believe (or disbelieve) what one does not apprehend (though some people seem to suppose that they can believe what they do not understand), yet one may apprehend something without believing or disbelieving it. In this respect belief may be compared with desire. It is one thing to think of something or apprehend it, and another to desire it (or even to have an aversion for it). Of course, one cannot desire what one does not apprehend (though one may experience a restless craving without knowing what he wants), but one can apprehend a thing without feeling either a desire or an aversion for it. Thoughts that are apprehended without being either believed or disbelieved are sometimes described as "floating ideas." Except perhaps in day-dreaming, in reading avowed fiction, and in aesthetic enjoyment "floating ideas" are probably uncommon. The suspension of judgment is a form of self-control or self-denial that most people find irksome—it is so much easier to have a definite belief or disbelief about everything between heaven and earth. This seems borne out partly by the popular identification of "not believing" something (which may denote merely a suspension of judgment) with "disbelieving."

Belief in the sense just explained is really equivalent to judgment—belief corresponding usually to positive judgments, disbelief to negative judgments. It was F. Brentano who gave vogue to the distinction between judgment and mere apprehension, on the ground that judgment involves what Stout has called the "yes-no-consciousness" over and above bare apprehension. This moment of belief or "yes-no-consciousness" seems to be something ultimate and unanalysable. But it is clearly variable in degree or fixity. There are many different (though hardly measurable) degrees of assurance with which a proposition is assented to or rejected.

It may just be noted in conclusion that some psychologists have identified belief with a certain feeling of vividness in the ideas or thoughts assented to (Hume); while others have treated it as a matter of will (Descartes, W. James, etc.).

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BELINSKY, VISSARION GRIGORIEVICH (1811–1848), Russian critic, born on June 13, 1811, at Fribourg, and died on June 9, 1848, at St. Petersburg; the son of an army doctor. At the University of Moscow he became friendly with Stankevich and other young writers, but he took no degree. On leaving the university, he wrote first of all for Nadézhdin's *Telescope*, and then after its suppression (1836), edited the *Moskovsky Nablyudatel*, of which Bakunin was at that time the proprietor. On the failure of this undertaking he became the principal literary critic of the *Otechestvennya Zapiski* in St. Petersburg. By this time he had come under the influence of the philosophy of Hegel, and his early friends were surprised to find that their champion, who had always supported what was new and revolutionary in Russian literature, was supporting the existing social and political régime, but after a few years he returned to his earlier position, and now supported the advanced school of Russian writers who sought to give pictures of life with a social significance. In 1846 he became critic of the *Sovremennik*, which had been purchased by Nekrasov and Panayev. Next year he was obliged to leave Russia for reasons of health, and addressed to Gogol a letter criticizing Gogol's *Correspondence with Friends*, a letter which became a kind of profession of faith among young Russians.

His collected works were edited by Vengerov (1901–10) and his life was written by Pypine (1876). *See* also D. S. Mirsky, *History of Russian Literature* (1927), for an estimate of Belinsky's influence on Russian literature.

BELISARIUS (*c.* 505–565), one of the most famous generals of the later Roman empire, was born about A.D. 505, in "Germania," a district on the borders of Thrace and Macedonia. As a youth he served in the bodyguard of Justinian, who appointed him commander of the Eastern army. He won a victory over the Persians in 530, but was defeated in the following year. Recalled to Constantinople, he married Antonina, a favourite of the empress Theodora. During the Nika sedition (532) he did Justinian good service, crushing the rebels who had proclaimed Hypatius emperor. In 533 he was put in command of the expedition against the Vandal kingdom in Africa. With 15,000 mercenaries, he took Carthage, defeated Gelimer the Vandal king, and carried him captive to Constantinople (534). As a reward Belisarius received the consulship. At this time Justinian decided to attack Italy where the Ostrogothic kingdom was shaken by internal dissensions. Accordingly, Belisarius invaded Sicily (535) and, after storming Naples and defending Rome for a year against almost the entire strength of the Goths in Italy, he captured Ravenna, and with it the Gothic king Vitiges. The Ostrogoths offered to acknowledge him emperor of the West, but he rejected the proposal and returned to Constantinople in 540. Next year he was sent to check the Persian king Chosroes (Anushirvan); but achieved no decisive result. In 544, the Goths having meanwhile reconquered Italy, Belisarius was sent with inadequate forces to oppose them. During five campaigns he held his enemies at bay, until he was removed from the command. Belisarius remained at Constantinople in retirement until 559, when at the head of a mixed multitude of peasants and soldiers he repelled the Bulgarian savages who had invaded the city. But this, like his former victories, roused Justinian's envy. The saviour of his country was coldly received and left unrewarded by his suspicious sovereign. Shortly afterwards Belisarius was accused of complicity in a conspiracy against the emperor (562); his fortune was confiscated and he was imprisoned in his palace. He was set free and restored to favour in 563, and died in 565.

The fiction of Belisarius wandering as a blind beggar through Constantinople, which has been adopted by Marmontel in his *Bélisaire* and by various painters and poets, is first heard of in the 10th century. Gibbon justly calls Belisarius the Africanus of New Rome. He was merciful as a conqueror, stern as a disciplinarian, enterprising and wary as a general; while his courage, loyalty and forbearance seem to have been almost unsullied. He was the idol of his soldiers, a good tactician, but not a great strategist.

BIBLIOGRAPHY.—Diehl, *Justinien* (1901); Procopius, *De Bellis* and *Historia Arcana* (best edition by J. Haury, 1905, 1907); *see* Gibbon, *Decline and Fall* (ed. Bury, vol. iv.); T. Hodgkin, *Italy and her Invaders* (vol. iv.); J. B. Bury, *Later Roman Empire* (1923), vol. ii.

BELIT, signifying the "lady," *par excellence* in the Babylonian religion. Accadian translation of Sumerian *dingir-Nin-(lil)* consort of En-(lil) of Nippur. The earth god and his consort are called *Bêl* and *Beltu* "Lord and Lady" in the older interlinear texts, but the Accadian translation is not provided with the determinative for goddess, and there is no evidence that the Babylonians recognized any goddess under the name *Bêlti, Belti-ia* "My Lady," until the Cassite period, where the title stands for Zarbanit, the goddess of Babylon and consort of Marduk, the *Bêl* of that period. There arose, under the transformation of the pantheon by the priests of Marduk, a tendency to identify the great Sumerian deities Enlil and Ninlil with Marduk and Zarbanit, and the "goddess Bêlit of Babylon" is consequently identified with the Wagon star, which in astrology is the constellation of Ninlil. The Babylonian goddess Bêlti, "my lady," or Belit-ni, "our lady," invariably means Zarbanit, spouse of Marduk, the Bêl of Babylon. It appears to have been given to Zarbanit after she had been identified with the great mother goddess *Makh,* called *bêlit-ilāni,* "queen of the gods," and more especially was "my lady" employed in addressing Ishtar, the mother and sister of Tammuz. In the later period Marduk and Zarbanit were identified with these deities (*see* TAMMUZ) and consequently "our lady," "my lady," originally addressed to Ishtar, became the title of Zarbanit. In survivals of the Tammuz cult in post-Babylonian times, Ishtar or Zarbanit, mother and sister of the dying god, appears in Aramaic and Arabic as *Beltîn,* "our lady." By *Beltis* the Greeks refer to Zarbanit of Babylon as well as to Aphrodite, the Semitic Ba'alat of Byblus. *Bélti* is the Latin transcription used by Philo, of Biblus.

BELIZE, the capital and principal seaport of British Honduras, on the Caribbean Sea, in 17° 29′ N., 88° 11′ W. (Pop. [1941] 17,289), occupies both banks of the river Belize, at its mouth. The ground is very little above sea level and the town is divided from the mainland by miles of swamps, the unhealthiness of which is mitigated by tidal inflow and fresh sea breezes. Its houses are generally built of wood on piles, with high roofs and wide verandas, and shaded by coco-nut or cabbage palms. The town is not unhealthy and the winter climate is pleasant. The swamps adjacent are being cut back and cleared and the level of the land raised by dredgings. Belize is connected by telegraph and telephone with the other chief towns of British Honduras, but communication by road is defective. The chief exports are mahogany, cedar, logwood, coco-nuts, sarsaparilla, tortoiseshell, deerskins, turtles and fruit, especially bananas. Breadstuffs, cotton fabrics and hardware are imported.

Belize probably derives its name from the French *balise,* "a beacon," some signal for the guidance of the buccaneers who once infested this region. Local tradition, however, connects the name with that of Wallis or Wallace, a Scottish buccaneer who, in 1638, settled with a party of logwood cutters on St. George's Cay, a small island off the town. In the 18th century the names Wallis and Belize were used interchangeably for the town, the river and the whole country. (*See* BRITISH HONDURAS.)

BELJAME, ALEXANDRE (1842–1906), French writer, was born at Villiers-le-Bel, Seine-et-Oise. He spent part of his childhood in England and was a frequent visitor in London. His lectures on English literature at the Sorbonne, where a chair was created expressly for him, did much to promote the study of English in France. In 1905–06 he was Clark lecturer on English literature at Trinity college, Cambridge. His best known book, *Le Public et les hommes de lettres en Angleterre au XVIIIe siècle* (1881), a masterly study of the conditions of literary life in England in the 18th century illustrated by the lives of Dryden, Addison and Pope, was crowned by the French Academy on the appearance of the second edition in 1897. He was a good Shakespearian scholar, and his editions of *Macbeth, Othello* and *Julius Caesar* also received an academic prize in 1902.

BELKNAP, WILLIAM WORTH (1829–1890), American soldier and politician, was born at Newburgh, N.Y., on Sept. 22, 1829. Entering the Union army in 1861, he took part in the battles of Shiloh, Corinth and Vicksburg, as major of the 15th Iowa volunteers. In the Atlanta campaign under Sherman he gained distinction, rising to the rank of brigadier-general in 1864 and major-general in 1865. Until 1869 he was collector of internal revenue for Iowa, leaving that post to become secretary of war. In 1876, because of unproved accusations of corruption, he resigned. He died at Washington, D.C., on Oct. 13, 1890.

BELL, ACTON, CURRER AND ELLIS: *see* BRONTË, CHARLOTTE, EMILY AND ANNE.

BELL, ALEXANDER GRAHAM (1847–1922), American inventor and physicist, inventor of the telephone; son of Alexander Melville Bell, was born in Edinburgh, Scotland, on March 3, 1847. He was educated at the University of Edinburgh and the University of London, and, because of failing health, removed with his father to Canada in 1870. In 1872 he opened in Boston a school for training teachers of the deaf and also gave instruction in the mechanics of speech. The following year he became professor of vocal physiology in Boston university. He exhibited in 1876 an apparatus embodying the results of his studies in the transmission of sound by electricity, and this invention, with improvements and modifications, constitutes the modern telephone (*q.v.*). He was the inventor also of the photophone, an instrument for transmitting sound by vibrations in a beam of light, and of phonographic apparatus. Later, he interested himself in the problem of mechanical flight. He gave numerous addresses and published many scientific monographs, including one on the formation of a deaf variety in the human race. Bell was the founder of the American Association to Promote the Teaching of Speech to the Deaf, was for a time president of the National Geographic Society, appointed by Congress in 1898 a regent of the Smithsonian Institution, and was a member of many learned societies. He died on Aug. 2, 1922, at his summer home near Baddeck, Nova Scotia.

BELL, ALEXANDER MELVILLE (1819–1905), American educationalist, was born at Edinburgh, Scotland, on March 1, 1819. He studied under and became the principal assistant of his father, Alexander Bell, an authority on phonetics and defective speech. From 1843 to 1865 he lectured on elocution at the University of Edinburgh, and from 1865 to 1870 at the University of London. In 1868, and again in 1870 and 1871, he lectured in the Lowell Institute course in Boston. In 1870 he became a lecturer on philology at Queen's College, Kingston, Ont.; and in 1881 he removed to Washington, D.C., where he devoted himself to the education of deaf mutes by the "visible speech" method of orthoepy, in which the alphabetical characters of his own invention were graphic diagrams of positions and motions of the organs of speech. He held high rank as an authority on physiological phonetics and was author of numerous works on orthoepy, elocution and education, among which were *Steno-Phonography* (1852); *Letters and Sounds* (1858); *Principles of Speech and Dictionary of Sounds* (1863); *Visible Speech: The Science of Universal Alphabetics* (1867); *Sounds and their Relations* (1881); *A Popular Manual of Visible Speech and Vocal Physiology* (1889); *The Science of Speech* (1897); *The Fundamentals of Elocution* (1899).

See John Hitz, *Alexander Melville Bell* (Washington, 1906).

BELL, ANDREW (1753–1832), British divine and educationist, was born at St. Andrews, Scotland. He graduated there, was a tutor in Virginia, U.S.A., and from 1789 superintendent of an orphan asylum at Madras. There scarcity of teachers led him to introduce the system of mutual tuition by the pupils. In 1797, after his return to London, he published a small pamphlet, *An Experiment in Education,* explaining his views on the subject. Little public attention was drawn towards the "monitorial" plan till Joseph Lancaster (*q.v.*), the Quaker, opened a school in Southwark, conducting it in accordance with Bell's principles, and improving on his system. Similar schools were established in great numbers; and the members of the Church of England resolved to set up similar institutions in which their own principles should be inculcated. In 1807 Bell was called from his rectory of Swanage, in Dorset, to organize a system of schools in accordance with these views, and in 1811 he became superintendent of the newly-formed National Society for Promoting the Education of the Poor in the Principles of the

Established Church. He was made a prebend of Westminster and master of Sherburn hospital, Durham, and was buried in Westminster Abbey. His great fortune was bequeathed almost entirely for educational purposes.

See J. D. Meiklejohn, *An Old Educational Reformer.*

BELL, SIR CHARLES (1774–1842), Scottish anatomist, was born at Edinburgh. Educated at the high school and the University of Edinburgh, he devoted himself chiefly to the study of anatomy, under the direction of his brother John. In 1802 he published a series of engravings showing the anatomy of the brain and nervous system taken from dissections made for the lectures or demonstrations he gave on the nervous system as part of the course of anatomical instruction of his brother. In 1804 he migrated to London. Before leaving Edinburgh, he had written his work on the *Anatomy of Expression,* in which he gave a rational explanation of the muscular movements which usually accompany the various emotions and passions.

In 1811 Bell published his *New Idea of the Anatomy of the Brain,* in which he announced the discovery of the different functions of the nerves corresponding with their relations to different parts of the brain; his latest researches were described in *The Nervous System of the Human Body* (1830), a collection of papers read by him before the Royal Society. He discovered that in the nervous trunks there are special sensory filaments, the office of which is to transmit impressions from the periphery of the body to the sensorium, and special motor filaments which convey motor impressions from the brain or other nerve centre to the muscles. He also showed that some nerves consist entirely of sensory filaments and are therefore sensory nerves, that others are composed of motor filaments and are therefore motor nerves, whilst a third variety contains both kinds of filaments and is therefore to be regarded as sensory-motor. Lastly, he showed that the anterior roots of the spinal nerves are *motor;* the posterior are *sensory.* These discoveries as a whole must be regarded as the greatest in physiology since that by William Harvey of the circulation of the blood.

In the year 1812 he was appointed surgeon to the Middlesex hospital, a post he retained for 24 years. He was also professor of anatomy, physiology and surgery to the College of Surgeons of London, and for many years teacher of anatomy in the school which used to exist in Great Windmill street. In 1815 he went to Brussels to treat the wounded of the battle of Waterloo. In 1836 he accepted the chair of surgery in the University of Edinburgh. He died at Hallow Park near Worcester on April 28, 1842.

BIBLIOGRAPHY.—Bell's chief works, other than those mentioned, are: *System of Comparative Surgery* (1807); *Lectures Concerning the Diseases of the Urethra* (1810); *Quarterly Reports of Cases in Surgery* (1816–18); *Observations on Injuries of the Spine and of the Thigh Bone* (1824); and *Practical Essays* (1841).

BELL, CHARLES FREDERICK MOBERLY (1847–1911), British journalist, was born in Alexandria, Egypt. Educated privately in England, he returned to Egypt in 1865, and there took up journalistic work, becoming *The Times* correspondent and founding *The Egyptian Gazette.* He had been *The Times* correspondent in Egypt for nearly 20 years when Mr. Walter called him to London in 1890 at a moment when the fortunes of the paper were at their lowest ebb, after the Parnell-Piggott scandals. Although in some ways rather out of touch with technical developments, his strong will, indomitable courage and tremendous industry were instrumental in keeping *The Times* alive during some very difficult years. He enormously improved the foreign service; he wrote with his own hand to *The Times* correspondents abroad, giving them all the encouragement and backing in his power. This was the time when he was associated with Mr. H. E. Hooper in publishing and selling *The Encyclopædia Britannica* and founding *The Times* Book Club. His dominating personality again asserted itself in 1908, when, in spite of much opposition, he brought about the sale of *The Times* to Lord Northcliffe. He then became managing editor, a post he retained until his death in his office chair on April 5 1911. In the introduction to his daughter's *Life* of him Sir Valentine Chirol says that if it was not given to Moberly Bell himself to bring *The Times* into smooth waters, "it was he who, in the darkest hours, saved it from utter shipwreck." While in Egypt, Bell wrote several books, including *Khedives and Pashas* (1884); *Egyptian Finance* (1887); *From Pharaoh to Fellah* (1889).

BIBLIOGRAPHY.—*See* F. Harcourt Kitchin, *Moberly Bell and his Times* (1925); E. H. C. Moberly Bell, *Life and Letters of C. F. Moberly Bell* (1927).

BELL, GEORGE JOSEPH (1770–1843), Scots jurist, born at Edinburgh on March 20, 1770, an elder brother of Sir Charles Bell, became advocate in 1791. He was one of the earliest and best friends of Francis Jeffrey. In 1804 he published a *Treatise on the Law of Bankruptcy* in Scotland which he enlarged and published in 1826 as *Commentaries on the Law of Scotland and on the principles of Mercantile Jurisprudence*—an institutional work of the highest excellence, praised by such jurists as Story and Kent. In 1821, Bell was elected professor of the law of Scotland at Edinburgh, and in 1831 appointed one of the principal clerks in the Supreme Court. He was put at the head of a commission in 1833 to enquire into the Scottish bankruptcy law; through the reports of the Commissioners, chiefly his handiwork, useful alterations were made. He died on Sept. 23, 1843. Bell's treatise, *Principles of the Law of Scotland,* became a textbook for students. The *Illustrations of the Principles* is also a work of high value. He is one of the four institutional authors who are cited as "authorities" in the Scots courts.

BELL, GERTRUDE MARGARET LOWTHIAN (1868–1926), English traveller and administrator, daughter of Sir Hugh Bell, Bart., by his first marriage, was one of the most remarkable women of her time. Her childhood was spent in the charming surroundings and liberal atmosphere of the Yorkshire home of her father and step-mother, Florence Bell, with both of whom she maintained affectionate and intellectual sympathy. With them and many others she carried on a correspondence of extraordinary spirit and distinction. A comparatively small part was edited by Lady Bell with cramping respect for the political exigencies of the day, and published in 1927 in two volumes under the title of *The Letters of Gertrude Bell.* A brilliant academic career at Oxford, where she took a First in History in 1887, was followed by more than a decade of intimate association with the best intellectual society. While she had opportunities of making herself familiar with the political life of several European countries, her life-work began during a visit to her uncle, Sir Frank Lascelles, then British Minister at Tehrān. The spell of the East claimed her for good. To this period we owe her translations of Hafidh, already foreshadowing the literary power and sympathy with orientalism manifest in works following at intervals. The fullness of her knowledge and strength were shown in an official report on the administration of Mesopotamia during the difficult period between the Armistice of 1918 and the rebellion of 1920.

At the end of 1899 Gertrude Bell entered on the Arabian activities which made her one of the memorable travellers. In that year she visited Jerusalem, travelling widely in Syria and Palestine. The next decade saw her back in those parts on frequent occasions. Her experiences, archaeological exploration playing an important part, were recorded in an admirable series of works: *Safar-Nama; Amurath to Amurath; Syria, the Desert and the Sown;* and, in conjunction with Sir William Ramsay, *The Thousand and One Churches.* By this time she was an acknowledged authority on Asia Minor and the northern borderlands of Arabia, but her heart was set on a journey into the interior of Arabia. In spite of many obstacles she embarked on this venture in 1913, travelling from Damascus and eventually reaching Hāïl, whither only one European woman (Lady Anne Blunt) had ever penetrated before her. Received coldly by the authorities of Hāïl and prevented from travelling farther south, she returned to Baghdad and thence across country to Damascus.

In ordinary circumstances this remarkable journey might have stood out as the chief feat of her life. But its results she never was to have time to publish. Soon after her return to civilization in 1914 the World War began and Gertrude Bell, after a short spell of war work in England and France, returned to the East. A short period in the Arab Bureau and a visit to the viceroy of India were preliminary steps to an appointment in Mesopotamia which in

various guises she retained to the day of her death. At first she worked with conspicuous success on the collection and collation of intelligence respecting the Arab tribes. In March 1917 she joined Sir Percy Cox at Baghdad in the actual, though not nominal, capacity of political secretary and played a strong part in the moulding of a scheme for the post-war administration of Mesopotamia. She next served Sir Arnold Wilson in a similar capacity, but her lack of sympathy with his policy manifested itself in almost open insubordination and in direct correspondence with the political chiefs in London. The situation had become acute when the rebellion once more threw the whole Mesopotamian problem into the melting pot. Sir Arnold Wilson was replaced by Sir Percy Cox and Gertrude Bell again assumed a dominating influence on affairs. For some months all went well with the provisional Arab Government set up in fulfilment of British promises, but no one played a more vigorous part than Gertrude Bell in upsetting this arrangement in favour of a Sharifian régime. Her notorious antipathy to Saiyid Talib Pasha, principal factor in the provisional Government, ranged her with friends of Feisul, recently ejected by the French from his Syrian throne. She worked powerfully at the Conference of Cairo (1921) to secure that Feisul should be offered the throne of 'Iraq and, on her return to Baghdad, she brought about the exile of Saiyid Talib. Feisul became king and for the next two years Gertrude Bell was the life and soul of a régime often shaken but left standing, thanks largely to her. By 1923, when Sir Percy Cox was succeeded by Sir Henry Dobbs, Gertrude Bell's work was done. Unable, however, to leave the country to which she was passionately devoted, she accepted the post of Honorary Director of Antiquities, and lavished all her zeal on the creation of a museum at Baghdad. There, in July 1926, worn out by years of strenuous work, she died and was buried.

See *Letters of Gertrude Bell* (2 vols., 1927), ed. Lady Bell.

(H. St. J. B. P.)

BELL, HENRY (1767–1830), the Scottish engineer, who placed the first steamboat on the Clyde, was born in Torphichen, Linlithgowshire, in 1767. He was apprenticed to his uncle, a millwright, and then to a shipmodeller at Bo'ness. He then went to London, where he found employment under John Rennie. Returning to Scotland in 1790, he first settled as a carpenter at Glasgow and afterwards removed to Helensburgh, on the Firth of Clyde, where he pursued his mechanical projects, and also found occasional employment as an engineer. In Jan. 1812 he placed on the Clyde a steamboat (which he named the "Comet") of about 25 tons, propelled by an engine of three horse-power, at a speed of seven miles an hour. Although the honour of priority is admitted to belong to the American engineer Robert Fulton, there appears to be no doubt that Fulton had received very material assistance in the construction of his vessel from Bell and others in Great Britain. A handsome sum was raised for Bell by subscription among the citizens of Glasgow, and he also received from the trustees of the River Clyde a pension of £100 a year. He died at Helensburgh on Nov. 14, 1830. A monument to his memory stands on the banks of the Clyde, at Dunglass, near Bowling.

BELL, HENRY GLASSFORD (1803–1874), Scots lawyer and man of letters, was born at Glasgow, and was called to the Scottish bar in 1832. He became sheriff substitute (1839), and then sheriff-principal (1867) of the county of Lanark. He was a member of the brilliant circle of *Blackwood's Magazine,* and figures in John Wilson's *Noctes Ambrosianae* as "Tallboys." His principal works were *Summer and Winter Hours* (1831); *Life of Mary, Queen of Scots* (2 vols., 1828–31), a brilliant defence, though rendered obsolete by later research; *Romances and Minor Poems* (1866), which show a sentimental, if undogmatic, sympathy for Roman Catholicism.

BELL, JACOB (1810–1859), British pharmaceutical chemist, was born in London on March 5, 1810. On the completion of his education, he joined his father in business as a chemist in Oxford street, and at the same time attended the chemistry lectures at the Royal Institution, and those on medicine at King's college. Always keenly alive to the interests of chemists in general, Bell originated in 1841 the scheme for the foundation of the Pharmaceutical Society of Great Britain. He also established the *Pharmaceutical Journal,* superintending its publication for eighteen years. In 1845 Bell drew up the draft of a bill to deal with the practice of pharmacy by unqualified persons, one of the provisions of which was the recognition of the Pharmaceutical Society as the governing body in all questions connected with pharmacy. In 1850 Bell entered parliament for St. Albans, and in 1851 he brought forward a bill which, however, when eventually it became law, only partially represented its sponsor's intentions. Bell wrote an *Historical Sketch of the Progress of Pharmacy in Great Britain.* He died on June 12, 1859.

BELL, JOHN (1691–1780), Scottish traveller, was born at Antermony, in Scotland, in 1691, and studied medicine. In 1714 he set out for St. Petersburg, where, through the introduction of a countryman, he was nominated medical attendant to Valensky, recently appointed to the Persian embassy, with whom he travelled from 1715 to 1718. The next four years he spent in an embassy to China, passing through Siberia and the great Tatar deserts. He had scarcely rested from this last journey when he was summoned to attend Peter the Great in his perilous expedition to Derbend and the Caspian Gates. In 1738 he was sent by the Russian government on a mission to Constantinople. In 1747 he retired to his estate of Antermony, where he spent the remainder of his life. His *Travels,* published at Glasgow in 1763, went through many editions, and are reprinted in Pinkerton's *Voyages and Travels* (vol. vii., 1811). A complete French translation appeared in 1766.

BELL, JOHN (1797–1869), American political leader, was born near Nashville, Tenn., on Feb. 15, 1797. He graduated at the University of Nashville in 1814, and in 1817 was elected to the State senate, but retiring after one term, he devoted himself for ten years to the study and the practice of the law. From 1827 until 1841 he was a member of the national House of Representatives, of which from June 1834 to March 1835 he was the Speaker, and in which he was conspicuous as a debater and a conservative leader. Though he entered political life as a Democrat, he became estranged from his party's leader, President Jackson, also a Tennessean, and after 1835 was one of the leaders of the Whig party in the South. In March 1841 he became the secretary of war in President Harrison's Cabinet, but in September, after the death of Harrison and the rupture between the Whig leaders and President Tyler, he resigned this position. From 1847 until 1859 he was a member of the United States Senate, and attracted attention by his ability in debate and his political independence, being one of two Southern senators to vote against the Kansas-Nebraska bill of 1854 and against the admission of Kansas with the Lecompton or pro-slavery constitution in 1858. Strongly conservative by temperament and devoted to the Union, he ardently desired to prevent the threatened secession of the Southern states in 1860, and was the candidate, for the presidency of the Constitutional Union party, often called from the names of its candidates for the presidency and the vice-presidency (Edward Everett) the "Bell and Everett party," which was made up largely of former Whigs and Southern "Know-Nothings," opposed sectionalism, and strove to prevent the disruption of the Union. The party adopted no platform, and discarding all other issues, resolved that "it is both the part of patriotism and of duty to recognize no political principle other than the constitution of the country, the union of the states, and the enforcement of the laws." Bell was defeated, but received a popular vote of 587,830 (mostly cast in the Southern states), and obtained the electoral votes of Virginia, Kentucky and Tennessee—39 altogether, out of a total of 303. Bell tried earnestly to prevent the secession of his own state, but after the issue of President Lincoln's proclamation of April 15, 1861, calling on the various states for volunteers, his efforts were unavailing, and when Tennessee joined the Confederacy Bell "went with his state." He took no part in the Civil War, and died Sept. 10, 1869.

BELL, ROBERT (1800–67), Irish man of letters, was born at Cork Jan. 16 1800, and died in London on April 12 1867. He was educated at Trinity College, Dublin, where he was one of the

founders of the Dublin Historical Society. His most important work is his annotated edition of the *English Poets* (1854–57; new ed., 1866), the works of each poet being prefaced by a memoir. He was a director of the Royal Literary Fund, and well known for his open-hearted generosity to fellow men of letters.

BELL. The number of different forms assumed by bells is very large, not all of which need be dealt with here. The term does not strictly include gongs, cymbals, metal plates, resonant bars of metal or wood, or tinkling ornaments, such as, *e.g.*, the "bells" upon the Jewish high priest's dress (Exodus xxviii. 32); nor is it necessary here to deal with such varieties as sheep or cow bells, or bells on sledges or harness. For house bells *see* the end of this article. A "diving-bell" (*see* DIVERS AND DIVING APPARATUS) is only so called from the analogy of its shape. The main interest of bells and bell-ringing has reference to church or tower bells, their history, construction and uses.

Early Bells.—Of bells before the Christian era there is no trustworthy evidence. The instruments which summoned the Romans to public baths or processions, or that which Lucian (A.D. 180) describes as set in motion by a water-clock (*clepsydra*) to measure time, were probably cymbals or resonant plates of metal, like the timbrels (*corybantia aera,* Virg. *Aen.* iii. 111) used in the worship of Cybele, or the Egyptian *sistrum* (*q.v.*), which seems to have been a sort of rattle. The earliest Latin word for a bell (*campana*) is late Latin of the 4th or 5th century A.D.; and the first application of bells to churches has been ascribed to Paulinus, bishop of Nola, in Campania, about A.D. 400. There is, however, no confirmation of this story.

It has been maintained with somewhat more reason that Pope Sabinianus (604) first used church bells; but it seems clear that they were introduced into France as early as 550. In the 7th century Bede mentions a bell brought from Italy by Benedict Biscop for his abbey at Wearmouth, and speaks of the sound of a bell being well known at Whitby abbey at the time of St. Hilda's death (680). St. Dunstan hung many in the 10th century; and in the 11th they were not uncommon in Switzerland and Germany.

Several old bells are extant in Scotland, Ireland and Wales; the oldest are often quadrangular, made of thin iron plates hammered and riveted together. A well-known specimen is St. Patrick's bell, preserved at Belfast, called *Clog an eadhachta Phatraic,* "the bell of St. Patrick's will." It is 6in. high, 5in. broad, 4in. deep, adorned with gems and gold and silver filigree-work; it is inscribed 1091 and 1105, but it is probably alluded to in Ulster annals in 552. In these early times bells were usually small; even in the 11th century a bell presented to the church at Orleans weighing 2,600lb. was thought large.

To these scanty records of the early history of bells may be added the enumeration of different kinds of bells by Hieronymus Magius, in his work *De Tintinnabulis:* (1) *Tintinnabulum,* a little bell, otherwise called *tinniolum,* for refectory or dormitory, according to Joannes Belethus, but Guillaume Durand names *squilla* for the refectory; (2) *Petasius,* or larger "broad-brimmed hat" bell; (3) *Codon,* orifice of trumpet, a Greek hand-bell; (4) *Nola,* a very small bell, used in the choir, according to Durand; (5) *Campana,* a large bell, first used in the Latin churches in the steeple (Durand), in the tower (Belethus); (6) *Squilla,* a shrill little bell. We read of *cymbalum* for the cloister (Durand) or *campanella* for the cloister (Belethus); *nolula* or *dupla* in the clock; *signum* in the tower (*e.g.*, in the *Excerptions* of St. Egbert, 750); the Portuguese still call a bell *sino.*

Bell-founding.—The earliest bells were probably not cast, but made of plates riveted together. Later, when casting was adopted, the earliest founders were often peripatetic artificers, who travelled about the country, setting up a temporary foundry to cast bells wherever they were wanted.

The chief English centres of the art in mediaeval times were London, York, Gloucester and Nottingham; and bells by "John of York" (14th century), Miles Graye (1605), Samuel Smith, father and son, of York (1680–1730), Abraham Rudhall and his descendants, of Gloucester (1684–1774), Mot (16th century), Lester and Pack (1750), Christopher Hodson of London (who cast "Great Tom" of Oxford, 1681), Richard Phelps (1716) and H. Bagley (18th century) are still in high repute. The Whitechapel Bell Foundry (now Mears and Stainbank), established by Robert Mot in 1570, incorporated the business of the Rudhalls, Lester and Pack, Phelps, Briant and others, and is now one of the leading firms of bell-founders; others being Gillett and Johnston, Croydon, and Taylor and Company, Loughborough, the founders of "Great Paul" for St. Paul's cathedral (1881).

Bell-metal is a mixture of copper and tin in the proportion of about four to one. In Henry III.'s reign it was about two to one. In Layard's Nineveh bronze bells, it was ten to one. Zinc and lead are used in small bells. The thickness of the bell's sound bow (or edge) ranges from one-twelfth to one-fifteenth of its diameter, and its height is approximately 12 times its thickness.

Bells have been made of the most various shapes within certain limits. The long narrow bell, the quadrangular, and the mitre-shaped all indicate, in Europe at least, antiquity, while the graceful curved-inwardly-midway and full trumpet-mouthed bell indicates an age not earlier than the 16th century.

The bell is first designed on paper according to the scale of measurement. Then the outer mould is formed in an iron case lined with loam—a mixture of special adhesive kinds of sand, cow-hair and other ingredients. The "strickle board" is fixed to an arm and central bar, and is swept round the loam until the required shape has been formed in the case. The inner mould, called the core, consists of a structure built up of bricks tier upon tier, coated with the same loam as that used in the case. This mould is formed by the other strickle board in a similar manner. These are the first, or rough, coats, and the moulds are then placed in the ovens to be thoroughly dried. This process may take two or three days in the case of a medium-sized bell, and longer in the case of larger bells.

The moulds are next brought out and coated a second time with a finer mixture of loam, and then returned again to the ovens to be dried. After this they are blacked and the surfaces "sleeked" so that the castings may come out clean and smooth. At this stage any inscriptions that may be required are stamped on the outer mould. The moulds are then put together, the case fitting over the core, and the metal, having been brought to the correct temperature, is then poured into each mould. The cooling process takes about 24 hours in the case of moderate sized bells or as much as a week in the case of larger ones. The case is then lifted off, the core is knocked out, and the bell is trimmed and sand-blasted to remove the black and grease. American founders use buffing wheels to bring a high polish to the surface of their bells.

Bell Tones and Tuning.—A good bell, properly struck, should give out two distinct notes—the strike note or key of the bell, and the hum note. There are other tones present, but these are not annoying to the ear if the bell is correctly made. The hum note should be a major sixth below the strike note. Such a bell possesses a full, round tone, and as it should be cast thick, it ought to last through the ages.

The pitch of a bell may be lowered by grinding away some of the metal on its inner surface and thus increasing its diameter; and raised by grinding the edge which decreases its diameter. But any alteration of a good bell, after it is cast, is apt to injure the quality of its tone.

In tuning a "ring" or series of bells, the practice of founders was formerly to take one set of notes (in England usually the nominals, on the Continent the fundamentals) and put these into tune, leaving the other tones to take care of themselves. But during recent years tuning methods have been vastly improved, with the aid of modern mechanical appliances, and all the five tones of a bell can now be tuned with perfect accuracy. The great bell ("Great Paul") cast by Messrs. Taylor for St. Paul's cathedral, London, has not all its tones in true harmony, but the great bell cast by the same founders for Beverley Minster is in perfect tune; and with the improved machinery now in use there is no reason why this should not be the case with all church bells.

History and Uses of Bells.—The history of bells is full of romantic interest. In civilized times they have been intimately associated, not only with all kinds of religious and social uses,

but with almost every important historical event. Their influence upon architecture has been not less remarkable, for to them indirectly we owe probably most of the famous towers in the world.

Bells early summoned soldiers to arms, as well as Christians to church. They sounded the alarm in fire or tumult; and the rights of the burghers in their bells were jealously guarded. Thus the chief bell in the cathedral often belonged to the town, not to the cathedral chapter. The curfew, the Carolus, and St. Mary's bell in the Antwerp tower all belong to the town; the rest are the property of the chapter. He who commanded the bell commanded the town; for by that sound, at a moment's notice, he could rally and concentrate his adherents. Many a bloody chapter in history has been rung in and out by bells.

On the third day of Easter 1282, at the ringing of the Sicilian vespers (which have given their name to the affair), 8,000 French were massacred in cold blood by John of Procida, who had thus planned to free Sicily from Charles of Anjou. On Aug. 24, St. Bartholomew's day, 1572, bells ushered in the massacre of the Huguenots in France, to the number, it is said, of 100,000. Bells have rung alike over slaughtered and ransomed cities; and far and wide throughout Europe in the hour of victory or irreparable loss. At the news of Nelson's triumph and death at Trafalgar, the bells of Chester rang a merry peal alternated with one deep toll, and similar incidents could be multiplied.

There are many old customs connected with the use of church bells, some of which have died out, while others remain here and there. The best known and perhaps oldest of these is the "Curfew" (*couvre-feu*), first enforced (though not perhaps introduced) by William the Conqueror in England as a signal for all lights and fires to be extinguished at 8 P.M.—probably to prevent nocturnal gatherings of disaffected subjects. In many towns it survived into the 19th century as a signal for closing shops at 8 or 9 P.M.; and it is still kept up in various places as an old custom.

Among secular uses connected with church bells are the "Mote" or "Common" bell, summoning to municipal or other meetings, as *e.g.*, the 7th at St. Mary's, Stamford, tolled for quarter sessions, or the bell at St. Mary's, Oxford, for meetings of Convocation. In some places one of the bells is known as the "Vestry Bell." The "Pancake Bell," still rung here and there on Shrove Tuesday, was originally a summons to confession before Lent; the "Harvest Bell" and "Seeding Bell" called labourers to their work; while the "Gleaning Bell" fixed the hours for beginning or leaving off gleaning, so that everyone might start fair and have an equal chance. The "Oven Bell" gave notice when the lord of the manor's oven was ready for his tenants to bake their bread; the "Market Bell" was a signal for selling to begin; and in some country districts a church bell is still rung at dinner time.

Other old customs are naturally connected with the ecclesiastical uses of bells. The "Passing Bell," rung for the dying, is now generally rung after death. "Burial Peals," once common at or after funerals, to scare away the evil spirits from the soul of the departed, though discouraged by bishops as early as the 14th century, were kept alive by popular superstition, and only finally checked in Puritan times; but they have been revived, since the spread of change-ringing, in the "muffled peals" now frequently rung as a mark of respect to deceased persons of public or local importance. The "Sermon Bell," rung in pre-Reformation times to give notice that a sermon was to be preached (*cf.* Shakespeare, *Henry IV.*, pt. 2, iv. 2. 4–7), survives in some places in a custom of ringing the tenor bell, before a service with a sermon; and a similar custom before a celebration of the Holy Communion preserves the memory of the "Sacrament Bell."

Large Bells.—There are a few bells of world-wide renown, and several others more or less celebrated. The great bell at Moscow, "Tsar Kolokol," which was cast in 1733, was in the earth 103 years and was raised by the emperor Nicholas in 1836. The present bell seems never to have been actually hung or rung, having been cracked in the furnace; and it now stands on a raised platform in the middle of a square. It weighs about 180 tons, height 19ft. 3in., circumference 60ft. 9in., thickness 2ft., weight of broken piece 11 tons. The second Moscow bell, the largest in the world in actual use, weighs 128 tons. In a pagoda in Upper Burma hangs a bell 16ft. in diameter, weighing about 80 tons. The great bell at Peking weighs 53 tons; Nanking, 22 tons; Olmütz, 17 tons; Vienna (1711), 17 tons; Notre Dame (1680), 17 tons; Erfurt, 13 tons; Great Peter, York Minster, recast in 1927, 11 tons; Great Paul, at St. Paul's cathedral, 16¾ tons; Great Tom at Oxford, 7½ tons; Great Tom at Lincoln, 5½ tons. Independence Hall bell, in Philadelphia, cast by Meneely in 1876, 6½ tons. Big Ben of the Westminster clock tower weighs 13½ tons; it was cast by George Mears under the direction of the first Lord Grimthorpe (E. Beckett Denison) in 1858, but is now cracked. Its four quarters were cast by Warner in 1856. The "Kaiserglocke" of Cologne cathedral, recast in 1875, with metal from French cannon captured in 1870–71, weighed 27½ tons, but was broken up during the World War and has since been replaced by a new bell weighing 25 tons. The 18¼-ton bourdon bell of the carillon of 72 bells in Riverside church, New York (supplied by Messrs. Gillett and Johnston, of Croydon, England), is the biggest bell in the world that has ever been tuned and the largest bell which has so far been cast in England.

Bell-ringing.—The science and art of bell-ringing, as practised upon church and tower bells, falls under two main heads:—(1) Mechanical ringing, in connection with the machinery of a clock or "carillon"; (2) Ringing by hand, by means of ropes attached to the fittings of the bells, whereby the bell itself is either moved as it hangs mouth downwards sufficiently for the clapper just to touch its side (called, technically, "chiming"); or is swung round nearly full circle with its mouth uppermost (technically "ringing"), in which case the impact of the clapper is much heavier, and the sound produced is consequently louder and more far-reaching. Mechanical ringing is more common in America and on the Continent of Europe, especially in Belgium and Flanders; ringing by hand is more common in England, where the development of change-ringing (*see* below) has brought it into prominence.

(1) *Mechanical ringing* is effected by a system of wires connected with small hammers striking the bells, usually on the outside in the case of clocks and inside in the case of chimes and carillons, and worked either by connection with the machinery of a clock, so as to play tunes or artificially arranged chimes at definite intervals; or with a key-board containing handles. The first of these methods is familiar in the chimes (Cambridge, Westminster, etc.) heard from many towers at the striking of the hours and quarters; or in hymn tunes played at intervals (*e.g.*, of three hours) upon church bells. The second method is peculiar to the "carillon" (*q.v.*) as found everywhere in Belgium, where with a set of from 20 or 30 to 60 or 70 bells a much wider scope for tunes and harmonies is provided than in English belfries, where the numbers of bells usually range from four to twelve in one key only. There are about 40 rings of 12 bells in England, some hundreds of rings of ten, perhaps 2,000 rings of eight, with a total of, say, 10,000 ringing peals.

(2) *Ringing by Hand.*—Church bells may be "chimed" or "rung" (*see* above). One man can, as a rule, chime three bells, with a rope in each hand and one foot in the loop of another. Some prefer the quieter sound of chiming as an introduction to divine service, but where a band of ringers is available and change-ringing is practised, the bells as a rule are rung. The practice of "clocking" a bell, in which the clapper, by means of a cord attached to it and pulled from below, is allowed to swing against the bell at rest, is often employed to save trouble; but the jar is very likely to crack the bell. In ringing, or in true chiming, the bell is in motion when struck.

For ringing, a bell is pulled up and "set" mouth uppermost. She (to ringers a bell is feminine) is then pulled off, first at "handstroke" (*i.e.*, with the hands on the "sally" or tufted portion of the rope, a few feet from its lower end) and then at "back-stroke" in the reverse direction (with the hands nearer the lower end, the rope having at the previous pull coiled round three-quarters of the wheel's circumference), describing at each pull a full circle till she comes back to the upright position. At each revolution the swing is chiefly done by the weight of the bell,

the ringer giving a pull of just sufficient strength to bring the bell back into the upright position; otherwise its swing would become gradually shorter till it remained at rest mouth downwards.

(3) *Electric Ringing.*—A device recently marketed by the Meneely Bell Company of Troy, N.Y., enables the ringer to play tunes and changes on chimes (carillons) of stationary bells from a console having keys like those of an organ. Wires lead from the console to relays, located near the bells, and wires from the relays are run to solenoids (large magnets) which are connected to the clappers. Pressure on the keys transmits the electricity to the solenoids which pull the clappers. Quick playing is thus secured, repeat blows at the rate of three per second being possible on any one bell. Nearly all American made chimes are now being designed for electric ringing.

Change-ringing.—When a given number of bells are rung over and over again in the same order, from the highest note, or "treble" to the lowest, or "tenor"—1, 2, 3, 4, 5, 6, 7, 8—they are said to be rung in "rounds." "Changes" are variations of this order—*e.g.,* 2 1 3 5 4 7 6 8, 2 3 1 4 5 6 7 8; and "change-ringing" is the art of ringing bells in "changes" so that a different "change" or rearrangement of order is produced at each pull of the bell-ropes, until, without any repetition of the same change, the bells come back into "rounds."

The general principle of all methods of change-ringing is that each bell, after striking in the first place or "lead," works gradually "up" to the last place or "behind," and "down" again to the first, and that no bell ever shifts more than one place in each change. Thus the ringer of any bell knows that whatever his position in one change, his place in the next will be either the same, or the place before or the place after. He does not have to learn by heart the different changes or variations of order; nor need he, unless he is the "conductor," know the exact order of any one change. He has to bear in mind, first, which way his bell is working, viz., whether "up" from the first to last place, or "down" from last to first; secondly, in what place his bell is striking; thirdly, what bell or bells are striking immediately before or after him—this being ascertained chiefly by "rope-sight," *i.e.,* the knack, acquired by practice, of seeing which rope is being pulled immediately before and after his own. He must also remember and apply the rules of the particular "method" which is being rung.

The following table representing the first 20 changes of a "plain course" of "Grandsire Triples" (for these terms, *see* below) illustrates the subject-matter of this section:

1 2 3 4 5 6 7 "Rounds."	7 5 6 1 4 2 3 (10th change.)
2 1 3 5 4 7 6 (1st change.)	5 7 1 6 2 4 3
2 3 1 4 5 6 7	5 1 7 2 6 3 4
3 2 4 1 6 5 7	1 5 2 7 3 6 4
3 4 2 6 1 7 5	1 2 5 3 7 4 6
4 3 6 2 7 1 5 (5th change.)	2 1 5 7 3 6 4 (15th change.)
4 6 3 7 2 5 1	2 5 1 3 7 4 6
6 4 7 3 5 2 1	5 2 3 1 4 7 6
6 7 4 5 3 1 2	5 3 2 4 1 6 7
7 6 5 4 1 3 2	3 5 4 2 6 1 7
	3 4 5 6 2 7 1 (20th change.)

It will be observed that at the 1st change the third bell and at the 15th the fifth bell, according to the rule of this "method," strikes a second blow in the third place ("makes third's place"). This stops the regular work of the bells which at the previous change were in the 4th, 5th, 6th and 7th places ("in 4, 5, 6, 7"), causing them to take a step backwards in their course, "up" or "down," or as it is technically called, to "dodge." Were it not for this the bells would come back into "rounds" at the 14th change. It is by the use of "place-making" and "dodging," according to the rules of various "methods," that the required number of changes, upon any number of bells, can be produced. But in order that this may be done, without the bells coming back into "rounds," further modifications of the "coursing order," called technically "Bobs" and "Singles," must be introduced. In ringing, notice of these alterations as they occur is given by one of the ringers, who acts as "conductor," calling out "Bob" or "Single" at the right moment to warn the ringers of certain bells to make the requisite alteration in the regular work of their bells. Hence, in ringing language, to "call" a peal or touch=to conduct it.

The number of *possible* "changes" on any given series of bells may be ascertained, according to the mathematical formula of permutations, by multiplying the number of the bells together. Thus on three bells, only six changes or variations of order ($1\times2\times3$) can be produced; on four bells, $1\times2\times3\times4=24$; and so on up to the immense figure of 479,001,600 changes obtainable upon 12 bells. As many as 21,000 changes, occupying over 12 hours, have been rung upon church bells. But the great physical strain upon the ringers—to say nothing of the effect upon those who are within hearing—makes such performances exceptional. The word "peal" is often, though incorrectly, used (1) for a set of church bells ("a peal of six," "a peal of eight"), for which the correct term is "a ring" of bells; (2) for any shorter performance than a full peal (*e.g.,* "wedding-peal," "muffled peal," etc.), called in ringing language a "touch."

Varying "Methods."—Change-ringing upon five bells is called "Doubles," upon seven bells "Triples," upon nine "Caters" (Fr. *quatre*), and upon 11 "Cinques," from the fact that at each change two, three, four or five pairs of bells change places with each other. "Doubles" can be and are rung when there are only five bells; but as a rule these "odd-bell" systems are rung with a "tenor behind," *i.e.,* struck at the end of each change; the number of bells in a tower being usually an even number—six, eight, ten or 12. In "even-bell" systems the tenor is "rung in" or "turned in," *i.e.,* changes with the other bells, and a different terminology is employed; change-ringing on six bells being called "Minor"; on eight bells, "Major"; on ten bells, "Royal"; and on 12, "Maximus."

As regards the application of the term "tenor," rather than "bass," to the largest bell in a peal, no satisfactory explanation has ever been offered—unless the suggestion can be so described that in a peal of ten the biggest bell is the "tenth" or "tenor!"

The principal "methods" of change-ringing, each of which has its special rules, are: (1) "Grandsire"; (2) "Plain Bob"; (3) "Treble Bob"; (4) "Stedman," from the name of its inventor, Fabian Stedman, about 1670. In "Grandsire" the treble and one other bell, in "Plain Bob" the treble alone, has a "plain hunt," *i.e.,* works from the first place, or "lead," to the last place, or "behind," and back again, without any dodging; in "Treble Bob" the treble has a uniform but zigzag course, dodging in each place on its way up and down. This is called a "Treble Bob hunt"; and under these two heads, according to the work of the treble, are classified a variety of "plain methods" and "Treble Bob methods," among the latter being the so-called "Surprise" methods, the most complicated and difficult of all. "Stedman's principle," which is *sui generis,* consists in the three front bells ringing their six possible changes, while the remaining pair or pairs of bells dodge. It is thus an "odd-bell" method adapted to five, seven, nine or 11 bells; as also is "Grandsire," though occasionally rung on even numbers of bells. "Treble Bob" is always, and "Plain Bob" generally, rung on even numbers—six, eight, ten or 12.

Quite distinct from the art of change-ringing is the science of "composing," *i.e.,* arranging and uniting by the proper "calls," subject to certain fixed laws and conditions, a number of groups of changes, so that no one change, or series of changes represented in those groups, shall be repeated. A composition, long or short, is said to be "true" if it is free from, "false" if it involves, such repetition; and the body of ascertained laws and conditions governing true composition in any method constitutes the test or "proof" to be applied to a composition in that method to demonstrate its truth or falseness. One of the objects kept in view by composers is musical effect. Certain sequences of contrasts of notes strike the ear as more musical than others; and an arrangement which brings up the more musical changes in quicker succession improves the musical effect of the "peal" or "touch." On seven bells all the possible changes must be inserted in a true peal; but on larger numbers of bells, where the choice is from an immense number of possible changes, the composer is free to select those which are most musical.

An Ancient Art.—The art of scientific change-ringing, originally peculiar to England and to-day practised outside England only in a few places in Canada, Australia, South Africa and the United States, does not seem to have been evolved before the

middle of the 17th century. Societies or guilds of ringers, however, existed much earlier. A patent roll of 39 Henry III. (1255) confirms the "Brethren of the Guild of Westminster, who are appointed to ring the great bells there," in the enjoyment of the "privileges and free customs which they have enjoyed from the time of Edward the Confessor." In 1602 (as appears from a ms. in the library of All Souls' college, Oxford) was founded a society called the "Scholars of Cheapside." In 1637 began the "Ancient Society of College Youths," so called from their meeting to practise on the six bells at St. Martin's, College hill, a church destroyed in the Great Fire of London, 1666. At first only "rounds" and "call-changes" were rung, till about 1642, when 120 "Bob Doubles" were achieved; but slow progress was made till 1677, when Fabian Stedman of Cambridge published his *Campanologia,* dedicating it to this society, his method being first rung about this time by some of its members.

Before the end of the 17th century was founded the "Society of London Scholars," the name of which was changed in 1746 to "Cumberland Youths" in compliment to the victor of Culloden. These two metropolitan societies still exist, and include in their membership most of the leading change-ringers of England; one of the oldest provincial societies being that of Saffron Walden in Essex, founded in 1623, and still holding an annual ringing festival. In the latter half of the 18th and first half of the 19th century change-ringing, which at first seems to have been an aristocratic pastime, degenerated in social repute. Church bells and their ringers, neglected by church authorities, became associated with the lower and least reputable phases of parochial life; and the belfry was too often an adjunct to the pothouse.

In the last half of the 19th century, however, there was a great revival of change-ringing, leading to improvements in belfries and in ringers, and to their gradual recognition as church workers. Diocesan or county associations for the promotion of change-ringing and of belfry reform spread knowledge of the art and aroused church officials to greater interest in and care for their bells. A central council of church bell ringers, consisting of delegates from these various societies, was also formed, and in the result, it is now less likely than ever that the Belgian carillons will be preferred in England to the peculiarly English system of ringing bells in peal; by which, whatever its difficulties, the musical sound of bells is most fully brought out, and their scientific construction best stimulated.

Bell Literature.—The early literature of bell-lore (or campanology) consists chiefly of scattered treatises or pamphlets upon the technique of different methods of change-ringing, or upon the bells of particular counties or districts. Two of the earliest are *Campanologia or the Art of Ringing Improved* (1677), and a chapter of "Advice to a Ringer" in the *School of Recreations,* or *Gentleman's Tutor* (1684), showing that in its early days bell-ringing was a fashionable pastime. The revival of change-ringing in recent years has produced many manuals, while *A Glossary of Technical Terms* used in connection with church bells and change-ringing was published in 1901, under the auspices of the Central Council of Church Bell Ringers. On the history of church bells and customs connected with them much curious information is given in North's *English Bells and Bell Lore* (1888). By the same author are monographs on the church bells of Leicestershire, Northamptonshire, Lincolnshire and Hertfordshire. There are similar works on the church bells of Suffolk and Cambridgeshire, by Dr. Raven; of Huntingdonshire, by the Rev. T. M. N. Owen; and on the church bells of Essex, by the Rev. C. Deedes. A compilation and summary of many data of bell-lore will be found in *A Book about Bells,* by the Rev. G. S. Tyack; and in a volume by Dr. Raven in the "Antiquary's Books" series (1906), entitled *The Bells of England,* which deals with the antiquarian side of bell-lore. Further may be mentioned *An Account of Church Bells* (Lukis); *The Church Bells of England* (Walters); *Clocks, Watches and Bells* (Lord Grimthorpe); and *Bells and Bell Tones,* a lecture delivered at the Musical Association by W. W. Starmer. (*See* also CARILLON.)

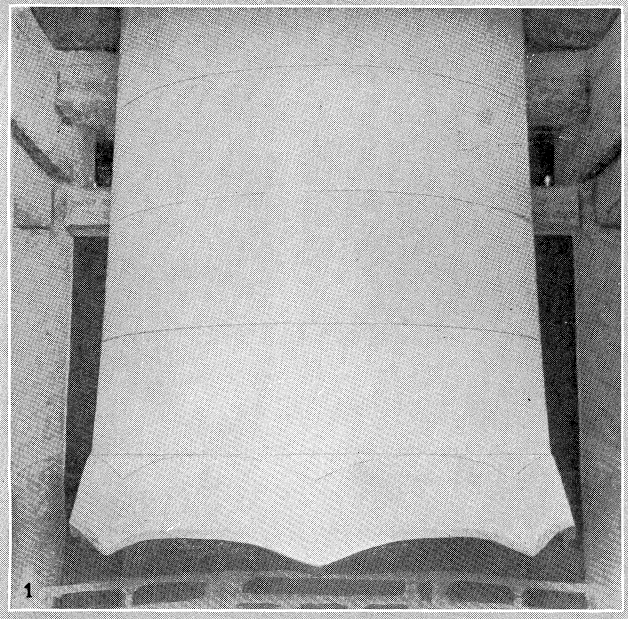
House Bells.—Ordinary house bells of the old type, with a clapper worked by a wire, require no description. In pneumatic bells the wires are replaced by pipes of narrow bore, and the current of air which is caused to flow along these by the pressing of a push-button actuates a small hammer which impinges rapidly against a bell or gong. An electric bell consists of a small electro-magnet acting on a soft iron armature, which is supported in such a way that, normally, it stands away from the magnet. When the latter is energized by the passage of an electric current, the armature is attracted towards it, and a small hammer attached to it strikes a blow on the bell or gong. This "single stroke" type of bell is largely used in railway signalling instruments. For domestic purposes, however, the bells are arranged so that the hammer strikes a series of strokes, continuing so long as the push-button which closes the electric circuit is pressed. A light spring is provided against which the armature rests when it is not attracted by the electro-magnet, and the current is arranged to pass through this spring and the armature on its way to the magnet. When the armature is attracted by the magnet it breaks contact with this spring, the current is interrupted and the magnet being no longer energized allows the armature to fall back on the spring and thus restore the circuit. In this way a rapid to and fro motion is imparted to the hammer. The electric current is supplied by a battery and conveyed by a wire. Bells of this kind cease to ring whenever the electrical continuity is interrupted, but in some cases, as in connection with burglar-alarms, it is desirable that the bell, once set in action, shall continue to ring even though the wires are cut. For this purpose, in "continuous ringing" bells, the current, started by the push or alarm apparatus, instead of working the bell, is made to operate a relay-switch and thus to bring into circuit a second battery which continues to ring the bell, no matter what happens to the first circuit.

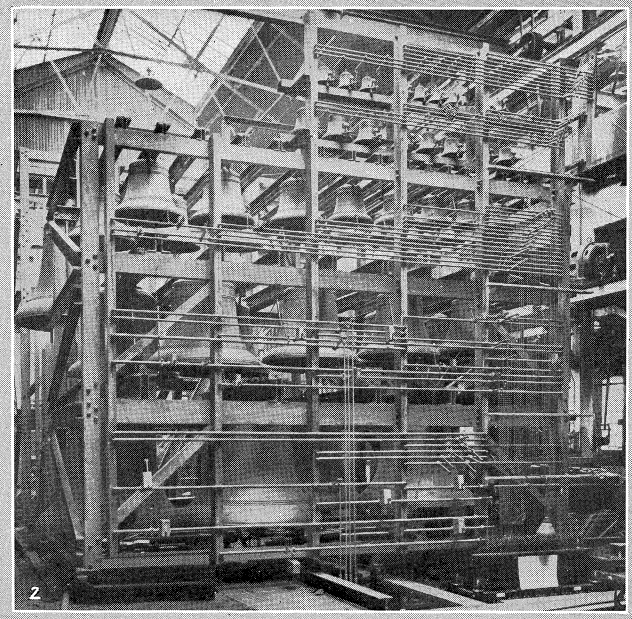
BELL, BOOK AND CANDLE, an old ceremony of pronouncing the "major excommunication" or "anathema." Its origins are not clear, but it goes back certainly to the end of the 9th century, if not to the middle of the 8th. In this formality the bell represents the public character of the act, for it served not only to call the participants together but to announce it to all; the ceremony was performed in some conspicuous place and, upon its termination, letters were written to bishops of other sees to report the fact. The book represents the authority of the words spoken by the presiding bishop. The candle is believed to symbolize the possibility that the ban may be lifted by the repentance and amendment of its victim, for just as the candles used are extinguished, so the excommunication itself may be. When the assemblage has been convoked a bishop appears with 12 priests; and all of the 13 hold lighted candles. The bishop, wearing violet vestments, then recites the formula, ending thus: "We separate him, together with his accomplices and abettors, from the precious body and blood of the Lord and from the society of all Christians; we exclude him from our holy mother the Church in heaven and on earth; we declare him excommunicate and anathema; we judge him damned, with the Devil and his angels and all the reprobate, to eternal fire until he shall recover himself from the toils of the Devil and return to amendment and to penitence." Those present answer, "So be it!" Then the bishop and the 12 priests extinguish their candles by dashing them to the ground and (as a general rule) the ceremony is ended. Sometimes the 108th psalm has been recited as a reference to Judas and other enemies of Christ.

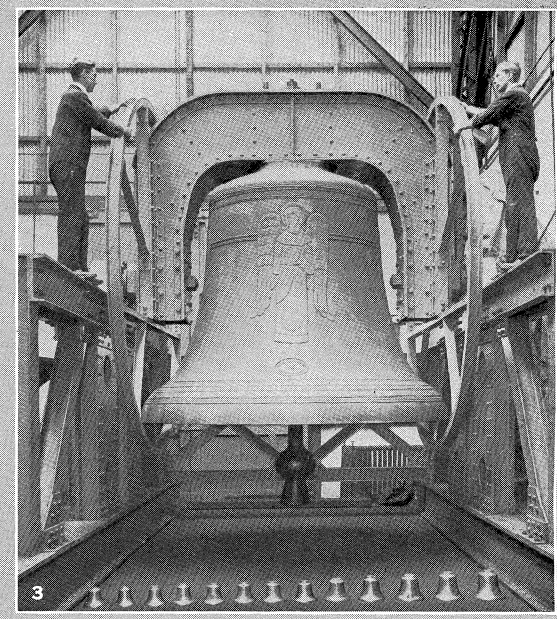
The present ceremonial of excommunication is to be found in the *Pontificale Romanum,* book iii., under the title *Ordo excommunicandi et absolvendi. See* also Catalan, *Pontificale romanum prolegomenis et commentariis illustratum,* vol. iii., 253 *et seq.* (2nd ed., Paris, 1852); Martène, *De antiquae Ecclesiae Ritibus,* book iii., ch. iv. (Rouen, 1700); Vacant et Mangenot, *Dictionnaire de Théologie catholique,* vol. i., coll. 1168–71.

BELLABELLA, the common name (popularized from the Indian corruption of Milbank) for a tribe of Kwakiutl Indians at Milbank, British Columbia, including the subtribes Kokaitk, Oetlitk and Oealitk. They were converted to Christianity by Protestant missionaries, and number about 300.

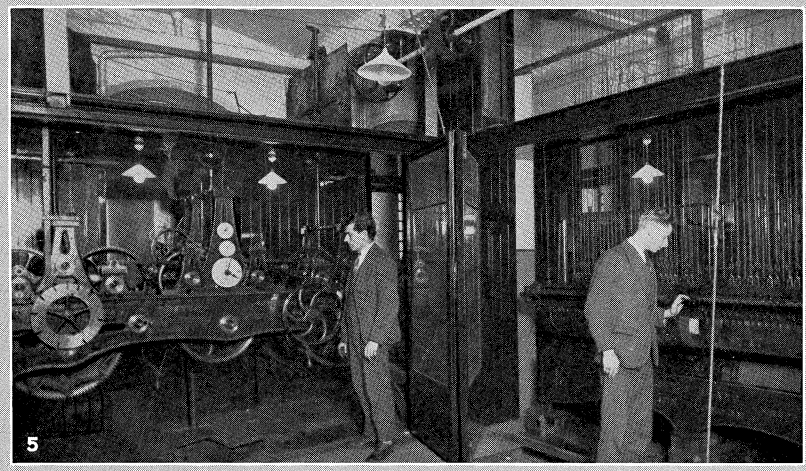
BELLACOOLA, an American Indian ethnic unit, also called Tallion, constituting the northernmost group of the Salishan family, of the Coast division. They lived in a number of inde-

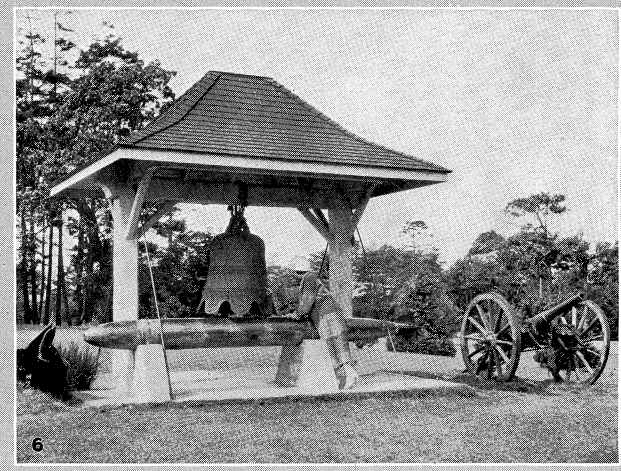












BY COURTESY OF (1, 4, 6) THE CANADIAN PACIFIC STEAMSHIPS, (5) COPR., H. W DOUGHTY

BELLS AND CARILLONS IN MANY PARTS OF THE WORLD

1. Bell in the Ta Chung Su temple, two miles northeast of Pekin, China, one of the largest hanging bells in the world. It is 17 ft. high, 34 ft. in circumference, 9 in. thick at the rim and weighs 53 tons. It was cast in 1409 for the Emperor Yung Lo
2. Carillon of 53 bells in the Ottawa parliament buildings. The weight of the bass bell, seen in the left foreground, is 10 tons, and there are 47 treble and middle register bells
3. The "bourdon" for the Laura Spelman Rockefeller Memorial carillon, Riverside church, New York city, said to be the largest bell ever cast in England, having a net weight of 18 tons 5 cwt. 1 qr. 18 lb. after tuning
4. The "king of bells" at the Kremlin, Moscow, weighing approximately 180 tons; height 19 ft. 3 in., circumference 60 ft. 9 in., greatest thickness 24 inches. It was cast in the year 1733 and added to the Ivanovskaya belfry in 1737. A fragment was broken from it soon after it was hung, rendering it unfit for service and leaving an aperture about 7 ft. high and 8 ft. wide
5. Carillon machinery which operates the bells at Manchester Town Hall, England. Keyboards on the Continental order have been introduced
6. A Chinese bell in Beaconhill park, Victoria, brought from a sacred palace in Pekin at the time of the Boxer rebellion. It was cast in 1627 and weighs 2000 pounds

pendent villages on Bentinck and Dean inlets and Bellacoola river in British Columbia. They adhered to the maritime culture restricted to the Northwest Coast. By 1902 their numbers had shrunk to 300. *See* F. Boas, in various writings on the area; and a monograph in press, *Can. Div. Ethn.*, by T. F. McIlwraith.

BELLADONNA, a name for the deadly nightshade (*Atropa belladonna*).

(*See* ATROPINE; NIGHTSHADE; SOLANACEAE.)

BELLAGIO, a village of Lombardy, Italy, province of Como, 15 mi. N.N.E. by steamer from Como. It is a resort on the promontory between the two southern arms of the lake. It works in silk and olive-wood. Pop. (1936) 864 (town), 3,643 (commune).

BELLAIRE, a city of Belmont county, O., U.S.A., on the Ohio river, 5 mi. below Wheeling. It is served by the Baltimore and Ohio and the Pennsylvania railways and federal highway 40. The population was 13,327 in 1930; and was 13,799 in 1940, federal census. It is the outlet for the Belmont county coal field, and the shipping point for fine Jersey cows raised in the vicinity. Iron, limestone and fire clay, found near, are utilized in the manufacture of galvanized and enamelled ware, agricultural implements, iron and steel, stoves, glass, rivets, and other commodities. The village was settled about 1795, incorporated in 1834 and chartered as a city in 1874.

BELLAMY, EDWARD (1850–1898), American author and social reformer, was born at Chicopee Falls (Mass.), March 25, 1850, and died there May 22, 1898. He studied at Union College, Schenectady, New York, and in Germany; was admitted to the bar in 1871, but soon became associate editor of the Springfield (Mass.) *Union* and then an editorial writer for the New York *Evening Post*. Although his first books were light fiction, such as *Dr. Heidenhoff's Process* (1880) and *Miss Ludington's Sister* (1884), his historical novel *The Duke of Stockbridge* (1900), with its sympathy for unfortunate debtors and the leaders of Shays' rebellion, showed the direction in which he was tending. By the time it was completed, he refused to allow it to be published by the local newspaper to which it was promised, expending all of his energy instead on social and economic reform. *Looking Backward, 2000–1887* (1888), the most popular of the American Utopian romances, was translated into several languages and has preserved his name until a day when many of the inventions he prophesied have become realities. Its sequel *Equality* (1897) and his attempts as writer, lecturer and politician to promote his communistic theories under the title of "Nationalism" are, however, almost forgotten.

BELLAMY, GEORGE ANNE (1727–1788), English actress, born at Fingal, Ireland, by her own account, on April 23, 1733, but more probably in 1727; the illegitimate daughter of Lord Tyrawley. On his appointment as ambassador to Russia, she went to live with her mother in London, made the acquaintance of Mrs. Woffington and Garrick, and adopted the theatrical profession. Her first engagement was at Covent Garden as Monimia in the *Orphan* in 1744. Her success was immediate, and till 1770 she acted in London, Edinburgh and Dublin, in all the principal tragic rôles. She played Juliet to Garrick's Romeo at Drury Lane at the time that Spranger Barry (*q.v.*) was giving the rival performances at Covent Garden, and was considered the better of the Juliets. Her last years were passed in poverty and ill-health. She died on Feb. 16, 1788. Her *Apology* (6 vols., 1785) gives an account of her long career and of her private life, the extravagance and licence of which were notorious. She was named George Anne by mistake for Georgiana.

BELLAMY, JOSEPH (1719–1790), American theologian, was born in Cheshire (Conn.) Feb. 20, 1719. He graduated from Yale in 1735, was licensed to preach when scarcely 18 years old, and from 1740 until his death, March 6, 1790, was pastor of the Congregational church at Bethlehem (Conn.). The publication of *True Religion Delineated* (1750), won for him a high reputation. His influence on the religious thought of his time in America was probably surpassed only by that of his old friend and teacher, Jonathan Edwards. His published works include *The Wisdom of God in the Permission of Sin* (1758), his most characteristic work; *Theron, Paulinus and Aspasio* (1759); *The Nature and Glory of the Gospel* (1762); *A Blow at the Root of Antinomianism* (1763); and *There is but One Covenant* (1769).

His collected *Works* were published in 3 vol. (1811–12), and were republished with a *Memoir* by Rev. Tryon Edwards (2 vol., 1850).

BELLARMINE (Ital. BELLARMINO), **ROBERTO FRANCESCO ROMOLO** (1542–1621), Italian cardinal and theologian, was born in Monte Pulciano, Tuscany, on Oct. 4, 1542. He entered the Society of Jesus in 1560. After three years at Rome he was sent to the Jesuit settlement at Mondovi in Piedmont; in 1567 and 1568 he was at Padua, studying theology under a master who belonged to the school of St. Thomas Aquinas. In 1569 he was sent to Louvain, and in 1570, after being ordained priest, began to lecture on theology there. His seven years' residence in the Low Countries brought him into relations with modes of thought differing from his own; and, though neither by temperament nor training inclined to the prevailing Augustinian doctrines of grace and free will, the current controversy compelled him to define his theological principles more clearly. On his return to Rome in 1576 he was chosen by Gregory XIII. to lecture on controversial theology in the new Roman college. The result appeared in the far-famed *Disputationes de Controversiis Christianae Fidei adversus huius temporis Haereticos* (3 vols., 1581, 1582, 1593), which called forth a multitude of answers on the Protestant side; the book exhausts the controversy as it was carried on in those days, and contains a lucid and uncompromising statement of Catholic doctrine. Bellarmine took part in the preparation of the Clementine edition (1592) of the Vulgate. He has been accused in this matter of some disingenuousness in regard to the concealment of numerous errors in the earlier edition, that of Sixtus; it appears, however, that, though he wished to spare that pope from censure, he did not conceal the inaccuracies of the edition or suggest that they were merely misprints. He was made cardinal in 1599 by Clement VIII., and two years later archbishop of Capua. He resigned his archbishopric in 1605. When health failed he retired to Monte Pulciano, where from 1607 to 1611 he acted as bishop. In 1610 he published his *De Potestate summi Pontificis in rebus temporalibus* against the posthumous work of William Barclay of Aberdeen, which denied the temporal power of the pope. Bellarmine trod here on difficult ground, for, although maintaining that the pope had the indirect right to depose unworthy rulers, he gave offence to Paul V. in not asserting more strongly the direct papal claim, whilst many French theologians, and especially Bossuet, condemned him for his defence of ultramontanism.

As a *consultor* of the Holy Office, Bellarmine took a prominent part in the first examination of Galileo's writings. He had followed with interest Galileo's scientific discoveries, and a respectful admiration grew up between them. Bellarmine did not proscribe the Copernican system, as has been maintained by Reusch (*Der Process Galileo's und die Jesuiten*, Bonn, 1879, p. 125); all he claimed was that it should be presented merely as an hypothesis, until it should receive scientific demonstration. When Galileo visited Rome in Dec. 1615 he was warmly received by Bellarmine, and the high regard in which he was held is clearly testified in Bellarmine's letters and in Galileo's dedication to the cardinal of his discourse on "flying bodies." He died in Rome on Sept. 17, 1621.

Bellarmine, whose life was a model of Christian virtue, is one of the greatest of Catholic controversialists; he has suffered the common fate of controversialists in that his methods of controversy and his achievements in it have been, and still are, the subject of acute controversy. His devotional treatises were very popular among English Catholics in the penal days. Bellarmine was beatified by Pius XI. on May 13, 1923, and his feast is kept on May 13 in Jesuit churches. He was canonized in 1930.

BIBLIOGRAPHY.—Of the older editions of Bellarmine's complete works the best is that in 7 vols. published at Cologne (1617–20); modern editions appeared in 8 vols. at Naples (1856–62, reprinted 1872), and in 12 vols. at Paris (1870–74). For complete bibliography of all works of Bellarmine, of translations and controversial writings against him, *see* C. Sommervogel, *Bibliothèque de la Compagnie de Jésus*, vol. i. cols. 1151–1254 (Brussels and Paris, 1890 *et seq.*); *id., Addenda*, pp. x.–xi. vol. viii., cols. 1797–1807. The main source for the life of Bellarmine is his Latin *Autobiography* (Rome, 1675; Louvain, 1753), which was reprinted with original text and

German translation by Döllinger and Reusch, *Die Selbstbiographie des Cardinals Bellarmin* (Bonn, 1887). The *Epistolae Familiares*, a very incomplete collection of letters, was published by J. Fuligatti (Rome, 1650), who is also the author of *Vita del cardinale Bellarmino della Compagnia di Giesù* (Rome, 1624). The best modern studies are J. B. Couderc's *Le Vénérable Cardinal Bellarmin* (2 vols., Paris, 1893); X. le Bachelet's article in A. Vacant's *Dict. de théol. cat.*, cols. 560–599, with exhaustive bibliography; J. Bzodrick, *The Life and Work of Blessed Robert Francis, Cardinal Bellarmine, S.J.* (1928).

BELLARY or **BALLARI,** a city and district of British India, in the Madras presidency. The city is 305m. by rail from Madras. Pop. (over 58,000 in 1901) fell below 35,000 in 1911, owing to plague, and was 56,148 in 1941. The fort rises from a huge mass of granite rock, which, with a circumference of nearly 2m., juts up abruptly to a height of 450ft. above the plain. To the east and south lies an irregular heap of boulders, but to the west is an unbroken precipice, and the north is walled by bare rugged ridges. It is defended by two distinct lines of works. The upper fort is a quadrangular building on the summit, with only one approach, and was deemed impregnable by the Mysore princes. It contains several cisterns, excavated in the rock. The lower fort, with barracks, church, etc., and many private houses, lies at the eastern base of the rock and measures about half-a-mile in diameter. The fort of Bellary was originally built by Hanumapa in the 16th century. It was first dependent on the kingdom of Vijayanagar, afterwards on Bijapur, and subsequently subject to the nizam and Hyder Ali. The latter erected the present fortifications, according to tradition, with the assistance of a French engineer in his service, whom he afterwards hanged for not building the fort on a higher rock adjacent to it. Bellary is a temporary military station. There is a considerable trade in cotton, in connection with which there are large steam presses, and some manufacture of cotton cloth. There are a cotton spinning mill, distilleries and a sugar factory.

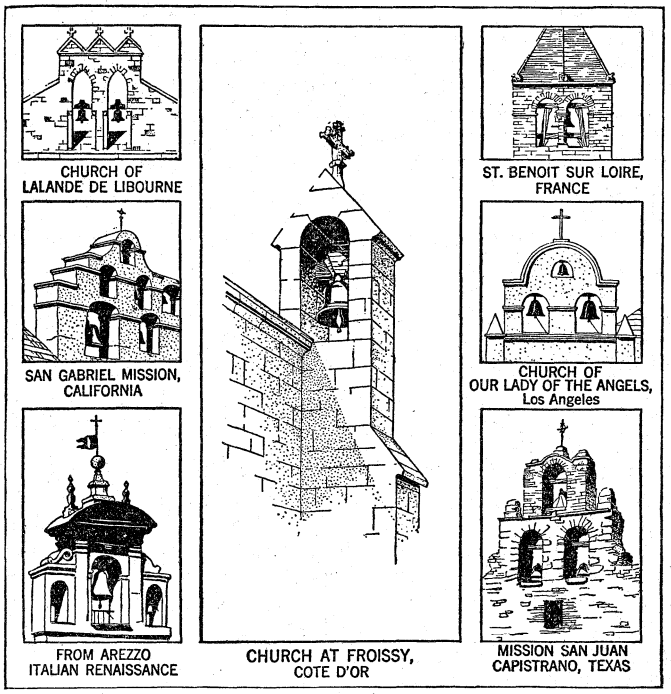
The district of Bellary has an area of 5,714 sq. miles. It consists chiefly of an extensive plateau between the eastern and western Ghats, of a height varying from 800–1,000 ft. above the sea. The highest tracts are on the west, where the surface rises towards the culminating range of hills, and on the south, where it rises to the elevated tableland of Mysore. Towards the centre the almost treeless plain presents a monotonous aspect, broken only by a few rocky elevations that rise abruptly from the black soil. The district is watered by five rivers: the Tungabhadra, formed by the junction of two streams, Tunga and Bhadra, the Haggari, Hindri, Chitravati and Pennar, the last considered sacred by the natives. None of the rivers is navigable and all are fordable during the dry season. The climate of Bellary is extremely dry, and it has a smaller rainfall than any other district in south India. Bellary is subject to disastrous storms and hurricanes, and to famines. Pop. (1941) 1,051,235. The principal crops are millet, other food-grains, pulse, ground-nuts and cotton. There are manufactures of cotton and woollen goods, and cotton is largely exported. The district is traversed by the Madras and Southern Mahratta railways, meeting on the eastern border at Guntakal junction, where another line branches off to connect with Bezwada.

Little is known of the early history of the district. It contains the ruined capital of the ancient Hindu kingdom of Vijayanagar, and on the overthrow of that State by the Mohammedans in 1564 the tract now forming the district of Bellary was split up into a number of military holdings. Between 1635 and 1800 the Carnatic was held by the Bijapur rulers, by the Mahrattas, by the great Mogul's viceroy, by Hyder Ali of Mysore and by the nizam of Hyderabad. The latter ceded it to the British in 1800 in return for protection by a force of British troops to be stationed at his capital. In 1808 the "Ceded Districts," as they were called, were split into two districts, Cuddapah and Bellary. In 1882 the district of Anantapur was formed into a separate collectorate.

BELLBIRD, the name of a species of the genus *Chasmorhynchus* and especially of *C. niveus,* the male of which carries a long, fleshy, erectile appendage ornamented with short white feathers on the forehead. The name is derived from the note. *C. tricarunculatus* carries three wattles, one at each angle, and one at the base, of the beak. The bellbirds belong to the tropical American family Cotingidae, cotingas or chatterers (*q.v.*), which include the umbrella bird (*q.v.*) and the cock of the rock (*q.v.*).

BELL BOY, sometimes called bell hop, in the United States one who attends to the general needs of a hotel guest. Most hotels prefer to hire bell boys over 18 years old, in order to avoid legal restrictions incumbent upon the employment of minors. Some managers, however, employ young boys as pages, and train them for permanent service. City hotels, inasmuch as their summers are usually dull, are often willing to take on the migratory type of boys who move with the seasons from city to resort and back again. College students often act as bell boys in summer resorts.

BELL-COT, BELL-GABLE or **BELL-TURRET,** a structure, not a tower, in which bells are hung. It occurs in the form of a gable rising from a main wall, a dormer in a sloping



VARIOUS EXAMPLES SHOWING THE TREATMENT AS A SMALL TOWER (ST. BENOIT); BUTTRESS PINNACLE (FROISSY); PIERCED WALL SECTION

roof or a miniature tower or turret at the corner of a building. A favourite position is at the top of the main west gable of a church. Occasionally, even when a tower is present, a small bell, known as the "sanctus bell," will be hung in a bell-cot near the eastern end of the church. The bell-cot for this bell is often at the centre of the crossing of nave and transepts and elaborated into a flèche (*q.v.*). In Renaissance churches, particularly in Spain and the Spanish colonies, the bell-cot is frequently a large section of wall, often separated from any building, and pierced with arches in each of which a bell is hung.

BELLE ALLIANCE, LA, the name of a farm occupied by the centre of the French army at the battle of Waterloo (*see* WATERLOO CAMPAIGN); and also the name used by the Prussians for the battle itself.

BELLEAU, RÉMY (*c.* 1528–1577), French poet, and member of the Pléiade (*see* DAURAT, JEAN), was born at Nogent-le-Rotrou. He studied with Ronsard and others under Jean Daurat at the Collège de Coqueret. He was attached to René de Lorraine, marquis d'Elboeuf, in the expedition against Naples in 1557, where he did good military service. Belleau was an enthusiast for the new learning and joined the group of young poets with ardour. In 1556 he published the first translation of Anacreon which had appeared in French. In the next year he published his first collection of poems, the *Petites inventions* in which he describes stones, insects, and flowers. The *Amours et nouveaux échanges des pierres précieuses . . .* (1576) contains perhaps his most characteristic work. Its title is quoted in Ronsard's epitaph on his tomb:

Luy mesme a basti son tombeau
Dedans ses Pierres Précieuses.

He wrote commentaries to Ronsard's *Amours* in 1560, notes which evinced delicate taste and prodigious learning. Like Ronsard and Joachim Du Bellay, he was extremely deaf. His days passed peacefully in the midst of his books and friends. His most considerable work is *La Bergerie* (1565–72), a pastoral in prose and verse written in imitation of Sannazaro. The lines on April in the *Bergerie* are well known to all readers of French poetry. Belleau was the French Herrick, full of picturesqueness, warmth, and colour. Extremely popular in his own age, he shared the fate of his friends and was undeservedly forgotten in the next. Regnier said: "Belleau ne parle pas comme on parle à la ville"; and his lyrical beauty was lost on the trim 17th century. Belleau's other works include a comedy entitled *La Reconnue,* in short rhymed lines, which is not without humour and life, and a comic masterpiece, a macaronic poem on the religious wars, *Dictamen metrificum de bello huguenotico et reistrorum piglamine ad sodales.*

The *Oeuvres complètes* (1867) of Rémy Belleau were edited by A. Gouverneur; and his *Oeuvres poétiques* (1879) by M. Ch. Marty-Laveaux in his *Pléiade française; see* also C. A. Sainte-Beuve, *Tableau historique et critique de la poésie française au XVIe siècle* (ed. 1876).

BELLEAU WOOD, a tract of forest land, in area less than a square mile, 5m. N.W. of Château-Thierry, and 42m. E. of Paris, notable for the second clash between U.S.A. and German troops in the World War. When the German offensive of May 27, 1918, was launched on the Aisne, the 2nd Division of the American Expeditionary Force under Gen. Bundy was rushed to the assistance of the French VI. Army and deployed across the Paris–Château-Thierry road west of the latter town. On its front lay Belleau wood and the villages of Torcy, Bouresches and Vaux, all occupied by the enemy. The Germans had been halted at Château-Thierry but were consolidating themselves at Vaux and in Belleau wood in preparation for a renewed advance west of Château-Thierry. The task of dislodging them was entrusted to the marine corps brigade under Gen. Harbord.

The attack was made on June 6, and the woods were penetrated but could not be held. The ground was extremely difficult, almost impenetrable underbrush covering a rugged outcrop of rock. Three days later the attack was renewed. The fighting was bitter, but, after a struggle lasting over a fortnight, the woods were finally taken by the 2nd Division; Bouresches and Vaux were also captured, and the German advance—at a most dangerous point—was effectively blocked. In this engagement the Germans lost 24 guns and 1,654 prisoners, but the United States losses were severe, amounting to 285 officers and 7,585 men killed, wounded and missing. The battleground was in 1923 dedicated as a permanent memorial to the United States officers and men who lost their lives there, and the French Government ordered the name to be changed to that of Bois de la Brigade de Marine. (*See* CHEMIN-DES-DAMES, BATTLE OF THE, 1918; WORLD WAR I.)

BELLECOUR (1725–1778), French actor, whose real name was JEAN CLAUDE GILLES COLSON, was born on Jan. 16 1725, the son of a portrait painter. After playing in the provinces he made his début, on Dec. 21 1750, as Achilles in *Iphigénie.* He was more successful, however, in comedy parts. He wrote a successful play, *Fausses apparences* (1761), and was very useful to the Comédie Française in editing and adapting the plays of others. He died on Nov. 19 1778.

His wife, ROSE PERRINE LE ROY DE LA CORBINAYE, was born at Lamballe on Dec. 20 1730, the daughter of an artillery officer. Under the name of Beaumenard she made her first Paris appearance in 1743 as Gogo in Favart's *Le Coq du village.* After a year at the Opéra Comique she played in several companies, including that of Marshal Saxe. In 1749 she made her début at the Comédie Française as Dorine in *Tartufe,* and her success was immediate. She retired in 1756, but reappeared in 1761 as Madame Bellecour, and continued her successes in soubrette parts in the plays of Molière and de Regnard. She retired at the age of sixty, but the Revolution put an end to her pension, and she died in poverty on Aug. 5 1799.

BELLEFONTAINE, a city of Ohio, U.S.A., on a hill 1,550ft. above sea-level, 45m. N.W. of Columbus; the county seat of Logan county. It is served by the Big Four and the New York Central railways. The population in 1940 was 9,808. It has large railway car shops, and its manufactures include hearses, ambulances, custom buses, metal furniture and oil burners. The town was settled about 1818 and incorporated in 1835. Several springs of clear water in the vicinity suggested its name.

BELLEGARDE, HEINRICH JOSEPH JOHANNES, COUNT VON (1756–1845), Austrian soldier and statesman, was born at Dresden on Aug. 29, 1756, and for a short time served in the Saxon army. Transferring his services to Austria in 1771 he earned distinction in the Turkish War of 1788–89 and the Netherlands campaigns of 1793–94, and in the campaign of 1796 in Germany, on the staff of the archduke Charles, whom he accompanied to Italy in the following year. In 1799 he commanded a corps in eastern Switzerland, connecting the armies of the archduke and Suvarov, and finally joined the latter in north Italy. He conducted the siege of the citadel of Alessandria, and was present at the decisive battle of Novi. He served again in the latter part of the Marengo campaign of 1800 in the rank of general of cavalry. In 1805, when the archduke Charles left to take command in Italy, Bellegarde became president *ad interim* of the council of war. He was soon employed, however, in the field, and at the sanguinary battle of Caldiero he commanded the Austrian right. In the war of 1809 he commanded the extreme right wing of the main army (*see* NAPOLEONIC CAMPAIGNS). Cut off from Charles as the result of the battle of Eckmühl, he retreated into Bohemia, but managed to rejoin before the great battles near Vienna (Aspern and Wagram). From 1809–13 Bellegarde, now field marshal, was governor-general of Galicia, but was often called to preside over the meetings of the Aulic Council (*q.v.*), especially in 1810 in connection with the reorganization of the Austrian army. In 1813–14–15 he led the Austrian armies in Italy. His successes in these campaigns were diplomatic as well as military, and he ended them by crushing the last attempt of Murat in 1815. From 1816–25 (when he had to retire owing to failing eyesight) he held various distinguished civil and military posts. He died in 1845.

See K. von Smola *Das Leben des F. M. von Bellegarde* (1847).

BELLE-ÎLE-EN-MER, an island 10½ mi. by 6 mi. maximum, lying parallel to the mainland coast 8 mi. S. by W. of the Quiberon peninsula, southern Brittany, France. Pop. (1936) 2,365. The island rises in cliffs, sharply indented at irregular intervals, to a moor-covered surface with an average elevation of 140 ft. In protected valleys, many subtropical plants, *e.g.,* fig and myrtle, flourish. The climate is marine in type, with warm summers, very mild winters, and heavy rains concentrated in the winter season. Along the coast are several small fishing settlements, among which Le Palais is the largest (pop. 1936 1,726). A citadel built there in 1572 was strengthened by fortifications added during the ensuing three centuries when the island's location as an outpost of the mainland ports, L'Orient and St. Nazaire, was of great import to France. Agricultural hamlets occupy protected locations in the inland valleys. The population of the island declined markedly in the 19th century. Agriculture for local supply, fishing, and the preservation of sardines, anchovies, etc., support the inhabitants. Megalithic monuments similar to those on the nearby mainland suggest early occupation of the island. It was a property of the abbey of Ste. Croix at Quimperlé from the 9th century to 1572, when it was sold to the Retz family. It became a crown possession in 1718. The British occupied it from 1761 to 1763, at which time it was returned to France by the same treaty which deprived her of the colony of Nova Scotia. (H. M. KL.)

BELLE-ISLE, CHARLES LOUIS AUGUSTE FOUQUET, COMTE, and later DUC, DE (1684–1761), French soldier and statesman, grandson of Nicholas Fouquet, was born at Villefranche, Rouergue, on Sept. 22, 1684. He entered the army at an early age, and distinguished himself in the war of the Spanish Succession and in the Spanish war of 1718–19. In the war of the Polish Succession he was in command of a corps under Marshal Berwick, and on the conclusion of peace (1736) became governor of the fortresses of Metz, Toul and Verdun and a marshal of France. In 1741 he was employed by the French government in Germany to oppose the pragmatic sanction and to

secure the election of Charles, Elector of Bavaria, as emperor. During the war of the Austrian Succession he stormed Prague (Nov. 26, 1741), and then executed that difficult retreat in 1742 to Eger, which was one of the most remarkable achievements of the French army in this campaign. In crossing Hanover on his way to Berlin he was captured by the English, but was exchanged in 1745. In 1746 he was placed in command of the "Army of Piedmont" in Provence, where he repelled the Italo-Spanish invasion and carried the war into Lombardy. He was created duke and peer of France (1748) and was minister of war in 1757–60, carrying out substantial reorganizations in the army. He died at Versailles Jan. 26, 1761.

His brother, LOUIS CHARLES ARMAND FOUQUET, known as the Chevalier de Belle-Isle, was a distinguished soldier and was killed at the Battle of Exilles on July 19, 1746.

BELLE ISLE, STRAIT OF, the more northerly of the two channels connecting the Gulf of St. Lawrence with the Atlantic between northern Newfoundland and Labrador; its length is 35m. from north-east to south-west, breadth 10 to 15m. Belle Isle is a precipitous granite island, 700ft. high, at its Atlantic entrance, with lighthouses and wireless station. The strait is in the most direct route from Europe to the St. Lawrence, but is open only from June till the end of November, and even then is often dangerous through floating ice and fogs. Through it Jacques Cartier sailed in 1534. The southern or Cabot strait between Cape Ray in Newfoundland and Cape North in Cape Breton, was discovered later, and the expansion below Belle Isle was long known as *La Grande Baie.* Cabot strait is open all the year, but has occasional drift ice.

BELLENDEN (BALLANTYNE or BANNATYNE), **JOHN** (fl. 1533–1587), Scottish writer, was educated at the universities of St. Andrews and Paris. He was in the service of James V. from the king's earliest years, as clerk of accounts. At the request of James he undertook translations of Boece's *Historia Scotorum,* which had appeared at Paris in 1527, and the first five books of Livy. In 1533, he became archdeacon of Moray and a canon of Ross. He was a strenuous opponent of the Reformation, and is said by some authorities to have died at Rome, in 1550; by others to have been still living in 1587. His translation of Boece, entitled *The History and Chronicles of Scotland,* is remarkable for its freedom and vigour of expression.

The *History* was published in 1536; and, edited by Maitland, was reprinted in 1821. The translation of Livy was not printed till 1822. Two mss. of the latter are extant, one, the older, in the Advocates' library, Edinburgh (which was the basis of the normalized text of 1822), the other (*c.* 1550) in the possession of Mr. Ogilvie Forbes, of Boyndlie. An edition of the work was edited for the Scottish Text Society by Mr. W. A. Craigie (1901, 1903). The second volume of this edition contains also a complete reprint of the portions of the holograph first draft which were discovered in the British Museum in 1902. Two poems by Bellenden —*The Proheme to the Cosmographe* and the *Proheme of the History*—appeared in the 1536 edition of the *History of Scotland.* Others, bearing his name in the well-known Bannatyne ms. collection made by his namesake George Bannatyne (*q.v.*), may or may not be his. Sir David Lyndsay, in his prologue to the *Papyngo,* speaks vaguely of:

> Ane cunnyng Clark quhilk wrythith craftelie
> Ane plant of poetis callit Ballendyne,
> Quhose ornat workis my wit can nocht defyne.

The chief sources of information regarding Bellenden's life are the *Accounts of the Lord High Treasurer of Scotland,* his own works and the ecclesiastical records.

BELLENDEN, WILLIAM, Scottish classical scholar (died after 1625). He lived in the reign of James I. (VI. of Scotland), who appointed him "master of requests." Bellenden lived at Paris, where he became professor at the university, and advocate in the parliament. In 1605 was published anonymously his *Ciceronis Princeps,* a compilation of all Cicero's remarks on regal government, digested and systematically arranged. In 1612 there appeared a similar work on consular authority and the Roman senate, *Ciceronis Consul, Senator, Senatusque Romanus.* His third work, *De Statu Prisci Orbis* (1615), is a good outline of general history. All three works were combined in a large volume, entitled *De Statu Libri Tres* (1615), which was first brought into due notice by Dr. Samuel Parr, who published an edition in 1787. The greatest of Bellenden's works is the treatise *De Tribus Luminibus Romanorum,* published posthumously at Paris in 1633. The book is unfinished, and treats only of the first luminary, Cicero; the others intended were apparently Seneca and Pliny. It is said that nearly all the copies were lost on the passage to England. One is in the Cambridge university library.

BELLEROPHON or BELLEROPHONTES, a hero, probably of Oriental origin, although provided with a Greek pedigree as early as Homer. In the *Iliad* (vi., 153 foll.), he is son of Glaucus, the son of Sisyphus of Ephyre (traditionally identified with Corinth). Anteia, wife of Proetus, king of Argos, loves him, and on her overtures being rejected, falsely accuses him to her husband (theme of Potiphar's wife, fairly common in Greek). He sends Bellerophon to his father-in-law, the king of Lycia (Iobates as later authors call him), with a written message that he is to be slain. The king sends him against the Chimaera (literally "goat," a fire-breathing monster part goat, part serpent, part lion), then against the Solymi, a warlike tribe, then against the Amazons, and finally, when he vanquishes them all, sets chosen warriors in ambush to kill him. Bellerophon kills them, and the king, recognizing him as more than human, marries him to his daughter. He lives in prosperity a while, then falls out of favour with the gods, loses two of his children, and wanders, grief-stricken and shunning mankind, over the "Aleian Plain," *i.e.,* the Plain of Wandering.



AFTER THE RELIEF IN THE PALAZZO SPADA, ROME

BELLEROPHON LEADING THE WINGED HORSE, PEGASUS, WHICH HE TAMED WITH DIVINE ASSISTANCE

Later authors, from Pindar on, add that while still at Corinth, Bellerophon tamed the winged horse Pegasus (*q.v.*) with a bridle which Athena gave him; that he visited Proetus because he had slain either the Corinthian hero Bellerus or his own brother, and so went into exile; that he used Pegasus to fight the Chimaera, and afterwards to punish Anteia (or, as they call her Stheneboea), by inducing her to ride with him and then dropping her from a great height; that he earned the wrath of the gods by trying to fly up to Heaven, being thrown from Pegasus in consequence, and lamed.

His adventures were frequently represented in ancient art, and formed the subject of the *Iobates* of Sophocles, the *Bellerophontes* and *Stheneboea* of Euripides. Only fragments of these survive.

AUTHORITIES.—To those named in the text, add Pindar, *Isthmians,* vi. (vii.), with his and Homer's scholiasts; Apollodoros, ii. 30 foll.

BIBLIOGRAPHY.—Articles in Roscher's *Lexikon* and Pauly-Wissowa *Realencyklopädie;* Preller-Robert, *Griechische Mythologie;* L. Malten in *Jahrbuch d.k. deutsch archaol. Instituts* (1925).

BELLES-LETTRES, a term used to designate the more artistic and imaginative forms of literature, as poetry or romance, as opposed to more pedestrian and exact studies. Modern usage applies the word more often to the lesser than to the greater peaks of literature, and denotes the essay and the critical study rather than the epics of Homer or the plays of Shakespeare. The term appears to have been first used in English by Swift (1710).

BELLEVILLE, port of entry, Ont., Can., capital of Hastings co., 106 mi. E.N.E. of Toronto, on Bay of Quinte and the Canadian National and Canadian Pacific railways. Pop. (1941) 15,710. Communication is maintained with Lake Ontario and the St. Lawrence by Canadian Steamship lines. An agricultural centre, it exports cheese and farm produce. Industries are planing mills and cement works, cheese factories and various manufactures. It contains the Ontario School for the Deaf and Alma college.

BELLEVILLE, a city of Illinois, U.S.A., 14 mi. S.E. of St. Louis, adjoining East St. Louis; the county seat of St. Clair county. It is served by the Illinois Central, the Louisville and Nashville and the Southern railways and (through a belt line for freight) by 22 other railways entering East St. Louis. The population was 24,823 in 1920, of which 2,393 were foreign-born white —the majority from Germany—and was 28,405 in 1940 by the federal census.

The manufacture of gas and coal stoves, ranges, and warm-air furnaces has been the leading industry for 60 years, employing normally 2,000–2,500 skilled workmen. Other important products are castings, shoes, hosiery, shirts, dresses, trousers, stencil-cutting machines, flour and feed, bricks, auto tops, caskets, mine machinery, threshing machines and tractors. Notable crops of winter wheat and potatoes and a fine variety of white asparagus are grown in the vicinity. Belleville is in the midst of an important bituminous coal field. About 3,000 miners live in the city, and the 60 mines within a few miles have a combined productive capacity of 6,000,000 tons a year.

A U.S. army air corps station, Scott field, is six miles east of Belleville. In 1940 Scott field was designated headquarters of the general headquarters air force. In 1941, the personnel numbered 165 officers and approximately 8,000 enlisted men.

On June 1, 1939, when the air corps expansion program went into effect, Scott field was designated as the Scott field branch of the air corps technical schools.

Belleville was settled about 1806; established as the county seat in 1814; and incorporated as a city in 1850. Originally Compton Hill, it was renamed when it became the county seat. Ninian Edwards, the first governor of the territory of Illinois, and Lyman Trumbull, author of the 13th amendment to the constitution, were residents of the city. There is an Indian mound seven miles to the northwest.

BELLEVILLE, a town of Essex county, N.J., U.S.A., on the Passaic river, adjoining Newark, and served by the Erie railroad. The population was 26,974 in 1930 and 28,167 in 1940 by the federal census. It is a residential suburb of Newark and New York, and also has considerable manufacturing industries (with an output in 1937 valued at $21,998,003), including wire, wire cloth, hats, brushes and chemicals. Belleville township was separated from Bloomfield in 1839. A commission form of government was adopted in 1914.

BELLEVUE, a city of Ohio, U.S.A., 45 mi. S.E. of Toledo, in Huron and Sandusky counties on federal highway 20; served by the New York Central, the Nickel Plate, the Wheeling and Lake Erie and the Pennsylvania railways. Pop. (1940) 6,127. It has railroad shops, limestone quarries, flour mills and canning factories; manufactures include stoves, plumbing fixtures, automotive parts, light bulbs, steel, farm machinery.

BELLEVUE, a residential borough of Allegheny county, Pennsylvania, U.S.A., on the Ohio river and the Pennsylvania railroad, 5 mi. N.W. of Pittsburgh. Its population in 1930 was 10,252; in 1940, 10,488.

BELLEY, a town of France, capital of an arrondissement, department of Ain, 52m. S.E. of Bourg by the P.L.M. railway. Pop. (1936) 4,846. It is situated on vine-covered hills at the southern extremity of the Jura, 3m. from the right bank of the Rhone. Belley is of Roman origin. It was the capital of the province of Bugey, a dependency of Savoy till 1601, when it was ceded to France. In 1385 it was destroyed by fire and rebuilt by the dukes of Savoy. The cathedral of St. Jean has a choir dating from 1413. The manufacture of morocco leather goods and the quarrying of the lithographic stone found in the vicinity are carried on, and there is trade in cattle, grain, wine, truffles and dressed pork. Belley is the seat of a bishop (5th century onwards) and has a prefect, and a tribunal of first instance.

BELLFLOWER, the name given to various species of *Campanula* (*q.v.*) because of the shape of their handsome flowers.

BELL HARP, a curious musical instrument invented in the 18th century by an Englishman, John Simcox. It was neither a bell nor a harp, but a kind of dulcimer or psaltery (*q.v.*), which derived the first half of its name from the fact that it was suspended and swung from two ear-like projections while being played.

BELLI, GIUSEPPE GIOACHINO (1791–1863), Italian poet, was born at Rome, on Sept. 10, 1791. He wrote some 2,000 satirical sonnets which give a vivid picture of the Rome of the last days of the temporal power. He died on Dec. 21, 1863.

See Morandi's edition, *I sonetti romaneschi* (1886–89).

BELLIGERENCY, the state of carrying on war in accordance with the law of nations. Insurgents are not as such excluded from recognition as belligerents, and, even where not recognized as belligerents by the government against which they have rebelled, they may be so recognized by a neutral state, as in the case of the American Civil War, when the Southern states were recognized as belligerents by Great Britain, though regarded as rebels by the Northern states. The recognition of belligerency by a neutral state does not, however, imply recognition of independent political existence. The Hague Convention iv., 1907, deals with the qualifications of belligerents. To entitle troops to the special privileges attaching to belligerency, it is provided that all regular, militia or volunteer forces shall be commanded by persons responsible for the acts of their men, that all such shall carry distinctive emblems, recognizable at a distance, that arms shall be carried openly and operations conducted in accordance with the laws and customs of war. In naval war, privateering having been finally abolished as among the parties to it by the Declaration of Paris, a privateer is not entitled, as between such parties, to the rights of belligerency. As between states, one of whom is not a party to the Declaration, the right to grant letters of marque would remain intact for both parties, and the privateer, *as between them,* would be a belligerent; as regards neutrals, the situation would be complicated (*see* PRIVATEER).

BELLINGHAM, SIR EDWARD (d. 1549) was a son of Edward Bellingham of Erringham, Sussex, his mother being a member of the Shelley family. In May 1548 he was sent to Ireland as lord deputy. Ireland was then in a very disturbed condition, but the new governor crushed a rebellion of the O'Connors in Leinster, freed the Pale from rebels, built forts, and made the English power respected in Munster and Connaught. Bellingham, however, was a headstrong man, and was constantly quarrelling with his council; but one of his opponents admitted that he was "the best man of war that ever he had seen in Ireland." His short but successful term of office was ended by his recall in 1549.

See R. Bagwell, *Ireland Under the Tudors,* vol. i. (1885).

BELLINGHAM, a city near the northwest corner of Washington, U.S.A., on the east shore of Bellingham bay, 18 mi. from the Canadian border; a port of entry and the county seat of Whatcom county. It is on the Pacific highway; is served by the Great Northern, the Northern Pacific and the Chicago, Milwaukee, St. Paul and Pacific railways, and is a port of call for coastal and intercoastal steamship lines. Its area is 18.7 sq.mi. The population was 11,062 in 1900; 30,823 in 1930; and was 29,314 in 1940 by the federal census.

Bellingham is surrounded by some of the loveliest scenery in America. The Olympic, the Cascade and the Coast Range mountains are clearly visible from the city, with the San Juan islands and Puget sound just outside. Within a few miles are several fresh-water lakes. Glacier-crowned Mt. Baker (10,750 ft.) and Mt. Shuksan (9,038 ft.) are 60 mi. E., in the Mt. Baker recreation area of 75,000 ac. in the Mt. Baker national forest. This scenic area is reached by a federal and state highway which is open the year round.

Bellingham has a diversity of industries, including lumber and shingle mills, salmon, vegetable and fruit canneries, cement, plywood and wood-pulp plants, furniture factory, paper mill and coal mine.

Bellingham has a deepwater harbour and ships great quantities of industrial products, as well as dairy products, eggs and poultry, including 500,000 chicks from the large co-operative hatcheries of the county. Bellingham is the home of the largest salmon-canning establishment in the world and is an outfitting point for the Alaska fishing industry. The largest of the state

teachers colleges is there. It was opened in 1899, and has a total yearly enrolment of 2,000.

Bellingham is supported by a rich agricultural district. Whatcom county is fifth in the nation in poultry production, first in the state in dairy production, and raises superior tulips and narcissuses.

Bellingham was formed in 1903 by the consolidation of the cities of Whatcom and Fairhaven.

BELLINI, the name of a family of craftsmen in Venice, three members of which fill a great place in the history of the Venetian school of painting in the 15th and early in the 16th century.

I. JACOPO BELLINI (*c.* 1400–*c.* 1470) was the son of a tinsmith or pewterer, Nicoletto Bellini, by his wife Franceschina. When the accomplished Umbrian master Gentile da Fabriano came to practise at Venice, where art was backward, several young men of the city took service under him as pupils. Among these was Jacopo Bellini, who followed his teacher to Florence, where the progress made, alike in truth to natural fact and in sense of classic grace and style, by masters like Donatello and Ghiberti, Masaccio and Paolo Uccello, offered him better instruction than he could obtain even from his Umbrian teacher. By 1429 Jacopo was settled at Venice and married to a wife from Pesaro named Anna, who bore her husband two sons, Gentile and Giovanni (though some evidences have been thought to point rather to Giovanni having been his son by another mother), and a daughter Nicolosia. In 1436 Jacopo was at Verona, painting a Crucifixion in fresco for the cathedral (destroyed by order of the archbishop in 1750, but the composition, a vast one of many figures, has been preserved in an old engraving). About 1440 he must have paid a visit to the court of Ferrara, where there prevailed a spirit of free culture and humanism most congenial to his tastes. His relations with the house of Este, which seem to have begun with a portrait of Leonello d'Este, son of the reigning marquis Niccolo III., appear to have been kept up, and among Jacopo's extant drawings are several that probably belong to the scheme of a monument erected to the memory of the marquis Niccolo ten years later. He was also employed by Sigismondo Malatesta at the court of Rimini. In 1453 he received a grant from the confraternity for the marriage of his daughter Nicolosia with Andrea Mantegna, a marriage which had the effect of transferring the gifted young Paduan master definitively from the following of Squarcione to that of Bellini. In 1456 he painted a figure of Lorenzo Giustiniani, first patriarch of Venice, for his monument in San Pietro di Castello, and in 1457, with a son for salaried assistant, three figures of saints in the great hall of the patriarch. His activity can be traced in documents down to Aug. 1470, but in Nov. 1471 his wife Anna describes herself as his relict, so that he must have died some time in the interval.

The materials which have reached posterity for a critical judgment on his work consist of four or five pictures only, together with two important and invaluable books of drawings. These prove him to have been a worthy third, following the Umbrian Gentile da Fabriano and the Veronese Pisanello, in that trio of artists who in the first half of the 15th century carried towards maturity the art of painting in Venice and the neighbouring cities. Of his pictures, an important signed example is a life-size Christ Crucified in the archbishop's palace at Verona. The rest are almost all Madonnas; two signed, one in the Tadini gallery at Lovere, another in the Venice academy; a third, unsigned and long ascribed in error to Gentile da Fabriano, in the Louvre, with the portrait of Sigismondo Malatesta as donor; a fourth, richest of all in colour and ornamental detail, in the Uffizi at Florence. Plausibly, though less certainly, ascribed to him are a fifth Madonna at Bergamo, a warrior-saint on horseback (San Crisogono) in the church of San Trovaso at Venice, a Crucifixion in the Museo Correr, and an Adoration of the Magi in private possession at Ferrara. But an abundance of drawings and studies are preserved in two precious albums in the British Museum and the Louvre. The former, which is the earlier in date, belonged to the painter's elder son Gentile, and was by him bequeathed to his brother Giovanni. It consists of 99 paper pages, each covered on both sides with drawings made with a lead point, an instrument unusual at this date. Two or three of the drawings have been worked over in pen; of the remainder many have become dim from time and rubbing. The album at the Louvre, discovered in 1883 in the loft of a country-house in Guienne, is equally rich and better preserved, the drawings being all highly finished in pen, probably over effaced preliminary sketches in chalk or lead. The range of subjects is much the same in both collections, and in both extremely varied, proving Jacopo to have been a craftsman of many-sided curiosity and invention. Jacopo's influence on the development of Venetian art was very great, not only directly through his two sons and his son-in-law Mantegna, but through other and independent contemporary workshops of the city, in none of which did it remain unfelt.

II. GENTILE BELLINI (*c.* 1429–1507), the elder son of Jacopo, first appears independently as the painter of a Madonna, much in his father's manner, dated 1460, and now in the Berlin museum. In July 1466 we find him contracting with the officers of the Scuola of St. Mark as an independent artist to decorate the doors of their organ. These paintings still exist in a blackened condition. They represent four saints, colossal in size, and designed with much of the harsh and searching austerity which characterized the Paduan school under Squarcione. Gentile must have risen steadily in the esteem of his fellow-citizens, since in 1474 we find him commissioned by the senate to restore, renew, and when necessary replace, the series of paintings, the work of an earlier generation of artists, which were perishing from damp on the walls of the Hall of the Great Council in the ducal palace. In continuation of this work Gentile undertook a series of independent paintings on subjects of Venetian history for the same hall, but had apparently only finished one, representing the delivery of the consecrated candle by the pope to the doge, when his labours were interrupted by a mission to the East. The sultan Mohammed II. had despatched a friendly embassy to Venice, inviting the doge to visit him at Constantinople and at the same time requesting the despatch of an excellent painter to work at his court. Gentile Bellini with two assistants was selected for the mission, his brother Giovanni being at the same time appointed to fill his place on the works for the Hall of the Great Council. Gentile gave great satisfaction to the sultan, and returned after about a year with a knighthood, some fine clothes, a gold chain and a pension. The surviving fruits of his labours at Contantinople consist of a large painting representing the reception of an ambassador in that city, now in the Louvre; a highly finished portrait of the sultan himself, one of the treasures, despite its damaged condition, of the collection of the late Sir Henry Layard, and now in the National Gallery, London; an exquisitely wrought small portrait in water-colour of a scribe, found in 1905 by a private collector in the bazaar at Constantinople and now in the collection of Mrs. Gardner at Boston; and two pen-and-ink drawings of Turkish types, now in the British Museum. Early copies of two or three other similar drawings are in the Städel Institute at Frankfort.

A place had been left open for Gentile to continue working beside his brother Giovanni in the ducal palace; and soon after 1480 he began to carry out his share in the great series of frescoes, unfortunately destroyed by fire in 1577, illustrating the part played by Venice in the struggles between the papacy and the emperor Barbarossa. These works were executed not on the wall itself but on canvas (the climate of Venice having so many times proved fatal to wall paintings), and probably in oil, a method which all the artists of Venice, following the example set by Antonello da Messina, had by this time learnt or were learning to practise. They received the highest praise both from contemporary and from later Venetian critics, but no fragment of them survived the fire of 1577, though a drawing in the British Museum purports to be the artist's original sketch for the subject of the pope bestowing a sword and his blessing on the doge and his army. Their character can to some extent be judged by a certain number of kindred historical and processional works by the artist which have been preserved. Of such the Academy at Venice has three which were painted between 1490 and 1500 for the Scuola of St. John the Evangelist, and represent certain events connected with a famous relic belonging to the Scuola, namely, a supposed frag

ment of the true cross. All have been much injured and repainted; nevertheless one at least, showing the procession of the relic through St. Mark's Place and the thanksgiving of a father who owed to it the miraculous cure of his son, still gives a good idea of the painter's powers and style. Great accuracy and firmness of individual portraiture, a strong gift, derived no doubt from his father's example, for grouping and marshalling a crowd of personages in spaces of fine architectural perspective, the severity and dryness of the Paduan manner much mitigated by the dawning splendour of true Venetian colour—these are the qualities that no injury has been able to deface. They are again manifest in an interesting Adoration of the Magi in the Layard collection at the National Gallery, London, and reappear still more forcibly in the last work undertaken by the artist, the great picture, now at the Brera in Milan, of St. Mark preaching at Alexandria; this was commissioned by the Scuola of St. Mark in March, 1505, and left by the artist in his will, dated Feb. 18, 1507, to be finished by his brother Giovanni. Of single portraits by this artist, who was almost as famous for them as for processional groups, there survive one of a doge at the Museo Correr in Venice, one of Catarina Cornaro at Budapest, one of a mathematician at the National Gallery, another of a monk in the same gallery, signed wrongly to all appearance with the name of Giovanni Bellini, besides one or two others in private hands. The features of Gentile himself are known from a portrait medallion by Camelio, and can be recognized in two extant drawings, one at Berlin supposed to be by the painter's own hand, and another, much larger and more finished, at Christ Church, Oxford, which is variously attributed to Bonsignori and A. Vivarini.

III. Giovanni Bellini (*c.* 1430–1516) is generally assumed to have been the second son of Jacopo by his wife Anna; though the fact that she does not mention him in her will with her other sons has thrown some slight doubt upon the matter. Until the age of nearly thirty both sons served as their father's assistants in works at Venice and Padua. In Giovanni's earliest independent works, we find him more strongly influenced by the harsh and searching manner of the Paduan school, and especially of his own brother-in-law Mantegna, than by the more graceful and facile style of Jacopo. This influence seems to have lasted at full strength until after the departure of Mantegna for the court of Mantua in 1460. The earliest of Giovanni's independent works no doubt date from before this period. Three of these exist at the Correr museum in Venice: a Crucifixion, a Transfiguration, and a Dead Christ supported by Angels. Two Madonnas of the same or even earlier date are in America, one at the Metropolitan Museum, New York, the other in the Johnson Collection, Philadelphia; a third, that of Signor Frizzoni is now in the Museo Correo at Venice; while two beautiful works in the National Gallery of London seem to bring the period to a close. One of these is of a rare subject, the Blood of the Redeemer; the other is the fine picture of Christ's Agony in the Garden, formerly in the Northbrook collection. The last-named piece was evidently executed in friendly rivalry with Mantegna, whose version of the subject hangs near by; the main idea of the composition in both cases being taken from a drawing by Jacopo Bellini in the British Museum sketch-book. In all these pictures Giovanni combines with the Paduan severity of drawing and complex rigidity of drapery a depth of religious feeling and human pathos which is his own. They are all executed in the old tempera method; and in the last named the tragedy of the scene is softened by a new and beautiful effect of romantic sunrise colour. In a somewhat changed and more personal manner, with less harshness of contour and a broader treatment of forms and draperies, but not less force of religious feeling, are the two pictures of the Dead Christ supported by Angels, in these days one of the master's most frequent themes, at Rimini and at Berlin. Chronologically to be placed with these are two Madonnas, one at the church of the Madonna del Orto at Venice and one in the Lochis collection at Bergamo; devout intensity of feeling and rich solemnity of colour being, as in the case of all these early Madonnas, combined with a singularly direct rendering of the natural movements and attitudes of children.

The above-named works, all executed in tempera, are no doubt earlier than the date of Giovanni's first appointment to work along with his brother and other artists in the Scuola di San Marco, where among other subjects he was commissioned in 1470 to paint a Deluge with Noah's Ark. None of the master's works of this kind, whether painted for the various schools or confraternities or for the ducal palace, have survived. To the decade following 1470 must probably be assigned a Transfiguration now in the Naples museum, and also the great altar-piece of the Coronation of the Virgin at Pesaro. After 1479–80 very much of Giovanni's time and energy must have been taken up by his duties as conservator of the paintings in the great hall of the ducal palace. Besides repairing and renewing the works of his predecessors he was commissioned to paint a number of new subjects, six or seven in all, in further illustration of the part played by Venice in the wars of Barbarossa and the Pope. Not a trace of these survived the fire of 1577; neither have any other examples of his historical and processional compositions come down. Of the other, the religious class of his work, including both altar-pieces with many figures and simple Madonnas, a considerable number have fortunately been preserved. They show him gradually throwing off the last restraints of the 15th-century manner; gradually acquiring a complete mastery of the new oil medium introduced in Venice by Antonello da Messina about 1473, and mastering with its help all, or nearly all, the secrets of the perfect fusion of colours and atmospheric gradation of tones. The old intensity of pathetic and devout feeling gradually fades away and gives place to a noble, if more worldly, serenity and charm. The enthroned Virgin and Child become tranquil and commanding in their sweetness; the personages of the attendant saints gain in power, presence and individuality; enchanting groups of singing and viol-playing angels symbolize and complete the harmony of the scene. The full splendour of Venetian colour invests alike the figures, their architectural framework, the landscape and the sky. The altar-piece of the Frari at Venice, the altar-piece of San Giobbe, now at the academy, the Virgin between SS. Paul and George, also at the academy, and the altar-piece with the kneeling doge Barbarigo at Murano, are among the most conspicuous examples. Simple Madonnas of the same period (about 1485–90) are in the Venice academy, in the National Gallery, at Turin and at Bergamo. An interval of some years seems to separate the last-named altar-pieces from that of the church of San Zaccaria at Venice, which is perhaps the most beautiful and imposing of all, and is dated 1505. Another great altar-piece with saints, that of the church of San Francesco de la Vigna at Venice, belongs to 1507; that of La Corona at Vicenza, a Baptism of Christ in a landscape, to 1510; to 1513 that of San Giovanni Crisostomo at Venice, where the aged saint Jerome, seated on a hill, is raised high against a resplendent sunset background, with SS. Christopher and Augustine standing facing each other below him, in front. The examples which remain of Giovanni's activity in the interval between the altar-pieces of San Giobbe and of Murano and that of San Zaccaria, consist of one allegorical picture in the Uffizi at Florence, the subject of which is an illustration of a French mediaeval allegory, the *Pèlerinage de l'âme* by Guillaume de Guilleville, and a set of five other allegories or moral emblems, on a smaller scale and very romantically treated, in the academy at Venice. To these should probably be added, as painted towards the year 1505, the portrait of the doge Loredano in the National Gallery, the only portrait by the master which has been preserved, and in its own manner one of the most masterly in the whole range of painting.

The last ten or twelve years of the master's life saw him besieged with more commissions than he could well complete. Albrecht Dürer, visiting Venice for a second time in 1506, reports Giovanni Bellini as still the best painter in the city, and as full of all courtesy and generosity towards foreign brethren of the brush. In 1507 Gentile Bellini died, and Giovanni completed the picture of the "Preaching of St. Mark" which he had left unfinished. In 1514 Giovanni undertook to paint a Bacchanal for the duke Alfonso of Ferrara, but died in 1516, leaving it to be finished by his pupils; this picture is now at Alnwick.

Both in the artistic and in the worldly sense, the career of Giovanni Bellini was upon the whole the most serenely and unbrokenly prosperous, from youth to extreme old age, which fell to the lot of any artist of the early Renaissance. He lived to see his own school far outshine that of his rivals, the Vivarini of Murano; he embodied, with ever growing and maturing power, all the devotional gravity and much also of the worldly splendour of the Venice of his time; and he saw his influence propagated by a host of pupils, two of whom at least, Giorgione and Titian, surpassed their master. Giorgione he outlived by five years; Titian, as we have seen, challenged an equal place beside his teacher. Among the best known of his other pupils were, in his earlier time, Andrea Previtali, Cima da Conegliano, Marco Basaiti, Niccolo Rondinelli, Piermaria Pennacchi, Martino da Udine, Girolamo Mocetto; in later time, Pierfrancesco Bissolo, Vincenzo Catena, Lorenzo Lotto and Sebastian del Piombo.

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(S. C.; X.)

BELLINI, LORENZO (1643–1704), Italian physician and anatomist, was born at Florence on Sept. 3, 1643. At the age of 20, when he had already begun his researches on the structure of the kidneys and had described the ducts known by his name (*Exercitatio anatomica de structura et usu renum,* 1662), he was chosen professor of theoretical medicine at Pisa, but soon after was transferred to the chair of anatomy. He died at Florence on Jan. 8, 1704.

BELLINI, VINCENZO (1801–1835), operatic composer of the Italian school, was born at Catania in Sicily, on Nov. 3, 1801. He was descended from a family of musicians, both his father and grandfather having been composers of some reputation. After having received his preparatory musical education at home, he entered the conservatoire of Naples, where he studied singing and composition under Tritto and Zingarelli. His first opera, *Adelson e Savina,* was performed in 1825 at a small theatre in Naples; his second dramatic work, *Bianca e Fernando,* was produced next year at the San Carlo theatre of the same city, and made his name known in Italy. His next work, *Il Pirata* (1827), was written for the Scala in Milan, to words by Felice Romano, with whom Bellini formed a union of friendship to be severed only by his early death. Of Bellini's operas the best known are: *I Montecchi e Capuleti* (1830), in which the part of Romeo, sung in England by Madame Pasta, became a favourite with all the great contraltos; *La Sonnambula* (1831); *Norma,* Bellini's best and most popular creation (1831); and *I Puritani* (1835), written for the Italian opera in Paris, and to some extent under the influence of French music. He was seized with a sudden illness, and died at his villa in Puteaux near Paris, on Sept. 24, 1835. Bellini's operas had an immense vogue in their day, and then suffered a rather undeserved eclipse. They had little dramatic force, but a wealth of melody.

See C. Labat, *Bellini* (Bordeaux, 1865); A. Pougin, *Bellini, sa vie et ses oeuvres* (1868); Pizzetti, *La musica di Vincenzo Bellini* (1916).

BELLINZONA, the political capital of the Swiss canton of Tessin or Ticino, 105m. from Lucerne by the St. Gotthard railway, and 14m. from Locarno. Until 1881 it was joint capital of the canton, with Lugano and Locarno. The old town is built on some high ground rising from the level valley floor of the Ticino, a little below the junction of the Val Mesocco. It thus blocked the road from Germany to Italy, while a great wall was built from the town to the river bank. Bellinzona still possesses three picturesque castles (restored in modern times), dating in their present form from the 15th century. They belonged for several centuries to the three Swiss cantons which were masters of the town. The most westerly, Castello Grande (or San Michele), belonged to Uri; the central castle, that of Montebello, was the property of Schwyz; while that of Sasso Corbaro was in the hands of Unterwalden. The church of San Biagio (Blaise) has a remarkable 14th-century fresco, while the collegiate church of San Stefano dates from the 16th century. Pop. (1941) 10,952, practically all Roman Catholics and German speaking.

Bellinzona is possibly of Roman origin; it is first mentioned in 590. It played a considerable part in the early history of Lombardy, being a key to several Alpine passes. In the 8th century it belonged to the bishop of Como, while in the 13th and 14th centuries it was tossed to and fro between the cities of Milan and Como. In 1499 (like the rest of the Milanese) it was occupied by the French, but in 1500 it was taken by Uri. In 1503 the French king ceded it to Uri, Schwyz and Unterwalden. It became in 1798 the capital of the canton Bellinzona of the Helvetic republic, but in 1803 it was united to the newly-formed canton of Ticino.

BELLMAN, KARL MIKAEL (1740–1795), Swedish poet, son of a civil servant, was born at Stockholm. When he was 19 he became clerk in a bank and afterwards in the customs, but his habits were irregular and he was frequently in great distress, particularly after the death of his patron, Gustavus III. As early as 1757 he published *Evangeliska Dödstänkar,* meditations on the Passion from the German of David von Schweidnitz, and during the next few years wrote, besides other translations, a great quantity of poems, imitative for the most part of Dalin. In 1760 appeared his first characteristic work, *Månan* (The Moon), a satirical poem, which was revised and edited by Dalin. But the great work of his life occupied him from 1765–80, and consists of the collections of dithyrambic odes known as *Fredmans Epistlar* (1790) and *Fredmans Sånger* (1791). Fredman and his friends were well-known characters in the Stockholm pot-houses, where Bellman studied them from the life. He was accustomed, when in the presence of none but confidential friends, to announce that the god was about to visit him. He would shut his eyes, take his zither, and begin apparently to improvise the music and the words of a long Bacchic ode in praise of love or wine. Most of his melodies are taken direct, or with slight adaptations, from old Swedish ballads, and still retain their popularity. His torrents of rhymes are not without their method; wild as they seem, they all conform to the rules of style which he accepted. A great Swedish critic has remarked that the jovial humour of Bellman is, after all, only "sorrow clad in rose-colour," and this underlying pathos gives his poems their undying charm. Much of Bellman's work was only printed after his death, *Bihang till Fredmans Epistlar* (Nyköping, 1809), *Fredmans Handskrifter* (Uppsala, 1813), *Skaldestycken* ("Poems," 1814) being among the most important of these posthumous works. A colossal bronze bust of the poet by Byström (erected by the Swedish Academy in 1829) adorns the public gardens of Stockholm, and a statue by Alfred Nyström is in the Hasselbacken, Stockholm. Bellman was a favourite companion of King Gustavus III.

The best edition of his works was published at Stockholm, edited by J. G. Carlén, with biographical notes, illustrations and music (1856–61); *see* also monographs on Bellman by Nils Erdmann (1895) and by F. Niedner (Berlin, 1905).

BELL-METAL, the alloy used for bell founding, consists of three to five parts of copper to one of tin. It is a metal harder than either of its components, and empirical experiment discovered ages ago that it possesses a peculiar degree of sonority. (*See* ALLOYS.)

BELLO, ANDRÉS (1781–1865), South American poet and scholar, was born at Caracas, Venezuela, on Nov. 29, 1781. After having been associated with the revolutionary movement against

Spain, in 1810 he was sent on a political mission to London, where he resided for 19 years, acting as secretary to the legations of Chile, Colombia and Venezuela, spending his free time in study, teaching and journalism. In 1829 he accepted a post in the Chilean treasury, settled at Santiago and took a prominent part in the intellectual life of the city, particularly in founding the national university (1843), of which he became rector. He was nominated senator, and died at Santiago de Chile on Oct. 15, 1865. Bello was mainly responsible for the civil code promulgated in 1855. His prose works deal with such varied subjects as law, philosophy, literary criticism and philology; of these the most important is his *Gramática castellana* (1847), the leading authority on the subject. But his position in literature proper is secured by his *Silvas Americanas,* a poem written during his residence in England, which conveys with extraordinary force the majestic impression of the South American landscape.

Bello's complete works were issued in 15 volumes by the Chilean government (Santiago de Chile, 1881–93); he is the subject of an excellent biography by Miguel Luis Ammunátegui (Santiago de Chile, 1882).

BELLOC, JOSEPH HILAIRE PIERRE (1870–), British author, was born at La Celle, St. Cloud, France, July 27, 1870, the son of a French barrister, Louis Swanton Belloc. His mother, Bessie Rayner Parkes (1829–1925), was prominent in the early days of the woman suffrage movement. Belloc was educated at the Oratory school, Edgbaston, then, as a French citizen, served with the artillery at Toul, afterwards entering Balliol college, Oxford, in 1893. He was naturalized in 1902. He was M.P. for Salford from 1906 to 1910, first as a Liberal then as an Independent.

Verses and Sonnets (1896) launched Belloc on a varied, not to say tempestuous, literary voyage. Historical studies of *Danton* (1899) and *Robespierre* (1901) first proved his lively historical sense and compelling prose style. His independence of mind in politics showed itself at Oxford, later as a staunch opponent of the South African War and again in the circumstances of his retirement from parliamentary politics; it was shown too, in his association with Cecil Chesterton in conducting *The Eye Witness,* and in writing *The Party System* (1911) and *The Servile State* (1912). Books of nonsense rhymes, such as *The Bad Child's Book of Beasts* (1896); *The Path to Rome* (1902); satires such as *Mr. Clutterbuck's Election* (1908) and *The Mercy of Allah* (1922); numerous volumes of essays and travel sketches; collected poems (1924); military and topographical studies; and *The Cruise of the Nona* (1925). As an upholder of nationalism and the Catholic tradition Belloc has written *The Jews* (1922), *Europe and the Faith* (1920), *How the Reformation Happened* (1928). His works on French history include *Marie Antoinette* (1909), *Joan of Arc* (1929), *Richelieu* (1930) and *Napoleon* (1932). He has written *History of England* (4 vols., 1925–31), *Charles I* (1933), *Cromwell* (1934), *Milton* (1935), *The Crusade* (1937).

BELLONA, originally DUELLONA, in Roman mythology, the goddess of war (*bellum, duellum*), corresponding to the Greek *Enuō*. Sometimes known as the sister or wife of Mars, she has been identified with the Sabine war goddess Nērio. Her temple at Rome, dedicated by Appius Claudius Caecus (296 B.C.) during a battle with the Samnites and Etruscans (Ovid, *Fasti,* vi, 201), stood in the Campus Martius, near the Flaminian Circus, and outside the city's gates. There the senate met to discuss a general's claim to a triumph and to receive foreign ambassadors. In front of it was the *columna bellica,* where the ceremony of declaring war by the *fetialis* (*see* HERALD) took place.

The Asiatic Bellona, whose worship was introduced into Rome from Comana, in Cappadocia, apparently by Sulla, during the first Mithridatic war is to be distinguished from this native Italian goddess. A new temple was built for her and a college of priests (*Bellonarii*) instituted to conduct her fanatical rites, at which, wearing black dresses, they lacerated their arms and loins, sprinkled the blood from their wounds on the spectators, and even drank that of the sacrificial victims.

See W. W. Fowler, *Roman Festivals* (1899); G. Wissowa, *Religion und Kultus der Römer* (1912).

BELLOT, JOSEPH RENÉ (1826–1853), French arctic explorer, was born at Rochefort on March 18, 1826, the son of a farrier. With the aid of the authorities of his native town he was enabled at the age of 15 to enter the naval school. He took part in the Anglo-French expedition of 1845 to Madagascar, and received the cross of the Legion of Honour for distinguished conduct. He afterwards took part in another Anglo-French expedition, that of Parana, which opened the river La Plata to commerce. In 1851 he joined the arctic expedition under the command of Captain Kennedy in search of Sir John Franklin, and discovered the strait between Boothia Felix and Somerset Land which bears his name. Early in 1852 he was promoted lieutenant, and in the same year accompanied the Franklin search expedition under Captain Inglefield. He perished by falling into a crevasse (Aug. 1853).

BELLOWS, ALBERT F. (1829–1883), American landscape painter, was born at Milford, Mass., Nov. 20, 1829. He first studied architecture, then turned to painting, and worked in Paris and in the Royal academy at Antwerp. He painted much in England; was a member of the National Academy of Design, and of the American Water Color society, New York; and an honorary member of the Royal Belgian Society of Water-Colourists. His earlier work was *genre,* in oils; after 1865 he used water colours more and more exclusively and painted landscapes. Among his water colours are "Afternoon in Surrey" (1868); "Sunday in Devonshire" (1876), exhibited at the Philadelphia Exposition; "New England Village School" (1878); and "The Parsonage" (1879). He died in Auburndale, Mass., on Nov. 24, 1883.

BELLOWS, GEORGE WESLEY (1882–1925), American artist, was born in Columbus, O., on Aug. 12, 1882. Educated at Ohio State university, he moved in 1904 to New York, where he studied art under Robert Henri. In 1910, 1918 and 1919 he was an instructor at the Art Students' League in New York city, and in 1919 taught also at the Chicago Art institute. His work is distinguished by dignity of composition, vitality and intense interest in life. His drawings and lithographs include many notable illustrations of sporting subjects, and his painting showed at first a preference for sable shades. Later, however, he added to the distinction of his drawing a rich, vibrant use of colour. Among his paintings may be mentioned "Jean and Anna," in the Albright Art gallery, Buffalo, N.Y.; "Emma and Her Children," in the Boston Museum of Fine Arts; "Portrait of My Mother," in the Chicago Art institute; "Polo Game," in the Columbus Gallery of Fine Arts; "Stag at Sharkeys," in the Cleveland museum; "Men of the Docks," owned by Randolph-Macon Woman's college, Lynchburg, Va.; "Up the Hudson," in the Metropolitan Museum, New York city; and "North River," in the Pennsylvania Academy of Fine Arts. He died in New York city on Jan. 8, 1925.

See Thomas Beer, *The Lithographs of George Bellows* (New York, 1927); Mrs. Bellows, Robert Henri and Eugene Speicher, Eds., *The Paintings of George Bellows* (1929).

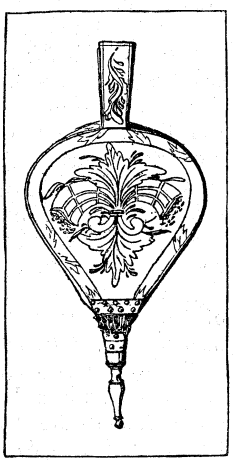
BELLOWS, HENRY WHITNEY (1814–1882), U.S. clergyman, was born in Boston, Mass. He was graduated from the Divinity school at Harvard university, and by the time he was 24 was minister of the First Unitarian church (later known as All Souls Church) in New York city. During the Civil War, Bellows succeeded in raising the funds for the establishment of the United States Sanitary commission, of which he was first president (1861–78). After the war, he devoted himself to reform of the civil service. He was the founder and editor of one Unitarian newspaper and the editor of another. He died in New York city Jan. 30, 1882.

BELLOWS, an appliance to produce a current of air by compressing a collapsible bag or receptacle into which air has been admitted. The O.E. word for bellows was *blástbaelig; i.e.,* "blow-bag." By the 11th century *baelig,* bag, is found in early glossaries. *Baelig* became in M.E. *bely,* the plural "bellies" being found till the 16th century, when "bellows" appears, and the word in the singular ceases to be used.

Among the earliest contrivances employed for producing the movement of air under a small pressure were those used in Egypt during the Greek occupation. These depended upon the heating of the air, which, being raised in pressure and bulk, was made to

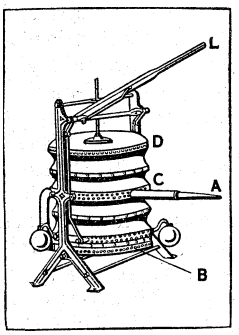
force water out of closed vessels, the water being afterwards employed for moving some kind of mechanism. In the process of iron smelting there is still used in some parts of India an artificial blast, produced by a simple form of bellows made from the skins of goats; bellows of this kind probably represent one of the earliest contrivances used for producing currents of air.

The bellows now in use consists, in its simplest form, of two flat boards, of rectangular, circular or pear shape, connected round their edges by a wide band of leather so as to include an air chamber, which can be increased or diminished in volume by separating the boards or bringing them nearer together. The leather is kept from collapsing, on the separation of the boards, by wire rings which act like the ribs of animals. The lower board has a hole in the centre, covered inside by a leather flap or valve which can only open inwards; there is also an open outlet, generally in the form of a pipe or nozzle, the aperture of which is much smaller than that of the valve. When the upper board is raised air rushes into the cavity through the valve to fill up the partial vacuum produced; on again depressing the upper board the valve is closed by the air seeking an outlet, and this air is discharged through the open nozzle with a velocity depending on the pressure exerted.



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART
A PAIR OF 18TH CENTURY AMERICAN BELLOWS

Double Bellows.—It is evident that the current of air produced is not continuous but intermittent or in puffs, because an interval is needed to refill the cavity after each discharge. In order to remedy this drawback the *double bellows* are used. To understand their action it is only necessary to conceive an additional board with valve, like the lower board of the single bellows, attached in the same way by leather below this lower board. Thus there are three boards, forming two cavities, the two lower boards being fitted with air-valves. The lowest board is held down by a weight and another weight rests on the top board. In working these double bellows the lowest board is raised, driving the air from the lower cavity into the upper. On lowering the bottom board again a fresh supply of air is drawn in through the bottom valve, to be discharged again when the board is raised. As the air passes from the lower to the upper cavity it is kept from returning by the valve in the middle board, and in this way a quantity of air is sent into the upper cavity each time the lowest board is raised. The weight on the top board provides the necessary pressure for the blast, and at the same time causes the current of air delivered to be fairly continuous. When the air is being forced into the upper cavity the weight is being raised, and, during the interval when the lowest board is descending, the weight is slowly forcing the top board down and thus keeping up a continuous flow of air.



BY COURTESY OF MESSRS. ALLDAYS AND ONIONS, LTD.
DOUBLE BLAST CIRCULAR BELLOWS, FOR CONTINUOUS BLAST
A. Blast pipe; B. Movable lowest board; C. Fixed middle board; D. Movable uppermost board, pressed upon by weight shown; L. Hand lever

Hand-bellows for domestic use are generally shaped like a pear, with the hinge at the narrow end. The same shape was adopted for the older forms of smiths' bellows, with the difference that two bellows were used superposed, in a manner similar to that just described, so as to provide for a continuous blast. In the later form of smiths' bellows the same principle is employed, but the boards are made circular in shape and are always maintained roughly parallel to one another. These are shown in the figure. Here A is the blast pipe, B the movable lowest board, C the fixed middle board, close to which the pipe A is inserted, and D is the movable uppermost board pressed upon by the weight shown. The board B is raised by means of a hand lever L, through either a chain or a connecting rod, and lowered by a weight. The size of the weight on D depends on the air pressure required. For instance, if a blast pressure of half a pound per square inch is wanted and the boards are 18 in. in diameter, and therefore have an area of 254 sq. in., on each of the 254 sq. in. there is to be a pressure of half a pound, so that the weight to balance this must be half of 254, or 127 pounds. The diameter of the air-pipe can be varied to suit the required conditions. Instead of bellows with flexible sides, a sliding arrangement is sometimes used; this consists of what are really two boxes fitting into one another with the open sides both facing inwards, as if one were acting as a lid to the other. By having a valve and outlet pipe fitted as in the bellows and sliding them alternately apart and together, an intermittent blast is produced. The chief defect of this arrangement is the leakage of air caused by the difficulty in making the joint a sufficiently good fit to be air-tight.

BELLOWS FALLS, an incorporated village of Windham county, Vermont, U.S.A., beautifully situated on the Connecticut river, 30m. from the southern boundary of the State; on federal highway 5, and served by the Boston and Maine and the Rutland railways. The population was 3,930 in 1930, and had increased to 4,236 in 1940 by the federal census of that year. The village is the trade centre for a surrounding population of 20,000, a summer resort, and the shipping point for dairy and farm products. There is a co-operative creamery supplied from 900 farms, and many cars of bottled milk go to Boston daily. Hydro-electric power (60,000h.p.) is developed from the falls of the Connecticut at this point, and the village has numerous manufacturing industries. Bellows Falls was settled about 1761 and incorporated in 1831. The damage in the village and vicinity from the floods of 1927 was estimated at about $2,000,000.

BELLOY, DORMONT DE, the name assumed by PIERRE LAURENT BUIRETTE (1727–1775), French dramatist. He was born at Saint-Flour, in Auvergne, on Nov. 17, 1727, and educated for the bar. To escape from a profession he disliked he joined a troupe of comedians playing in the courts of the northern sovereigns. He returned to Paris with *Zelmire* (1762), a fantastic drama which met with great success. This was followed in 1765 by the patriotic play, *Le Siège de Calais,* which had a sensational success, and was followed by *Gaston et Bayard* (1771), *Pedro le cruel* (1772) and *Gabrielle de Vergy* (1777). None of these attained the success of the earlier plays. De Belloy died on March 5, 1775. His death is said to have been hastened by disappointment.

BELL PITS, small holes or shafts, 3ft. or 4ft. in diameter, driven through a few feet of overlying strata to the seam of coal, and then widened out to allow for excavation. In Sussex there are bell pits which were sunk in prehistoric times to obtain flints for the making of stone implements.

BELL ROCK or **INCHCAPE ROCK,** a sandstone reef in the North Sea, 12m. S.E. of Arbroath, Angus Forfarshire, Scotland. It measures 2,000ft. in length, is under water at high tide, but at low tide is exposed for a few feet, the sea for a distance of 100yds. around being then only three fathoms deep. Lying in the fairway of vessels making or leaving the Tay and Forth, besides ports farther north, it was a constant menace. In the great gale of 1799 seventy sail were wrecked off the reef, and next year Robert Stevenson modelled a tower and reported that its erection was feasible, but parliamentary powers were only obtained in 1806 and operations began August 1807. Though John Rennie had meanwhile been associated with Stevenson as consulting engineer, the design and details are wholly Stevenson's work. The tower is 80ft. high; its diameter at the base is 42ft., decreasing to 15ft. at the top. It is solid for 30ft. at which height the doorway is placed. A bust of Stevenson by Samuel Joseph (d. 1850) was placed in the tower. According to tradition an abbot of Aberbrothock (Arbroath) had ordered a bell—whence the name of the rock—to be fastened to the reef so as to respond to movements of the waves. This was destroyed by a pirate, whose ship was afterwards wrecked at this very spot, the rover and his men being drowned. Southey made the incident the subject of his ballad of "The Inchcape Rock."

BELLUNO (anc. *Bellunum*), episcopal see, Venetia, Italy, capital of province of Belluno, 54 mi. north of Treviso by rail and 28 mi. direct, at confluence of Ardo and Piave, 1,285 ft. above sea-level. Pop. (1936) 10,083 (town); 25,547 (commune). It surrendered voluntarily to Venice in 1420 and remained Venetian until 1797. The fine early Lombard Renaissance Palazzo dei Rettori is the seat of the prefecture.

BELLWORT (*Uvularia*), the name given to a group of handsome woodland plants of the lily family, native to eastern North America. There are five or six species, all low perennials with slender, creeping root stocks which send up leafy stems from 6 to 20 in. high, bearing large pale yellow flowers, usually solitary and drooping at the ends of the branches, and blooming from April to June. The most conspicuous is the large-flowered bellwort (*U. grandiflora*). This bears ovate leaves somewhat hairy below when young and narrowly bell-shaped, lemon-yellow, six-parted flowers about 1½ in. long. It is found from Quebec westward to Minnesota and southward to Georgia and Kansas. The somewhat smaller perfoliate bellwort (*U. perfoliata*), with more pointed leaves, which are smooth below, occurs from Quebec and Ontario south to Florida and Mississippi. In the two foregoing species the leaves appear as if impaled upon the stem (perfoliate). The other much smaller species, by some authorities regarded as belonging to the genus *Oakesia,* have sessile leaves. The sessile-leaved bellwort (*U. sessilifolia*) ranges from New Brunswick to Minnesota and south to Georgia and Arkansas. The mountain bellwort (*U. puberula*) is restricted to the mountains of Virginia, West Virginia and North Carolina, while the delicate *U. floridana* is found only in central Florida.

BELMONT, AUGUST (1816–1890), American banker and financier, was born at Alzei, Rhenish Prussia, on Dec. 8, 1816. He entered the banking house of the Rothschilds at Frankfort, acted as their agent for a time at Naples, and in 1837 settled in New York as their American representative. In 1853–55 he was chargé d'affaires for the United States at The Hague, and from 1855 to 1858 was the American minister resident there. He energetically supported the Union cause during the Civil War, and exerted a strong influence in favour of the north upon the merchants and financiers of England and France. He died in New York on Nov. 24, 1890. His son, PERRY BELMONT (1850–), was a member of congress from 1881–89, serving in 1885–87 as chairman of the committee on foreign affairs. In 1889 he was United States minister to Spain. Another son, AUGUST BELMONT (1853–1924), was prominent in financing and building the New York subway.

A volume entitled *Letters, Speeches and Addresses of August Belmont* (the elder) was published at New York in 1890.

BELMONT, a residential town of Middlesex county, Massachusetts, U.S.A., on the Boston and Maine railroad, 6 mi. W. by N. of Boston, adjoining Cambridge. It was formed from parts of Watertown, Waltham and West Cambridge, and was incorporated in 1859 after a bitter contest through several successive legislatures. Its area is 4.8 sq.mi. The population in 1860 was 1,198; in 1920 it was 10,749; and in 1940, according to the federal census, 26,867. The principal villages are Belmont and Waverly. The Massachusetts general hospital in 1876 established its convalescent home on a tract of 114 ac. known as Waverly Highlands; and in 1895 the McLean hospital moved to Waverly from Somerville.

BELO HORIZONTE, a city of Brazil, capital of the state of Minas Gerais, about 50 mi. N.W. of Ouro Preto, connected with the Central railway of Brazil by a branch line 9 mi. in length. Pop. in 1940, 179,770; (*município* 211,650). The city was built by the state on an open plateau about 2,500 ft. above the sea, and provided with all necessary public buildings, gas, water and tramway services before the seat of government was transferred from Ouro Preto. The city is considered one of the most attractive state capitals of Brazil.

BELOIT, a city of Rock county, Wis., U.S.A., on Rock river, 70 mi. S.W. of Milwaukee, on the southern boundary of the state. It is served by the Chicago and North Western and the Chicago, Milwaukee, St. Paul and Pacific railways. The population was 25,365 in 1940. The city has a pleasant situation on high bluffs on both sides of the river, which furnishes abundant water power. The industrial production in 1940 was valued at $50,000,000, and included diesel engines, pumps, paper making machinery, woodworking machinery, refrigeration, radiators, air-conditioning equipment, paper, knives, grinders, taps, dies, punch presses, shoes, electric brakes, railroad signals, fireworks, hosiery, shears, rotary ovens, dairy products, chemicals, magnetos and motors. Beloit college, on a commanding site east of the river, was founded in 1846 through the efforts of the Congregational and Presbyterian churches to meet the educational needs of the new region opened up by the Black Hawk War. It has an enrolment of 574. Beloit was founded by New Englanders in 1838, and was chartered in 1856.

BELOMANCY, a form of divination (*q.v.*) by means of arrows, practised by the Babylonians, Scythians and other ancient peoples (from βέλος, a dart, and μαντεία, prophecy or divination). Nebuchadrezzar (Ezek. xxi 21) resorted to this practice "when he stood in the parting of the way . . . to use divination: he made his arrows bright."

BELON, PIERRE (1517–1564), French naturalist, was born near Le Mans (Sarthe). He studied medicine at Paris, where he took the degree of doctor, and then became a pupil of the botanist Valerius Cordus (1515–44) at Wittenberg. Belon, who was highly favoured both by Henry II and by Charles IX, was assassinated at Paris in April 1564. His works include: *Les observations de plusieurs singularités et choses mémorables trouvées en Grèce, Asie, etc.* (1553, enlarged ed., Antwerp, 1555); *L'Histoire naturelle des estranges poissons* (1551), *De aquatilibus* (1553). Belon was one of the first workers in the science of comparative anatomy.

BELOW, FRITZ VON (1853–1918), German general, was born on Sept. 23, 1853 at Danzig. He served in the war of 1870–71, and in 1912 was appointed to the command of the 21st army corps. He fought with the 6th army on the western front at the beginning of World War I, but his corps was transferred in 1915 to the eastern front. In 1916 he was chief in command of the 1st army, which was engaged in Nov. 1916 on the Somme. He died in a field hospital on the western front on Nov. 23, 1918.

BELOW, OTTO VON (1857–1944), German general, was born at Danzig on Jan. 18, 1857. At the beginning of World War I he was in command of the 2nd infantry div. at Insterburg in East Prussia. In command of the 1st reserve corps, he took part in the battles which resulted in the almost complete destruction of the Russian army of the Narev. He was then appointed to the chief command of the 8th army, which bore an essential part in the victory over the Russian 10th army at the battles of the Masurian Lakes (Feb. 7–15, 1915). In May 1915 he was placed in chief command of the German Niemen army and pressed forward with it in Courland (Kurland) and Lithuania as far as the southern reaches of the Dvina. In the autumn of 1916 he received the command of the German army group in Macedonia and in the autumn of 1917 was placed in chief command of the 14th army, which was fighting against Italy. In 1918 he led the 17th army, which particularly distinguished itself in the battles around Arras. After the war he was for a short period general in command of the 17th army corps at Danzig. He resigned in June 1919, and died March 15, 1944.

BELPER, urban district, Derbyshire, England, on the river Derwent, 7 mi. N. of Derby on the L.M.S. Ry. Pop. (1938) 14,520. Area 6.7 sq.mi. Until 1846 Belper (Beaurepaire) formed part of the parish of Duffield, granted by William I to Henry de Ferrers, the Domesday commissioner. There is no distinct mention of Belper till 1296, when the manor was held by Edmund Crouchback, earl of Lancaster, who was granted the lands of Robert de Ferrers, earl of Derby. Edmund had a hunting seat there named Beaurepaire and founded the chapel of St. John. The manor thus became parcel of the duchy of Lancaster. It afterwards passed to the Jodrell family. The neighbourhood was severely scourged by the plague of 1609. The staple trade is the manufacture of cotton thread, but hosiery and stoves and grates are important industries.

BELSHAZZAR, a Babylonian general of the 6th century B.C. Until the decipherment of the cuneiform inscriptions, he was known only from the book of Daniel (v. 2, 11, 13, 18) and its

reproduction in Josephus, where he is represented as the son of Nebuchadrezzar and the last king of Babylon. His identification with Nabonidos, the last Babylonian king according to the native historian Berossus, goes back to Josephus. In 1854 Sir H. C. Rawlinson discovered the name of Bel-sarra-uzur—"O Bel, defend the king"—in an inscription belonging to the first year of Nabonidos which had been discovered in the ruins of the temple of the Moon-god at Muqayyar or Ur. Here Nabonidos calls him his "first-born son." In the contracts and similar documents there are frequent references to Belshazzar, who is sometimes entitled simply "the son of the king."

He was never king himself, nor was he son of Nebuchadrezzar. Indeed his father Nabonidos (Nabunaid), the son of Nabu-baladsu-iqhi, was not related to the family of Nebuchadrezzar and owed his accession to the throne to a palace revolution. Belshazzar took command of the army, living with it in the camp near Sippara, and the measures of defence organized against the invasion of Cyrus appear to have been due to him. Hence Jewish tradition substituted him for his less known father, and rightly concluded that his death marked the fall of the Babylonian monarchy. According to the Babylonian Chronicle, from the 7th year of Nabonidos (548 B.C.) onwards "the son of the king" was with the army in Akkad, that is, in the close neighbourhood of Sippara. At an earlier period there is frequent mention of his trading transactions, which were carried out through his house-steward or agent. Thus in 545 B.C. he lent 20 manehs of silver to a private individual, a Persian by race, on the security of the property of the latter.

The legends of Belshazzar's feast and of the siege and capture of Babylon by Cyrus which have come down to us from the book of Daniel and the *Cyropaedia* of Xenophon have been shown by the contemporaneous inscriptions to have been a "projection backwards" of the re-conquest of the city by Darius Hystaspes. The actual facts were very different (*see* BABYLONIA AND ASSYRIA: *History*). His death subsequent to the surrender of Babylon and the capture of Nabonidos, and with it the last native effort to resist the invader, would account for the position he assumed in later tradition and the substitution of his name for that of the actual king.

See Th. G. Pinches, *P.S.B.A.*, May 1884; H. Winckler, *Zeitschrift für Assyriologie*, ii. 2, 3 (1887); *Records of the Past*, new series, i. p. 22–31 (1888); A. H. Sayce, *The Higher Criticism*, p. 497–537 (1893).

BELT, THOMAS (1832–1878), English geologist and naturalist, was born at Newcastle-on-Tyne, and educated in that city. He spent eight years on the Australian gold fields and some time gold-mining in Nova Scotia, returning to England about 1860. In 1861 he issued a separate work entitled *Mineral Veins: an Enquiry into their Origin, founded on a Study of the Auriferous Quartz Veins of Australia.* He was searching for gold when he investigated the rocks and fossils of the Lingula Flags at Dolgelly, his observations being published in a now classic memoir in the *Geological Magazine* for 1867. He then spent four active and adventurous years in charge of some Nicaraguan mines, the results being given in his *Naturalist in Nicaragua* (1874), a work of high merit. In his scientific papers he dealt boldly and suggestively with the phenomena of the Glacial period in Britain and in various parts of the world. After many further expeditions to Russia, Siberia and Colorado, he died at Denver on Sept. 21, 1878.

BELT, a flat strap of leather or other material, used as a girdle (*q.v.*), especially the *cinctura gladii* or sword-belt, the chief "ornament of investiture" of an earl or knight (O.Ger. *balz*); in machinery, a flexible strap passing round from one drum, pulley or wheel to another, for the purpose of power-transmission (*see* BELTING FOR POWER TRANSMISSION). The word is applied to the belts of the planet Jupiter, to the armour-belt at the waterline of a warship, or to a narrow tract of country with special characteristics, such as the earthquake belt across a continent.

BELTANE, BELTENE, BELTINE or **BEAL-TENE** (Scot.Gael. *bealltain*), the Celtic name for May-day, on which was held a festival originally common to all the Celtic peoples. The most important ceremony in later centuries was the lighting of the bonfires known as "beltane fires," which is believed to represent the Druidical worship of the sun-god. He who had the misfortune to get the charcoal-blackened bit of the cake cooked at the fire became *cailleach bealtine* (the beltane carline)—a term of great reproach. In the north-east of Scotland beltane fires were still kindled in the latter half of the 18th century. Cormac, archbishop of Cashel about the year 908, furnishes in his glossary the earliest notice of beltane. (*See* Trans. Irish Acad. xiv. pp. 100, 122, 123.) The Highlanders have a proverb, "He is between two beltane fires."

The derivation of the word beltane is obscure. Following Cormac, it has been usual to regard it as a combination of the name of the god Bel or Baal or Bil with the Celtic *teine*, fire. Theories thereby connecting the Semitic Baal with Celtic mythology are now repudiated by scientific philologists, and the *New English Dictionary* accepts Dr. Whitley Stoke's view that beltane can have no connection with *teine*, fire. Beltane, Hallowmas, Candlemas, and Lammas were in ancient Scotland four quarter days.

For a full description of the beltane celebration in the Highlands of Scotland during the 18th century, *see* John Ramsay, *Scotland and Scotsmen in the 18th Century* (1888); also J. Robertson in Sinclair's *Statistical Account of Scotland*, xi. 620; Thomas Pennant, *Tour in Scotland* (1769–70); W. Gregor, "Notes on Beltane Cakes," *Folklore*, vi. (1895), p. 2; and "Notes on the Folklore of the North-East of Scotland," p. 167 (*Folklore Soc.* vii. 1881); A. Bertrand, *La Religion des Gaulois* (1897); Jamieson, *Scottish Dictionary* (1808); A. Macbain, *Celtic Mythology and Religion* (1917); Cormac's *Glossary* has been edited by O'Donovan and Stokes (1862).

BELTING FOR POWER TRANSMISSION. The transmission of power from an engine or motor to a machine by the method of driving shaft and pulley demands the employment of belts or ropes of careful manufacture. These are variously of leather, friction surface rubber balata, solid woven cotton and other materials. Despite the advance of electrical power transmission, belt and rope drive is still largely employed, and the manufacture of power-belting is an industry of considerable dimensions. In addition to the selection of the best type of belt for a given type of power transmission from a manufacturing standpoint, other important considerations are belt fastenings, pulleys to be used, stresses and loading under maximum conditions. When the power to be transmitted is not large, round or V-shaped belts are used. Cases of this are seen in the cooling fan and generator of automobiles and transmission drives on motorcycles. Most of the applications in industry, however, are of the leather, rubber, cotton or steel types of flat belt.

LEATHER BELTING

Manufacture of Leather Belting.—The raw material for this article is the product of the heavy-leather tanning industry known as a Strap Butt. The best and most serviceable leather is derived from butts cut from steer hides. The Strap Butt represents approximately 50% of the total weight of leather produced from a hide, and in area is about $4\frac{1}{2}$ by $4\frac{1}{4}$ft. Rough leather, which is hard, brittle and non-elastic, must be curried to bring it to the pliable condition essential to procure durability, good adhesion to the pulleys and the elasticity required for good power transmission.

In currying, the rough leather is first soaked in a weak tan liquor until the fibres become fairly soft and pliable. At this stage the grain (hair side) and flesh (inside) are thoroughly cleansed from all foreign matter deposited on them during the process of tanning. Subsequently, whilst the leather is in a moist condition, a mixture of best quality cod-liver oil and tallow is well rubbed in on one surface, a dressing of cod oil to the other side, and the butts are hung up to dry. During the drying process the lighter constituents of the grease are absorbed by the fibres. Just before the leather is quite dry the butts are taken down and damped. Another application of grease is given on the opposite side to the first one. At a later stage the butts are "set out," *i.e.*, friction and pressure is applied to the hair side by oscillating or rotary machinery, which extends the leather, works out the grain, and makes the butt as flat as possible. The butt is generally stretched because the elongation of the leather within its elastic limit is of vital importance to its efficient transmission of power.

It is stretched either as a whole or in three sections, the important factor being to leave the leather in the stretching apparatus until it is dry. After stretching and drying, the "belting butt" is put through a finishing process termed "jacking," which smoothes out the leather and gives it a glazed surface. This lends an attractive appearance to the leather but adds nothing to its transmission ability. When the currying is completed the butts are brushed over lightly with warm tallow and laid down in pile to mature. This is of great importance in producing good wearing leather, the time occupied in the whole process of currying and maturing being approximately four months. Before being cut into strips, the curried Strap Butt is finished, *i.e.*, all surplus grease is scraped away and the surfaces are rubbed over to give them a finish.

Hides, and consequently Strap Butt, have both natural and artificial faults. The natural ones are uneven growth, poor texture, and at certain seasons warble holes caused by the "gad" fly. The artificial ones are butchers' cuts, fleshers' galls on the flesh, horn marks and scratches on the grain, all of which must be eliminated from the leather used in the making up of a good, serviceable and reliable belt. The growth of the Strap Butt is very similar to the shape of the steer, that is to say, the thickest parts are over and along the ribs. That portion which covers the spinal region is thinner but sound material, the general thickness tapering from the hind quarters to the commencement of the neck. The best hides for belting are those taken from three-year-old steers and are known as "Green Packer" steer hides. Green hides are best for belting if they are removed from the animals in the fall and winter months. During this period of the year, the hair is shorter and the hide cleaner.

Eliminating Weakness.—The tanner cuts the butts $4\frac{1}{2}$ to $4\frac{3}{4}$ft. long according to growth, but the difference in thickness between the butt end (hind quarters) and the shoulder end is too great to allow the last 8 to 10 inches at the shoulder end to be used in making a high quality belt. To eliminate this weak spot, therefore, a strip 8 to 10 inches wide is cut away the full width of the butt, which represents a loss of 12% in weight and quite a big loss in value. The shortened butt is now cut into two slightly unequal portions for ease in handling when being cut into strips, which is done on a circular knife running at a high speed.

The cutter carefully examines each portion of the butt for flaws and to ascertain its growth and thickness; the centre portion of the butt, being thinner, produces narrower belting than that portion which covered the centre of the ribs of the steer. From the region two or three inches past the centre line of the ribs to within $1\frac{1}{2}$ to 2 inches of the tip of the butt end flank, the growth falls away and narrower belting is cut; ultimately a piece 3 to 4 inches wide on each portion is left, which is too poor in quality for belting requirements. This represents about 7% of the starting weight of the butt.

The cut lengths are passed forward to the squarer, who examines each one carefully for flaws and thin ends, and decides just where to cut away the leather which is not up to the standard required; in doing so he cuts the ends square, to facilitate the operation of splicing.

Matching the Strips.—In making up a complete roll of belting the strips are carefully matched and graded to ensure that they are of similar texture and as near as possible similar thickness, so that the made-up belt will be well-balanced. When satisfactory in this respect the lengths are spliced, *i.e.*, the ends of each strip are bevelled on alternate surfaces. The bevelled surfaces are roughed up to produce a suitable surface for the cement.

The joints are now fitted, *i.e.*, the bevelled surfaces are carefully measured and marked off to a fixed length which varies according to the width of the strips. The lips are thinned to a feathered edge, great attention being given to ensure that the spliced ends lie and fit properly on each other.

In cementing, a good adhesive gelatine in a warm liquid state is applied and well rubbed into the prepared splices. The covered areas, one spliced from the grain side, the other from the flesh side, are laid on each other, in a hydraulic box-press and pressed down every few minutes till the box is full. Pressure is now left on for several hours to enable the cement to set and also partly dry. When the boxes are emptied each joint is carefully examined to see that the cement is well set and the lips have a good hold, the whole roll being laid down until the joints are quite dry before they are sewn. In sewing, a white or a horny lace is generally used. The holes are pierced with an awl, and the lace is threaded in and pulled up tight, the whole being a hand operation. Joints are also hemp sewn, both by machine and hand labour. Occasionally copper-wire sewn joints are specified, but copper rivets are not essential, as waterproof joints can be supplied for use in damp situations.

In making "cemented only" belting, a splice about one inch longer than for sewn work is generally made and a higher grade of cement is employed.

In making double belts, two plies are first prepared as single belts with "cemented only" joints, then these two plies are cemented together flesh side to flesh side, and as required are supplied "cemented only," sewn with laces, hemp or copper wire. After the sewing operation the edges of the leather are finished flat or round and the roll which measures generally 300–350ft. long is ready for use.

A high breaking strain does not mean that the leather will wear well; in fact, the opposite is the case. The hardest wearing leather comes from the centre of the butt, and it is well known that, owing to its close texture, this region of the butt has a comparatively low breaking strain, whereas the outer edges of the butt, which are more open in texture and stretch more, always give a high breaking strain.

Initial Stretch.—The initial stretch in leather belting can be, and is, eliminated by the up-to-date manufacturer, who only leaves just sufficient stretch to provide the elasticity required for good power transmission. The process is, however, expensive and adds to the prime cost of the belting, but in these days of high-speed production the extra outlay for "stretchless" belting is a paying proposition.

Mineral Retanning of Leather.—Leather belting of first quality at its best is sometimes not highly flexible. A certain stiffness, peculiar to the leather, has been overcome by the introduction of the mineral retanning process. This process results in a leather of extreme flexibility, increased tensile strength and increased frictional qualities; it enables it to stand the action of water and steam and, to a certain extent, the effect of corrosive acids.

Leather belts withstand much overloading, but they require some care and attention during their effective life. An occasional application of curriers' dubbin furnishes fresh lubricants to the fibres when they become dry. Belt dressings as sold by the dealer are generally more harmful than useful, while giving temporary release from slipping they make the leather harsh and dry in the long run, and thus shorten its life. Leather belts are long lived and are often repaired again and again. Cases are on record of leather belts which have performed their duty efficiently for 25 to 30 and even 40 years. The best makes of leather belting are sold on a measurement basis, the per foot price-list being graded according to width and thickness. (R. M. O.)

BALATA BELTING

This belting employs balata, a gum obtained from the bullet tree (*Mimusops balata*), which is a native of Guiana and the West Indies. Balata is related to gutta-percha, the latex containing a high proportion of that substance. Its advantages for the purpose of belting are non-elasticity, great power of penetration when in solution (so that the fabric used as a base can be rendered thoroughly waterproof and solid), and tenacity in binding the plies. It offers great resistance to oxidation.

The basis of the balata belt is cotton-duck, necessarily of high grade, for its fibres must withstand the strains of transmission, and be of such evenness of quality and texture that the belt throughout its length and width is of uniform strength and suppleness to ensure true running. American cotton of long staple gives the best results. For the requirements of belting the duck must be both tightly spun and woven. The relation of the strength of the weft to the warp is of considerable importance, for although all the tension in a belt would appear to bear on the warp, yet this

must be strengthened and supported by the weft, or the belt will lose its shape, pull narrow and stretch.

The duck is thoroughly impregnated with a carefully cleaned solution of balata. This operation is most important, for the duck must be thoroughly saturated before being made up into belts. After evaporation of the solvent agent, the treated duck is ready for translation into various widths and plies. It is therefore heated to reduce the balata to a partially melted state, and in this condition the duck is folded in the number of plies required under heavy pressure. The belt is then passed through very heavy rollers, and severe tension applied by way of tests. The result is a belt of great tensile strength and true running. An ingenious manufacturer has designed a belt which combines balata with leather. The upper part of the belt is of balata based on cotton-duck as here described; beneath it are transverse strips of oak-tanned leather attached to the balata by strong metal rivets so well sunk into the leather that they do not touch the pulleys. The balata takes the pull, and the leather strips which are attached to it give grip. (X.)

RUBBER BELTING

This type, as it is known in the United States, is composed of cotton duck impregnated with a strong, tenacious, slow-ageing rubber compound. The present methods of manufacture produce a belt, homogeneous, strong, flexible and durable. The rubber friction compound is not merely spread on the surface of the cotton duck, but is forced into the pores by massive calender rollers. Therefore the strength of the finished belt depends upon the strength of its duck, and the strength of the duck is proportioned to its weight and its quality. By weight is meant the actual scale weight of a piece of duck 36 in. by 42 in. when dry. These dimensions are known as "U.S. trade standard." The breaking tensile strength of the average 32 oz. duck 1 in. wide is about 500 lb.; of 28 oz. duck, 440 lb. The duck is first inspected, after which tests are made for tensile strength, crimp, etc. The next step is impregnation of the duck with the rubber compound. Before this can be done the duck must be thoroughly dried as the rubber compound will not adhere to a moist surface. This is accomplished by running it over a series of warm plates or heated rollers. The duck, while warm, is then passed through a calendering machine which compresses the rubber compound into it.

TEXTILE BELTING

This is made by weaving in a loom or building up a belt with layers of canvas stitched together. The success of this type of belting depends upon the weight and grade of cotton duck or other material employed, the method of stitching the duck plies together and the character of the impregnating compounds. In the better grades, the weight of the duck is usually 36 to 37½ oz. to a standard 36 in. by 42 in. strip and possesses a tensile strength of from 550 to 600 lb. per in. per width per ply. There are two general methods of manufacture in use, one known as the round edge and the other as the folded. After the belt is formed and stitched, it is treated with the impregnating compound which makes it water-proof, and in some cases oil-proof. Generally, belts treated with a cheap filling are very stiff and hence do not conform to the pulley, making it more difficult to transmit the desired power. Textile belts are used more for conveyor service than for the transmission of power.

Hair power belting is used where special resistance is required to the action of acids, moisture and oils. Frequently this is made of cotton of the highest grade, having long fibre cotton yarn specially selected, and hair from the long-hair two-humped Bactrian camel of northern China, Mongolia and Siberia. It is woven on looms under tension which results in a closely woven, one-piece fabric, uniform throughout. It is then treated with special compounds for preserving its life and pliability. Prior to weaving, the hair is cleaned and the longest fibres are made up into yarn. The yarn is then rolled on spools into a "beam" which forms the warp of the belt; a cotton filler and binder is used to complete the woven structure.

STEEL BELTING

This type of belt has been used with considerable success in Germany since 1906 but results in the United States have not been as satisfactory. The steel belt is used in the same manner as the leather belt, except that it is narrow, thin and of very light material. It is put on the pulley with a relatively high initial tension and hence runs without sag. The material used is frequently a charcoal steel, prepared and hardened by processes that are for the most part secret. Steel belts are not adapted to tight and loose pulleys, but crossed belts will work satisfactorily, provided the distance between the shafts is held above a certain predetermined ratio to the width of the belt. Sometimes several steel belts are used with one transmission. (W. STA.)

BELTON, a city of Texas, U.S.A., 55m. N.E. of Austin; the county-seat of Bell county. It is on Federal highway 81, and is served by the Santa Fe and the Missouri-Kansas-Texas railways. The population in 1940 was 3,572. Cotton, grain, honey and hogs are raised in the surrounding country. The city has cotton gins and compresses, cottonseed-oil and cotton-yarn factories, and a poultry-dressing plant. It is the seat of Baylor College for Women, opened at Independence in 1851 as the women's section of Baylor university (chartered in 1845 by the Republic of Texas) and removed to Belton in 1886.

BELTRAMI, EUGENIO (1835–1900), Italian mathematician, was born at Cremona. He came of a well-known and cultured family; was educated at Cremona and later at Pavia, where he studied mathematics under Brioschi. Beltrami held an appointment in the administration of the Italian railways until 1862 when he began his academic career as professor extraordinarius in algebra and geometry, at Bologna. The following year he was appointed professor of geodesy at Pisa, but he returned to Bologna in 1866 as professor of rational mechanics. In 1873 Beltrami became professor at Rome and was elected a member of the Reale Accademia dei Lincei. Between 1876 and 1891 he lectured on mathematical physics and higher mechanics at Pavia, then returned to Rome where he remained until his death, Feb. 18, 1900. Beltrami's work on non-Euclidean geometry follows that of Riemann and Lobatchewsky; his most important contributions, dealing with the theory of hyperbolic space, were published in the *Giornale Matematico di Napoli* (1868). He was also the author of papers on differential parameters in which he used the theory of invariants (1869), on flexures of ruled surfaces and on the general theory of surfaces. While at Pavia and Rome Beltrami wrote a number of papers on various branches of mathematical physics such as hydrodynamics, elasticity, physical optics, theory of potential, electricity, magnetism, conduction of heat and thermodynamics. A good deal of this work aims at clearing up some of the obscurities present in Maxwell's work. After his death Beltrami's papers were collected and published under the title *Opere Matematiche* by the University of Rome (3 vols., 1902–10).

BELUGA or **"WHITE WHALE"** (*Delphinapterus leucas*), a cetacean of the dolphin-porpoise subfamily *Delphinapterinae*. A native of the arctic seas, it extends in the western Atlantic as far south as the river St. Lawrence, which it ascends for a considerable distance, and in the north Pacific as far south as Cook's Inlet, Alaska. In colour it is almost pure white; the maximum length is about 18 ft.; and the back fin is lacking. (*See* CETACEA.)

BELVEDERE or **BELVIDERE,** an architectural structure built in the upper part of a building or in any elevated position so as to command a fine view. The belvedere assumes various forms, such as an angle turret, a cupola, a loggia or open gallery. The name is applied to the whole building, as the Belvedere gallery in the Vatican at Rome, or the Belvedere palace in Vienna.

BELVIDERE, a city of Illinois, U.S.A., 70m. N.W. of Chicago, on the Kishwaukee river, at an altitude of 800ft.; the county seat of Boone county. It is on federal highway 20, and state highways 5 and 76 and is served by the Chicago and North Western railroad. The population in 1940 was 8,094. The fertile river valley produces chiefly grain and hay, and milk for the Chicago market. Manufactures include sewing machines, washing machines, rubber products, casket hardware, evaporated milk, beauty parlor equipment, screw-machined parts, polishes,

canned vegetables, computing scales and milk-bottle caps. The municipal water supply comes from artesian wells. Belvidere was founded in 1836 and incorporated in 1852 and again in 1881.

BELZONI, GIOVANNI BATTISTA (1778–1823), Italian explorer of Egyptian antiquities, was born at Padua. He and his wife in 1803 moved to London, where they lived in extreme poverty until they found a livelihood by exhibiting feats of strength at Astley's circus, to which he was introduced by Henry Salt. Belzoni had invented a hydraulic machine and went to Egypt to induce Mohammed Ali to adopt it for the regulation of the Nile waters. In Egypt he was again befriended by Henry Salt, then consul-general, who sent him to Thebes, whence he removed with great skill the colossal bust of Rameses II., commonly called Young Memnon, which he shipped for England, where it is in the British Museum. He investigated the great temple of Edfu, visited Elephantine and Philae, cleared the great temple at Abu Simbel of sand (1817), made excavations at Karnak, and opened up the sepulchre of Seti I. ("Belzoni's Tomb"). He was the first to penetrate into the second pyramid of Giza, and the first European in modern times to visit the oasis of Baharia, which he supposed to be that of Siwa. He also identified the ruins of Berenice on the Red Sea. In 1819 he returned to England, and published, in 1820, his *Narrative of the Operations and Recent Discoveries within the Pyramids, Temples, Tombs, and Excavations in Egypt and Nubia,* etc. In 1823 he set out for West Africa, intending to penetrate to Timbuktu. He reached Benin, but died of dysentery at a village called Gwato on Dec. 3, 1823. In 1829 his widow published his drawings of the royal tombs at Thebes.

BEM, JOSEF (1795–1850), Polish soldier, was born at Tarnow in Galicia, and was educated at the military school at Warsaw. Joining a Polish artillery regiment in the French service, he took part in the Russian campaign of 1812, and brilliantly distinguished himself in the defence of Danzig (Jan.–Nov. 1813). On returning to Poland he was for a time in the Russian service, but lost his post, and his liberty as well for some time, for his outspokenness. In the Polish War of Independence his skill as an artillery officer won for the Polish general Skrynecki the battle of Igany (March 8 1831), and he distinguished himself at the indecisive battle of Ostrolenká (May 26). He took part in the desperate defence of Warsaw against Prince Paskievich (Sept. 6–7 1831). Then Bem escaped to Paris, where he supported himself by teaching mathematics. In 1848 he attempted to hold Vienna against the imperial troops, and, after the capitulation, hastened to Pressburg to offer his services to Kossuth. He was entrusted with the defence of Transylvania at the end of 1848, and in 1849, as the general of the Szeklers (*q.v.*), he performed miracles with his little army, notably at the bridge of Piski (Feb. 9), where, after fighting all day, he drove back an immense force of pursuers. After recovering Transylvania he was sent to drive the Austrian general Puchner out of the Banat of Temesvár. Bem defeated him at Orsova (May 16), but the Russian invasion recalled him to Transylvania. From July 12–22 he was fighting continually, but finally, on July 31 his army was annihilated by overwhelming numbers near Segesvár (Schässburg), Bem only escaping by feigning death. Bem was in command and was seriously wounded in the last pitched battle of the war, fought on Aug. 9 at Temesvár. On the collapse of the rebellion he fled to Turkey, adopted Mohammedanism, and under the name of Murad Pasha served as governor of Aleppo, where, at the risk of his life, he saved the Christian population from being massacred by the Muslims. Here he died on Sept. 16 1850. The tiny, withered, sickly body of Bem was animated by heroic temper. Even the rough Szeklers regarded him with superstitious reverence. A statue to his honour has been erected at Maros-Vásárhely, but he lives still more enduringly in the verses of the patriot poet Sandor Petöfi.

See Johann Czetz, *Memoiren über Bems Feldzug* (Hamburg, 1850); Kálmán Deresényi, *General Bem's Winter Campaign in Transylvania, 1848–49* (Hung.) (1896).

BEMA, in ecclesiastical architecture, the semi-circular recess or apse (*q.v.*) in the basilica, where later the altar was placed. It generally is roofed with a half dome. In early Christian churches the seats of the priests were against the wall, looking into the body of the church, that of the bishop being in the centre. The bema is generally ascended by steps and railed off. In Greece the bema was the general name of any raised platform. Thus the word was applied to the tribunal from which orators addressed assemblies of the citizens at Athens. That in the Pnyx, where the Ecclesia often met, was a stone platform 10 to 11ft. high. In the Athenian law court counsel addressed the court from such a platform; it is not known whether each had a separate bema or whether there was only one to which each counsel and the witnesses in turn ascended (*cf.* W. Wyse in his edition of Isaeus, p. 440). Another bema was the platform on which stood the urns for the reception of the bronze discs (ψῆφοι) by which at the end of the 4th century B.C. the judges recorded their decisions.

BEMBERG, HERMAN (1861–), French musical composer, was born of French parents at Buenos Aires, and studied at the Paris Conservatoire, under Massenet, whose influence, with that of Gounod, is strongly marked in his music. His grand opera *Elaine* was produced at Covent Garden in 1892 and in New York in 1894. Among his songs the dramatic recitative *Ballade du Désespéré* is well known.

BEMBO, PIETRO (1470–1547), Italian cardinal and scholar, was born at Venice. While still a boy he accompanied his father to Florence, and there learnt to love the Tuscan dialect which he afterwards cultivated. He accompanied Giulio de' Medici to Rome, where he was appointed secretary to Leo X. (1513). On the pontiff's death he retired to Padua, and in 1529 he accepted the office of historiographer to his native city, being shortly afterwards appointed librarian of St. Mark's. The offer of a cardinal's hat by Pope Paul III. took him in 1539 again to Rome, where he renounced the study of classical literature and devoted himself to theology and classical history, receiving before long as reward of his conversion the bishoprics of Gubbio and Bergamo. As a writer, Bembo is the *beau ideal* of a purist. The exact imitation of the style of the classics was the highest perfection at which he aimed.

His works (collected edition, Venice, 1729) include a *History of Venice* (1551) from 1487 to 1513, dialogues, poems, and what we should now call essays. Perhaps the most famous are a little treatise on Italian prose and a dialogue entitled *Gli Asolani,* in which platonic affection is recommended, to the amusement of the reader who remembers the relations of the beautiful Morosina with the author. The edition of Petrarch's *Italian Poems* (1501) and the *Terzerime* (1502), both published by Aldus, were edited by Bembo. See *Opere de P. Bembo* (Venice, 1729); Casa, *Vita di Bembo,* in 2nd vol. of his works.

BEMIDJI, a city in the midst of the woods and lakes of northern Minnesota, U.S.A., about 150 mi. N.W. of Duluth; the county seat of Beltrami county. On Federal highways 2 and 71, and served by the Great Northern, the Soo, the Northern Pacific, and the Minneapolis, Red Lake and Manitoba railways. The population was 2,183 in 1900; 7,086 in 1920; and in 1940 was 9,427, federal census. The city is built around the lower end of Lake Bemidji and bordered on the south by Lake Irving, through both of which the Mississippi river flows from its source in Lake Itasca (within a State park) 25 mi. to the southwest. It has an altitude of 1,343 feet. It is a distributing and supply point for the lumbering industry of the region, a base for summer excursions, for fishing, and hunting big game. There are sawmills, box factories, and woodworking mills; cement works and brickyards; woollen mills; creameries and a plant making peat products. A state teachers college is situated there.

Bemidji is an Indian word meaning "easy crossing," applied to the narrows across the Mississippi between the two lakes, and also the name of a Chippewa chief who was a staunch friend of the early settlers, after whom the city was named.

BEMIS, EDWARD WEBSTER (1860–1930), American economist, was born at Springfield (Mass.), April 7, 1860, and was educated at Amherst and Johns Hopkins university. He held the professorship of history and political economy in Vanderbilt university (1889–92), was associate professor of political economy in the University of Chicago (1892–95), assistant statistician to

the Illinois bureau of labour statistics (1896), and professor of economics and history in the Kansas State Agricultural college (1897–99). Thereafter he devoted himself to practical rather than theoretical work, ultimately becoming consulting engineer on public utilities, and a member of the advisory board of the valuation bureau of the Interstate Commerce commission (1913–23). In 1901 he became superintendent of the Cleveland waterworks. He wrote much on municipal government, his more important works being *Municipal Ownership of Gas-Works in the United States* (1891) and *Municipal Monopolies* (1899).

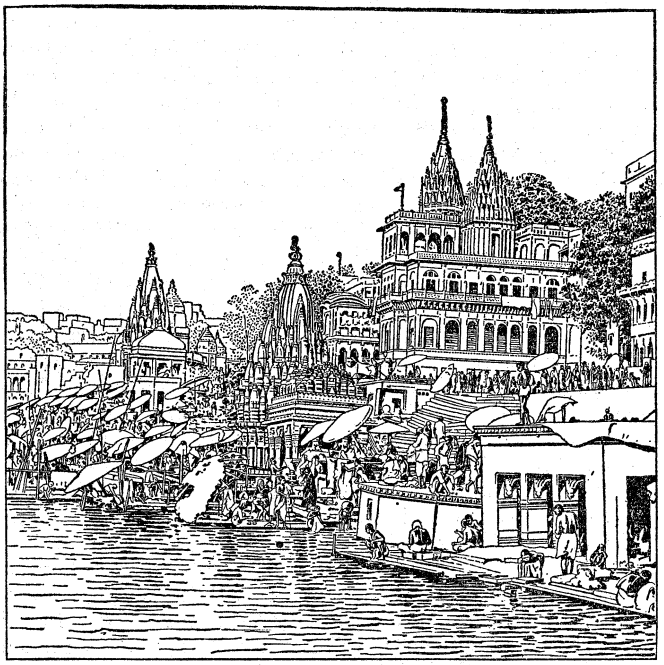
BÉMONT, CHARLES (1848–1939), French scholar, and director of the École des Hautes Études in Paris, was born in Paris, on Nov. 16, 1848. His studies were chiefly in English and European mediaeval history, his most important works being: *Simon de Montfort, comte de Leicester* (1884); *Histoire de l'Europe au moyen âge, de 395 à 1270* (1891, with G. Monod); *Les chartes des libertés anglaises* (1892); *Recueil d'actes relatifs à l'administration des rois d'Angleterre en Guyenne au XIII siècle* (1914). In 1896 Bémont published a supplement to the first volume of the *Gascon Rolls,* begun by F. Michel, and in 1900 and 1906 he issued the second and third volumes. The University of Oxford conferred the honorary degree of Litt.D. on him in 1909.

BEN, in the Scottish phrase "a but and a ben," the inner room of a house in which there is only one outer door, so that the entrance to the inner room is through the outer, the but (O.E. *bennan* within, and *butan,* without). Hence "a but and a ben" meant originally a living room and sleeping room, and so a dwelling or a cottage.

BENARES, an Indian state in political relations with the resident in Gwalior; area 894 sq. mi., and pop. 451,428 in 1941. This is the latest Indian state to be so constituted, the maharajah having been given powers as a ruling chief in 1911. His ancestor, Balwant Singh, although nominally an ordinary landholder, succeeded in establishing his independence of the Oudh court, and helped the British at the battle of Buxar. His son was the famous Chet Singh, whose differences with Warren Hastings are familiar matters of history. Chet Singh's nephew was reinstated by the East India company; the tracts which had been under the family's management on behalf of the Oudh wazirs were taken over by the British, and the rajah was confirmed in the possession of what long continued to be known as the "family domains," for which Balwant Singh had received a grant from the Delhi emperor. The immediate predecessor to the present chief was staunch to the British cause in the Mutiny; and the status of the family in relation to their own properties steadily approximated to that of an independent prince. The personal character, loyalty and munificence of the maharaja ultimately turned the scale; and in 1910 his property was formally recognized as an Indian state. The maharaja has a salute of 13 guns (15 local), and owns outside his territory large estates as an ordinary land-holder in adjoining districts in the United Provinces and Bihar.

The capital of the state is Ramnagar (pop. 12,493 in 1931), a small town with a fine fort on the river, which is the maharaja's palace. The view from it down to the river front of Benares city is magnificent. The town was transferred to the State at a later date than the outlying lands, after having been greatly improved by the maharaja at his own cost. A Brahman himself and a patron of learning, the maharaja presented the Hindu university with the site of its buildings opposite Ramnagar, as well as with a handsome endowment.

BENARES or **KASI,** the holy city of the Hindus, which gives its name to a district and division in the United Provinces of India. It ranks in the affection and reverence of the Hindus as Mecca does for the Moslems, and to western eyes its great antiquity and its unique picturesqueness invest it with an interest all its own. Hsüan Tsang, the celebrated Chinese pilgrim, visited Benares in the 7th century A.D. and described it as containing 30 Buddhist monasteries, with about 3,000 monks, and about 100 temples of Hindu gods. Hinduism has long supplanted Buddhism, and the modern temples number upwards of 1,500. The Ganges here forms a fine sweep of about 4 mi. in length, the city rising on the high northern bank on the outside of the curve, and forming a magnificent panorama of buildings in many varieties of oriental architecture with the minarets of the mosque of Aurangzeb towering above all. The bank of the river is entirely lined with stone, and there are many very fine ghats or landing-places built by pious devotees, and highly ornamented. These are generally crowded with bathers and worshippers, who come to wash away their sins in the sacred river Ganges; and among them constantly



BATHERS AT THE MANIKARNA GHAT, OR LANDING PLACE, IN BENARES

Benares with its 1,500 temples, and its picturesque situation on the great Ganges river, has a solemnity unmatched by any city in the world. It is annually visited by thousands of Hindu pilgrims who come to wash away their sins in the sacred river. Near the Manikarna Ghat is the well said to have been dug by Vishnu, the second person of the Hindu trinity

rises the smoke of funeral pyres, for to the pious Hindu, death on the bank of the stream is the door to salvation. Shrines and temples, and palaces belonging to great Hindu nobles and princes rise tier over tier from the water's edge; but few of the present buildings are of high antiquity. Among the most conspicuous are the mosque of Arangzeb, built in the middle of the Hindu quarter; the Bisheshwar or Golden temple, important less through architectural beauty than through its rank as the holiest spot in the holy city; and the Durga temple, which, like most of the other principal temples, is a Mahratta building of the 17th century. The temples are mostly small, placed in the angles of the streets, under the shadow of the lofty houses; and many of them are covered with beautiful and elaborate carvings of flowers, animals and palm branches. The observatory of Rajah Jai Singh is a notable building of the year 1693. The internal streets of the town are so winding and narrow that there is not room for a carriage to pass, and it is difficult to penetrate them even on horseback. The level of the roadway is considerably lower than the ground-floors of the houses, which have generally arched rooms in front, with little shops behind them, and above these they are richly embellished with verandahs, galleries, projecting oriel windows and very broad overhanging eaves supported by carved brackets. The houses are often painted a deep red and covered with pictures of flowers, men, women, bulls, elephants, and gods and goddesses in all the many forms known in Hindu mythology.

The sacred area of Benares is bounded by a road 50 mi. in circuit, which it is the hope of every Hindu to tread once in his life. Many thousands make the pilgrimage every year, after bathing in the sacred river. Besides the immense resort to Benares of poor pilgrims from every part of India, as well as from Tibet and Burma, numbers of rich Hindus in the decline of life go there for religious salvation. These devotees lavish large sums in indiscriminate charity, and it is the hope of sharing in such pious distributions that brings together a repulsive concourse of religious

mendicants from all quarters of the country, many of them deformed, as a voluntary badge of their calling, by every form of physical distortion. At the other extreme of the human scale are large numbers of Brahmans of noted sanctity and learning, to whose feet flock disciples from all over India, and who make Benares the most famous centre of Sanskritic studies.

The city had a population in 1941 of 263,100. The European quarter lies west of the native town, on both sides of the river Barna. Here is the cantonment of Sikraul, no longer of much military importance, and the suburb of Sigra, the seat of the chief missionary institutions. The principal modern buildings are the Prince of Wales' hospital (commemorating the visit of King Edward VII to the city in 1876), the town hall and the old Mint now occupied by the maharajah. The Benares college, including a first-grade and a Sanskrit college, was opened in 1791, but its fine buildings date from 1852. The Central Hindu college was opened in 1898, and was moved some 20 years later to a fine site on the river opposite Ramnagar. The buildings erected there are now the home of the Benares Hindu university, the first private and sectarian university to be established by law in India. Benares is well served by rail, and is a busy trading centre. Its chief manufactures are silk brocades, gold and silver thread, gold filigree work, German-silver work, embossed brass vessels and lacquered toys; but the brasswork for which it used to be famous has greatly degenerated.

The Hindu kingdom of Benares is said to have been founded by Kas Raja about 1200 B.C. Subsequently it became part of the kingdom of Kanauj, which in A.D. 1193 was conquered by Mohammed of Ghor. On the dismemberment of the Delhi empire, it was seized by Safdar Jang, the nawab wazir of Oudh, by whose grandson it was ceded to the East India company by the treaty of 1775.

The DISTRICT OF BENARES extends over both sides of the Ganges and has an area of 1,094 sq.mi. The surface of the country is remarkably level, with numerous deep ravines in the calcareous conglomerate. The soil is a clayey or a sandy loam, and very fertile except where there is a saline efflorescence known as *reh* or *usar*. The principal rivers are the Ganges, Karamnasa, Gumti and Barna. The principal crops are barley, rice, wheat, other food-grains, pulse, sugar-cane and (formerly) opium. The population in 1941 was 1,218,629.

The DIVISION OF BENARES has an area of 9,468 sq.mi., and comprises the districts of Benares, Mirzapur, Jaunpur, Ghazipur and Ballia. In 1941 the population was 5,545,257.

BENAVENTE Y MARTÍNEZ, JACINTO (1866–), Spanish playwright and critic, was born in Madrid, the son of a physician. He entered the law faculty of the university there, but, preferring literature, left without taking a degree. His first critical work was *Letters of Women* (1893) which he followed up with the comedy *El Nido Ajeno* (1894). He came under the influence of the French theatre for a brief time, but soon distinguished himself by originality, imagination and purity of style. His light and elegant comedies were at first criticized as deficient in action, merely satirical dialogues aimed against society. When his first comedy was produced the Spanish stage was monopolized by the Basque, José Echegaray (*q.v.*), but Benavente soon proved his superiority and took his place. His dialogue is brilliant, his characters true to life and the action never flags.

Several of Benavente's plays have been translated into various foreign languages and produced in remote parts of the world. He himself travelled through the United States and Spanish America superintending the execution of his plays by a company formed under his own eye. In 1922 he received the Nobel prize for literature.

Among his most notable plays are *Vested Interests* (1907), *Saturday Night* (1903), *Brute Force* (1908), *The Vulgar* (1901), *The Mistress of the House* (1901) and *The Rose of Autumn* (1905).

BENBOW, JOHN (1653–1702), English admiral, the son of a tanner in Shrewsbury, went to sea when very young, and served in the navy (1678–81). On the accession of William III. he re-entered the navy as a lieutenant and was rapidly promoted. After taking part in the bombardment of St. Malo (1693), and superintending the blockade of Dunkirk (1696), he sailed in 1698 for the West Indies, where he compelled the Spaniards to restore two vessels belonging to the Scottish colonists at Darien (*see* PATERSON, WILLIAM) which they had seized. On his return he was appointed vice-admiral, and was frequently consulted by the king. In 1701 he was sent again to the West Indies as commander-in-chief. On Aug. 19 1702, when cruising with a squadron of seven ships, he sighted, and chased four French vessels commanded by M. du Casse near Santa Marta. Admiral Benbow's captains were mutinous, and he was left unsupported in his flagship the "Breda." His right leg was shattered by a chain-shot, despite which he remained on the quarter-deck till morning, when the flagrant disobedience of the captains under him, and the disabled condition of his ship, forced him reluctantly to abandon the chase. After his return to Jamaica, where his subordinates were tried by court-martial, he died of his wounds on Nov. 4, 1702. A great deal of legendary matter has collected round his name, and the facts of his life are obscure.

See Yonge's *Hist. of the British Navy*, vol. i.; Campbell's *British Admirals*, vol. iii.; also Owen and Blakeway's *History of Shrewsbury*.

BENCH, a long narrow wooden seat for several persons, with or without a back. While the chair was yet a seat of state or dignity the bench was ordinarily used by the commonalty. It is still extensively employed for other than domestic purposes, as in schools, churches and places of amusement. Bench or Banc, in law, originally was the seat occupied by judges in court; hence the term is used of a tribunal of justice itself, as the King's Bench (*q.v.*) the Common Bench, and is now applied to judges or magistrates collectively as the "judicial bench," "bench of magistrates." The word is also applied to any seat where a number of people sit in an official capacity, or as equivalent to the dignity itself, as "the civic bench," the "bench of aldermen," the "episcopal bench," the "front bench," *i.e.*, that reserved for the leaders of either party in the British House of Commons.

BENCH MARK, a surveyor's mark cut in stone or some durable material to indicate a point in a line of levels for the determination of altitudes over a given district. The name is taken from the "angle-iron" which is inserted in the horizontal incision as a "bench" or support for the levelling staff. The mark of the "broad arrow" is generally incised with the bench-mark so that the horizontal bar passes through its apex.

BENCH TABLE, the stone seat which sometimes runs round the walls and the piers of large churches; it often occurs in porches.

BENCKENDORFF, ALEXANDER, COUNT (1849–1917), Russian diplomat, began his career as an attaché in Florence, proceeding thence to Rome. In 1897 he was appointed minister in Copenhagen, and remained there until 1903, when he was promoted to the Court of St. James. The atmosphere, at the time, was unfavourable to an Anglo-Russian *rapprochement*. But on the conclusion of the secret convention at Björkö (1905) between Wilhelm II. and Nicholas II., which was likely to disrupt the Franco-Russian Alliance and so involve Russia in a continental league against England, Count Benckendorff was invited to Copenhagen and served as a confidential intermediary between Russia and Great Britain. The Björkö intrigue evaporated without leaving any tangible result, and the historic *rapprochement* between Great Britain, France and Russia took its course. Benckendorff made his home in London where he died Jan. 11 1917.

BEND, a city in the central part of Oregon, U.S.A., on the Deschutes river, 196 mi. S.E. of Portland; the county seat of Deschutes county. It is on federal highways 97 and 20 and is served by the Spokane, Portland and Seattle and the Union Pacific railways. The population was 8,848 in 1930; and in 1940 was 10,021 by the federal census. Bend is the shipping and trading centre of a lumbering region and an irrigated district which produces wool, poultry, dairy and beef-cattle, as well as hay, alsike clover seed and other crops. It has lumber-mills and box factories, a creamery, iron foundries and machine shops, and a furniture manufacturing plant. There are interesting caves in the vicinity, one of which is Lava cave in Lava Cave state park.

Popular lake resorts in the Cascades are easily accessible, and 106 mi. S. is the northern entrance to the Crater Lake national park.

BEND, (1) a bending or curvature (Old Eng. *bendan*) as in "the bend of a river," or technically the ribs or "wales" of a ship. (2) A nautical term for a knot (Old Eng. *bindan,* to bind). (3) A term of heraldry (*q.v.*) signifying a diagonal band or stripe across a shield from the dexter chief to the sinister base (Old Fr. *bende,* a ribbon). In tanning, the half of a hide from which the thinner parts have been trimmed away, "bendleather" being the thickest and best sole-leather.

BENDA, the name of a family of Czech musicians, of whom the most important is Jiři who was a pupil of his elder brother, František (1709–1786), *Concertmeister* in Berlin. Jiři Benda, the violinist, was a famous clavier player and oboist, who was born on June 30, 1722, and died on Nov. 6, 1795. He played in the royal orchestra at Berlin, and in 1748 became *Kapellmeister* to the duke of Gotha, but his chief interest for modern musical history lies in his melodramas. Being a far more solid musician than Rousseau he deserves the title of the musical pioneer of that art-form (*i.e.,* the accompaniment of spoken words by illustrative music) in a sense which cannot be claimed for Rousseau on the strength of his Pygmalion. Benda's first melodrama, *Ariadne auf Naxos,* was written in 1774 after his return from a visit to Italy. He was a voluminous composer, also of masses, cantatas and operettas. Mozart's imagination was much fired by Benda's new vehicle for dramatic expression, and in 1778 he wrote to his father with the greatest enthusiasm about a project for composing a duodrama on the model of Benda's *Ariadne auf Naxos* and *Medea.*

BENDA, JULIEN (1868–), French essayist and novelist, was born in Paris on Dec. 26, 1868. His first work appeared in 1898, a commentary on the Dreyfus affair, published in the *Revue Blanche.* He contributed to *Cahiers de la Quinzaine* by Charles Péguy. His first important work is *L'Ordination* (1912), an analytical novel, profound and concise, reminiscent of Benjamin Constant's *L'Adolphe,* but his chief claim to notice is his systematic opposition to the Bergsonian philosophy (*Le Bergsonisme,* 1912; and *Sur le Succès du Bergsonisme,* 1917). In his eyes this doctrine was the apotheosis of irrational instincts or the mere reactions of the senses; he countered it with a conceptualist rationalism, in the manner rather of the French aetiologists than of the great traditional philosophers. His most important work is the *Trahison des Clercs* (1927)—an indictment against the prostitution of intelligence in the service of political passions, which he considers real moral treason. This brilliant pamphlet made a great impression at the time of its publication.

BEN DAY PROCESS, a medium invented about 1879 by Benjamin Day for use in photomechanical engraving for adding tints, shading or stippling to line engravings. Its use eliminates the shading of a drawing by hand and, being mechanical, it avoids the irregularities of hand-drawn work. A numerous and varied selection of mediums, including straight, wave, curved and graduated-line tints; grain stipples and textures; and hand and mechanical-stipples, are available. The drawing, executed in all particulars as for reproduction as a line engraving, that is, drawn in India ink upon a white background, is photographed by the photo-engraver and a negative of the ultimate size of the engraving secured. From this negative a faint image is printed upon the sensitized zinc. Areas not to have Ben Day are painted out on the zinc with gum gamboge. The Ben Day medium, which is in relief, is inked with acid-resisting ink and printed upon the zinc. The zinc is now washed with water to remove the gamboge and then etched in the regular way. When several different tints and shadings are required on a single engraving, each required tint must be separately inked and printed on the zinc, the engraver covering up such areas where the shading is not to print. The ordinary method of indicating on the drawing the portions to be shaded is to paste a transparent flap upon it and mark the areas of each Ben Day with coloured crayon, although where only one tint is to be used the drawing itself is sometimes marked with a light blue wash. A more unusual use of Ben Day is the making of a set of four-line engravings from a single black and white drawing, setting up the tints in such a way that when each separate engraving is printed progressively, one upon the other, with blue, yellow, red and black inks, a coloured illustration is secured which somewhat resembles, but does not equal, four-colour process printing.

BENDER: *see* TIGHINA.

BENDIGO (formerly Sandhurst), a city in Victoria (Australia) situated on the flank of the Great Divide *c.* 100 m. N.N.W. of Melbourne. In 1851 alluvial gold was discovered on a sheep-run and the richness of the finds rapidly attracted population. In 1853 some three million pounds' worth of gold was obtained. Later the quartz reefs, which everywhere intersect the country as ridges and rises, were attacked. Characteristic of the Bendigo field, which is 15 m. by 3 m., or 45 sq.m. in extent, are the saddle reefs, caused by the corrugation of the Ordovician slates and sandstones, in two opposite directions (north-south, east-west) and the filling in of the dome-shaped cavities with auriferous quartz. The "caps" of these reefs—*i.e.,* the portions forming the saddle "seat" or "centre country"—are 29–50 ft. wide, may continue along the axis for 20 m. or more, and have a vertical thickness of 20–30 ft. The "legs" on the reefs taper obliquely downwards for about 100 ft. and are 3–4 ft. across. Saddles occur one under another, as many as 24 having been found in 2,200 ft. The ores are not high-grade, but the great bulk available, improved mining and milling technique and an assured and cheap supply of water, have made working continuous and it is now conducted at deep levels (53 shafts over 2,000 ft.; several over 4,000 ft., one said to be the deepest gold mine in the world, 4,614 ft.). Some 20 million oz. (£80 million) have been obtained (1925: 17,700 oz.=*c.* £70,000). Bendigo, created a city in 1871, is a well-ordered and dignified town (pop., 1933, 25,340 [29,131 with suburbs]). Besides mining, foundries, potteries, tanneries and numerous smaller factories and railway works exist. The climate (mean ann. temps. 70°–45° F; average ann. rainfall 21.5 in., with marked dry period in Jan., Feb., March) is suitable for fruit, vegetable and vine-growing. Bendigo is, therefore, a flourishing market centre, and sends early fruit and vegetables to Melbourne (101 m. by rail). In early days mining was often hampered by lack of water, but large-scale conservation works (Coliban river and reservoirs at Malmesbury) have, since 1870, provided a plentiful supply.

BENDL, KAREL (1838–1897), Bohemian composer, was born on April 16, 1838, at Prague. He studied at the organ school, and in 1858 had already composed a number of small choral works. In 1861 his *Poletuje holubice* won a prize and at once became a favourite with the local choral societies. In 1864 Bendl went to Brussels, where for a short time he held the post of second conductor of the opera. After visiting Amsterdam and Paris he returned to Prague. Here in 1865 he was appointed conductor of the choral society known as *Hlahol,* and he held the post until 1879, when Baron Dervies engaged his services for his private band. Bendl's first opera *Lejla* was produced in 1868. It was followed by *Břetislav a Jitka* (1870), *Stary Ženich,* a comic opera (1883), *Karel Skreta* (1883), *Ditě Tábora,* a prize opera (1892), and *Máti Mila* (1891). Other works by Bendl are *Indicka Princezna,* an operetta (1877), *Cernohorci,* a prize opera (1881), *Čarovny Květ* (1875). Bendl published a mass in D minor for male voices and another mass for a mixed choir; two songs to *Ave Maria;* a violin sonata and a string quartet in F; and a quantity of songs and choruses in the national style. Bendl helped Dvořák in his early days by lending him scores which he was too poor to buy. He died on Sept. 20, 1897, at Prague.

BENEDEK, LUDWIG, RITTER VON (1804–1881), Austrian general, was born at Ödenburg in Hungary on July 14, 1804, his father being a doctor. He received his commission in the Austrian army as ensign in 1822, and rose rapidly in the service. He distinguished himself in the campaigns of Galicia (1846), Italy (1847–48), and Hungary (1849). In the Hungarian campaign he served on Radetzky's (*q.v.*) staff. In the war of 1859 in Italy, Benedek commanded the VIII. corps, and at the battle of Solferino was in command of the right of the Austrian position. That portion of the struggle which was fought out between Benedek and the Piedmontese army is sometimes called the battle of San Martino. Benedek covered the retreat of the rest of the Austrian

army to the Mincio. His reputation was now at its highest, and his great popularity was enhanced, in the prevailing discontent with the reactionary and clerical government of previous years, by the fact that he was a Protestant and not of noble birth. He was promoted *Feldzeugmeister* and in 1860 appointed quartermaster-general to the army, and soon afterwards governor-general and commander-in-chief in Hungary, in succession to the archduke Albert. In 1861 he was made commander-in-chief in Venetia and the adjoining provinces of the empire. In 1864 he resigned the quartermaster-generalship and devoted himself exclusively to the command of the army in Italy. In 1861 he had been made a life-member of the house of peers. In 1866 war with Prussia and with Italy became imminent. Benedek was appointed to command the Army of the North against the Prussians, the control of affairs in Italy being taken over by the archduke Albert. For the story of the campaign of Königgrätz, in which the Austrians under Benedek's command were decisively defeated, *see* SEVEN WEEKS' WAR. Benedek took over his new command as a stranger to the country and to the troops. Only the personal command of the emperor and the requests of the archduke Albert prevailed upon him to "sacrifice his honour." When he took the field his despondency was increased by the passive obstruction he met with amongst his officers, and by the unpreparedness which he found existing at the front. Further his assistants, Lieutenant Field Marshal von Henikstein, and Major-General Krismanić in particular, endeavoured to control Benedek's operations in the spirit of the 18th-century strategists. Under these circumstances, and against the superior numbers, *moral* and armament of the Prussians, the Austrians were foredoomed to defeat. A series of partial actions convinced Benedek that success was unattainable, and he telegraphed to the emperor advising him to make peace; the emperor refused on the ground that no decisive battle had been fought; Benedek, thereupon, instead of retreating across the Elbe, determined to bring on a decisive engagement, and took up a position with the whole of his forces near Königgrätz with the Elbe in his rear. Here he was completely defeated by the Prussians on July 3, but they could not prevent him from making good his retreat over the river in magnificent order on the evening of the battle. He conducted the operations of his army in retreat up to the great concentration at Vienna under the archduke Albert, and was then suspended from his command and a court-martial ordered; the emperor, however, in December determined that the inquiry should be stopped. Benedek from this time lived in absolute retirement, and having given his word of honour to the archduke Albert that he would not attempt to rehabilitate himself before the world, he published no defence of his conduct, and even destroyed his papers relating to the campaign of 1866. This attitude of self-sacrificing loyalty he maintained even when on Nov. 8, 1866, the official *Wiener Zeitung* published an article in which he was made responsible for all the disasters of the war. The history of the campaign from the Austrian point of view as at present known leaves much unexplained, and the published material is primarily of a controversial character. There can be little doubt that Benedek was the victim of political necessities, perhaps of court intrigues. For the rest of his life he lived at Graz, where he died on April 27, 1881.

See H. Friedjung, *Benedeks nachgelassene Papiere* (Leipzig, 1901, 3rd and enlarged ed., 1904), and *Der Kampf um die Vorherrschaft in Deutschland 1859–1866* (Stuttgart, 1897; 6th ed., 1904–05); V. Schlichtling, *Moltke und Benedek* (1900); A. Krauss, *Moltke, Benedek und Napoleon* (1901); and a *roman à clé* by Gräfin Salburg, entitled *Königsglaube* (Dresden, 1906). The brief memoir in *Allgemeine deutsche Biographie* represents the court view of Benedek's case.

BENEDETTI, VINCENT, COUNT (1817–1900), French diplomatist, was born at Bastia, Corsica, on April 29, 1817. In the year 1840 he entered the service of the French foreign office. He spent eight years in Egypt, being appointed consul in 1845; in 1848 he was made consul at Palermo, and in 1851 he became first secretary of embassy at Constantinople. For 15 months during the progress of the Crimean War he acted as chargé d'affaires. In the second volume of his essays he gives some recollections of his experiences in the East, including an account of Mohammed Ali, and a (not very friendly) sketch of Lord Stratford de Redcliffe. In 1855 he was employed in the foreign office at Paris, and acted as secretary to the congress at Paris (1855–56). During the next few years he was chiefly occupied with Italian affairs, in which he was much interested. Chosen in 1861 to be the first envoy of France to the king of Italy, he resigned his post the next year, when the anti-Italian party began to gain the ascendancy in Paris. In 1864 he was appointed ambassador at the court of Prussia.

Benedetti remained in Berlin till the outbreak of war in 1870, and during these years he played an important part in the diplomatic history of Europe. His position was a difficult one, for Napoleon did not keep him fully informed as to the course of French policy. In 1866, during the critical weeks which followed the attempt of Napoleon to intervene between Prussia and Austria, he accompanied the Prussian headquarters in the advance on Vienna, and during a visit to Vienna he helped to arrange the preliminaries of the armistice signed at Nikolsburg. It was after this that he was instructed to present to Bismarck French demands for "compensation," and in August, after his return to Berlin, as a result of his discussions with Bismarck, a draft treaty was drawn up, in which Prussia promised France her support in the annexation of Belgium. This treaty was never concluded, but the draft, which was in Benedetti's handwriting, was kept by Bismarck and, in 1870, a few days after the outbreak of the war, was published by him in *The Times*. During 1867 Benedetti was much occupied with the affair of Luxembourg. In July 1870, when the candidature of the prince of Hohenzollern for the throne of Spain became known, Benedetti was instructed by the duc de Gramont to present to the king of Prussia, who was then at Ems, the French demands, that the king should order the prince to withdraw, and afterwards that the king should promise that the candidature would never be renewed. This last demand Benedetti submitted to the king in an informal meeting on the promenade at Ems, and the misleading reports of the conversation which were circulated were the immediate cause of the war which followed, for the Germans were led to believe that Benedetti had insulted the king, and the French that the king had insulted the ambassador. Benedetti was severely attacked in his own country for his conduct as ambassador, and the duc de Gramont attempted to throw upon him the blame for the failures of French diplomacy. He answered the charges brought against him in a book *Ma Mission en Prusse* (1871), which still remains one of the most valuable authorities for the study of Bismarck's diplomacy. In this Benedetti successfully defends himself, and shows that he had kept his government well informed; he had even warned them a year before as to the proposed Hohenzollern candidature. Even if he had been outwitted by Bismarck in the matter of the treaty of 1866, the policy of the treaty was not his, but was that of E. Drouyn de Lluys. The idea of the annexation of part of Belgium to France had been suggested to him first by Bismarck; and the use to which Bismarck put the draft was not one which he could be expected to anticipate, for he had carried on the negotiations in good faith. After the fall of the Empire he retired to Corsica. He lived to see his defence confirmed by later publications, which threw more light on the secret history of the times. He published in 1895 a volume of *Essais diplomatiques*, containing a full account of his mission to Ems, written in 1873; and in 1897 a second series dealing with the Eastern question. He died on March 28, 1900, while on a visit to Paris. He received the title of count from Napoleon.

See Sorel, *Histoire diplomatique* (1875); Rothan, *La Politique Française en 1866* (1879), and *L'Affaire du Luxembourg* (1881); Sybel, *Die Begründung des deutschen Reiches* (Munich, 1889), etc.

(J. W. H.)

BENEDICT (Benedictus), the name taken by 15 of the popes.

Benedict I. succeeded John III. and was pope from 575 to 579, during the incursions of the Lombards and the series of plagues and famines which followed these invasions.

Benedict II. was pope from 684 to 685. He succeeded Leo II. but his ordination was delayed for some months until the leave of the emperor Constantine was obtained.

Benedict III. was pope from 855 to 858. He was chosen by the clergy and people of Rome, but the election was not confirmed by the emperor, Louis II., who appointed an anti-pope, Anastasius (the librarian). The imperial government at length recognized Benedict and discontinued its opposition. The mythical pope Joan is usually placed between Benedict and his predecessor Leo IV.

Benedict IV. was pope from 900 to 903.

Benedict V. was pope from 964 to 965. He was elected by the Romans on the death of John XII. The emperor Otto I. did not approve of the choice and carried off the pope to Hamburg, where he died.

Benedict VI. was pope from 972 to 974. He was installed pope under the protection of the emperor Otto the Great. On the death of the emperor the turbulent citizens of Rome renewed their outrages, and the pope himself was strangled by order of Crescentius, the son of the notorious Theodora, who replaced him by a deacon called Franco who took the name of Boniface VII.

Benedict VII. was pope from 974 to 983. He was elected through the intervention of a representative of the emperor, Count Sicco, who drove out the intruder Franco (afterwards Pope Boniface VII). Benedict governed Rome quietly for nearly nine years, a somewhat rare thing in those days.

Benedict VIII., pope from 1012 to 1024, was called originally Theophylactus. He was a layman, a member of the family of the count of Tusculum, and was opposed by an anti-pope, Gregory; but defeated him with the aid of King Henry II. of Saxony, whom he crowned emperor in 1014. In his pontificate the Saracens began to attack the southern coasts of Europe and effected a settlement in Sardinia. The Normans also then began to settle in Italy, but their relations with Benedict were friendly. In Italy Benedict supported the policy of the emperor Henry II., and at the Council of Pavia (1022) exerted himself in favour of ecclesiastical discipline.

Benedict IX., pope from 1033 to 1056, son of Alberic, count of Tusculum, and nephew of Benedict VIII., was also called Theophylactus. He was installed pope at the age of 12 through the influence of his father. The disorders of his conduct, though tolerated by the emperors, Conrad II. and Henry III., at length disgusted the Romans, who drove him out in 1044 and appointed Silvester III. his successor. Silvester remained in the papal chair but a few weeks, as the people of Tusculum quickly recovered their influence and reinstated their pope. Benedict, however, sold his rights to his godfather, the priest Johannes Gratianus, who was installed under the name of Gregory VI. (1045). The following year Henry III. obtained, at the Council of Sutri, the deposition of the three competing popes and replaced them by Suidger, bishop of Bamberg, who took the name of Clement II. But before the close of 1047, Clement II. died, and Benedict was reinstalled for the third time. At last, on July 17, 1048, the marquis of Tuscany drove him from Rome, where he was never seen again.

Benedict X. (Johannes "Mincius," *i.e.*, the lout or dolt, bishop of Velletri) was pope from 1058 to 1059. He was elected on the death of Stephen IX. through the influence of the Roman barons, who, however, had pledged themselves to take no action without Hildebrand, who was then absent from Rome. Hildebrand put forward an opposition pope in the person of Gerard, bishop of Florence (pope as Nicholas II.) whom he supported against the Roman aristocracy. With the help of the Normans, Hildebrand seized the castle of Galeria, where Benedict had taken refuge, and degraded him to the rank of a simple priest.

Benedict XI. (Niccolo Boccasini), pope from 1303 to 1304, the son of a notary, was born in 1240 at Treviso. Entering the Dominican order in 1254, he became lector, prior of the convent, provincial of his order in Lombardy, and in 1296 its general. In 1298 he was created cardinal priest of Santa Sabina, and in 1300 cardinal bishop of Ostia and Velletri. He was a loyal supporter of Boniface VIII. in his struggle with Philip the Fair of France, and in 1302 he was papal legate in Hungary. On Oct. 22, 1303, he was unanimously elected pope. He did much to conciliate the enemies made by his predecessor, notably France, the Colonnas and King Frederick II. of Sicily: nevertheless on June 7, 1304, he excommunicated William of Nogaret and all the Italians who had captured Boniface in Anagni. Benedict died at Perugia on July 7, 1304; if he was really poisoned, suspicion would fall primarily on Nogaret. His successor, Clement V., transferred the papal residence to Avignon. Among Benedict's works are commentaries on part of the Psalms and on the Gospel of Matthew. His beatification took place in 1733.

See C. Grandjean "Registres de Benoît XI." (Paris, 1883 ff.), *Bibliothèque des Écoles françaises d'Athènes de Rome.*

Benedict XII. (Jacques Fournier), pope from 1334 to 1342, was born at Saverdun on the Arriège. Entering the Cistercian cloister, Bolbonne and graduating doctor of theology at Paris, he became, in 1311, abbot of Fontfroide, in 1317 bishop of Pamiers, and in 1327 of Mirepoix. Created cardinal priest of Santa Prisca, in Dec. 1327, by his uncle John XXII., he was elected his successor on Dec. 20, 1334. Benedict made appointments carefully, reformed monastic orders and consistently opposed nepotism. Unable to remove his capital to Rome or to Bologna, he began to erect a great palace at Avignon. He was a learned theologian, and in 1336 he declared that souls of saints may attain the fullness of beatific vision *before* the last judgment. In 1339 he entered upon fruitless negotiations for the reunion of the Greek and Roman churches. French influence made futile his attempt to come to an understanding with the emperor Louis the Bavarian, who had been excommunicated by John XXII. for stirring up sedition in Italy. He died on April 25, 1342.

See the source publications of G. Daumet (*Lettres closes, patentes, et curiales,* . . . Paris, 1899 ff.) and J. M. Vidal (Lettres communes . . . Paris, 1903 ff.).

Benedict XIII. (Pedro de Luna) (*c.* 1328–1422 or 1423), anti-pope belonged to one of the most noble families in Aragon. His high birth, his legal learning—he was for a long time professor of canon law at Montpelier—and the irreproachable purity of his life recommended him to Pope Gregory XI., who created him cardinal deacon of S. Maria in Cosmedin in 1374. He was elected pope, or rather anti-pope, by the cardinals of Avignon on Sept. 28, 1394. The hopes he had aroused that, by a voluntary abdication, he would restore unity to the church, were vain; though called upon by princes of France to carry out this plan, abandoned by his cardinals, besieged and finally kept under close observation in the palace of the popes (1398–1403), he stood firm. Escaping from Avignon, he again won obedience in France. He yielded, however, to the instances of the government of Charles VI., and began pourparlers for an interview with Gregory XII., with a view to their simultaneous abdication. The failure of these negotiations, for which he was only in part responsible, led to the universal movement of indignation and impatience, which ended, in France, in the declaration of neutrality (1408) and, at Pisa, in the decree of deposition against the two pontiffs (1409). Benedict XIII., who had on his part tried to call together a council at Perpignan, was by this time recognized hardly anywhere but in his native land, in Scotland, and in the estates of the countship of Armagnac. Abandoned by nearly all his adherents, he took refuge in the impregnable castle of Peñiscola, on a rock dominating the Mediterranean (1415). The Council of Constance then deposed him, as a perjurer, an incurable schismatic, and a heretic July 26, 1417. After struggling with the popes of Rome, Urban VI., Boniface IX., Innocent VII., and Gregory XII., and against the popes of Pisa, Alexander V. and John XXIII., Pedro de Luna, clinging more than ever to that apostolic seat which he still professed not to desire, again took up the struggle against Martin V., although the latter was recognized throughout almost all Christendom, and before his death (Nov. 29, 1422, or May 23, 1423) he nominated four new cardinals in order to carry on the schism.

See Fr. Ehrle. *Archiv für Lit und Kirchengesch.* vols. v., vi., vii.: N. Valois, *La France et le grand schisme d'occident* (1896–1902); Fr. Ehrle *"Martin de Alpartils chronica acitatorum temporibus domini Benedicti XIII."* (*Quellen und Forschungen aus dem Geb. der Gesch., Görres-Gesellschaft, Paderborn, 1906*).

Benedict XIII. (Piero Francesco Orsini), pope from 1724 to 1730, at first styled Benedict XIV., was born on Feb. 2, 1649,

of the ducal family of Orsini-Gravina. In 1667 he became a Dominican (as Vincentius Maria), studied theology and philosophy, was made a cardinal in 1672 and archbishop of Benevento in 1686. Elected pope on May 29, 1724, he attempted to reform clerical morals; but neither the decrees of the Latin council (1725) nor his personal precepts had much effect. He confirmed the bull *Unigenitus;* but, despite the Jesuits, allowed the Dominicans to preach the Augustinian doctrine of grace. State affairs he left entirely to the unpopular Cardinal Nicolo Coscia. He died on Feb. 21, 1730. His works were published in 3 vols. at Ravenna in 1728.

Benedict XIV. (Prospero Lorenzo Lambertini), pope from 1740 to 1758, was born at Bologna on March 31, 1675. At the age of 13 he entered the Collegium Clementinum at Rome. He served the Curia in many and important capacities, yet devoted his leisure time to theological and canonistic study. In 1725 Benedict XIII. made him an archbishop of Theodosia *in partibus,* then of Ancona (1727), and the next year created him cardinal priest. In 1731 Clement XII. translated him to his native city of Bologna, where, as archbishop, he was both efficient and popular. He published valuable works, notably *De sevorum Dei beatificatione et canonizatione, De sacrificio missae,* as well as a treatise on the feasts of Christ and the Virgin and of some saints honoured in Bologna. In a conclave which had lasted for months he was elected on Aug. 17, 1740, the successor of Clement XII. Benedict XIV. bettered the economic conditions of the papal states but was disinclined to undertake the needed thorough-going reform of its administration. He was the first pope expressly to recognize the king of Prussia as such. In 1741 he issued the bull *Immensa pastorum principis* demanding more humane treatment for the Indians of Brazil and Paraguay, and in the bulls *Ex quo singulari* (1742) and *Omnium sollicitudinum* (1744) he rebuked the missionary methods of the Jesuits in accommodating their message to the heathen usages of the Chinese and of the natives of Malabar. He reduced the number of holy days in several Catholic countries. To the end of his life he kept up his studies and his intercourse with other scholars, and founded several learned societies. His masterpiece, *Libri octo de synode diocesana,* begun in Bologna, appeared during his pontificate. He died on May 3, 1758.

His works, published in twelve quarto volumes at Rome (1747–1751), appeared in more nearly complete editions at Venice in 1767 and at Prato 1839–1846; also *Briefe Benedicts XIV.,* ed. F. X. Kraus (2nd ed., Freiburg, 1888); *Benedicti XIV. Papae opera inedita,* ed. F. Heiner (Freiburg, 1904). *See* Herzog-Hauck, *Realencyklopädie* ii. 572 ff.; Wetzer and Welter, *Kirchenlexikon* ii., 317 ff.

BENEDICT XV. (1854–1922), pope, was born at Pegli, in the diocese of Genoa, Nov. 21 1854, his name being Giacomo della Chiesa. He was educated in the seminary and at the University of Genoa, where he took his degree as doctor of law in 1875. He studied for the priesthood in the Collegio Capranica in Rome, from which he passed to the Accademia dei Nobili Ecclesiastici, the usual training school for those who devote themselves to the *carriera,* or diplomatic service, of the Vatican. Here he became the friend of Cardinal Rampolla, who, on being sent in 1885 as papal nuncio, to Madrid, took Chiesa with him as his private secretary. He remained in Spain four years, and in 1887, when Leo XIII. recalled Rampolla to make him his secretary of state, Chiesa also returned to Rome and was made minutante in his department.

In 1903, when Cardinal Merry del Val succeeded Rampolla as secretary of state, Chiesa was retained in his post. On Dec. 16 1907, Pius X. appointed him archbishop of Bologna, and on May 25, 1914, raised him to the dignity of cardinal. The outbreak of the World War in August of that year, and the death of Pius X. a few weeks later, found him in the midst of the pastoral duties of his great diocese. At this time, as cardinal-archbishop of Bologna, he delivered a remarkable address on the attitude and duty of the Church during the War, and strongly emphasized the paramount importance of the Holy See observing strict neutrality, while leaving nothing undone to restore peace and good will and to mitigate suffering. The address caused a deep impression, and was no doubt much in the minds of the cardinals when they assembled in conclave for the election of a new pope on Aug. 31 1914. On Sept. 3, after 10 scrutinies, or votings, Cardinal della Chiesa was elected by a large majority, and was proclaimed from the balcony of St. Peter's as Benedict XV.

During the War he preserved an attitude of strict neutrality, and made several attempts to effect peace. Official relations between France and the Vatican were resumed, and a British representative was accredited to the Papal court for the first time since the 17th century. He died Jan. 22 1922.

BENEDICT, SIR JULIUS (1804–1885), musician, was born at Stuttgart, the son of a Jewish banker, Nov. 27, 1804, and died in London June 5, 1885. He studied under Hummel and Weber at Dresden, and by the latter's influence received an appointment in Vienna in 1823. He then spent some years in Italy, conducting and writing, and finally went, at the suggestion of Malibran, to London in 1835. He became a naturalized Englishman, and, settling in London, was a familiar figure in English musical life for 50 years. In 1838 he became conductor of the English opera at Drury Lane during the period of Balfe's great popularity. In 1852 he became musical conductor under Mapleson's management at Her Majesty's theatre (and afterwards at Drury Lane), and in the same year conductor of the Harmonic Union. His best-known opera—one of a large number—*The Lily of Killarney,* written on the subject of Dion Boucicault's play *Colleen Bawn* to a libretto by Oxenford, was produced at Covent Garden in 1862. Benedict conducted every Norwich festival from 1845 to 1878 inclusive, and the Liverpool Philharmonic Society's concerts from 1876 to 1880. He was knighted in 1871. He died in London June 5, 1885.

BENEDICT BISCOP (628?–690), also known as Biscop Baducing, English churchman of noble family, was for a time a thegn of Oswiu, King of Northumbria. He then went abroad and after a second journey to Rome (he made five altogether) lived as a monk at Lerins (665–667). It was under his conduct that Theodore of Tarsus came from Rome to Canterbury in 669, and in the same year Benedict was appointed abbot of St. Peter's, Canterbury. Five years later he built the monastery of St. Peter at Wearmouth, on land granted him by Egfrith of Northumbria, and endowed it with the large collection of books and art treasures which he had brought from Rome. A papal letter in 678 exempted the monastery from external control, and in 682 Benedict erected a sister foundation (St. Paul) at Jarrow. He died on Jan. 12, 690. Bede was one of his pupils.

BÉNÉDICTINE, D.O.M. A famous aromatic liqueur made at Fécamp on the coast of Normandy, 44m. from Dieppe. Some connoisseurs regard it as the only rival to the old Chartreuse. Both liqueurs have a romantic history. The religious orders were early famed for their liqueurs. The abbey of Fécamp, the origin of which goes back to A.D. 665, had, in 1510, a very learned monk, named Dom Bernardo Vincelli; he dabbled in chemistry and was devoted to the preparation of medicinal beverages; and one day he succeeded in producing an elixir which soon acquired great reputation as a refreshing and recuperative cordial. Its fame spread. Francis I. visited the monastery in 1534, and praised the liqueur, which was named Bénédictine, *ad majorem Dei gloriam,* "for the greater glory of God." In the Revolution of 1793 the abbey of Fécamp was swept away and the monks dispersed.

The recipe for the liqueur, jealously guarded, and other documents were entrusted to the procureur fiscal of the abbey. These, 70 years later, fell into the hands of M Alexander Le Grand, a descendant of the original trustee. Being a wine merchant and having some knowledge of chemistry, he set about the task of reconstructing the liqueur. Eventually he succeeded and established a vast business. The present distillery buildings occupy the grounds which belonged to the old abbey. Every bottle of Bénédictine bears the ecclesiastical initials D.O.M. or *Deo Optimo Maximo*—"To God most good, most great."

BENEDICTINES or **BLACK MONKS,** monks living according to the Rule of St. Benedict of Nursia (*q.v.*). Subiaco in Latium was the cradle of the Benedictines, and in that same neighbourhood St. Benedict established 12 monasteries. Afterwards giving up the direction of these, he migrated to Monte Cas-

sino and there established the monastery which became the centre whence his rule and institute spread. From Monte Cassino he founded a monastery at Terracina. These 14 are the only monasteries of which we have any knowledge as being founded before St. Benedict's death.

About 580–590 Monte Cassino was sacked by the Lombards, and the community came to Rome and was established in a monastery attached to the Lateran Basilica, in the centre of the ecclesiastical world. It is now commonly recognized by scholars that when Gregory the Great became a monk and turned his palace on the Caelian hill into a monastery, the monastic life there carried out was fundamentally based on the Benedictine Rule (*see* F. H. Dudden, *Gregory the Great*, i. 108). From this monastery went forth St. Augustine and his companions on their mission to England in 596, carrying their monachism with them; thus England was the first country out of Italy in which Benedictine life was firmly planted. In the course of the 7th century Benedictine life was gradually introduced in Gaul. In the 8th it was carried into the Germanic lands from England; and during the 8th century it became, outside Ireland and other purely Celtic lands, the only rule and form of monastic life throughout western Europe—so completely that Charlemagne once asked if there ever had been any other monastic rule.

What may be called the inner side of Benedictine life and history is treated in the article MONASTICISM. Here it is possible to deal only with the broad facts of the external history. The chief external works achieved for western Europe by the Benedictines during the early middle ages may be summed up under the following heads.

1. **The Conversion of the Teutonic Races.**—The tendency of modern historical scholarship justifies the maintenance of the tradition that St. Augustine and his 40 companions were the first great Benedictine apostles and missioners. Through their efforts Christianity was firmly planted in various parts of England; and after the conversion of the country it was English Benedictines who evangelized Holland and the greater part of central Germany, and founded and organized the German Church. Others carried Christianity as far as Scandinavia and Poland. The conversion of the Teutonic races may properly be called the work of the Benedictines.

2. **The Civilization of North-western Europe.**—As the result of their missionary enterprises the Benedictines penetrated into all these lands and established monasteries, so that by the 10th or 11th century Benedictine houses existed in great numbers throughout the whole of Latin Christendom except Ireland. These monasteries became centres of civilizing influences by the method of presenting object lessons in organized work, in agriculture, in farming, in the arts and trades and also in well-ordered life. The unconscious method by which such great results were brought about has been well described by J. S. Brewer (*Preface* to Works of Giraldus Cambrensis, Rolls Series, iv.) and F. A. Gasquet (*English Monastic Life*).

3. **Education.**—Boys were educated in Benedictine houses from the beginning, but at first they were destined to be monks. The monasteries, however, played a great part in the educational side of the Carolingian revival; and certainly from that date schools for boys destined to live and work in the world were frequently attached to Benedictine monasteries. From that day to this, education has been among the recognized and principal works of Benedictines.

4. **Letters and Learning.**—This side of Benedictine life is most typically represented by the Venerable Bede (*q.v.*), the gentle and learned scholar of the early middle ages. In those times the monasteries were the only places of security and rest in western Europe, the only places where letters could in any measure be cultivated. It was in the monasteries that the writings of Latin antiquity, both classical and ecclesiastical, were transcribed and preserved.

In a gigantic system embracing hundreds of monasteries and thousands of monks, and spread over all the countries of western Europe, without any organic bond between the different houses, and exposed to all the vicissitudes of the wars and conquests of those wild times, to say that the monks often fell short of the ideal of their state, and sometimes short of the Christian, and even the moral standard, is but to say that monks are men. Failures there have been many, and scandals not a few in Benedictine history; but it may be said with truth that there does not appear to have been ever a period of widespread or universal corruption, however much at times and in places primitive love may have waxed cold. And when such declensions occurred, they soon called forth efforts at reform and revival; indeed these constantly recurring reform-movements are one of the most striking features of Benedictine history, and the great proof of the vitality of the institute throughout the ages.

The first of these movements arose during the Carolingian revival (*c.* 800), and is associated with the name of Benedict of Aniane. Under the auspices of Charlemagne and Louis the Pious he initiated a scheme for federating into one great order, with himself as abbot general, all the monasteries of Charles's empire, and for enforcing throughout a rigid uniformity in observance. For this purpose a synod of abbots was assembled at Aix-la-Chapelle in 817, and a series of 80 *Capitula* passed, regulating the life of the monasteries. The scheme as a whole was short-lived and did not survive its originator; but the *Capitula* were commonly recognized as supplying a useful and much-needed supplement to St. Benedict's Rule on points not sufficiently provided for therein. Accordingly these *Capitula* exercised a wide influence among Benedictines even outside the empire. And Benedict of Aniane's ideas of organization found embodiment a century later in the order of Cluny (910), which for a time overshadowed the great body of mere Benedictines (*see* CLUNY). Here it will suffice to say that the most distinctive features of the Cluny system were (1) a notable increase and prolongation of the church services, which came to take up the greater part of the working day; (2) a strongly centralized government, whereby the houses of the order in their hundreds were strictly subject to the abbot of Cluny.

Though forming a distinct, separate organism, Cluny claimed to be, and was recognized as, a body of Benedictine houses; but from that time onwards arose a number of independent bodies, or "orders," which took the Benedictine Rule as the basis of their life. By far the most important of these were the Cistercians, whose ground-idea was to reproduce exactly the life of St. Benedict's own monastery. What has here to be traced is the history of the great body of Benedictine monasteries that held aloof from these separatist movements.

For the first four or five centuries of Benedictine history there was no organic bond between any of the monasteries; each house formed an independent autonomous family, managing its own affairs and subject to no external authority or control except that of the bishop of the diocese. But the influence of Cluny, even on monasteries that did not enter into its organism, was enormous; many adopted Cluny customs and practices and moulded their life and spirit after the model it set; and many such monasteries became in turn centres of revival and reform in many lands, so that during the 10th and 11th centuries arose free unions of monasteries based on a common observance derived from a central abbey. But notwithstanding all these movements, the majority of the great Black Monk abbeys continued to the end of the 12th century in their primeval isolation. In the year 1215, at the fourth Lateran council regulations destined profoundly to modify Benedictine polity and history were made. It was decreed that the Benedictine houses of each ecclesiastical province should henceforth be federated for the purposes of mutual help and the maintenance of discipline, and that for these ends the abbots should every third year meet in a provincial chapter (or synod), in order to pass laws binding on all, and to appoint visitors who, in addition to the bishops, should canonically visit the monasteries and report on their condition in spirituals and temporals to the ensuing chapter. The English monks took the lead in carrying out this legislation; in 1218 the first chapter of the province of Canterbury was held at Oxford, and up to the dissolution under Henry VIII. the triennial chapters took place with wonderful regularity. The English Benedictines never advanced farther along the path

of centralization; up to their destruction this polity remained in operation among them, and proved itself by its results to be well adapted to the conditions of the Benedictine rule and life.

In other lands things did not on the whole go so well, and many causes at work during the later middle ages tended to bring about relaxation in the Benedictine houses. And so in the period of the reforming councils of Constance and Basel the state of the religious orders was seriously taken in hand, and in response to the public demand for reforming the Church "in head and members," reform movements were set on foot, as among others, so among the Benedictines of various parts of Europe. These movements issued in the congregational system which is the present polity among Benedictines. In the German lands, the system was kept on the lines of the Lateran decree, and received only some further developments in the direction of greater organization; but in Italy the congregation of S. Justina at Padua (1421) afterwards called the Cassinese, departed altogether from the old lines, setting up a highly centralized government, after the model of the Italian republics, whereby the autonomy of the monasteries was destroyed, and they were subjected to the authority of a central governing board. With various modifications or restrictions this latter system was imported into all the Latin lands, into Spain and Portugal, and thence into Brazil, and into Lorraine and France, where the celebrated congregation of St. Maur (*see* MAURISTS) was formed early in the 17th century.

In England the Benedictines had, from every point of view, flourished exceedingly. At the time of the Dissolution there were nearly 300 Black Benedictine houses, great and small, men and women, including most of the chief religious houses of the land (for lists *see* tables and maps in Gasquet's *English Monastic Life,* and *Catholic Encyclopaedia,* art. "Benedictines"). It is now hardly necessary to say that the grave charges brought against the monks are no longer credited by serious historians (Gasquet, *Henry VIII., and the Monasteries;* J. Gairdner, Prefaces to the relevant volumes of *Calendars of State Papers of Henry VIII.*). In Mary's reign some of the surviving monks were brought together, and Westminster abbey was restored. Of the monks who professed there during this momentary revival, one, Sigebert Buckley, lived on into the reign of James I.; and being the only survivor of the Benedictines of England, he invested with the English habit, and affiliated to Westminster abbey and to the English congregation, two English priests, already Benedictines in the Italian congregation (1607). By this act the old English Benedictine line was perpetuated; and in 1619 a number of English monks, professed in Spain, were aggregated by pontifical act to these representatives of the old English Benedictines, and thus was constituted the present English Benedictine congregation. Three or four monasteries of the revived English Benedictines were established on the Continent at the beginning of the 17th century, and remained there till driven back to England by the French Revolution.

The 19th century witnessed a series of remarkable revivals, beginning in Bavaria. The French congregation was inaugurated in 1833, and the German congregation in 1863. Two vigorous congregations have arisen in the United States. These are all new creations since 1830. In Italy, Spain, Portugal and Brazil only a few monasteries survive the various revolutions, and in a crippled state; but signs are not wanting of renewed life; St. Benedict's own monasteries of Subiaco and Monte Cassino are relatively flourishing. In Austria, Hungary and Switzerland there are some great abbeys, most of which have had a continued existence since the middle ages. The English congregation includes five large abbeys (Downside, Ampleforth, Woolhampton, Fort Augustus and Hereford) and four nunneries; and there are communities both of monks and nuns belonging to foreign congregations.

In Rome an international Benedictine college for theological studies was established by Leo XIII., who conferred on its abbot the title of "Abbot Primate," with precedence among Black Monk abbots. He is only *primus inter pares,* and exercises no kind of superiority over the other abbots or congregations. Thus the Benedictine polity may be described as a number of autonomous federations of autonomous monasteries. The individual monks, too, belong not to the order or the congregation, but each to the monastery in which he became a monk. The chief external work of the Benedictines at the present day is secondary education; there are secondary schools or *gymnasia* attached to most of the abbeys, and many of the nunneries have girls' schools. In certain countries (among them England) where there is a dearth of secular priests, Benedictines undertake parochial work.

In conclusion a word must be said on the Benedictine nuns. From the beginning the number of women living the Benedictine life has not fallen far short of that of the men. St. Gregory describes St. Benedict's sister Scholastica as a nun (*sanctimonialis*), and she is looked upon as the foundress of Benedictine nuns. As the institute spread to other lands nunneries arose on all sides, and nowhere were the Benedictine nuns more numerous or more remarkable than in England, from Saxon times to the Reformation. A strong type of womanhood is revealed in the correspondence of St. Boniface with various Saxon Benedictine nuns, some in England and some who accompanied him to the Continent and there established great convents. In the early times the Benedictine nuns were not strictly enclosed, and could, when occasion called for it, freely go out of their convent walls to perform any special work. It has to be said that in the course of the middle ages, especially the later middle ages, grave disorders arose in many convents; and this doubtless led, in the reform movements initiated by the councils of Constance and Basel, and later of Trent, to the introduction of strict enclosure in Benedictine convents, which now is the almost universal practice.

See E. C. Butler, *Benedictine Monachism* (1924); F. Cabrol, art. "Monasticism (Christian)" in Hasting's *Encyclopaedia of Religion and Ethics,* vol. ii., pp. 792–796, with many references to authorities; G. C. Alston, arts. "Benedict" and "Benedictine" in *Catholic Encyclopaedia,* vol. ii.; Mabillon's *Annales* is the great authority up to 12th century; the full account, with good bibliography, in Max Heimbucher's, *Orden und Kongregationen,* 1907, vol. i.; Newman's two essays on the Benedictines; Cardinal Gasquet, *Sketch of Monastic Constitutional History* (reprinted in *Monastic Life in the Middle Ages,* 1922).

BENEDICTION, strictly any blessing either of persons or things, but more commonly applied to formal blessings, such as are pronounced by the priest or minister at the close of religious services.

In the Roman Catholic Church the term is more often applied to a popular form of devotion to the Blessed Sacrament (*cf.* "Benediction of the Blessed Sacrament" in the *Catholic Encyclopaedia*). The details of this rite differ considerably in different places and in different circumstances, but the essential act is blessing the people with the host, which is taken from the tabernacle for the purpose and either left in the veiled ciborium or transferred to a monstrance and exposed for adoration before the blessing. The *Tantum ergo* and *O salutaris hostia* are commonly a part of this service and devotions to the Virgin, with the addition of the Rosary or other familiar prayers, are frequent accompaniments. The whole rite is, however, informal in character and spirit and the widest latitude is permitted in its use.

BENEDICT OF NURSIA, SAINT (*c.* 480–*c.* 543), the patriarch of Western monks. Our only authority for the facts of St. Benedict's life is bk. ii of St. Gregory's *Dialogues.* St. Gregory declares that he obtained his information from four of St. Benedict's disciples whom he names; and there can be no serious reason for doubting that it is possible to reconstruct the outlines of St. Benedict's career (*see* Hodgkin *Italy and her Invaders,* iv. 412). A precise chronology and a pedigree have been supplied for Benedict, according to which he was born in 480, of the great family of the Anicii; but all we know is what St. Gregory tells us, that he was born of good family in Nursia, near Spoleto in Umbria. His birth must have occurred within a few years of the date assigned; the only fixed chronological point is a visit of the Gothic king Totila to him in 543, when Benedict was already established at Monte Cassino and advanced in years (*Dial.* ii. 14, 15). He was sent by his parents to frequent the Roman schools, but shocked by the prevailing licentiousness he fled away. It has been usual to represent him as a mere boy at this time, but of late

years various considerations have been pointed out which make it more likely that he was a young man. He went to the mountainous districts of the Abruzzi, and at last came to the ruins of Nero's palace and the artificial lake at Subiaco, 40m. from Rome. Among the rocks on the side of the valley opposite the palace he found a cave in which he took up his abode, unknown to all except one friend, Romanus, a monk of a neighbouring monastery, who clothed him in the monastic habit and secretly supplied him with food. No one who has seen the spot will doubt that the Sacro Speco is indeed the cave wherein Benedict spent the three years of opening manhood in solitary prayer, contemplation and austerity. After this period of formation, his fame began to spread abroad, and the monks of a neighbouring monastery induced him to become their abbot; but their lives were irregular and dissolute, and on his trying to put down abuses they attempted to poison him. He returned to his cave, but disciples flocked to him, and in time he formed 12 monasteries in the neighbourhood, placing 12 monks in each, and himself retaining a general control over all. In time patricians and senators from Rome entrusted their young sons to his care, to be brought up as monks; in this manner came to him his two best-known disciples, Maurus and Placidus. Driven from Subiaco by the jealousy and molestations of a neighbouring priest, but leaving behind him communities in his 12 monasteries, he himself, accompanied by a small band of disciples, journeyed south until he came to Cassino, a town halfway between Rome and Naples. Climbing the high mountain that overhangs the town, he established on the summit the monastery with which his name has ever since been associated, and which for centuries was a chief centre of religious life for western Europe. He destroyed the remnants of paganism that lingered on here, and by his preaching gained the rustic population to Christianity. Few other facts of his career are known: there is record of his founding a monastery at Terracina; his death occurred after Totila's visit in 543.

Rule of St. Benedict.—In order to understand St. Benedict's character and spirit, and to discover the secret of the success of his institute, it is necessary, as St. Gregory says, to turn to his rule. St. Gregory's characterization of the rule as "conspicuous for its discretion" touches the most essential quality. The relation of St. Benedict's rule to earlier monastic rules, and of his institute to the prevailing monachism of his day, is explained in the article MONASTICISM. Here it is enough to say that nowadays it is commonly recognised by students that the manner of life instituted by St. Benedict was not intended to be, and as a matter of fact was not, one of any great austerity, when judged by the standard of his own day (*see* E. C. Butler *Lausiac History of Palladius,* pt. i., pp. 251–256). His monks were allowed proper clothes, sufficient food, ample sleep. The only bodily austerities were the abstinence from flesh meat and the unbroken fast till mid-day or even 3 P.M., but neither would appear so onerous in Italy even now, as to us in northern climes. Midnight office was no part of St. Benedict's rule: the time for rising for the night office varied from 1.30 to 3.0, according to the season, and the monks had had unbroken sleep for $7\frac{1}{2}$ or even eight hours, except in the hot weather, when in compensation they were allowed the traditional Italian summer siesta after the mid-day meal. The canonical office was chanted throughout, but the directly religious duties of the day can hardly have taken more than four or five hours—perhaps eight on Sundays. The remaining hours of the day were divided between work and reading, in the proportion (on the average of the whole year) of about six and four hours respectively. The "reading" in St. Benedict's time was probably confined to the Bible and the Fathers. The "work" contemplated by St. Benedict was ordinarily field work, as was natural in view of the conditions of the time and best suited to the majority of the monks; but the principle laid down is that the monks should do whatever work is most useful. There were from the beginning young boys in the monastery, who were educated by the monks according to the ideas of the time. We have seen St. Benedict evangelizing the pagan population round Monte Cassino; and a considerable time each day is assigned to the reading of the Fathers. Thus the germs of all the chief works carried on by his monks in later ages were to be found in his own monastery.

The rule consists of a prologue and 73 chapters. Though it has resisted all attempts to reduce it to an ordered scheme, and probably was not written on any set plan, still it is possible roughly to indicate its contents: after the prologue and introductory chapter setting forth St. Benedict's intention, follow instructions to the abbot on the manner in which he should govern his monastery (2, 3); next comes the ascetical portion of the rule, on the chief monastic virtues (4–7); then the regulations for the celebration of the canonical office, which St. Benedict calls "the work of God" or "the divine work," his monks' first duty, "of which nothing is to take precedence" (8–20); faults and punishments (23–30); the cellarer and property of the monastery (31, 32); community of goods (33, 34); various officials and daily life (21, 22, 35–57); reception of monks (58–61); miscellaneous (62–73).

The most remarkable chapters, in which St. Benedict's wisdom stands out most conspicuously, are those on the abbot (2, 3, 27, 64). The abbot is to govern the monastery with full and unquestioned patriarchal authority; on important matters he must consult the whole community and hear what each one, even the youngest, thinks; on matters of less weight he should consult a few of the elder monks; but in either case the decision rests entirely with him, and all are to acquiesce. He must, however, bear in mind that he will have to render an account of all his decisions and to answer for the souls of all his monks before the judgment seat of God. Moreover, he has to govern in accordance with the rule, and must endeavour, while enforcing discipline and implanting virtues not to sadden or "overdrive" his monks or give them cause for "just murmuring." In these chapters pre-eminently appears that element of "discretion," as St. Gregory calls it, or humanism as it would now be termed, which without doubt has been a chief cause of the success of the rule. The only critical manual edition of the rule is that of E. C. Butler, *S. Benedicti, editio critico-practica* (Freiburg, 1927). Of the many commentaries the most valuable are those of Paulus Diaconus (the earliest, *c.* 800), of Calmet and of Martène (Migne *Patrol. Lat.* lxvi.), and of Abbot Delatte, 1913 (translated).

BIBLIOGRAPHY.—On St. Benedict and his Rule and institute, *see* E. C. Butler, *Benedictine Monachism* (1924). An old English trans. of St. Gregory's *Dialogues* is reprinted in the Quarterly Series (Burns and Oates). On St. Benedict's life and Rule *see* Montalembert, *Monks of the West,* bk. iv.; Abbate L. Tosti, *S. Benedetto* (trans. 1896); Abbot Herwegen, *Der heilige Benedikt* (1926), the best modern monograph (translated) also Indexes to standard general histories of the period; Thomas Hodgkin's *Italy and Her Invaders* and Gregorovius' *History of the City of Rome* may be specially mentioned. But by far the best summaries in English are those contained in the relevant portions of F. H. Dudden's *Gregory the Great* (1905), i. 107–115, ii. 160–169. (E. C. B.)

BENEDICTUS, the hymn of Zacharias (Luke i. 68 *sqq.*), so called from the opening word of the Latin version. The hymn has been used in Christian worship since at least the 9th century, and was adopted into the Anglican Order of Morning Prayer from the Roman service of matin-lauds. In the Prayer Book of 1549 there was no alternative to the *Benedictus*; it was to be used "throughout the whole year." In 1552 the *Jubilate* was inserted without any restriction as to how often it should take the place of the *Benedictus.* The name is also given to a part of the Roman Catholic mass service beginning *Benedictus qui venit.*

BENEDICTUS ABBAS (d. 1194), abbot of Peterborough, whose name is accidentally connected with the *Gesta Henrici Regis Secundi,* one of the most valuable of English 12th century chronicles. He first makes his appearance in 1174, as the chancellor of Archbishop Richard, the successor of Becket in the primacy. In 1175 Benedictus became prior of Holy Trinity, Canterbury; in 1177 he received from Henry II. the abbacy of Peterborough which he held until his death. Benedictus wrote two works dealing with the martyrdom and the miracles of Becket. Fragments of the former work have come down to us in the compilation known as the *Quadrilogus,* which is printed in the fourth volume of J. C. Robertson's *Materials for the History of Thomas Becket* (Rolls series); the miracles are extant in their entirety, and are printed in the second volume of the same collection. Benedictus has been credited with the authorship of the *Gesta Henrici* on the ground that his name appears in the title

of the oldest manuscript. We have, however, conclusive evidence that Benedictus merely caused this work to be transcribed for the Peterborough library. It is only through the force of custom that the work is still occasionally cited under the name of Benedictus. The question of authorship has been discussed by Sir T. D. Hardy, Bishop Stubbs and Prof. Liebermann; but the results of the discussion are negative. Stubbs conjecturally identified the first part of the *Gesta* (1170–77) with the *Liber Tricolumnis,* a register of contemporary events kept by Richard Fitz Neal (*q.v.*), the treasurer of Henry II. and author of the *Dialogus de Scaccario;* the latter part (1177–92) was by the same authority ascribed to Roger of Hoveden, who makes large use of the *Gesta* in his own chronicle, copying them with few alterations beyond the addition of some documents. This theory, so far as concerns the *Liber Tricolumnis,* is rejected by Liebermann, and the most recent editors of the *Dialogus* (A. Hughes, C. G. Crump and C. Johnson, Oxford 1902). The work begins at Christmas 1169, and concludes in 1192; it is thus in form a fragment, covering portions of the reign of Henry II. and Richard I.

See W. Stubbs' *Gesta regis Henrici Secundi Benedicti abbatis* (Rolls series, 1867), and particularly the preface to the first volume; F. Liebermann in *Einleitung in den Dialogus de Scaccario* (Göttingen, 1875); in *Ostenglische Geschichtsquellen* (Hanover, 1892); and in Pertz's *Monumenta Germaniae Historica, Scriptores,* vol. xxvii. pp. 82, 83; and also the introduction to the *Dialogus de Scaccario* in the Oxford edition of 1902. (H. W. C. D.)

BENEDIX, JULIUS RODERICH (1811–1873), German dramatist and librettist, was born at Leipzig on Jan. 21, 1811, and was educated at the Thomasschule at Leipzig. He was manager of theatres at Wesel, Elberfeld, and Frankfort-on-Main, and died in Leipzig on Sept. 26, 1873. Benedix's comedies, the scenes of which are mostly laid in upper middle-class life, enjoyed a certain popularity for many years after his death; the best known are: *Dr. Wespe; Die Hochzeitsreise; Der Vetter; Das Gefängnis; Das Lügen; Ein Lustspiel; Der Störenfried; Die Dienstboten; Aschenbrödel; Die zärtlichen Verwandten.* The chief characteristics of his farces are a clear plot and bright, easy and natural dialogue. Among his more serious works are: *Bilder aus dem Schauspielerleben* (Leipzig, 1847); *Der mündliche Vortrag* (Leipzig, 1859–60); *Das Wesen des deutschen Rhythmus* (Leipzig, 1862); and, posthumously *Die Shakespearomanie* (1873), in which he attacks the extreme adoration of the British poet.

See Benedix's *Gesammelte dramatische Werke* (Leipzig, 1846–75); a selection under the title *Volkstheater* (Leipzig, 1882); and a collection of smaller comedies as *Haustheater* (10th ed., Leipzig, 1891); *see* Benedix's autobiography in the *Gartenlaube* (1871).

BENEFICE, a term first applied under the Roman empire to portions of land, the usufruct of which was granted by the emperors to their soldiers or others for life, as a reward or *beneficium* for past services, and as a retainer for future services.

The term benefice, according to the canon law, implies always an ecclesiastical office, *propter quod beneficium datur,* but it does not always imply a cure of souls. It has been defined to be the right which a clerk has to enjoy certain ecclesiastical revenues on condition of discharging certain services prescribed by the canons, or by usage, or by the conditions under which his office has been founded. These services might be those of a secular priest with cure of souls, or they might be those of a regular priest, a member of a religious order, without cure of souls; but in every case a benefice implied three things: (1) An obligation to discharge the duties of an office, which is altogether spiritual. (2) The right to enjoy the fruits attached to that office, which is the benefice itself. (3) The fruits themselves, which are the temporalities. By keeping these distinctions in view, the right of patronage in the case of secular benefices becomes intelligible, being in fact the right, which was originally vested in the donor of the temporalities, to present to the bishop a clerk to be admitted, if found fit by the bishop, to the office to which those temporalities are annexed. Secular or parochial benefices are of three kinds—rectories, vicarages, or perpetual curacies (*see* Advowson). Presentation on the part of the patron of the benefice is the first requisite in order that a clerk should become legally entitled to a benefice. The next requisite is that he should be admitted by the bishop as a fit person for the spiritual office to which the benefice is annexed. By the early constitutions of the Church of England, a bishop was allowed a space of two months to enquire and inform himself of the sufficiency of every presentee, but by the 95th of the canons of 1604, that interval has been abridged to 28 days, within which the bishop must admit or reject the clerk. If the bishop rejects the clerk within that time he is liable to a *duplex querela* in the courts of the metropolitan, or to a *quare impedit* in the high court of justice, or there may be an appeal under the Benefices Act 1898. Upon the bishop having satisfied himself of the sufficiency of the clerk, he proceeds to institute him to the spiritual office to which the benefice is annexed, but before such institution can take place, the clerk is required to make a declaration of assent to the Thirty-nine Articles of Religion and to the Book of Common Prayer according to a form prescribed in the Clerical Subscription Act, 1865, to make a declaration against simony in accordance with that act, and to take and subscribe the oath of allegiance according to the form in the Promissory Oaths Act 1868. The bishop, by the act of institution, commits to the clerk the cure of souls attached to the office to which the benefice is annexed. In cases where the bishop himself is patron of the benefice, the bishop collates the clerk to the benefice and office. It is not necessary that the bishop should personally institute or collate a clerk; he may issue a fiat to his vicar-general, or to a special commissary for that purpose. After the bishop or his commissary has instituted or collated the presentee, he issues a mandate under seal, addressed to the archdeacon or some other neighbouring clergyman, authorizing him to induct the clerk into his benefice—in other words, to put him into legal possession of the temporalities, which is done by some outward form, and for the most part by delivery of the bell-rope to the clerk, who thereupon tolls the bell. This form of induction is required to give the clerk a legal title to his *beneficium,* although his admission to the office by institution is sufficient to vacate any other benefice which he may already possess. What has been said above applies to rectories and vicarages. A perpetual curate is put in possession of his benefice by the licence of the bishop without institution, collation or induction; the patron is said to "nominate." The final duty of a new incumbent is on the first Sunday on which he officiates to "read himself in," *i.e.,* read the Thirty-nine Articles in the presence of the congregation and declare his assent thereto.

By a decree of the Lateran council of 1215, which was enforced in England, no clerk can hold two benefices with cure of souls, and if a beneficed clerk shall take a second benefice with cure of souls, he vacates *ipso facto* his first benefice. Dispensations, however, could be easily obtained from Rome, before the reformation of the Church of England, to enable a clerk to hold several ecclesiastical dignities or benefices at the same time, and by the Peterpence, Dispensations, etc., Act 1534, the power to grant such dispensations, which had been exercised by the Court of Rome, was transferred to the archbishop of Canterbury, certain ecclesiastical persons having been declared by a previous statute (1529) to be entitled to such dispensations. The system of pluralities carried with it, as a necessary consequence, systematic non-residence on the part of many incumbents, and delegation of their spiritual duties in respect of their cure of souls to assistant curates. The evils attendant on this system were found to be so great that the Pluralities Act 1838 was passed to abridge the holding of benefices in plurality, and it was enacted that no person should hold, under any circumstances more than two benefices, and this privilege was made subject to the restriction that his benefices were within ten statute miles of each other. By the Pluralities Act 1850 the restriction was further narrowed, so that no spiritual person could hold two benefices except the churches of such benefices were within three miles of each other by the nearest road, and the annual value of one of such benefices did not exceed £100. The Pluralities Acts Amendment Act 1885, however, enacted that two benefices could be held together, the churches of which are within four miles of each other, and the annual value of one of which does not exceed £200.

Benefices used to pay their first fruits (one year's profits) and tenths (of yearly profits) to Queen Anne's Bounty; but by a series

of enactments of which the last is the First Fruits and Tenths Measure 1926, this liability has been taken away. Their profits during vacation belong to the next incumbent. Tithe rent charge attached to a benefice is relieved from payment of one-half of the agricultural rates assessed thereon. An incumbent has to reside on his benefice nine months in the year, unless he gets leave for a longer absence from the bishop, and he has to maintain the house and other buildings in repair (*see* DILAPIDATION). Benefices may be exchanged by agreement between incumbents with the consent of the ordinary and of the patrons, and they may, with the consent of the patron and ordinary, be united or dissolved after being united. They may also be charged with the repayment of money laid out for their permanent advantage, and be augmented by the medium of Queen Anne's Bounty.

A benefice is avoided or vacated—(1) By death. (2) By resignation, if the bishop is willing to accept resignation. By the Incumbents' Resignation Acts, any clergyman who has been an incumbent of one benefice continuously for seven years, and is incapacitated by permanent mental or bodily infirmities from fulfilling his duties, may have assigned to him out of the benefice, a retiring pension, not exceeding one-third of its annual value. These provisions, however, are much modified by the Clergy Pensions Measure, 1926, and will, when that measure comes into full operation, disappear. (3) By cession, upon the clerk being instituted to another benefice or some other preferment incompatible with it. (4) By deprivation by an ecclesiastical court or by declaration of voidance (a) under the Clergy Discipline Act, 1892, (b) under the Public Worship Regulation Act 1874 (but this latter procedure is out of use), (c) under the Benefices Act 1898 if the living is under sequestration for a year, (d) under the Benefices (Ecclesiastical Duties) Measure 1026, if the inhibition of an incumbent for neglect of duties prescribed by the measure continues undetermined for five years. (5) By act of law in consequence of simony. (6) By default of the clerk to read himself in. Two or more benefices may be united. There have been several statutes on this subject but except for the City of London all the present law is contained in the Union of Benefices Measure 1923. For the city of London the provisions are contained in the Act 23 and 24 Vict. c. 142.

See also ADVOWSON; CURATE; GLEBE; INCUMBENT; RECTOR; VICAR. Also Phillimore, *Eccles. Law;* Cripps, *Law of Church and Clergy.*

BENEFICIARY, in law, one who holds a benefice; one who is beneficially entitled to, or interested in, property, *i.e.,* entitled to it for his own benefit, and not merely holding it for others, as does an executor or trustee. In this latter sense it is nearly equivalent to *cestui que trust,* a term which it is gradually superseding in modern law.

BENEFIT SOCIETIES, a term sometimes employed to describe associations formed for the purpose of obtaining for their members, or for the dependents of their members, certain deferred benefits, such as payments during sickness or funeral allowances. Benefit societies are in fact insurance societies, and their activities range over a wide field. The name benefit society is more frequently employed in the United States; in Great Britain such an institution is termed a friendly society. Under the National Insurance act, most of the British friendly societies have acquired a legal status as "Approved Societies" (*q.v.*).

(*See* FRIENDLY SOCIETIES, and NATIONAL INSURANCE: HEALTH.)

BENE-ISRAEL ("Sons of Israel"), a colony of Jews settled in Kolaba, Bombay and Shana districts and the native state of Janjira. With the Jews of Cochin, they represent a very ancient Judaic invasion of India. Some think the Bene-Israel settled in Kolaba in the 6th century B.C., but traditions indicate a far longer connection with India (*see* JEWS: § 3).

See R. E. Enthoven, *Tribes and Cartes of Bombay* (1920).

BENEKE, FRIEDRICH EDUARD (1798–1854), German psychologist, was born at Berlin on Feb. 17, 1798, and educated at the universities of Halle and Berlin. After studying theology under Schleiermacher and de Wette, he turned to philosophy, especially to English writers and the German modifiers of Kantianism, such as Jacobi, Fries and Schopenhauer. In 1820 he published his *Erkenntnisslehre,* his *Erfahrungsseelenlehre als Grundlage alles Wissens,* and his *De Veris Philosophiae Initiis.* His marked opposition to Hegelianism then dominant in Berlin, was shown more clearly in the short tract, *Neue Grundlegung zur Metaphysik* (1822), and in the able treatise, *Grundlegung zur Physik der Sitten* (1822), written against Kant's *Metaphysic of Ethics* deducing ethical principles from a basis of empirical feeling. In 1822 his lectures were prohibited at Berlin, possibly through Hegel's influence with the authorities, who also prevented him from obtaining a chair from the Saxon Government. After lecturing at Göttingen he was allowed to return to Berlin, and in 1832 became *professor extraordinarius* in the university, a post which he continued to hold till his death. In his *Neue Psychologie* (1845) and his *Lehrbuch der Psychologie als Naturwissenschaft* (1833), Beneke signalized as the two great stages in the progress of psychology the negation of innate ideas by Locke, and of faculties, in the ordinary acceptation of the term, by Herbart. His own contribution to the subject consists in his insistence that empirical psychology is the basis of all philosophy, that psychology depends on introspection and must be free from metaphysics and mathematics, and that mental phenomena must be treated by the genetic method. Starting from the rejections of innate ideas and the theory of faculties, Beneke supposes that originally the soul is an immense variety of powers or forces which differ only in tenacity, vivacity, receptivity and grouping and which gradually acquire definiteness through the action of *stimuli* from the outer world. If the impression be sufficiently strong, consciousness arises, and definite sensations and perceptions begin to be formed. There are no special faculties of judgment or reasoning. Judgment is the springing into consciousness of a concept alongside of an intuition, or of a higher concept alongside of a lower. Reasoning is merely a more complex judgment. The understanding is simply the mass of concepts lying in the background of unconsciousness, ready to be called up and to flow with force towards anything closely connected with them. Even memory is not a special faculty; it is simply the fundamental property of tenacity possessed by the original faculties. The very distinction between the great classes—Knowledge, Feeling and Will—may be referred to elementary differences in the original relations of faculty and impression (*see* ASSOCIATION OF IDEAS).

The special value of Beneke's works consists in their many acute psychological analyses which can be utilized in the training of unformed minds, but their original hypotheses are often hastily assumed and rest on a clumsy mechanical metaphor. As in all empirical theories of mental development, the higher categories which are apparently shown to result from the simple elements are really presupposed at every step. Particularly unsatisfactory is the account of consciousness, which is said to arise from the union of impression and faculty. The necessity of consciousness for any mental action whatsoever is apparently granted, but the conditions involved in it are never discussed or mentioned. The same defect appears in the account of ethical judgment; no amount of empirical fact can ever yield the notion of absolute duty.

A complete list of Beneke's writings appears in the appendix to Dressler's edition of the *Lehrbuch der Psychologie als Naturwissenschaft* (1861). The chief are:—*Psychologische Skizzen* (1825); *Pragmatische Psychologie oder Seelenlehre in der Anwendung auf das Leben* (1832); *Metaphysik und Religionsphilosophie* (1840); *Die neue Psychologie* (1845); *see* also J. G. Dressler, *Beneke oder Seelenlehre als Naturwissenschaft;* O. E. Hummel, *Die Unterrichtslehre Benekes* (1885); C. H. Th. Kuhn, *Die Sittenlehre F. E. Benekes* (1892); Brandt, *Beneke, the Man and His Philosophy* (New York, 1895); Joh. Friedrich, *F. E. Beneke* (Wiesbaden, 1898, with biography and list of works); Otto Gramzow, *F. E. Benekes Leben und Philos.* (Berne, 1899, with full bibliography); H. Hoffding, *Hist. of Mod. Phil.,* vol. ii. (Eng. trans., 1900); H. Renner, *Benekes Erkenntnistheorie* (Halle, 1902); A. Wandschneider, *Die Metaphysik Benekes* (1903); G. S. Brett, *Hist. of Psychology,* vol. iii. (1921); F. Ueberweg, *Grundriss der Geschichte der Philosophie,* pt. iv. (1923).

BENEŠ, EDUARD (1884–), Czechoslovak statesman, was born May 28, 1884, in the village of Kožlany, Czechoslovakia. His parents were poor peasants, but the boy was educated in the faculty of philosophy at Prague university, where fees are small and are wholly remitted in the case of poor students. He continued his education at the Sorbonne and the École de Science

Politique in Paris, then at Dijon, where he graduated as doctor of laws (1908). In 1909 he was appointed professor of economics at the Prague Academy of Commerce, in 1912 lecturer, and in 1922 professor in sociology at the University of Prague. When World War I broke out he was still a young man of 30, but was already one of the leaders of the Czechoslovak nationalist movement, and soon became Dr. Masaryk's right-hand man in the work of intensive nationalist propaganda which was precipitated by World War I. In 1915 he went to Paris to work as a journalist and diplomat in the cause of Czechoslovak liberation from the Habsburg yoke. There he collaborated with Dr. T. G. Masaryk and Gen. Stefanik in support of the Allied cause. In that same year he was made general secretary in the Czechoslovak National Council, the executive body of the national movement, which in 1918 was recognized by the Allies as the Czechoslovak Provisional Government.

Place in European Politics.—Dr. Beneš became Foreign Minister in the newly formed government, and himself formed one government (1921–22). He was the head of the Czechoslovak Delegation to the Paris Peace Conference (1919–20), and a signatory of the Peace Treaties. He was appointed Czechoslovak representative at the League of Nations in 1920; was elected a member of the League Council in 1923, and re-elected in 1925. He was co-founder of the Little Entente in Aug. 1920, part-author and keen advocate of the Geneva Protocol of 1924, and represented Czechoslovakia at the many diplomatic conferences to which she was a party after the War. On behalf of his country he initialled the Locarno Treaties on Oct. 16, 1925, and signed them in London on Dec. 1, 1925.

The outstanding personality of Beneš in the post-War years was, not unnaturally, the cause of controversy among students of affairs in western Europe, especially in Great Britain. British opinion of the Left criticized him on the occasion of several Franco-British diplomatic crises between 1920 and 1924, especially those created by the Genoa Conference and the Geneva Protocol, on the ground that his orientation was toward Paris rather than toward London. Others criticized him on the alleged ground of "interference" between Paris and London; and yet again, that his policy was that of an opportunist. The view, however, that is supported by the evidence of Dr. Beneš' public statements and by his record of action, appears to be that he regarded Czechoslovak political independence, in the first instance, as due largely to the Franco-British Entente and was therefore anxious to preserve the continuance of that entente. Franco-British diplomatic quarrels caused him anxiety, both for the particular interests of Czechoslovak security and for the general interests of European stability. At the same time, he showed himself to be an unsentimental realist, holding the view that a negative attitude in diplomacy was a blunder, irrespective of the merits of the case.

His object was the political and economic consolidation of Czechoslovakia, to be effected through the regional method of the Little Entente and through a general European stabilization. He adopted a most progressive policy toward Russia, Czechoslovakia being the first country in Europe to restart trade with that country. In common with the statesmen of most of the small nations in Europe, Dr. Beneš wished to see the principle of universal compulsory arbitration enshrined in international law. He partly evolved and subsequently advocated the Geneva Protocol of 1924. To Dr. Beneš the main attraction of the protocol was that it would, in his view, safeguard the interests of the small states, and best serve the interests of Europe.

It was not till the eve of the Locarno Conference in 1925, that he abandoned his public appeals on behalf of the principles of the protocol (even though the protocol itself was a dead letter by then); and he made it clear, when the Locarno treaties were initialled, that he regarded them as an instalment of the protocol idea. Dr. Beneš never concealed that in his view and in that of his Yugoslav and Rumanian colleagues it was an important function of the Little Entente to prevent any Hungarian or Habsburg coup against the 1919 settlement. It was largely due to his influence that the two attempts of April and Oct. 1921, to restore the Habsburg régime at Budapest, failed. Dr. Beneš has shown himself to be progressive in policy, and exceptionally well informed. His unbroken period of office, his work for the League of Nations and the close touch he has maintained with European affairs during seven years make him one of the most influential of post-War statesmen in Europe. After the Locarno treaties were negotiated he at once began laying the diplomatic foundations for a "Locarno" treaty for the east of Europe, to which Hungary should be a party on the analogy of Germany's participation in the western pact. He is the author of some 12 volumes on political and sociological subjects. When Professor Masaryk retired, Dr. Beneš was on Dec. 18, 1935, elected to succeed him as president of the Czechoslovak republic. In 1938, when the question of the German minorities in Czechoslovakia was forced into the front of European politics, Dr. Beneš was attacked by German propaganda as no head of an independent State had before been attacked by a country with which he was not at war; and on Oct. 15, 1938, owing to the new conditions arising from the signing of the Munich agreement, he resigned his office and became an exile from his country. (*See* CZECHOSLOVAKIA; LITTLE ENTENTE.)

BIBLIOGRAPHY.—Periodic pamphlets, reproducing his public statements, issued by Orbis (Prague, 1920–25); E. Beneš, *Five Years of Czechoslovak Foreign Policy* (1924). (G. G.; X.)

BENEVENTO, archiepiscopal see, Campania, Italy, capital of province of Benevento, 60 mi. by rail and 32 mi. direct N.E. of Naples, on a hill 400 ft. above sea-level at the confluence of the Calore and Sabdato. Pop. (1936) 26,692 (town); 37,865 (commune). *Beneventum,* originally *Maleventum* or *Maluentum,* supposedly founded in the imperial period by Diomedes, was the chief town of the Samnites, who took refuge here after their defeat by Rome (314 B.C.). It appears not to have fallen until Pyrrhus' absence in Sicily, but served Rome as a base of operations in the last campaign against him in 275 B.C. A Latin colony was planted there in 268 B.C., and the name was changed for the sake of the omen. It was a fortress important to the Romans in the Punic and Social Wars. It was the junction of the prolongation of the *Via Appia* from Capua, its continuation to Tarentum and Brundisium, the *Via Traiana* to Brundisium by Herdoniae, the road to Telesia and Aesernia, the road to Aesernia by Bovianum and the road to Abellinum and Salernum. The Triumphal Arch erected in honour of Trajan by the senate and people of Rome in A.D. 114 has important reliefs. Besides the ancient theatre, a large *cryptoporticus* 197ft. long and a brick arch (called the Arco del Sacramento) remain, while below the town is the Ponte Lebbroso, a bridge of the *Via Appia* over the Sabbato, and along the road to Avellino are remains of *thermae.* In front of the Madonna delle Grazie is a bull in red Egyptian granite and in the Piazza Papiniano the fragments of two Egyptian obelisks erected in A.D. 88 in front of the temple of Isis in honour of Domitian, the foundations of which were discovered close to the Arch of Trajan, with many fragments of fine sculptures. The city was razed by Totila (A.D. 542) and partly rebuilt (663), later mediaeval fortifications following the old lines. Benevento became the seat of a powerful Lombard duchy independent until 1053, when the emperor, Henry III., ceded it to Leo IX. in exchange for the bishopric of Bamberg; it continued in papal possession until 1806, when Napoleon granted it to Talleyrand with the title of prince. In 1815 it returned to the papacy, but was united to Italy in 1860. Much damage has been done by earthquakes. The circular church of S. Sofia (760), now modernized, has a roof supported by six ancient columns; the cathedral (9th–12th century) has a fine arcaded façade, incomplete square campanile (begun 1279) and bronze doors (early 13th century) adorned with bas-reliefs. The interior is in the form of a basilica, with double aisles borne by ancient columns. The 14th-century castle is at the highest point of the town.

Benevento is a station on the railway from Naples to Foggia, and has branch lines to Campobasso, Avellino and Cancello.

See A. Meomartini, *Monumenti e opere d'Arte di Benevento* (Benevento, 1899); *Benevento* (Arti Grafiche, Bergamo, 1909) well illustrated; A. Zazo, *Benevento nel Medievo* (Benevento, 1937).

Battle of Benevento, Feb. 26, 1266.—This ranks as one of the rare examples of intelligent mediaeval cavalry tactics. It

arose out of the long struggle between the Papacy and the house of Hohenstaufen, which held the kingdoms of Naples and Sicily. By an offer of the Crown of the Two Sicilies then held by Manfred, Pope Clement IV. in 1265 gained the aid of Charles of Anjou, brother of St. Louis. It may have been an attraction to Charles that the pope proclaimed his expedition as a crusade, but at least he came, with several thousand cavalry and a larger number of feudal foot. Charles himself arrived at Rome by sea in May 1265, but his main force only arrived by an overland march in Jan. 1266. By then he had so far exhausted the pope's subsidies that he had to move them off eight days later in order to gain a footing where they could live free off the enemy country. He found his path barred at Capua, where Manfred had taken up a position behind the Volturno. So strong was he that Charles judged an indirect approach to Naples was the wiser course, and preferred the risks of a winter march through the Apennines to that of a frontal assault. But his army suffered terribly, lost many of its horses, and had to abandon all its wheeled transport. And when the half-starved army descended into the plain at Benevento Charles found Manfred awaiting him. For the Volturno he had merely exchanged the Calore, crossable by only the one bridge. But if Charles's camp was threatened with starvation, Manfred's was threatened by disloyalty. He chose, whether from fear of delay or from knight-errantry, to attack on Feb. 26, when a few more days' waiting would have ensured Charles's exhaustion. Manfred's Saracen foot-archers led the way across the bridge, followed by the cavalry in three divisions or "battles." The first consisted of 1,200 Germans in the new plate armour instead of the usual chain-mail, the second of 1,000 Italian mercenaries, and the third of about 1,400 of his own knights, of dubious loyalty, together with his faithful Saracen light horse.

Charles wasted no time in preparing to meet him. He formed his cavalry likewise in three rather smaller divisions, with a couple of foot-soldiers behind each man-at-arms to aid him in the mêlée. The remainder of the foot skirmished in front ineffectively on both sides, and they were swept out of the way by the advance of Manfred's German cavalry. These steadily pressed back their mounted opponents until Charles threw in his second division. Even then the Germans held their own until it was noticed that as they raised their arms to strike an unprotected patch was exposed. The cry was passed down the French ranks to thrust at the armpits, and by this device the Germans were broken up. Manfred's second division came up over the narrow bridge too late to succour them, and, itself charged in front and in rear by French horsemen who swept round the flanks, soon dispersed. Late again, Manfred's third division arrived to find Charles's cavalry reformed. Before the charge was made, many of Manfred's disloyal nobles swerved away and left the field, and he himself found in the midst of the enemy the death he then deliberately sought. While we recognize the effect of the final and fatal disloyalty, the victory, however, was deservedly won by Charles's able control and well-timed use of his successive divisions.

BENEVOLENCE, a term for an act of kindness, or a gift of money or goods, but used in a special sense to indicate sums of money, disguised as gifts, which were extorted by various English kings from their subjects without consent of parliament (Lat. *bene,* well, and *volens,* wishing). Edward II. and Richard II. had obtained funds by resorting to forced loans, a practice which was probably not unusual in earlier times. Edward IV., however, discarded even the pretence of repayment, and in 1473 the word *benevolence* was first used with reference to a royal demand for a gift. Edward was very successful in these efforts, and as they only concerned a limited number of persons he did not incur serious unpopularity. But when Richard III. sought to emulate his brother's example protests were made which led to the passing of an act of parliament in 1484 abolishing benevolences as "new and unlawful inventions." In spite of this act Richard demanded a further benevolence; but it was Henry VII. who made the most extensive use of the system. In 1545 Henry VIII. demanded a "loving contribution" from all who possessed lands worth not less than forty shillings a year, or chattels to the value of £15.

In 1614 James I. ordered the sheriffs and magistrates in each county and borough to collect a general benevolence from all persons of ability, and with some difficulty about £40,000 was collected. Four counties had, however, distinguished themselves by protests against this demand, and the act of Richard III. had been cited by various objectors. Representatives from the four counties were accordingly called before the privy council, where Sir Edward Coke defended the action of the king, quoted the Tudor precedents and urged that the act of 1484 was to prevent exactions, not voluntary gifts such as James had requested. In 1615 an attempt to exact a benevolence in Ireland failed, and in 1620 it was decided to demand one for the defence of the Palatinate. Circular letters were sent out, punishments were inflicted, but many excuses were made and only about £34,000 was contributed. In 1621 a further attempt was made, judges of assize and others were ordered to press for contributions and wealthy men were called before the privy council and asked to name a sum at which to be rated. About £88,000 was thus raised, and in 1622, William Fiennes, 1st Viscount Saye and Sele, was imprisoned for six months for protesting. This was the last time benevolences were collected, although they were proposed in 1622, 1625, and 1633.

BENFEY, THEODOR (1809–1881), German philologist, and Sanskrit scholar, born on Jan. 29, 1809. He published in 1848 his edition of the *Sāmaveda;* in 1852–54 his *Manual of Sanskrit,* comprising a grammar and chrestomathy; in 1858 his practical Sanskrit grammar, afterwards translated into English; and in 1859 his edition of the *Pancha Tantra,* with an extensive dissertation on the fables and mythologies of primitive nations. In 1862 he was appointed professor at Göttingen and in 1866 he published his great Sanskrit-English dictionary. In 1869 he wrote a history of German philological research, especially oriental, during the 19th century. He died while engaged on a grammar of Vedic Sanskrit.

A collection of his various writings was published in 1890, prefaced by a memoir by his son.

BENGAL, a province of British India, bounded on the east by Assam and Burma; on the south by the Bay of Bengal and Madras; on the west by the provinces of Bihar and Orissa; and on the north by Nepal and Bhutan. It has an area (including the states of Cooch Behar and Tripura) of 82,812 sq.mi. and a population (1941) of 61,460,377.

The name Bengal is derived from the ancient Banga or Vanga, a kingdom conterminous with the delta of Bengal to the south of the Ganges and to the east of the river Bhagirathi. It occurs in the form Vangalam in an inscription of the 11th century at Tanjore, and in the form of Bangala it began to be used by Mohammedan writers in the latter part of the 13th century. Under Mohammedan rule the name applied specifically to the Gangetic delta, although the later conquests to the east of the Brahmaputra were eventually included within it. Under the English the name has at different periods borne very different significations. All the north-eastern factories of the East India company from Balasore, on the Orissa coast, to Patna, in the heart of Behar, belonged to the "Bengal establishment," and as British conquests crept higher up the rivers the term came to be applied to the whole of northern India. The presidency of Bengal eventually included all the British territories north of the Central Provinces, from the mouths of the Ganges and Brahmaputra to the Himalayas and the Punjab. The limits of the area bearing this designation have been reduced to their present dimensions by the formation of new provinces and the distribution of territory among them, viz., by the creation in 1836 of the North-Western Provinces now included with Oudh in the United Provinces, of Assam in 1874, and lastly of Behar and Orissa in 1912, when Bengal was made a presidency under a governor-in-council.

Physical Geography.—Bengal stretches from the Himalayas to the Bay of Bengal and, except for the mountains in Darjeeling district, the Sinchula hills in Jalpaiguri, the hill ranges of Chittagong, the Chittagong hill tracts, and Tripura, consists of a densely populated alluvial plain comprising the combined delta of the Ganges and Brahmaputra. A few slightly elevated tracts are

found, viz., in the west of the Burdwan division, where the ground rises towards the Chota Nagpur plateau, and the areas called the Barind covering 2,500sq.m. in the Rajshahi division and the Madhupur jungle in the Dacca division. Otherwise, Bengal is almost a level expanse intersected by numerous rivers with a very slight rise of level to the north. Calcutta, 86m. from the sea, is 21ft. above sea-level, while Siliguri, 300m. to the north of it, near the foot of the Himalayas, is only 400ft. above sea-level. Throughout these hundreds of miles not a single hill rises above the surface of the plain, and there is hardly an undulation to be seen. The monotony of the scenery is relieved, however, by the fresh verdure of the country, the belts of trees lining the rivers and streams and the clumps of bamboo in which the villages are embowered. To the north a belt of forest stretches across the submontane country known as the Tarai, and to the south lie the Sundarbans, a maze of tidal rivers or estuaries, which enclose a number of swampy islands covered with dense forests growing in soft mud partly in and partly out of the water. In the northern districts the rivers debouching from the Himalayas receive the drainage from the country on either side, absorb broad tributaries, and flow southwards with an increasing volume. But near the centre of the province the rivers enter upon a new stage of their career. Their main channels bifurcate, and each new stream so created throws off its own set of distributaries to right and left. The country which they thus enclose and intersect forms the delta of Bengal. It stretches out as a vast dead level, in which the rivers find their velocity checked and their current no longer able to carry along the silt which they have brought down. The streams, accordingly, deposit their alluvial burden in their channels and upon their banks, so that by degrees their beds rise above the level of the surrounding country. In the depressions between them are basins, sometimes of such a low level that they are mere swamps. As the rivers creep farther down the delta they become more and more sluggish and their bifurcations and interlacings more complicated. The last scene of all is a wilderness of swamp and forest, where the net work of channels merges into the sea.



BY COURTESY OF NORTHERN BAPTIST CONVENTION

MEMBER OF A BENGAL MOUNTAIN TRIBE

The earrings, hung in place with string, are heavy and must sometimes be taken off, to rest the ears

The physical characteristics of the greater part of the country have been determined by the eastward march of the Ganges. This great river, on entering Bengal, originally found its way to the sea by the channels of the Bhagirathi and Hooghly. As this channel silted up, the main stream, unable to deflect westwards owing to the rocky barrier of the Rajmahal hills, made its way eastward, cutting through the soft friable soil. In this way the Ichamati, Jalangi, and Matabhanga became in turn its chief distributary, until it found an outlet by the present channel of the Padma. The Brahmaputra, on the other hand, has moved westward. It formerly flowed south-east through the centre of Mymensingh to Bhairab Bazar, but in the beginning of the 19th century it broke westwards and joined the Ganges near Goalundo.

In the central portion of the Gangetic delta the process of land formation has practically come to an end owing to the Ganges having deserted its former channels. The beds of the rivers down which it passed have silted up and their mouths have become choked to a greater or less degree. Consequently they no longer receive the volume of water which, spilling over the banks in times of flood, used to enrich the land with silt deposit. Their own distributaries have similarly degenerated, and except during the rains they have little or no current and they have become reaches of stagnant water choked by vegetation. Land is no longer being built up and as it is deprived of the natural manuring it used to receive the productive capacity of the soil has been reduced. In the east, however, the country watered by the Padma, the Brahmaputra, and the Meghna is in active process of formation, for every year during the rains the rivers overflow their banks and leave their silt upon the adjacent flats. Thousands of square miles are annually enriched by a top-dressing of virgin soil—a system of natural manuring which renders elaborate tillage unnecessary. During the annual inundation the rice fields to the extent of many hundreds of square miles are submerged. The country is then a sheet of water from which the village sites and scattered trees alone stand out.

Rivers.—The Ganges in its course through Bengal is known as the Padma and the Brahmaputra as the Jamuna. The other chief rivers are the Meghna, Tista, Damodar, Rupnarain and Hooghly. The Meghna bears the name of the Surma in the upper portion of its course. It receives the Padma, and with it the waters of both the Ganges and the Brahmaputra, between Narayanganj and Chandpur. It then expands into a broad estuary, which near the Bay of Bengal encloses two large islands Hatia and Dakshin Shahbazpur; the neighbouring island of Sandwip was probably formed by its silt. The Tista drains the state of Sikkim and, flowing through North Bengal, joins the Brahmaputra in Rangpur district. It was formerly an affluent of the Ganges but deserted its old channel and cut out its present bed in 1787. The Damodar (368m. long) flows from Chota Nagpur through west Bengal and joins the Hooghly shortly before it falls into the sea. It drains an area of 2,500sq.m. and is liable to sudden floods: in 1913 it laid 1,200sq.m. in Bengal under water and destroyed or damaged the houses of 250,000 people. The Rupnarain is another river of western Bengal and also an affluent of the Hooghly. The Hooghly is simply a continuation of the Bhagirathi, that name being applied to the river in the last 120m. of its course. Its importance as a highway of commerce is out of all proportion to its length.

Climate.—The climate is distinguished by high humidity caused by moist winds from the Bay of Bengal, especially during the rainy season. The proportion of vapour in the air then ranges from 83 to 88 (100 representing saturation). The western districts come within the range of hot west winds from the Gangetic valley, but they do not penetrate further. A maximum temperature of 117° has been recorded at Midnapore and Bankura. In the province as a whole the annual mean varies from 80° at those two places to 75° at Jalpaiguri. The coolest month is January, when the mean is 65°. The annual average rainfall varies from 50 to 75in. in west, south-west and centre of Bengal, and from 75 to 120in. elsewhere, except at the foot of the Himalayas, where the fall is over 200 inches.



BY COURTESY OF THE CANADIAN PACIFIC STEAMSHIP COMPANY

A NATIVE PORTER IN BENGAL, A LAND WHERE HUMAN LABOUR IS CHEAPER THAN THAT OF ANIMAL OR MACHINE

Cyclones from the Bay of Bengal occasionally cause widespread disaster, especially if accompanied by a storm-wave. The cyclone of 1864 caused 48,000 deaths and that of 1876, with an awful storm-wave, 100,000. In more recent times the cyclone of 1919 killed over 3,000 persons and 40,000 cattle, besides doing enormous damage to property.

Geology.—Bengal is of little interest from a geological point of view, for the greater part of it is occupied by alluvial deposits. The bulk consists of new alluvium; old alluvium is found in the Barind and the Madhupur jungle. The great thickness of the Gangetic alluvium is shown by a borehole at Calcutta, which was carried to a depth of 481ft. without entering any marine deposit. The Gondwana system of deposits is represented in the Burdwan and Bankura districts, where the Raniganj strata contain valuable coal measures, while ironstone shales yield iron ore.

The People.—In respect of population no less than of physical geography Bengal is remarkably homogeneous, for 96% of the people belong to the distinctive Bengali races speaking the Bengali

language. It draws largely on other parts of India for its labour force, and the immigrant population accounts for the presence of $1\frac{3}{4}$ millions speaking Hindi and Urdu. The province of Behar and Orissa alone sends $1\frac{1}{4}$ million of its people to Bengal. Apart from immigrants, the constituents of the population other than indigenous Bengalis are few. The number of Arakanese speakers is 86,000 and of Nepalese 134,000, while the Tipperas and Chakmas, hill tribes in the southeast, number 191,000 and 89,000. Mohammedans, representing 55% of the population, outnumber the Hindus by 6 millions and account for one-third of the total number of Mohammedans in India. They are increasing more rapidly than the Hindus, and their religious life is stimulated by revivalist movements, notably in eastern Bengal, where in many parts one cannot travel a mile without seeing a mosque, often a humble structure of corrugated iron. Buddhism is the faith of 330,000 persons, mainly in the Chittagong division and Darjeeling. Christianity is professed by 183,000 persons. The country is densely populated considering its dependence on agriculture and the absence of large industries except in a few areas. The average density is 615 per sq.m. (compared with 684 in England and Wales) and rises to over 1,000 in a rural block of 9,000sq.m. in eastern Bengal.

Agriculture.—The staple crop of the province is rice, which, being a semi-aquatic plant requiring a thin covering of water for successful growth, finds almost ideal conditions in Bengal. It is cultivated on four-fifths of the cropped area. There are three harvests in the year—the *boro,* or spring rice; *aus,* or autumn rice; and *aman,* or winter rice. Of these the last or winter rice is by far the most extensively cultivated and forms the great harvest of the year. In marshy areas a species is grown which is adapted to their peculiar conditions, for its growth keeps pace with the rise of the water. The stem grows to a height of 10 to 20ft. and the grains are reaped from boats. Bengal is the most important rice-producing area in northern India and raises more than enough for local consumption, the balance being exported overseas and to other parts of India. Rice accounts for over 93% of the total food grains grown, and thus large quantities of other cereals are imported in order to supply the needs of the people, especially from Behar and the United Provinces. Bengal has almost a monopoly of jute cultivation, and supplies the whole world with fibre for sackcloth. The area under jute is normally over two million acres; and thus rice and jute together occupy nearly 80% of the total cultivated area in Bengal. Oil seeds such as linseed, rape, mustard and sesamum occupy one million acres, and sugar cane 250,000 acres. Fruit and vegetables cover 770,000 acres. Bengal is the chief tobacco growing province in India, with 286,000 acres devoted to the plant. Cultivation is centred chiefly in Rangpur, Jalpaiguri and Cooch Behar; the leaf supplies local demands, and is also exported to Burma, where it is converted into the well-known Burmese cheroots. Small quantities of special crops such as drugs and narcotics are cultivated. Cinchona is grown by the Government for quinine manufacture at Darjeeling; and the narcotic-producing hemp *ganja* (*Cannabis sativa*) in a carefully regulated area in the Rajshahi district. Over 200,000 acres are tea gardens, chiefly in the Darjeeling and Jalpaiguri districts.

Manufactures and Mines.—Bengal possesses three industrial areas. The first, of a semi-agricultural character, comprises the tea districts of Darjeeling and Jalpaiguri, where tea is manufactured as well as grown. The second area consists of the west of the Burdwan district, where metallurgical industries have been established in close proximity to the Raniganj coalfield. This field was for long the most important in the country, but was surpassed in 1905 by the Jharia field in Behar and Orissa. It extends into Bankura, Birbhum and Manbhum, and the Bengal portions had in 1936 an output of 6·7 million tons, raised in 190 mines. Iron ore occurs in the neighbourhood, but production is now very small, the deposits having been worked since 1874. Pottery is also manufactured. The third and largest industrial tract is situated along the banks of the Hooghly. Engineering, cotton and jute manufacturing and various subsidiary industries are carried on. Out of the total of 1,694 factories in 1936, jute mills, with over 280,000 operatives, were the most important. There were also 27 cotton mills with 28,000 workers.

Administration.—Since April 1937, when Bengal was constituted an autonomous province, the administration has been carried on by a governor and a legislature consisting of a Legislative Council, which is composed of 57 elected members and not less than 6 or not more than 8 nominated members; and a Legislative Assembly, consisting of 250 elected members. For administrative purposes the province is divided into 27 districts grouped in 5 divisions, each under a commissioner, *viz.,* Burdwan, Presidency, Chittagong, Dacca, Rajshahi. By Act of 1923 the Calcutta Corporation was reconstructed with an elected mayor and officials.

Commerce.—The sea-borne trade of Bengal is almost entirely concentrated at Calcutta, which serves as the chief port, not only for Bengal but also for Assam, the United Provinces, and Behar and Orissa. The port of Chittagong is, in a minor degree, an outlet for the produce of Assam and of adjoining districts, but its trade is not comparable with that of Calcutta, which has practically a monopoly of the exports of jute and coal, and is the main distributing centre for imports brought from overseas. The principal imports are cotton piece goods, railway materials, metals and machinery, oils, sugar, cotton, twist and salt; and the principal exports are jute, tea, hides, rice, oil-seeds and lac. The inter-provincial trade is mostly carried on with Behar and Orissa, Assam, the United Provinces and the Central Provinces. The frontier trade of Bengal is registered with Nepal, Sikkim, Tibet and Bhutan, but except with Nepal the amount is insignificant. There are few commercial centres of any importance apart from Calcutta and Chittagong except those connected with the industrial area in Burdwan, such as Asansol and Raniganj, and river marts connected with the jute collecting trade, such as Narayanganj, Madaripur and Chandpur. In the interior, most of the towns merely supply local needs, and much of the trade is transacted in weekly or bi-weekly village markets.

Railways and Transport.—Bengal is well supplied with railways, of which three have the seaport of Calcutta as the centre of the system. The East Indian connects Bengal with northern India, the Bengal-Nagpur with the Central Provinces and Madras, and the Eastern Bengal State railway with Assam and, by connecting with the Bengal and north-western railway, with the north Gangetic districts of Behar and Orissa and the United Provinces. The Assam-Bengal railway, with its terminus at Chittagong, also links the south-east of the province with Assam.

Rivers and other waterways still carry a large part of the traffic of Bengal, especially in the delta. Inland steamer services ply along the Ganges, Brahmaputra, and other rivers, and eastern Bengal is connected with Calcutta by a route through the Sundarbans consisting of waterways and navigable channels (some artificial) of a total length of nearly 1,200 miles. In many parts of the provinces the rivers, streams and creeks are the natural means of communication; in eastern Bengal most villages can be reached by boats and some by boats alone.

HISTORY

The northern part of the province of Behar (*q.v.*) constituted the ancient kingdom of Magadha, the nucleus of the successive great empires of the Mauryas, Andhras and Guptas. Its chief town, Patna, is the ancient Pataliputra (the Palimbothra of the Greeks), once the capital of India. The Delta or southern part of Bengal lay beyond the ancient Sanskrit polity, and was governed by a number of local kings belonging to a pre-Aryan stock. The Chinese travellers, Fa Hien in the 5th century, and Hsüan Tsang in the 7th century, found the Buddhist religion prevailing throughout Bengal, but already in a fierce struggle with Hinduism, which ended about the 9th or 10th century in the general establishment of the latter faith. Until the end of the 12th century Hindu princes governed in a number of petty principalities, till, in 1199, Mohammed Bakhtiyar Khilji was appointed to lead the first Muslim invasion into Bengal. The Mohammedan conquest of Behar dates from A.D. 1197. From this time until 1340 Bengal was ruled by governors appointed by the Mohammedan emperors. From 1340 to 1539 its governors

asserted a precarious independence. From 1540 to 1576 Bengal passed under the rule of the Pathan or Afghan dynasty but on the overthrow of this house by Akbar, Bengal was incorporated into the Mogul empire, and administered by governors appointed by the Delhi emperor, until the treaties of 1765, which placed Bengal, Behar and Orissa under the administration of the East India Company. The company formed its earliest settlements in Bengal in the first half of the 17th century. In 1696 factors purchased from the grandson of Aurangzeb the villages which have since grown up into Calcutta. During the next 50 years the British had a long and hazardous struggle alike with the Mogul governors of the province and the Mahratta armies which invaded it. In 1756 this struggle culminated in the great outrage known as the Black Hole of Calcutta, followed by Clive's battle of Plassey and capture of Calcutta, which avenged it. During the subsequent years of confused fighting, British military supremacy was established in Bengal, and procured the treaties of 1765, by which the provinces of Bengal, Behar and Orissa passed under British administration. Warren Hastings (1772–85) consolidated the British power and Lord Teignmouth (1786–93) formed a regular system of Anglo-Indian legislation. The landholders under the native system had started, for the most part, as collectors of the revenues, and gradually acquired certain prescriptive rights as quasi-proprietors of the estates entrusted to them by the Government. In 1793 Lord Cornwallis declared their rights perpetual (the Permanent Settlement of the Land Revenue). But the Cornwallis code, while defining the rights of the proprietors, failed to give adequate recognition to the rights of the under-tenants, and the cultivators. After half a century of rural disquiet, the rights of the cultivators were at length carefully formulated by Act X. of 1859. This measure, now known as the land law of Bengal, effected for the rights of the under-holders and cultivators what the Cornwallis code in 1793 had effected for those of the superior landholders. In Bengal the Indian Mutiny (*q.v.*) began at Barrackpore, was communicated to Dacca in Eastern Bengal, and for a time raged in Behar, producing the memorable defence of the billiard-room at Arrah by a handful of civilians and Sikhs. Since 1858, when the country passed to the crown, the history of Bengal has been one of steady progress. Five great lines of railway have been constructed, and the coalfields and iron ores have opened up prospects of still further internal development.

During the decade 1891–1901 Bengal escaped the rigours of the famine and plague which afflicted central and western India, though there was a serious outbreak of plague at Calcutta, and in Patna in 1900–1. The earthquake of June 12, 1897, which had its centre of disturbance in Assam, was felt throughout Eastern and northern Bengal. Far more destructive to life was the cyclone and storm-wave that broke over Chittagong district on the night of Oct. 24, 1897. Apart from damage to shipping and buildings, the low-lying lands along the coast were completely submerged, and in many villages half the inhabitants were drowned. The loss of human lives was reported to be about 14,000. In 1905 it was realized that Bengal had become too unwieldy for the administration of a single lieutenant-governor and the province was divided, in spite of bitter Hindu opposition. All the districts east of the Brahmaputra were constituted as a separate province (Eastern Bengal), and as a protest there was a firm boycott of British goods and demonstrations by the "National Volunteers" were common.

When Sir J. Bampfylde Fuller took up the administration as first lieutenant-governor of Eastern Bengal the usual addresses of welcome were omitted and Hindus abstained from paying the customary calls. After six months, however, it seemed as though things were settling down and it became obvious that the earlier agitation was largely artificial. In August, however, the lieutenant-governor resigned owing to a difference with the central government. Acting on a report of Dr. P. Chatterji, inspector of schools, dated Jan. 2, 1906, the lieutenant-governor, on Feb. 10 addressed a letter to the registrar of Calcutta university recommending that the privilege of affiliation to the university should be withdrawn from the Banwarilal and Victoria high schools at Sirajganj in Pabna, as a punishment for the seditious conduct of both pupils and teachers. Apart from numerous cases of illegal interference with trade and of disorder in the streets reported against the students, two specific outrages had occurred on Nov. 15: the raiding of a cart laden with English cloth belonging to Marwari traders, and a cowardly assault by some 40 or 50 lads on the English manager of the Bank of Bengal. All attempts to discover and punish the offenders had been frustrated by the refusal of the school authorities to take action. The secretary of the home department of the Government of India, however, refused to support Sir Bampfylde Fuller, who at once tendered his resignation (July 15), which was accepted by the viceroy on Aug. 3. By the Anglo-Indian press the news was received with something like consternation, the *Times of India* describing the resignation as one of the gravest blunders ever committed in the history of British rule in India, and as a direct incentive to the forces of disquiet, disturbance and unrest. On Aug. 7 the day of Sir Bampfylde Fuller's departure from Dacca, a mass-meeting of 30,000 Mohammedans was held, which placed on record their disapproval of a system of government "which maintains no continuity of policy," and expressed its feeling that the lowering of British prestige must "alienate the sympathy of a numerically important and loyal section of His Majesty's subjects." On Aug. 8, Calcutta was the scene of several large demonstrations at which the Swadeshi vow was renewed, and at which resolutions were passed declining to accept the partition as a settled fact, and resolving on the continuance of the agitation.

From 1910 to 1912 the remainder of Bengal together with Behar and Orissa was administered by a governor and two councillors, but a new Presidency reuniting all Bengali speaking areas was created in 1912. In 1921 the constitution of the council was changed: "reserved" subjects being dealt with by the governor and four executive councillors, two being Indians; and "transferred" subjects by the governor and three Indian ministers. In accordance with the Government of India Act (1935) Bengal was constituted an autonomous province in 1937 (*see* the section *Administration* above). *See* also CALCUTTA; BEHAR; ASSAM and INDIA: *History, ad fin.*

See C. E. Buckland, *Bengal under the Lieutenant-Governors* (1901); Sir James Bourdillon, *The Partition of Bengal* (Society of Arts, 1905); official blue-books on *The Reconstitution of the Provinces of Bengal and Assam* (Cd. 2658 and 2746), and *Resignation of Sir J. Bampfylde Fuller,* lieutenant-governor, etc. (Cd. 3242); L. J. S. O'Malley, *History of Bengal, Bihar and Orissa under British Rule* (1925).

BENGAL, BAY OF, part of the Indian Ocean, lying between peninsular India and Burma. The 100-fathom line runs parallel to the Coromandel coast some 50m. away, and encloses the Andaman and Nicobar islands, submerged continuations of the Arakan ranges, on the east. Opposite the mouth of the Ganges the submarine platform is greatly extended. The bay receives many large rivers: the Ganges and Brahmaputra on the north, the Irrawaddy on the east, and the Mahanadi, Godavari, Kistna and Cauvery on the west; all remarkable for their deltas. The Deccan coast provides no harbours, Madras having a mere open roadstead, but on the east the drowned coast has given many good ports, such as Akyab, Moulmein and Rangoon. Islands include the Andaman, Nicobar and Mergui groups. Cheduba and other islands off the Burmese coast are remarkable for a chain of mud volcanoes, occasionally active.

BENGALI LANGUAGE AND LITERATURE. The Bengali language is one of four forms of speech composing the eastern group of the Indo-Aryan Languages (*q.v.*).

Bengali is spoken in the province of Bengal proper; *i.e.,* in, and on both sides of, the delta of the Ganges. The name "Bengali" is an English word, derived from the English word "Bengal." The language is known as *Bangga-Bhāṣā,* or the language of *Bangga; i.e.,* "Bengal."

It is a descendant of Māgadhī Prakrit (*see* PRAKRIT LANGUAGES), which spread from south Behar in three lines southwards, where it developed into Oriya; south-eastwards into Bengal proper, where it became Bengali; and eastwards, through northern Bengal, into Assam, where it became Assamese. Thus

the language of northern Bengal, though usually and conveniently treated as a dialect of Bengali, is, in reality, a connecting link between Assamese and Bihari, the language of Behar. Northern Bengali and Assamese often agree in their grammar with Oriya, as against standard Bengali.

Bengali has two main dialects, a western and an eastern, the former being the standard. The eastern dialect has a tendency to disaspiration, the pronunciation of *c* as *ts*, of *ch* as *s*, and of *j* as *z*. In the northern part of the tract a medial *r* is often elided, and in the extreme east there is a broader pronunciation of the vowel *a*, like that in the English word "ball," *k* is sounded like the *ch* in "loch," and both *c* and *ch* are pronounced like *s*. The letter *p* is often sounded like *w*, and *s* like *h*; the latter, when initial, is dropped. The distinction between cerebral and dental letters is lost. In the south-east, near Chittagong, the local dialect is practically a new language and is unintelligible to a man from western Bengal. Throughout the eastern districts there is a strong tendency to epenthesis; *e.g.*, *kāli* is pronounced *kāil*.

Abbreviations used: A. = Assamese, Bg. = Bengali, O. = Oriya, Pr. = Prakrit, Mg. Pr. = Māgadhī Prakrit, Skr. = Sanskrit. (In transliteration, *c* has the sound of *ch*, in church. Thus Caitānya, Caṇḍī, are pronounced Chaitanya, Chaṇḍī.)

Vocabulary.—Literary Bengali abounds in *tatsamas*, words borrowed in modern times from Sanskrit (*see* INDO-ARYAN LANGUAGES), which have intruded themselves into the speech of the educated so that, in the literary language, when a genuine Bengali or *tadbhava* word is used in literature it is frequently not put into writing, but the corresponding learned *tatsama* is written in its place, although the *tadbhava* is read.

Phonetics.—The vowel *a* is sounded like the *o* in "hot," and is represented in the present article by *ŏ*. The pronunciation of this frequently recurring vowel gives a tone to the general sound of the languages. In Bg. a final vowel preceded by a single consonant is generally not pronounced for nouns, a final *a* being freely sounded in adjectives and verbs. The sound of such a final *a* is that of the second *o* in "promote." In Bg. a medial *a* sometimes has the sound of the first *o* in "promote." In eastern Bg. a medial *a* is often sounded like the *a* in "ball," and is then transliterated *ȧ*. *Ā* has preserved as a rule its proper sound of *a* in "father." The distinction between *i* and *ī* and between *u* and *ū* is everywhere lost in pronunciation, although in *tatsama* words the Sanskrit spelling is followed in literature. In Bg. the vowel *ē* may be long or short and the syllable *ya* preceded by a consonant has the sound of a short *e*, and is often pronounced like the *a* in the German *Mann*, a sound here phonetically represented by *ȧ*. The syllable *yā*, when following a consonant, has this *ȧ*-sound, so that the English word "bank" is written *byänk* in Bengali characters. *Ō* in Bg., when it does not carry the accent, is shortened to the sound of the first *o* in "promote," a sound also sometimes taken by a medial *a*. The diphthongs *āī* (in *tatsamas*; *i.e.*, the Skr. *āi*) and *ai* (in *tadbhavas*) are sounded like *oi* in "oil" in Bg. and the diphthongs *āū* and *au* are sounded like the *au* in the German *Haus*. In colloquial Bg. the two syllables *āi* often have the sound of *ē*.

In eastern Bengal *k* has often the sound of *ch* in "loch." The tendency to pronounce the consonants *c* and *ch* like *s*, and *j* and *jh* as *zh* (*i.e.*, the *s* in "pleasure") or (when final) *z*, is observable in Bg., though usually considered vulgar. In parts of eastern Bengal *c* is pronounced like *ts*. In eastern Bg. there is a strong tendency to pronounce both dentals and cerebrals as semi-cerebrals, as in the neighbouring Tibeto-Burmans. In Bg. *ṇ* has universally become *n*. *Y* is usually pronounced as *j*, unless it is a merely euphonic bridge to avoid a hiatus between two vowels, as in *kariyā* for *kari-ā*. When *y* is the final element of a conjunct consonant, in Bg. (except in the south-east) it is very faintly pronounced. In compensation the preceding member of the conjunct is doubled and the preceding vowel is shortened if possible, thus *vākya* becomes *bākkyō*. *M* and *v* when similarly situated are altogether elided in Bg. *R* is generally pronounced correctly, except that when a member of a compound it is often not pronounced in colloquial Bg. In north-eastern Bengali a medial *r* is commonly dropped. The vulgar commonly confound *n* and *l*. The old cerebral *ḷ* of Pr. has disappeared in Bg. The semi-vowel *v* (*w*) becomes *b* in Bg.; when Bg. wishes to represent a *w*, it has to write *ōyā*. Bg. pronounces all uncompounded sibilants as if they were *ś*, like the English *sh* in "shin," as in Mg. Pr. (*see* PRAKRIT LANGUAGES). In eastern Bg. *s* becomes frankly *h* and is then often dropped. The compound *kṣ* is everywhere treated as if it were *khy*. In colloquial Bg. there is a tendency to disaspiration. In eastern Bg. there is a cockney tendency to drop *h*.

Declension.—Sex is distinguished either by the use of qualifying terms, such as "male" or "female," or by the employment of different words, as in the case of our "bull" and "cow." The plural number is almost always denoted by the addition of some word meaning "many" or "collection" to the singular, although sometimes a true plural is used in the case of nouns denoting human beings. Case was originally indicated by postpositions (*see* INDO-ARYAN LANGUAGES), which in many instances have been joined to the noun, forming one word with it.

A noun often takes *ē* (*e*) in the nominative singular, when it is the subject of a transitive verb. The nominative plural may, in the case of human beings, be formed by adding *ā* to the genitive singular. The same is the case with the pronouns.

Pronominal suffixes are freely used in the conjugation of verbs.

The adjective does not change for gender, for number or for case.

The personal pronouns have new nominatives formed from the oblique base. In the first and second persons the singulars have fallen into disuse in polite conversation, and the plurals are used honorifically for the singular, as in the case of the English "you" for "thou." For the plural, new plurals are formed from the new singular (old plural) bases. The Bg. pronouns are, *mui* (old), I; *āmi* (modern), I; *tui* (old), thou; *tumi* (modern), thou; *sē*, *tini*, he; *ē*, *ini*, this; *ō*, *uni*, that; *jē*, *jini*, who; *kē*, who?; *ki*, what?; *kōn*, what (adjective)?; *kēha*, anyone; *kichu*, anything; *kōna*, any.

All these pronouns have plurals and oblique forms to which the case suffixes are added.

Conjugation.—Colloquial Bg. differs most from the literary dialect in the conjugation of the verb. There is no distinction between singular and plural. Most of the old singular forms have survived in a non-honorific sense, but are rarely employed in polite language except in the third person. The old plural forms are generally employed for the singular also.

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BENGALI LITERATURE

The earliest Bengali writer is the Vaishnava poet Caṇḍī Dās, A.D. 1400. His language does not differ much from modern Bengali. He founded a school of poets who wrote hymns in honour of Krishna, many of whom, in later times, became connected with the 16th-century religious revival instituted by Caitanya. In the 15th century Kāśī Rām translated the *Mahābhārata* and Kṛttibās Ojhā the *Rāmāyaṇa*. The principal figure of the 17th century was Mukunda Rām who left two admirable poems, *Caṇḍī* and *Śrīmanta Saudāgar*. Parts of the former have been translated by Prof. Cowell into English verse. With Bhārat Candra and his much admired but artificial *Bidyā Sundar* (18th century), the list of old Bengali authors closes. They wrote in genuine nervous Bengali, and the conspicuous success of many of them disproves the contention that modern literary Bengali needs the help of its imported Sanskrit vocabulary to express anything but simple ideas. Modern literary Bengali arose early in the 19th century, after the revival of Sanskrit learning in Calcutta, under the influence of the English college of Fort William. It became increasingly the slave of Sanskrit, but it had some excellent writers, notably the late Bankim Candra, whose novels have been translated into many languages. Even he, however, sometimes laboured under Sanskrit fetters, and it was only comparatively recently that a partial reaction, largely influenced by Sir Rabindranath Tagore (*q.v.*), set in in favour of a more natural language. Since then several writers of distinction have arisen.

Oriya Literature.—This does not go back beyond the 16th century, though examples of the language are found in inscriptions of the 13th century. Nearly all the works are connected with the history of Krishna, and the 16th-century translation of the *Bhāgavata Purāṇa* into Oriya still exercises great influence on the masses. Dīna Kṛṣṇa Dās (17th century) was the author of a popular work entitled *Rasa Kallola,* which deals with the early life of Krishna. Every verse begins with the letter *k*. Upēndra Bhañja, Rājā of Gumsur, a petty hill State, is the most famous of Oriya poets, and was the most prolific. His work is insipid to European taste, and often unintelligible or obscene. Oriya poetry has been an artificial production, the work of *paṇḍits,* bound by rules of Sanskrit rhetoric, and appealing only to the learned.

Assamese Literature.—The Assamese are justly proud of their national literature. It had an independent growth, and its strength, unlike other Indian literatures, lies in history. The chronicles go back for 600 years, and a knowledge of their contents is part of the education of the upper classes. In poetry, the 15th-century Vaishnava reformer, Śankar Dēb, was a voluminous writer. His best known work is a translation of the *Bhāgavata Purāṇa.* About the same time Ananta Kandali translated the *Mahābhārata* and the *Rāmāyaṇa.* Medicine was much studied, and there are translations of all the principal Sanskrit medical works. Forty or 50 vernacular dramatic works are still acted. Some date back to the time of Śankar Dēb.

BENGASI (BENGHAZI, anc. *Euhesperides* or *Hesperides-Berenice*), chief seaport and city of Bengasi province of Libya. Pop. (1939) 66,009, 22,463 of whom are Italians, not including the garrison. It is on a narrow strip of land between the Gulf of Sidra and a salt marsh, in 30° 7′ N. lat. and 20° 3′ E. long. In spite of extensive expenditures, the harbour is accessible only to vessels of light draught. The export trade is largely in barley, shipped to European maltsters. The ivory, ostrich feathers, etc. formerly brought to Bengasi by caravan have been almost wholly diverted to Khartoum, though Bengasi is the starting point of the shortest route to Wadai. The neighbouring coast is frequented by Greek and Italian sponge fishers. There is regular communication by steamer with Syracuse and Derria. Railways (3.11 ft.) run northeast via El Abiar (37 mi.) to Barce (67 mi.) and southeast to Soluch (36 mi.).

Founded by the Greeks of Cyrenaica under the name Hesperides, the town received from Ptolemy III the name of Berenice in honour of his wife. The ruins of the ancient town, which superseded Cyrene and Barca as chief place in the province after the 3rd century A.D., are now nearly buried in the sand. There are numerous rock-cut tombs of the Ptolemaic and Roman period, when there was a considerable Jewish colony. No traces exist of the buildings attributed to Justinian, who is said to have fortified it. The modern town lies southwest of the original site. In World War II Bengasi suffered considerably, changing hands no less than five times. Taken by the British Feb. 9, 1941, it was reoccupied by Italians April 4. The British again took the city Dec. 25, 1941, but abandoned it to axis forces under Gen. Rommel, Jan. 29, 1942. It was finally captured by the British 8th army, Nov. 21, 1942. (*See* also CYRENAICA.) (P. W. I.)

BENGEL, JOHANN ALBRECHT (1687–1752), Lutheran divine and scholar, was born at Winnenden, Württemberg, on June 24, 1687. He studied at the University of Tübingen and from 1713 to 1741 was master (*Klosterpräceptor*) of the *Klosterschule* at Denkendorf, a seminary for candidates for the ministry established in a former monastery. To these years, the period of his greatest intellectual activity, belong many of his chief works. In 1741 he was appointed General Superintendent at Herbrechtingen, where he remained till 1749, when he was raised to the dignity of consistorial counsellor and prelate of Alpirspach, with a residence in Stuttgart. He died at Stuttgart on Nov. 2, 1752.

The works on which Bengel's reputation rests as a biblical scholar and critic are his edition of the Greek New Testament, and his *Gnomon* or *Exegetical Commentary* on the same.

His edition of the Greek Testament based on 20 mss. 12 of which he had himself collated, was published at Tübingen in 1734, and at Stuttgart in the same year, but without the critical apparatus. The text was followed by a critical apparatus, the first part of which consisted of an introduction to the criticism of the New Testament, in the thirty-fourth section of which he laid down and explained his celebrated canon, "*Proclivi scriptioni praestat ardua*" ("The difficult reading is to be preferred to that which is easy"), the soundness of which, as a general principle, has been recognized by succeeding critics. The second part of the critical apparatus was devoted to a consideration of the various readings, and here Bengel adopted the plan of stating the evidence both *against* and *in favour* of a particular reading. Bengel was the first definitely to propound the theory of families or recensions of mss. His investigations had led him to see that a certain affinity or resemblance existed amongst many of the authorities for the Greek text—mss., versions, and ecclesiastical writers; that if a peculiar reading, *e.g.,* was found in one of these, it was generally found also in the other members of the same class; and this general relationship seemed to point ultimately to a common origin for all the authorities which presented such peculiarities. Although disposed at first to divide the various documents into three classes, he finally adopted a classification into two—the African or older family of documents, and the Asiatic, or more recent class, to which he attached only a subordinate value. In answer to the many strictures passed on his work Bengel published a *Defence of the Greek Text of His New Testament,* which he prefixed to his *Harmony of the Four Gospels* (1736).

The work on which Bengel's reputation as an exegete is mainly based, is his *Gnomon Novi Testamenti, or Exegetical Annotations on the New Testament* (1742). It was the fruit of twenty years' labour, and exhibits with a brevity of expression, which, it has been said, "condenses more matter into a line than can be extracted from pages of other writers," the results of his study. The principles of interpretation on which he proceeded were, to import nothing *into* Scripture, but to draw *out of* it everything that it really contained, in conformity with grammatico-historical rules; not to be hampered by dogmatical considerations; and not to be influenced by the symbolical books. Bengel's *Gnomon* passed through many editions and was translated into German and into English.

See Oskar Wächter's *J. A. Bengels Lebensabriss;* J. C. F. Burk (*J. A. Bengels Leben und Wirken*), translated into English by Rev. R. F. Walker (London, 1837); and E. Nestle, *Bengel als Gelehrter* (1893).

BENGUELLA: *see* ANGOLA.

BENI (EL BENI), a lowland department of north-eastern Bolivia. Population in 1941 about 60,000 (estimated); area 83,741 sq.mi. The "Llanos de Mojos," famous for their flourishing Jesuit mission settlements of the 17th and 18th centuries, occupy the eastern part of this department and are still inhabited by an industrious peaceful native population, devoted to cattle raising and primitive methods of agriculture. Cattle and forest products, including rubber and coca, are exported to a limited extent. The capital, Trinidad (pop. 1942, 12,000), is about six miles from the Mamoré river in an open fertile country, and was once a flourishing Jesuit mission.

BENÍ, a river of Bolivia, a tributary of the Madeira, rising in the elevated Cordilleras near the city of La Paz and at first known as the Rio de La Paz, and flowing east, and north-east, to a junction with the Mamoré at 10° 20′ S. lat. to form the Madeira. Fully one-half of its length is through the mountainous districts of central Bolivia, where it is fed by a large number of rivers and streams from the snowclad peaks, and may be described as a raging torrent. Below Reyes its course is through the forest-covered hills and open plains of northern Bolivia, where some of the old Indian missions were situated. The lower river is navigable for 217 m. from Reyes to the Esperanza rapids, 18 m. above its confluence with the Mamoré, where a fall of 20 ft. in a distance of 330 yds. obstructs free navigation. Its principal affluent is the Madre de Dios, or Mayu-tata, which rises in the eastern Cordilleras about 35 m. east of Cuzco, and flows in an east and north-east direction through northern Bolivia to a junction with the Beni 120 m. above its mouth. The principal tributaries of the Madre de Dios are the Inambari and Paucartambo, both large

rivers, and the Chandless, Marcapata, and Tambopata. In length and size of its tributaries the Madre de Dios is a more important river than the Beni itself, and is navigable during the wet season to the foot of the Andes, 180 m. from Cuzco.

BENI AMER: *see* BEJA.

BENI HELBA: *see* BAKKARA.

BENIN, the name of a country, city and river of British West Africa, west of the main channel of the lower Niger, forming part of Southern Nigeria. The name was formerly applied to the coast from the Volta, in 0° 40′ E., to the Rio del Rey, in 8° 40′ E., and included the Slave Coast, the whole delta of the Niger and a small portion of the country to the eastward. Some trace of this earlier application remains in the name "Bight of Benin," still given to that part of the sea which washes the Slave Coast, whilst up to 1894 "Benin" was used to designate the French possessions on the coast now included in Dahomey.

In its restricted sense Benin is the country formerly ruled by the king of Benin city. This area, at one time very extensive, gradually contracted as subject tribes and towns acquired independence. The coast-line held by Benin had passed out of its sovereignty by the middle of the 19th century. In physical characteristics, climate, flora and fauna, Benin in no way differs from the rest of the southern portion of Nigeria (*q.v.*). Benin river (known also as the Jakri outlet), though linked to the Niger system by a network of creeks, is an independent stream. It enters the Atlantic in about 5° 46′ N., 5° 3′ E., and at its mouth, which is obstructed by a sand bar, is 2m. wide. The river is navigable by small steamers up to Sapele, a town on the south bank immediately below the junction of its head streams (the Ethopie and the Jamieson). The Ologi and Gwato creeks enter the Benin on the right or north bank, and on the same side (8m. above the mouth of the river) a channel, the Lagos creek, 170m. long, branches off to the north-west, affording a waterway to Lagos. From the south or left bank of the Benin the Forcados mouth of the Niger can be reached by the Nana creek. By this route ships drawing 16′ 6″ can reach Sapele.

The Beni are a pure Negro tribe, speaking a distinct language, but having many characteristics common to those of the Yoruba- and Ewe-speaking tribes. Like the Ashanti and Dahomeyans the Beni had a well-organized and powerful government and possessed a culture rare among Negro races.

Benin city (pop. about 15,000) is in a clearing of the forest, 25 mi. from the river-port of Gwato, on Gwato creek. Of the ancient city, whose buildings excited the admiration of travellers in the 17th and 18th centuries, scarcely a trace remains. The houses are neatly built of clay, coloured with red ochre, and frequently ornamented with rudely carved pillars.

Since the abolition of the slave trade the chief exports of the country are palm-oil and timber. Among the articles prized by the Beni is coral, of which the chiefs wear great quantities. After the British occupation, an extensive trade developed in oil, kernels, timber, ivory and rubber. In the rubber and timber industries great strides have been made.

HISTORY

Benin was one of the most highly organized of the Negro states on the West Coast of Africa; it shared with Dahomey and Ashanti an unenviable notoriety for the system of human sacrifices (the "customs" as they were called), which marked their religious and court ceremonies. The Portuguese discovered Benin about the year 1485, and they carried on with the Bini (less correctly Benis) a brisk trade in slaves, the slaves being taken to Elmina and sold to the natives of the Gold Coast. The Portuguese found Benin a powerful state, and so it continued until about the middle of the 19th century. Europeans in the 17th century spoke of it as Great Benin; colonists from Benin founded the ports of Lagos and Badagry. While the area of the kingdom was small (somewhat larger than Wales), its influence was very wide and is said to have extended west as far as Sierra Leone and south to the Congo river. This arose from the belief that the chief spirit or "juju" of Benin was the most powerful in West Africa. This spirit dwelt in Benin city which was the seat of a theocracy of priests. The *oba* or king, though nominally supreme, appears to have often been a puppet in the hands of the priests. Revered as a species of divinity, the king seldom left the enclosure surrounding his palace. The worship of the "juju" demanded human sacrifices to an appalling extent, the usual form of sacrifice being crucifixion. Although blood flowed so freely the people do not appear to have indulged in wanton cruelty, and it is stated that they usually stupefied the victims before putting them to death. The Bini were more civilized in several respects than the neighbouring peoples. They were especially noted for their brass and ivory work. Although they may have owed something to their contact with the Portuguese, their culture was essentially native, and their dealings with white men were almost confined to matters of commerce. The Portuguese withdrew from the coast in the 18th century, but one of the most striking proofs of their commercial influence is the fact that a corrupt Lusitanian dialect was spoken by the older natives up to the last quarter of the 19th century.

The first British expedition to Benin was in 1553; after that time a considerable trade grew up between England and that country, ivory, palm-oil and pepper being the chief commodities exported from Benin. The Dutch afterwards established "factories" and maintained them for a considerable time, chiefly with a view to the slave trade. A trading station founded by the French in 1788 was destroyed by the British in 1792. In 1863 Sir Richard Burton, then British consul at Fernando Po, went to Benin to try to put a stop to human sacrifices, an attempt in which he did not succeed. At that time the decline in power of the kingdom of Benin was obvious, and the city was in a decaying condition. In 1885 the coast-line of Benin was placed under British protection, and steps were taken to enter into friendly relations with the king. In March 1892 Captain (later Sir) H. L. Gallwey, British vice-consul, succeeded in concluding a treaty with the king, Overami. The treaty, however, proved of no avail nor did the banishment, in 1894, of Nana, a truculent chief of Lower Benin, induce the *oba* to mend his ways. In Jan. 1897 J. R. Phillips, acting consul-general, and eight Europeans were brutally massacred on the road from Gwato to Benin city, whilst on a mission to the king. Phillips had persisted in starting for Benin despite the repeated request of King Overami that he should delay his visit until he (the king) had finished the celebration of the annual "customs." A punitive expedition was organized under the command of Admiral Sir Harry Rawson. A force of 1,200 men was landed on the Benin river on Feb. 12. Five days later the city of Benin was occupied after considerable fighting. The town, which was found to be reeking of human sacrifices, was partly burned, and on the 22nd the expedition started on its return. Overami and chiefs responsible for the massacre were placed on their trial; the king was deported to Calabar, and the chiefs, six in all, were executed. A second punitive expedition in 1899 completed the pacification of the country. On this occasion the leader of the attack on the Phillips mission was captured and executed.

After the deposition of Overami the government was entrusted to a council of chiefs under the guidance of British officials. Human sacrifices were stopped and slavery abolished. Overami died in exile at Calabar in 1914 and, acceding to the wishes of the people, his son was recognized as *oba*. At the same time the country was made the Benin province of Southern Nigeria, a British Resident advising, but interfering as little as possible, with the native government. The system worked well and the substitution in 1916 of direct taxation for the former unlimited exactions of the chiefs was welcomed. Mr. Ormsby-Gore, under-secretary of state for the colonies, who visited Benin in 1926, congratulated the *oba* and his council on the marked contentment and prosperity of the country.

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Roth, *Great Benin, its Customs, Art and Horrors* (Halifax, 1903), a comprehensive and profusely illustrated work, with an annotated bibliography. *See* also the reports on Nigeria issued annually by the Colonial Office, London. (F. R. C.)

BENITOITE, a mineral discovered in 1907 near the headwaters of the San Benito river, San Benito county, Calif., in veins with natrolite in glaucophane schist. It is a titano-silicate of barium ($BaTiSi_3O_9$), crystallizing in the trigonal system, with a hardness of 6·5 and specific gravity 3·65. It may be colourless or blue, the colour varying sometimes in different parts, and passing to a deep sapphire blue. The blue variety is cut as a gem-stone, and often resembles blue spinel, though its softness distinguishes it from spinel and sapphire.

BENJAMIN, a tribe of Israel which traced its pedigree back to Jacob and Rachel (Gen. xxxv., the alternative name Ben-oni may have originated in a period of intertribal hostility such as that described in Jud. xix–xxi.). The tribe is thus regarded from the first as closely allied, though possibly subordinate, to the Joseph tribes. This view is borne out by the geographical position of Benjamin in the period that succeeded the Conquest, for its settlements lay to the south of Ephraim and Manasseh, immediately bordering on the territory of the Jebusites, which remained unsubdued by Israel till the time of David. The fact that after the death of Solomon it was traditionally a part of the southern kingdom is probably to be explained by its proximity to Jerusalem, and it is a striking fact that the chief sanctuary of the northern kingdom, Bethel, was originally included in the territories of this tribe. The rape of the maidens of Shiloh (Jud. xxi. 16 *seq.*) may point to the recognition of admixture with Canaanite blood.

The tribe is characterized as fierce and warlike (*cf.* Gen. xlix. 27, Jud. xix.–xxi.), and was especially noted for the skill of its left-handed slingers (Jud. iii. 15, xx. 16, I Chron. xii. 2). It produced two of the great heroes of early Israel, Ehud (Jud. iii. 12–31) and Saul, and it is to the latter that we must ascribe the unification of Israel and the foundation of the monarchy. The later ascription of Jerusalem to this tribe added to a religious importance established by such centres of worship as Bethel, Gibeon, and Anathoth, while it is interesting to note that St. Paul himself claimed Benjamite descent. (T. H. R.)

BENJAMIN, JUDAH PHILIP (1811–1884), Anglo-American lawyer, of Jewish descent, was born a British subject at St. Thomas in the West Indies, on Aug. 11, 1811. After 1818 his parents lived in Charleston (S.C.). He went to Yale in 1825, but left there without taking a degree, and entered an attorney's office in New Orleans, being admitted to the bar in 1832. Together with John Slidell, he compiled a valuable digest of decisions of the superior courts of New Orleans and Louisiana. In 1848 he was admitted a councillor of the Supreme Court, and in 1852 he was elected a senator for Louisiana. He withdrew from the Senate in 1861 to join Jefferson Davis's provisional government as attorney-general, becoming afterwards his secretary of war (1861–1862), and chief secretary of State (1862–65). After the surrender at Appomattox he escaped from the coast of Florida, and after many vicissitudes reached England an exile.

The influence of English judges who knew his abilities and circumstances enabled him to be called to the bar on June 6, 1866. After working as pupil to C. E. Pollock, Benjamin joined the northern circuit, and a large proportion of his early practice came from solicitors at Liverpool who had correspondents in New Orleans. Having received a patent of precedence, he was, on Nov. 2, 1872, called within the bar as a queen's counsel. Benjamin had a power of marshalling facts and arguments that rendered him extremely effective, particularly before judges. He was less successful in addressing juries. He retired in 1882 to a house in Paris, and died there on May 6, 1884.

His *Treatise on the Law of Sale of Personal Property with References to the American Decisions and to the French Code and Civil Law*—a bulky volume known to practitioners as *Benjamin on Sales*—is the principal text-book on its subject. Many of his American speeches have been published.

See *Judah P. Benjamin,* by Pierce Butler (Philadelphia, 1907, with a good bibliography).

BENJAMIN OF TUDELA (in Navarre), a Jewish rabbi of the 12th century. He visited Constantinople, Egypt, Assyria and Persia, and penetrated to the frontiers of China, his journeys occupying about 13 years. His *Itinerary* is valuable for the Jewish history of the 12th century.

BIBLIOGRAPHY.—The *Itinerary* was translated from the Hebrew into Latin by Arias Montanus in 1575, and appeared in a French version by Baratier in 1734. There have been various English translations. One was published by Asher in 1840; another (with critical Hebrew text) by M. N. Adler (*Jewish Quarterly Review,* vols. xvi.–xviii.; also reprinted as a separate volume, 1907).

BEN LEDI, a mountain of Perthshire, Scotland, 2,875ft. high. (*See* PERTHSHIRE.)

BENLLIURE Y GIL, JOSÉ (1855–1937), Spanish painter, born at Valencia, studied under Domingo, and was sent to the Spanish school in Rome. He was one of the select circle pensioned by the Spanish government for residence in Italy and executed several state orders for the decoration of public buildings; but he owes his chief fame to his large paintings, notably the "Vision in the Colosseum" and the "Valley of Jehosaphat and the Resurrection of the Dead." He became the leader of the Spanish art colony in Rome, where he also worked as a sculptor.

BEN LOMOND, a mountain in north-west Stirlingshire, Scotland, 3,192ft. high (*see* LOMOND, LOCH).

BENLOWES, EDWARD (1603?–76), English poet, son of Andrew Benlowes of Brent Hall, Essex, matriculated at St. John's College, Cambridge, in 1620, and on leaving the university made a prolonged tour on the continent of Europe. He was a Roman Catholic in middle life, but became a convert to Protestantism in his later years. He dissipated his fortune by openhanded generosity to his friends and relations, and possibly by serving in the Civil War; so that he was in great poverty at the time of his death in Oxford, Dec. 18 1676. The last eight years of his life were passed at Oxford.

Many of his writings are in Latin. His most important work is *Theophila, or Love's Sacrifice, a Divine Poem* (1652). The poem deals with mystical religion, telling how the soul, represented by Theophila, ascends by humility, zeal and contemplation, and triumphs over the sins of the senses. It is written in a curious stanza of three lines of unequal length rhyming together, and is full of the most far-fetched "conceits." Until his revival by Professor Saintsbury justice had hardly been done to Benlowes's poetical merits and indisputable piety. Samuel Butler, who satirized him in his "Character of a Small Poet," found abundant matter for ridicule in his eccentricities; and Pope placed him in the *Dunciad* as "Benlowes, propitious still to blockheads, bows."

His *Theophila* was reprinted by S. W. Singer; and in *Minor Poets of the Caroline Period,* vol. i. (1905), Mr. Saintsbury reprinted *Theophila* and two other poems by Benlowes, "The Summary of Wisedome," and "A Poetic Descant upon a Private Music-Meeting."

BEN MACDHUI: *see* ABERDEENSHIRE.

BENNET, JOHN, English madrigalist, whose first known published work, *Madrigalls to Foure Voyces,* was printed in 1599 (the years of his birth and death are unknown). He contributed to Morley's *Triumphs of Oriana* (1601), five hymn tunes to *Barley's Psalter* between 1604 and 1614, and some of his compositions occur in Thomas Ravenscroft's *Briefe Discourse* (1614). In the preface to the *Briefe Discourse* Ravenscroft praises him as a "gentleman admirable for all kinds of composures." No later published works of his are extant, though there is an anthem by him in Thomas Myntell's ms. *Tristitiae Remedium* (British museum), a collection dated 1616. The *Madrigalls to Foure Voyces,* "All creatures that are merry-minded," from the *Triumphs of Oriana* and two pieces from the *Briefe Discourse* have been printed by the English madrigal society. Ms. compositions exist in the collections of the British museum, Fitzwilliam museum and Peterhouse college, Cambridge, and Christ Church, Oxford.

BENNETT, CHARLES EDWIN (1858–1921), American classical scholar, was born April 6, 1858, in Providence (R.I.). He graduated from Brown university in 1878, and also studied at Harvard and in Germany. After teaching in secondary schools in Florida, New York, and Nebraska, he became professor of

Latin in the University of Wisconsin in 1889, of classical philology at Brown university in 1891, and of Latin at Cornell university in 1892. His syntactical studies are based on a statistical examination of Latin texts, and are marked by a fresh system of nomenclature. Of interest are his advocacy of "quantitative" reading of Latin verse, and his *Critique of Some Recent Subjunctive Theories* in *Cornell Studies in Classical Philology,* of which he was editor. Bennett's *Latin Grammar* (1895) was the first successful attempt in America to adopt the method of the brief, scholarly *Schulgrammatik.* Besides editing various Latin classics, he wrote, with G. P. Bristol, *The Teaching of Greek and Latin in Secondary Schools* (1900), and *The Latin Language* (1907), and with W. A. Hammond translated *The Characters of Theophrastus* (1902). His later publications include *Syntax of Early Latin* (1910–14); and *New Latin Composition* (1912). He died May 2, 1921, at Ithaca (N.Y.).

BENNETT, ENOCH ARNOLD (1867–1931), English novelist and dramatist, born at Hanley, Staffordshire on May 27, 1867. After leaving school he entered a lawyer's office, but in 1893, having published several stories and articles, decided to devote himself to writing and settled in London where he obtained the position of assistant-editor on the magazine, *Woman.* He succeeded to the editorship in 1896. It was not till after he was 30 years old that his first novel, *A Man From the North* (1898), was published. In 1900 he resigned his editorship, and since then he has been a prolific writer of fiction and miscellaneous literature. As book after book appeared under his name—books as various as *The Grand Babylon Hotel* (1902), *Anna of the Five Towns* (1904), *The Truth About An Author* (1903)—it was impossible to doubt that a fresh kind of whimsical impudent and realistic imagination was engaged in the task of providing us with literary entertainment. Here was a writer who made ordinary life seem extraordinary, who mingled the real and the fantastic, and who had humour, candour and knowledge of a hard world that to most readers was as foreign as fairyland. It was not yet certain, however, that Mr. Bennett would ever do justice to his talent. Many people regarded him merely as an exceptionally skilful writer for the market till at the age of 40 he published *The Old Wives' Tale* (1908) and took his place among the modern masters of fiction. Mr. Bennett proceeded to justify the praises he had won with *The Old Wives' Tale* by writing a succession of remarkable novels and short stories, *Clayhanger* (1910), *The Card* (1911), *Hilda Lessways* (1911), and *The Matador of the Five Towns* (1912). This was the most exuberant period of his career. *Clayhanger* is a chapter of English social history, and in it and its sequels, *Hilda Lessways* and *These Twain* (1916), he has made the people of the Five Towns as real to the imagination as the people of Trollope's Barsetshire. Neither of the sequels is a book on the same level as *Clayhanger,* but the three novels form a trilogy which is one of the literary monuments of the age. And if *Clayhanger* is a masterpiece, *The Card,* a picaresque story of a successful man, is no less so. Meanwhile Mr. Bennett had written a number of plays, including *Milestones* (1912), in which he collaborated with Mr. Edward Knoblock. In 1913 his very successful play, *The Great Adventure* (founded on his novel, *Buried Alive*) was produced. During the next ten years Mr. Bennett continued to write novels, plays, literary criticism and (during the war with Germany) political articles without adding to his reputation. He was always pungent, always efficient, always interesting, but he seemed to be getting more and more remote from the life he knew best, and in *The Pretty Lady* (1918) he wrote of London follies with more cunning than inspiration. Then, in 1923, with *Riceyman Steps,* a study of miserliness, he added another novel to the list of his masterpieces. Here, once more, he expressed what a critic has called "his vision of the astounding bizarrerie of daily life." It is the sincerity of that vision which has made Mr. Bennett as individual an interpreter of the life of his own time or people as Mr. Kipling or Sir J. M. Barrie. He can invest even what is uninteresting with prodigious interest, and the lives of the dull become exciting in his hands. We find the same appetite for life in his volumes of commonsense philosophy and in his causeries on books as in his novels and short stories. He is eagerly intent on the modern spectacle, and absorbs books, music, painting and ideas to a point at which less robust men would grow satiated. It is said that he misses the finer delicacies of prose but it is impossible to deny that he is an artist as well as a writer of genius. There is a buried poet—and Mr. Bennett has written and published verse—in a writer who can recreate as he has done the legend of the troubled lives of mortals and their pathetic and wonderful joys. Bennett died on March 27, 1931. (R. Ld.)

BENNETT, JAMES GORDON (1795–1872), American journalist, founder and editor of the New York *Herald,* was born at Newmills, Banffshire, Scotland, in 1795. He was educated for the Roman Catholic priesthood in a seminary at Aberdeen, but in the spring of 1819 he emigrated to America. After earning a meagre living as teacher, proof-reader and translator in Halifax (Nova Scotia), Boston, New York and Charleston (S.C.), he returned to New York, where he projected a school, gave lectures on political economy and did subordinate work for the journals. During the next ten years he was employed on various papers, was the Washington correspondent of the New York *Enquirer* and associate editor of the *Courier and Enquirer,* his articles attracting much attention. He founded the short-lived *Globe* in New York in 1832; and in 1833–34 was the chief editor and one of the proprietors of the *Pennsylvanian* at Philadelphia. On May 6 1835, he published the first number of a small one-cent paper bearing the title of New York *Herald* and issuing from a cellar in which the proprietor and editor played also the part of salesman.

In his initial issue he outlined his policy: "We shall support no party—be the agent of no faction or *coterie,* and care nothing for any election, or any candidate from president down to constable"; and to this he consistently adhered. By his industry, and sagacity he made the paper a great commercial success. He devoted attention particularly to the gathering of news and was the first to introduce many of the methods of the modern American reporter. He published on June 13 1835, the first Wall Street financial article to appear in any American newspaper; printed a vivid and detailed account of the great fire of Dec. 1835, in New York; was the first, in 1846, to obtain the report in full by telegraph of a long political speech; during the Civil War maintained a large staff of war correspondents; and was a leader in the use of illustrations. Bennett continued to edit the *Herald* almost till his death on June 1 1872.

His son, James Gordon Bennett (1841–1918), born May 10 1841, and educated abroad and by private tutors, shared his father's burdens after 1866, and succeeded his father in the control of the *Herald.* He founded the *Evening Telegram,* established a daily edition of the *Herald* in London and later in Paris, sent Henry M. Stanley on his mission to find Livingstone in Central Africa, fitted out the "Jeannette" Polar Expedition, and in 1883 organized (with John W. Mackay) the Commercial Cable Company. On May 14 1918, he died in France, whence he had long directed the policies of the New York *Herald.* In his will he provided for the establishment of the James Gordon Bennett Memorial Home for New York journalists, in memory of his father.

See I. C. Pray's *Memoirs of James Gordon Bennett and His Times* (1855); also shorter accounts in James Parton's *Famous Americans of Recent Times* (1867); W. G. Bleyer's *Main Currents in the History of American Journalism* (1927) and O. G. Villard's *Some Newspapers and Newspaper Men* (1926). The best biography is D. C. Seitz, *The James Gordon Bennetts* (1928). Personal impressions are given by A. S. Crockett, *When James Gordon Bennett Was Caliph of Bagdad* (1926).

BENNETT, JOHN HUGHES (1812–1875), English physician and pathologist, was born in London on Aug. 31, 1812. He was educated at Exeter and the university of Edinburgh, and in 1837 graduated with the highest honours. During the next four years he studied in Paris and Germany, and on his return to Edinburgh in 1841 published a *Treatise on Cod-liver Oil as a Therapeutic Agent.* In the same year he began to lecture as an extra-academical teacher on histology, drawing attention to the importance of the microscope in the investigation of disease; and as physician to the Royal Dispensary he instituted courses of "polyclinical

medicine." From 1843 to 1874 he was professor of the institutes of medicine at Edinburgh. He died on Sept. 25, 1875, at Norwich.

BENNETT, RICHARD BEDFORD (1870–), Canadian statesman. Born at Hopewell, New Brunswick, July 3, 1870, Mr. Bennett graduated at Dalhousie University, Halifax, and in 1893 was admitted to the bar. In 1897 he migrated westwards, serving in the legislative assemblies of the N.W. Territories and of Alberta. In 1911 he entered the House of Commons as member for Calgary. In 1917 he was Director General of National Service and in 1921, Attorney-General. In 1927 he became leader of the Conservative Party and in 1930 he was returned to office as Prime Minister. Strongly nationalist in economics, he was largely responsible for the Ottawa Conference in 1932. In October 1935 he was heavily defeated by the Liberals led by Mackenzie King whose policy leans towards reciprocity with the United States.

BENNETT, SIR WILLIAM STERNDALE (1816–1875), English musical composer, was born at Sheffield on April 13, 1816. He entered the choir of King's college chapel in 1824, and there studied the pianoforte besides composition at the Royal Academy. It was during this time that he wrote several of his most appreciated works, in which may be traced influences of the contemporary movement of music in Germany, which country he frequently visited during the years 1836–42. At one of the Rhenish musical festivals in Düsseldorf he made the acquaintance of Mendelssohn, and soon afterwards renewed it at Leipzig. Bennett was made musical professor at Cambridge in 1856, and was permanent conductor of the Philharmonic society from 1856 until 1866, when he became principal of the Royal Academy of Music. Among his best works may be mentioned his three sketches for pianoforte solo, *The Lake, The Millstream* and *The Fountain,* and his 3rd pianoforte concerto; for the orchestra, his symphony in G minor, and his overture *The Naiads;* and for voices, his cantata *The May Queen,* written for the Leeds Festival in 1858. For the jubilee of the Philharmonic society he wrote the overture *Paradise and the Peri* (1862); his sacred cantata the *Woman of Samaria* (first performed 1867) also achieved popularity, as did his *Maid of Orleans,* a sonata based on Schiller's tragedy which he produced shortly before his death. He was knighted in 1871. He died on Feb. 15, 1875.

BEN NEVIS, highest mountain in the British Isles, Inverness-shire, Scotland. It is 4,406ft. above sea level, 4½m. E.S.E. of Fort William, the meridian of 5° W. passing through it. From Banavie on the Caledonian canal, it shows two great masses, and though bulky is much less striking than many other Highland hills. Its summit is a plateau of 100ac. with a slight slope to the south and a sheer fall to the north-east of more than 1,500ft. Snow lies in some corries all the year round. The rocks of its lower half are mainly granite and gneiss, its upper half of porphyritic greenstone; a variety of minerals occur. Its circumference at the base is about 24m. It is flanked west and south by the glen and water of Nevis, on the east by the river and glen of Treig, and on the north by the river and glen of Spean. A bridle road up the mountain leaves Glen Nevis at Achintee; it has a gradient nowhere exceeding 1 in 5. It was made for the use of workers at the Meteorological observatory mentioned below: some of the bridges have fallen. A small hotel on the summit has long been closed and is in ruins, and the observatory maintained there from 1881 to 1905 was afterwards closed for lack of funds. Its observations showed mean temperatures of 23·4° in January and 41·7° in July at the summit, while at Fort William the figures were 38·7° and 57·1° respectively; the mean annual precipitation at the summit was 170·8in.; at Fort William, 80in.

BENNIGSEN, LEVIN AUGUST, COUNT VON (1745–1826), Russian general, of Hanoverian family, was born Feb. 10, 1745, in Brunswick, and served in the Hanoverian Army until 1764. In 1773 he entered the Russian service as a field officer. He fought against the Turks in 1774 and in 1778, becoming lieutenant-colonel in the latter year. He distinguished himself repeatedly in the Polish War of 1793–94 and in the Persian War of 1796. The part played by Bennigsen in the actual assassination of the tsar Paul I. is not fully known, but he took a most active share in the formation and conduct of the conspiracy. Alexander I. made him governor-general of Lithuania in 1801, and in 1802 a general of cavalry. In 1806 he was in command of one of the Russian armies operating against Napoleon, when he fought the battle of Pultusk and met the emperor in person in the sanguinary battle of Eylau (Feb. 8, 1807). Here he could claim to have inflicted the first reverse suffered by Napoleon, but six months later Bennigsen met with the crushing defeat of Friedland (June 14, 1807), the direct consequence of which was the Treaty of Tilsit. Bennigsen now retired for some years, but in the campaign of 1812 he fought at Borodino, and defeated Murat in the engagement of Tarutino, but on account of a quarrel with Marshal Kutusov he was compelled to retire. After the death of Kutusov he was recalled and placed at the head of an army. Bennigsen led one of the columns which made the decisive attack on the last day of the battle of Leipzig (Oct. 16–19, 1813). On the same evening he was made a count by the emperor Alexander I., and he afterwards commanded the forces which operated against Marshal Devout in North Germany. He retired from active service in 1818, and settled on his Hanoverian estate of Banteln near Hildesheim. Count Bennigsen died on Dec. 3, 1826. His son, ALEXANDER LEVIN, count von Bennigsen (1809–93), was a distinguished Hanoverian statesman.

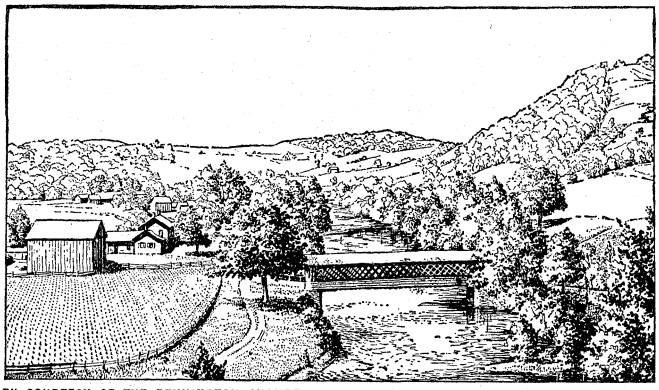
BENNIGSEN, RUDOLF VON (1824–1902), German politician, was born at Lüneburg on July 10 1824, the son of an officer in the Hanoverian army. In 1855 he was elected a member of the second chamber and at once became the recognized leader of the Liberal opposition to the reactionary Government. He must be distinguished from Count Bennigsen, a member of the same family and son of the distinguished Russian general, who was also one of the parliamentary leaders at the time. Bennigsen was founder and president of the National Verein, a society which arose out of the public excitement created by the war between France and Austria, and had for its object the formation of a national party which should strive for the unity and the constitutional liberty of the whole Fatherland. It united the moderate Liberals throughout Germany and at once became a great political power, notwithstanding all the efforts of the Governments and especially of the king of Hanover to suppress it. In 1866 Bennigsen used all his influence to keep Hanover neutral in the conflict between Prussia and Austria, but in vain. In May of this year he had an important interview with Bismarck, who wished to secure his support for the reform of the confederation, and after the war was over at once accepted the position of a Prussian subject, and took his seat in the diet of the North German Confederation and in the Prussian parliament. He used his influence to procure as much autonomy as possible for the province of Hanover, but he was a strong opponent of the Guelph party. The National Verein, its work being done, was now dissolved; but Bennigsen was one of the founders of a new political party—the National Liberals—who, while they supported Bismarck's national policy, hoped to secure the constitutional development of the country. For the next 30 years he was president of the party. Many amendments suggested by him were introduced in the debates on the constitution; in 1870 he undertook a mission to South Germany to strengthen the national party there, and was consulted by Bismarck while at Versailles. It was he who brought about the compromise on the military bill in 1874. In 1877 he was offered the post of vice-chancellor with a seat in the Prussian ministry, but refused it because Bismarck or the king would not agree to his conditions. From this time his relations with the Government were less friendly, and in 1878 he brought about the rejection of the first Socialist bill. In 1883 he resigned his seat in parliament owing to the reactionary measures of the Government, which made it impossible for him to continue his former co-operation with Bismarck, but returned in 1887 to support the coalition of national parties. One of the first acts of the emperor William II. was to appoint him president of the province of Hanover. In 1897 he resigned this post and retired from public life. He died on Aug. 7 1902.

See H. Oncken, *Rudolf von Bennigsen* (1910); *Rudolf von Bennigsens Reden,* ed. W. Schultze and F. Thimme (Halle a.d.S., 1911, etc.).

BENNINGTON, a town in the south-west part of Vermont, U.S.A., 35m. N.E. of Albany, on the Rutland Railroad, and

at the intersection of main highways from three States; the county-seat of Bennington county. The population in 1940 was 7,628.

Bennington is picturesquely situated on the Walloomsac river, at the foot of the Green mountains. Nearby is Mt. Anthony (2,345ft.) which commands a wonderful view. There is an apple orchard of 3,500ac. 6m. from the village. The distinctive manufactures are knit goods, woollen fabrics, paper, fine furniture, brushes and waxed paper. The historical museum and art gallery has important collections. The Vermont soldiers home, Walloomsac inn (established in 1764), the oldest tavern in the State, and the Old First church (built in 1804–05) are points of historic interest. "Old Bennington," the part first settled, is a beautiful village, with many well-preserved colonial houses.



BY COURTESY OF THE BENNINGTON CHAMBER OF COMMERCE

THE COUNTRY-SIDE ABOUT BENNINGTON, VERMONT, WITH ONE OF FEW REMAINING WOODEN-COVERED BRIDGES IN THE FOREGROUND

The town was surveyed in 1749, by the order of Governor Benning Wentworth of New Hampshire, after whom it was named, and was one of the "New Hampshire Grants" disputed by New York. The first log-cabin was built in 1761, the town was organized in 1762, and the village was incorporated in 1849. It was the home of Ethan Allen and Seth Warner, and the centre of the activities of the "Green Mountain Boys." During the Revolutionary War an important supply base of the Continental Army was maintained here. Gen. Burgoyne, on his way to New York from Canada in 1777, sent two detachments of his army (including Germans and Indians) to seize the stores. They were decisively defeated by Gen. John Stark in a battle fought on Aug. 16 on New York soil about 6m. W. of the village and this had an important influence on Burgoyne's campaign. The battle is commemorated by a monument 301ft. high. The flag raised at this battle is said to be the oldest "stars and stripes" in existence. In 1828–29 William Lloyd Garrison lived here, and published *The Journal of the Times*. The pottery industry, established by Captain John Norton in 1793, flourished for a century, and its products are much sought by collectors.

BENNO (1010–1106), bishop of Meissen, Germany, son of Werner, count of Woldenburg, was educated at Gosslar, and in 1066 was nominated by the emperor Henry IV. to the see of Meissen. In the troubles between empire and papacy that followed, Benno took part against the emperor. In 1085 he was deposed by the synod of Mainz, but after the death of Pope Gregory VII. he submitted, and on the recommendation of the imperialist Pope Clement III. was restored to his see, which he held till his death. His canonization (1523) drew from Luther a violent brochure "against the new false god and old devil, who is to be lifted up at Meissen."

For bibliography *see* Ulysse Chevalier, *Répertoire des sources hist., Bio-bibliographie, s.v.* "Bennon."

BENOÎT, PETER LEONARD LEOPOLD (1834–1901), Flemish composer, was born on Aug. 17, 1834, at Harlebeke, Flanders. In 1851 he entered the Brussels conservatoire, where he studied under Fétis. During this period he composed music to many melodramas, and to an opera *Le Village dans les montagnes* for the Park theatre, of which in 1856 he became conductor. He won a government prize and a money grant in 1857 by his cantata *Le Meurtre d' Abel,* and this enabled him to travel through Germany. In the course of his travels he wrote an essay *L'École de musique flamande et son avenir.* On his return he produced at Brussels his *Messe Solennelle,* which was praised by Fétis. In 1861 he visited Paris for the production of his opera *Le Roi des Aulnes* ("Erlkönig"), which, though accepted by the Théâtre Lyrique, was never mounted; while there he conducted at the Bouffes-Parisiens. Returning to Belgium he produced at Antwerp a sacred *tetralogy,* consisting of his *Cantate de Noël,* the above-mentioned *Mass,* a *Te Deum* and a *Requiem,* written in accordance with his own special theory. Later he gathered round him a small band of enthusiasts, who strove, but with little success, to form a national Flemish school whose music should differ completely from that of the French and German schools. Benoît's more important compositions include the Flemish oratorios *De Schelde* and *Lucifer,* the latter of which met with complete failure on its production in London in 1888; the operas *Het Dorp int Gebirgte* and *Isa,* the *Drama Christi;* an enormous mass of songs, choruses, small cantatas and motets. He died at Antwerp, March 8, 1901.

See Stoffel's, *Peter Benoît* (1901).

BENOÎT DE SAINTE-MORE or **SAINTE-MAURE,** 12th century French troubadour, supposed author of the *Chronique des ducs de Normandie* and the *Roman de Troie.* It cannot, however, be regarded as certain that the Benoît of the *Chronique* is the same person as the Benoît who wrote the romance of Troy. Wace in his *Roman de Rou* brought down Norman history to the reign of Henry I., but here Henry II. seems to have withdrawn his patronage, and at the end of his poem Wace refers to a *maistre Beneeit* who had received a similar commission. There is no other contemporary poem extant dealing with the subject except the *Chronique des ducs de Normandie,* and Wace's rival has been commonly identified with Benoît de Sainte-More. The poem contains over 40,000 lines, and relates the history of the Norman dukes from Rollo to Henry I., with a preliminary sketch of the Danish invasions and the adventures of Hastings and his companions. Benoît drew his information from the *De moribus et actis primorum Normanniae ducum* of Dudon de Saint Quentin as far as 1002 and then followed the chronicle of William of Jumièges, also of Ordericus Vitalis and others. The *Chronique* probably dates from about 1172 to 1176. In the *Roman de Troie,* written about 1160, Benoît expressly asserts his authorship. He mentions "Omers" with great respect as *li clers merveillos,* but his authority for the story is naturally not Homer but the apocryphal *Historia de excidio Trojae* of Dares the Phrygian, possibly in an amplified version now lost, and the *Ephemerides belli Trojani* of Dictys of Crete. The poem runs to about 30,000 lines. The personages of the classical story are converted into heroes of romance. They have their castles and their abbeys, and act in accordance with feudal custom. In the *Roman de Troie* first appeared the episode of Troïlus and Briseïda, that was to be developed later in the *Filostrato,* which in its turn formed the basis of Chaucer's *Troilus and Creseide.* The Shakespearian play of *Troilus and Cressida* is also indirectly derived from Benoît's story.

On the strength of a certain similarity of treatment Benoît has sometimes been credited with the authorship of the anonymous *Roman d'Énéas* and of the *Roman de Thèbes,* a romance derived indirectly from the *Thebaïs* of Statius. M. Constans is inclined to negative both these attributions.

The *Chronique des ducs de Normandie* was edited by Francisque Michel in 1836–44; the *Roman de Troie* by A. Joly in 1870–71 and by L. Constans (6 vols., 1904–12) the *Énéas,* by J. J. Salverda de Grave in H. Suchier's *Bibliotheca Normannica* in 1891; the *Roman de Thebès* for the *Société des anciens textes français,* by M. L. Constans in 1890. *See* E. D. Grand in *La Grande Encyclopédie;* L. Constans in Petit de Julleville's *Hist. de la langue et de la litt. française* (vol. i., pp. 171–225), where the three romances are analysed at length. The prefaces to the editions just mentioned discuss the authorship of the romances.

BENSBERG, a large commune (Landgemeinde), in the Mülheim district of Rhenish Prussia, Germany, south of Bergisch Gladbach. Pop. (1939) 15,573. It manufactures metals, leather and explosives.

BENSERADE, ISAAC DE (1613–1691), French poet, was born in Paris, and baptized on Nov. 5, 1613. He enjoyed the patronage of Richelieu, and then of Anne of Austria. He wrote some indifferent plays, but enjoyed a great reputation until the failure of his version (1676) of the *Metamorphoses* of Ovid. Benserade would probably be forgotten but for his sonnet on Job (1651). This sonnet, which he sent to a young lady with his paraphrase on Job, having been placed in competition with the *Urania* of Voiture, a dispute on their relative merits long divided the whole court and the wits into two parties, styled respectively the *Jobelins* and the *Uranists*. The partisans of Benserade were headed by the prince de Conti and Mlle. de Scudéry, while Mme. de Montausier and J. G. de Balzac took the side of Voiture.

Some years before his death Oct. 19, 1691, Benserade retired to Chantilly, and devoted himself to a translation of the Psalms, which he nearly completed.

BENSLEY, ROBERT (d. *c.* 1809), English actor praised by Charles Lamb in the *Essays of Elia,* played important parts at the Drury Lane, Covent Garden, and Haymarket theatres from 1765 to 1796. His most successful rôle was Malvolio.

BENSON, EDWARD WHITE (1829–1896), archbishop of Canterbury, was born on July 14, 1829, at Birmingham, the son of a manufacturing chemist, who came of a family of Yorkshire dalesmen. He was educated at King Edward VI.'s school, Birmingham, and Trinity college, Cambridge, graduated in 1852 as a senior optime, 8th classic and senior chancellor's medallist, and became a fellow of his college. He was ordained deacon in 1854 and priest in 1856. He was assistant master at Rugby, for the latter part of the time under Frederick Temple, who became his life-long friend, and then (1859–68) headmaster of the newly founded Wellington College. He had married in 1859 his cousin, Mary Sidgwick. He became prebendary of Lincoln and examining chaplain to the bishop in 1868, and in 1872 chancellor of the diocese. Early in 1877 he was appointed to the new see of Truro. The new bishop put fresh life into the organization of the church in Cornwall, and during his tenure of office Truro Cathedral was built and (1887) consecrated. On the death of Dr. Tait, Benson was nominated to the see of Canterbury, and enthroned on March 29, 1883.

Frequent communications passed between him and the heads of the Eastern churches. With their approval a bishop was again consecrated, after six years' interval (1881–87), for the Anglican congregations in Jerusalem and the East; and the features which had made the plan objectionable to many English churchmen were now abolished. In 1886, after much careful investigation, he founded the "Archbishop's Mission to the Assyrian Christians," having for its object the instruction and the strengthening from within of the "Nestorian" churches. An interchange of courtesies with the Metropolitan of Kiev on the occasion of the 900th anniversary of the conversion of Russia (1888), led to a friendlier feeling between the English and Russian churches, but with the efforts towards a *rapprochement* with the Church of Rome the archbishop would have nothing to do.

With the other churches of the Anglican Communion the archbishop's relations were cordial in the extreme. He sat on the ecclesiastical courts commission (1881–83) and the sweating commission (1888–90). He brought bills into parliament to reform church patronage and church discipline. The latter became law in 1892, and the former was merged in the Benefices bills, which passed in 1898, after his death. He wrote and spoke against Welsh disestablishment (1893); and under his guidance, the existing agencies for church defence were consolidated. He helped to establish the House of Laymen in the province of Canterbury (1886). The most important ecclesiastical event of his primacy was the judgment in the case of the bishop of Lincoln (*see* LINCOLN JUDGMENT). In 1896 the archbishop went to Ireland. He was received with enthusiasm, but the tour fatigued him. On Sunday morning Oct. 11, just after his return, he was on a visit to Mr. Gladstone, when he died in Hawarden parish church, suddenly, from heart failure.

Archbishop Benson left numerous writings, including an essay on "The Cathedral" (1878), and charges, sermons and addresses. But his two chief works, posthumously published, are his *Cyprian* (1897), which had occupied him at intervals since early manhood; and *The Apocalypse, an Introductory Study* (1900), interesting and beautiful, but limited by the fact that the method of study is that of a Greek play, not of a Hebrew apocalypse. The archbishop's knowledge of the past was both wide and minute, but it was that of an antiquary rather than of a historian. "I think," writes his son, "he was more interested in modern movements for their resemblance to ancient than vice versa." He wrote some hymns, including "O Throned, O Crowned," and a beautiful version of *Urbs Beata.* His "grandeur in social function" was unequalled and his interests were very wide. But above all else he was a great ecclesiastic. He paid less attention to secular politics than Archbishop Tait; but if a man is to be judged by the effect of his work, it is Benson and not Tait who should be described as a great statesman. His biography, by his son, reveals him as a man of devout and holy life, impulsive indeed and masterful, but one who learned self-restraint by strenuous endeavour.

See A. C. Benson, *Life of Archbishop Benson* (1899); J. H. Bernard, *Archbishop Benson in Ireland,* 1897; Sir L. T. Dibden, in the *Quarterly Review,* Oct. 1897.

His eldest son, ARTHUR CHRISTOPHER BENSON (1862–1925), was educated at Eton and King's College, Cambridge. He was a master at Eton College from 1885 to 1903. His literary capacity was early shown in the remarkable fiction of his *Memoirs of Arthur Hamilton* (1886) under the pseudonym of "Christopher Carr," and his *Poems* (1893) and *Lyrics* (1895) established his reputation as a writer of verse. Among his works are *Fasti Etonenses* (1899); his father's *Life* (1899); *The Schoolmaster* (1902), a commentary on the aims and methods of an assistant schoolmaster in a public school; a study of Archbishop Laud (1887); monographs on D. G. Rossetti (1904), Edward Fitz-Gerald (1905) and Walter Pater (1906), in the "English Men of Letters" series; *Lord Vyet and other Poems* (1897), *Peace and other Poems* (1905), *The Upton Letters* (1905), *From a College Window* (1906), *Beside Still Waters* (1907). He collaborated with Lord Esher in editing the *Correspondence of Queen Victoria* (1907). Benson wrote the words of the anthem "Land of Hope and Glory." Some of these writings, and above all, *From a College Window,* have had an extraordinary vogue in the United States. He wrote in all some 50 books. He went to reside in Cambridge in 1904. He was elected a fellow of Magdalene College, and in 1915 became its master. He entertained lavishly, and did the honours of the college with grace and dignity. He died June 17, 1925. He never married. He left a large fortune mainly the result of his literary work. He bequeathed £2,000 to his college "as an hospitality fund."

See *Selections from his Diary,* edited by Percy Lubbock (1926).

The third son, EDWARD FREDERICK BENSON (1867–1940), was educated at Marlborough College and King's College, Cambridge. He worked at Athens for the British Archaeological Society from 1892 to 1895, and later in Egypt for the Hellenic Society. In 1893 his society novel, *Dodo,* brought him to the front among the writers of clever fiction; and this was followed by other novels, notably *The Vintage* (1898) and *The Capsina* (1899), the subjects of which were drawn from modern Greece. Among his later works may be mentioned *The Challoners* (1904), *David of King's* (1924) and *Mezzanine* (1926).

The fourth son, ROBERT HUGH BENSON (1871–1914), was educated at Eton and at Trinity College, Cambridge. After reading with Dean Vaughan at Llandaff he took orders, and in 1898 became a member of the Community of the Resurrection at Mirfield. In 1903 he became a Roman Catholic, was ordained priest at Rome in the following year, and returned to Cambridge as assistant priest of the Roman Catholic church there. He achieved remarkable success as a preacher, also as a novelist, his best novels being historical romances intended to serve also as Catholic propaganda. A small volume of poems (Dec. 1914) was published after his death. He became a Papal Chamberlain in 1911. He died on Oct. 19, 1914, after a short illness at Salford, where he was conducting a mission.

Among his numerous publications are *The Light Invisible, By What*

Authority? The King's Achievement, Richard Raynal, Solitary, The Queen's Tragedy, The Sentimentalists, Lords of the World. See his *Life* by C. C. Martindale, S.J., and *Hugh* by A. C. Benson.

BENSON, SIR FRANK (ROBERT) (1858–1939), English actor, son of William Benson of Alresford, Hants, was born on Nov. 4, 1858. While at New college he produced the first Oxford Greek play, the *Agamemnon.* He made his first professional appearance at the Lyceum, under Irving, in *Romeo and Juliet,* as Paris, in 1882. In the next year he went into managership with a company of his own, taken over from Walter Bentley. In 1886 he married Gertrude Constance Featherstonhaugh, who acted in his company and continued to play leading parts with him. Besides appearing in London he toured regularly in Shakespeare, and went to Canada (1913) and South Africa (1921). His finest parts were Hamlet, Coriolanus, Richard II, Lear, and Petruchio. By his organization of a regular touring company, and by his foundation of a dramatic school of acting in 1901, Benson exercised a most important influence on the contemporary stage. From the first he devoted himself largely to the production of Shakespeare's plays. After 1888 he organized 26 of the annual Stratford-on-Avon Shakespearian Festivals. He was knighted in 1916.

BENSON, FRANK WESTON (1862–), American painter, was born in Salem (Mass.), March 24, 1862. He was a pupil of Boulanger and of Lefebvre in Paris; won a silver medal at the Paris exhibition (1900); the Potter Palmer medal and prize, Chicago (1910); Logan prize, Chicago society of etchers (1918); William A. Clark prize and Corcoran gold medal (1919), and became a member of the "Ten Americans," and of the national academy of design, New York. In addition to his reputation as a painter, he achieved success with his etchings and wash drawings of wild fowl, a field in which his talent is especially spontaneous and happy. He was one of the decorators of the Congressional library, Washington (D.C.).

BENSON, GEORGE (1699–1762), English dissenting minister, was born at Great Salkeld, in Cumberland. His most important works are: *History of the First Planting of the Christian Religion* (1738); *Reasonableness of the Christian Religion* (1743); the *History of the Life of Jesus Christ,* posthumously published in 1764.

BENSON, WILLIAM SHEPHERD (1855–1932), American naval officer, was born at Macon, Ga., on Sept 25, 1855. He graduated from the U.S. Naval academy in 1877; became captain in 1909, and rear admiral in 1915. He had been commandant of the Philadelphia Navy Yard for two years when, in 1915, he was appointed chief of naval operations. He was a member of the commission appointed to confer with the Allied Powers in 1917, and was appointed naval representative for preparing the terms of the Armistice (1918) and naval adviser to the American peace commission. He was retired automatically in 1919, with the rank of rear-admiral. In 1920 he was appointed chairman of the U.S. shipping board and made admiral for life.

BENT, JAMES THEODORE (1852–1897), English traveller, was the son of James Bent of Baildon house, near Leeds, Yorkshire, where he was born on March 30, 1852. He was educated at Repton school and Wadham college, Oxford, where he graduated in 1875. He spent considerable time in the Aegean archipelago, of which he wrote in *The Cyclades; or Life among the Insular Greeks* (1885). The years 1885–88 were given up to archaeological investigations in Asia Minor, his discoveries being communicated to the *Journal of Hellenic Studies* and other publications. In 1889 he undertook excavations in the Bahrein islands of the Persian gulf, and found evidence that they had been a primitive home of the Phoenician race. After an expedition in 1890 to Cilicia Trachea Bent spent a year in South Africa. He made the first detailed examination of the remarkable ruins at Great Zimbabwe. Bent described his work in *The Ruined Cities of Mashonaland* (1892). In 1893 he investigated the ruins of Axum and other places in the north of Abyssinia, partially made known before by the researches of Henry Salt and others, and *The Sacred City of the Ethiopians* (1893) gave an account of this expedition. Bent now visited at considerable risk the almost unknown Hadramut country (1893–94), and during this and later journeys in southern Arabia he studied the ancient history of the country, its physical features and actual condition. On the Dhafar coast in 1894–95 he visited ruins which he identified with the Abyssapolis of the frankincense merchants. In 1895–96 he examined part of the African coast of the Red sea, finding there the ruins of a very ancient gold-mine and traces of what he considered Sabean influence. While on another journey in south Arabia (1896–97), Bent was seized with malarial fever, and died in London on May 5, 1897, a few days after his return. Mrs. Bent, who had contributed by her skill as a photographer and in other ways to the success of her husband's journeys, published in 1900 *Southern Arabia, Soudan and Sakotra,* in which were given the results of their last expedition into that region. The conclusions at which Bent arrived as to the Semitic origin of the ruins in Mashonaland have not been accepted by archaeologists, but the value of his pioneer work is undeniable (*see* ZIMBABWE).

BENTHAM, GEORGE (1800–1884), English botanist, was born at Stoke near Portsmouth on Sept. 22, 1800. His father, Sir Samuel Bentham (1757–1831), the only brother of Jeremy Bentham, was a naval architect in the service of the empress Catherine II. of Russia. The Bentham family spent much time on the Continent, and after 1815 settled at Montpellier. There George read A. P. de Candolle's *Flore française* and was much impressed with its analytical tables. He began forthwith to collect the materials for his first botanical work, *Catalogue des plantes indigènes des Pyrénées et du Bas Languedoc* (1826). From 1826–32 he acted as secretary to his uncle, Jeremy Bentham, and studied for the bar at Lincoln's Inn. But the inheritance of his father's and his uncle's fortunes made him independent, and enabled him to spend his time in his herbarium and his library.

In 1854 he found the maintenance of a herbarium and library too great a tax on his means. He therefore offered them to the Government on the understanding that they should form the foundation of such necessary aids to research in the Royal Botanic Gardens at Kew. In 1858 his *Handbook of the British Flora* was published, and has been reprinted several times (ed. 7, 1924). The government, in 1857, sanctioned a scheme for the preparation of a series of Flora of British colonies and possessions. Bentham began with the *Flora Hongkongensis* in 1861. This was followed by the *Flora Australiensis,* in seven volumes (1863–78). His greatest work was the *Genera Plantarum,* 3 vol. (1862–83) in collaboration with Sir Joseph Hooker. He seemed at last only to live for the completion of this monumental work. He died on Sept. 10, 1884.

During the period 1826–32, he wrote the *Outline of a New System of Logic, with a Critical Examination of Dr. Whateley's Elements of Logic* (1827) and a number of articles on various legal subjects. In his *Outline* the principle of the qualification of the predicate was explicitly stated for the first time.

See B. D. Jackson, *George Bentham* (English Men of Science Series, 1906), and *Ann. Bot.,* vol. xii (1898).

BENTHAM, JEREMY (1748–1832), English philosopher and jurist, was born on Feb. 15, 1748, in Red Lion street, Houndsditch, London, the son of an attorney. His father afterwards retired to a country house near Reading, where young Jeremy spent many happy days. At the age of three the child is said to have read eagerly such works as Rapin's *History* and to have begun the study of Latin. While at Westminster school he obtained a reputation for Greek and Latin verse writing, and he was only 13 when he matriculated at Queen's college, Oxford, where his most important acquisition seems to have been a thorough acquaintance with Sanderson's *Logic.* He took his degree in 1763, and in the same year entered Lincoln's Inn, and took his seat as a student in the Queen's Bench, where he listened with rapture to the judgments of Lord Mansfield. He managed also to hear Blackstone's lectures at Oxford, but says that he immediately detected the fallacies which underlay the rounded periods of the future judge. He spent his time in making chemical experiments and in speculating upon legal abuses rather than in reading Coke upon Littleton and the Reports. On being called to the bar he "found a cause or two at nurse for him, which

he did his best to put to death," to the bitter disappointment of his father, who had confidently looked forward to seeing him upon the Woolsack.

The first fruits of Bentham's studies, the *Fragment on Government,* appeared in 1776. The subtitle, "an examination of what is delivered on the subject of government in the Introduction to William Blackstone's Commentaries," indicates the nature of the work. Bentham found the "grand and fundamental" fault of the *Commentaries* to be Blackstone's "antipathy to reform." This book, written in a clear and concise style very different from that of Bentham's later works, may be said to mark the beginning of philosophic radicalism. This attack upon Blackstone's praises of the English Constitution was variously attributed to Lord Mansfield, Lord Camden and Lord Ashburton. Lord Shelburne (afterwards first marquess of Lansdowne) read the book, and called upon its author in 1781 in his chambers at Lincoln's Inn. Henceforth Bentham was a frequent guest at Bowood, where he met Miss Caroline Fox (daughter of the second Lord Holland), to whom he afterwards made a proposal of marriage. At this period Bentham's mind was much occupied with his *Rationale of Punishments and Rewards,* which was published in French by Etienne Dumont in 1811, but only appeared in English in 1825. In 1785 Bentham started, by way of Italy and Constantinople, on a visit to his brother, Samuel Bentham, a naval engineer, holding the rank of colonel in the Russian service; and it was in Russia that he wrote his *Defence of Usury* (pr. 1787). This, his first essay in economic science, cast in the form of a series of letters from Russia, shows him as a disciple of Adam Smith, but one who insisted on the extreme logical application of Smith's principles. He argued that every man was the best judge of his own interest, that it was desirable from the public point of view that he should seek it without hindrance, and that there was no reason for limiting the application of this doctrine in the matter of lending money at interest. His later works on political economy followed the *laissez-faire* principle, though with modifications. In the *Manual of Political Economy,* first partially printed by Dumont in the *Bibliothèque britannique* (Geneva 1798) he gives a list of the *agenda* and *non-agenda* for the State, the former being a very short and the latter an extended list. The book is a re-statement of Adam Smith's point of view from the philosophical and political standpoint.

Disappointed after his return to England in 1788 in the hope which he had entertained of making a career in political life, he settled down to discovering the principles of legislation. The great work, upon which he had been engaged for many years, the *Introduction to Principles of Morals and Legislation,* was published in 1789. In this book he defines the principle of utility, as "that property in any object whereby it tends to produce pleasure, good or happiness, or to prevent the happening of mischief, pain, evil or unhappiness to the party whose interest is considered." Mankind, he said, was governed by two sovereign motives—pain and pleasure, and the principle of utility recognized this subjection. The object of all legislation must be the "greatest happiness of the greatest number" (the phrase appears to have originated with Beccaria) and Bentham's insistence on this is not successfully reconciled with his individualist principle of utility; he did in fact advocate certain economic measures on succession and taxation which were in conflict with individualism. On the legal side he deduced from the principle of utility that since all punishment is itself evil it ought only to be admitted "so far as it promises to exclude some greater evil."

The fame of the *Principles* spread widely and rapidly. Bentham was made a French citizen in 1792; and his advice was respectfully received in most of the States of Europe and America, with many of the leading men of which he maintained an active correspondence; one of the most curious of these exchanges is with Mehemet Ali. In 1817 he became a bencher of Lincoln's Inn. His ambition was to be allowed to prepare a code of laws for his own or some foreign country. The codification of law was one of his chief preoccupations, but he seems to have underestimated its difficulties and to have overlooked the necessity of diversity of institutions adapted to the tradition and civilization of different countries. In his conception of the treatment of criminals Bentham was far in advance of his age, and must be reckoned among the pioneers of prison reform. It is true that the particular scheme he worked out was bizarre, and spoiled by the elaborate detail which Bentham loved. Under his scheme he believed "morals would be reformed, health preserved, industry invigorated, instruction diffused. . . ." During nearly a quarter of a century he was engaged in negotiations with the Government for the erection of a "Panopticon," for the central inspection of convicts: these were eventually abandoned, and Bentham received in 1813, in pursuance of an act of parliament, £23,000 by way of compensation. In 1797–98 he studied the poor law question, and put forward suggestions which were not dissimilar from those actually adopted in 1834. It was at a later period of his life that he propounded schemes for cutting canals through the isthmus of Suez and the isthmus of Panama.

In 1823 he established the *Westminster Review,* to spread the principles of philosophic radicalism. Bentham had been brought up a Tory, but he had changed his political ideas and had come to believe that his ideal of general happiness could only be accomplished under democratic institutions. As far back as 1809 he had written a tract, *A Catechism of Parliamentary Reform,* which advocated annual elections, equal electoral districts, a wide suffrage and the secret ballot, but it was not published till 1817. He drafted a series of resolutions on reform based on this tract which were moved in the House of Commons in 1818. Bentham died in Queen's Square place on June 6, 1832, in his 85th year. In accordance with his directions, his body was dissected in the presence of his friends, and the skeleton is still preserved in University college, London. At the time of his death he was working on his Constitutional Code, the first volume of which had appeared in 1827.

Bentham's life was a happy one for its kind. He gathered around him a group of congenial friends and pupils, such as the Mills, the Austins and Bowring, with whom he could discuss the problems upon which he was engaged, and by whom several of his books were practically rewritten from the mass of rough though orderly memoranda which the master had himself prepared. Thus, for instance, the *Rationale of Judicial Evidence* was written out by J. S. Mill, and the *Book of Fallacies* by Bingham. The services which Etienne Dumont rendered in recasting as well as translating the works of Bentham were still more important. It is often difficult to distinguish what part of the work is Bentham's and what is due to his assistants.

A graphic account is given by the American minister, Richard Rush (in *Residence at the Court of London*), of an evening spent at his London house in the summer of the year 1818. "If Mr. Bentham's character is peculiar," he says, "so is his place of residence. It was a kind of blind alley, the end of which widened into a small, neat courtyard. There by itself stands Mr. Bentham's house. Shrubbery graced its area and flowers its window-sills. It was like an oasis in the desert. Its name is the Hermitage. Mr. Bentham received me with the simplicity of a philosopher. I should have taken him for seventy or upwards. . . . The company was small but choice—Mr. Brougham, Sir Samuel Romilly, Mr. Mill, author of a well-known work on India, M. Dumont, the learned Genevan, once the associate of Mirabeau, were all who sat down to table."

Whether or not he can be said to have founded a school, many of Bentham's doctrines have become so far part of the common thought of the time that there is hardly an educated man who does not accept as too clear for argument some truths which were invisible till Bentham pointed them out. His sensitively honourable nature was shocked by the enormous abuses which confronted him on commencing the study of the law. He rebelled at hearing the system under which they flourished described as the perfection of human reason. But he was no merely destructive critic. He was determined to find a solid foundation for both morality and law, and to raise upon it an edifice, no stone of which should be laid except in accordance with the deductions of the severest logic. Most of Bentham's conclusions result from the application of a rigorous common sense to the

facts of society. J. S. Mill said of his work: "There is hardly anything in Bentham's philosophy which is not true. The bad part of his writings is his resolute denial of all that he does not see; of all truths but those which he recognizes."

As a jurist he inquires of all institutions whether their utility justifies their existence. If not, he is prepared to suggest a new form of institution by which the needful service may be rendered. English institutions had never before been so comprehensively and dispassionately surveyed. His writings have been and remain a storehouse of instruction for statesmen, an armoury for legal reformers. "Pillé par tout le monde," as Talleyrand said of him, "il est toujours riche." To trace the results of his teaching in England alone would be to write a history of the legislation of half a century. Upon the whole administrative machinery of government, upon criminal law and upon procedure, both criminal and civil, his influence has been most salutary; and the great legal revolution which in 1873 purported to accomplish the fusion of law and equity is not obscurely traceable to the same source. Those of Bentham's suggestions which have hitherto been carried out have affected the matter or contents of the law. The hopes which have been from time to time entertained, that his suggestions for the improvement of its form and expression were about to receive the attention which they deserved, have hitherto been disappointed.

BIBLIOGRAPHY.—Bentham's *Works,* together with an Introduction by J. Hill Burton, selections from his correspondence and a biography, were published by Dr. Bowring, in eleven closely printed volumes (1838–1843). This edition does not include the *Deontology,* which, much rewritten, had been published by Bowring in 1834. Translations of the *Works* or of separate treatises have appeared in most European languages. Large masses of Bentham's mss., mostly unpublished, are preserved at University college, London (*see* T. Whittaker's *Report,* 1892, on these mss., as newly catalogued and reclassified by him in 155 parcels); also in the British Museum (*see* E. Nys, *Études de droit international et de droit politique,* 1901, pp. 291–333). *See* farther on the life and writings of Bentham: L. Stephen, *The English Utilitarians* (1900), vol. i.; C. M. Atkinson, *Jeremy Bentham* (1905); A. C. Doyle, *Jeremy Bentham, Selected Bibliography* (1899); O. Kraus, *Zur theorie des Wertes* (Berlin, 1901); C. M. Atkinson, *Jeremy Bentham* (1905); J. McCunn, *Six Radical Thinkers* (1910); W. R. Sorley, *Bentham and the Early Utilitarians* (1914); H. G. Lundin, "Influence of J. Bentham on English Democratic Development" (University of Iowa *Studies,* vol. vii., 1920); Graham Wallas, *Jeremy Bentham* (1922); C. Philipson, *Three Criminal Law Reformers* (1923).

BENTHAMISM means the views, especially the ethical views, of Jeremy Bentham (*q.v.*). It is sometimes used as synonymous with Utilitarianism (*q.v.*). (*See* also ETHICS, HISTORY OF.)

BENTHOS, the name used to denote collectively the sedentary bottom-living animal and plant life of the sea, in contradistinction to the drifting plankton (*q.v.*) and actively-swimming nekton (*q.v.*). *See* MARINE BIOLOGY.

BENTINCK, LORD WILLIAM (1774–1839), governor-general of India, second son of the 3rd duke of Portland, was born on Sept. 14, 1774. He entered the army, rose to the rank of lieutenant-colonel and was present at Marengo. In 1803 he was nominated governor of Madras, where he quarrelled with the chief justice, Sir Henry Gwillim, and several members of his council. The sepoy mutiny at Vellore in 1807 led to his recall. His name was considered at this time for the post of governor-general, but Lord Minto was selected instead: and it was not until twenty years later that he succeeded Lord Amherst in that office. His governor-generalship (1827–35) was notable for many reforms, chief among which were the suppression of the Thugs (*q.v.*), the abolition of suttee, and the making of the English language the basis of education in India. Lord William's administration was essentially peaceful, but progressive and successful. He died in Paris on June 17, 1839.

See Demetrius C. Boulger, *Lord William Bentinck,* in the "Rulers of India" series (1892).

BENTINCK, LORD WILLIAM GEORGE FREDERICK CAVENDISH, better known as LORD GEORGE BENTINCK (1802–1848), British politician, was the second surviving son of the fourth duke of Portland, by Henrietta, sister of Viscountess Canning, and was born on Feb. 27 1802. He served in the army for some years, and entered parliament in 1828 for King's Lynn, which he represented for 20 years. Till within three years of his death he was little known out of the sporting world.

He belonged originally to the moderate Whig party, and voted in favour of Catholic emancipation, as also for the Reform bill, though he opposed some of its principal details. Soon after, however, he joined the ranks of the Opposition, with whom he sided up to 1846. When, in that year, Sir Robert Peel openly declared in favour of free trade, the advocates of the corn-laws, then without a leader, discovered that Lord George Bentinck was the only man of position and family around whom the several sections of the Opposition could be brought to rally. He soon gave convincing evidence of powers so formidable that the Protectionist party under his leadership was at once stiffened into real importance. Towards Peel, in particular, his hostility was uncompromising. Believing, as he himself expressed it, that that statesman and his colleagues had "hounded to the death his illustrious relative" Canning, he combined with his political opposition a degree of personal animosity that gave additional force to his invective.

He abandoned his connection with the turf, disposed of his magnificent stud and devoted his whole energies to the laborious duties of a parliamentary leader. Apart from the question of the corn-laws, however, his politics were decidedly independent. In opposition to the rest of his party, he supported the bill for removing the Jewish disabilities, and was favourable to the scheme for the payment of the Roman Catholic clergy in Ireland by the landowners. The result was that on Dec. 23 1847 he wrote a letter resigning the Protectionist leadership, though he still remained active in politics.

But his positive abilities as a constructive statesman were not to be tested, for he died suddenly at Welbeck Sept. 21 1848. It was to be left to Disraeli to bring the Conservative Party into power, with Protection outside its programme.

See B. Disraeli (Lord Beaconsfield), *Lord George Bentinck: a Political Biography* (1851).

BENTIVOGLIO, GIOVANNI (1443–1508), tyrant of Bologna, was born after the murder of his father, the chief magistrate of the commune. In 1462 Giovanni made himself master of the city, although it was nominally a fief of the Church under a papal legate. He ruled with a stern sway for nearly half a century, but the brilliance of his court, his encouragement of the fine arts and his decoration of the city with sumptuous edifices to some extent compensated the Bolognese for the loss of their liberty. Cesare Borgia (*q.v.*) contemplated the subjugation of Bologna in 1500, when he was crushing the various despots of Romagna, but Bentivoglio was saved by French intervention. In 1502 he took part in the conspiracy against Cesare, but, when the latter obtained French assistance, he abandoned his fellow-conspirators and helped Borgia to overcome them. During the brief pontificate of Pius III., who succeeded Alexander VI. in 1503, Bentivoglio enjoyed a respite, but the new pope, Julius II., was determined to reduce all the former papal states to obedience. Having won Louis XII. of France to his side, he led an army against Bologna, excommunicated Bentivoglio and forced him to abandon the city (Nov. 1506). The deposed tyrant took refuge with the French, whom he trusted more than the pope, and died at Milan in 1508.

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BENTIVOGLIO, GUIDO (1579–1644), Italian cardinal, statesman and historian, was born at Ferrara in 1579. He was private chamberlain to Clement VIII.; and Paul V. created him archbishop of Rhodes (1607), and nuncio first to Flanders and then to France. He was created cardinal in 1621. A close friend of Pope Urban VIII., he was marked out as Urban's successor, but on Sept. 7 1644, he died suddenly at the opening of the conclave. Bentivoglio's principal works are: *Della Guerra di Fiandria* (best edition, Cologne, 1633–39), translated into English by Henry, earl of Monmouth (London, 1654); *Lettere diplomatiche di Guido Bentivoglio* (Brussels, 1631, frequently reprinted, best edition by L. Scarabelli, 2 vols., Turin, 1852). The complete edition of his works was published at Venice in 1668 in quarto.

BENTLEY, JOHN FRANCIS (1839–1902), English architect, was born at Doncaster, Jan. 30, 1839, and died at Clapham, London, March 2, 1902. He began as an engineer, passing after a short time into a builder's office and then went as pupil to Henry Clutton, an architect whose practice was largely ecclesiastical and influenced by the French Gothic school. Bentley refused the partnership offered by Clutton and went into practice on his own account in 1862. His earliest important undertaking was the enlargement and decorative treatment of St. Francis church, Notting Hill, London, followed by other ecclesiastical work in London and the country, in which he showed an increasing tendency towards a more English form of Gothic design. The seminary of St. Thomas, at Hammersmith, London (now the Sacred Heart convent), is noteworthy for the beauty of its treatment and carefully conceived plan, and was followed by St. John's school at Beaumont, one of the best examples of his work based on English Renaissance of the 17th century. Holy Rood church, at Watford, built in 1892, is an excellent example of Bentley's skill in adapting mediaeval ideals to the circumstances of our times.

In his 56th year Bentley was appointed by Cardinal Vaughan as the architect of the proposed Roman Catholic cathedral in Westminster, London. The Byzantine style was chosen, Bentley equipped himself for dealing with the problem by studying his subject in Italy and Constantinople, and spent several months in Rome and northern Italy in 1894. From a series of sketch plans, prepared on his return, was evolved that for the cathedral as now built. In the beginning it was intended that the whole of the inside surface should be clothed with marble and mosaic. There was, however, much difficulty in arriving at a comprehensive pictorial scheme for the treatment of the vast building. Bentley himself prepared a very thoughtful and complete proposal, of which only a small part is embodied in the mosaics already executed.

In May, 1898, he visited the United States to prepare plans for the proposed cathedral at Brooklyn; the designs, in which he reverted to Gothic, were left incomplete at his death, which took place on the eve of his being presented with the gold medal of the Royal Institute of British Architects. Besides his architectural works, Bentley's talent in designing for the subsidiary arts found scope in numerous commissions for stained glass, furniture, metal work, embroidery and the like.

See W. de l'Hôpital, *Westminster Cathedral and its Architect* (1920); T. J. Willson, "Memoir" *Journal of Royal Institute of British Architects* (III Series, vol. ix.).

BENTLEY, RICHARD (1662–1742), English scholar and critic, was born at Oulton near Wakefield, Yorkshire, and educated at St. John's college, Cambridge. In 1683 he became tutor to the son of Dean Stillingfleet, a position which gave him access to the best private library in England, and brought him into contact with many of the learned men of the day. In 1689 he accompanied his pupil to Oxford where he soon became intimate with many distinguished scholars. Dr. John Mill, who was producing from a Bodleian ms. the *editio princeps* of John Malalas, requested Bentley to look through the sheet and make remarks on the text. This gave rise to Bentley's *Epistola ad Millium* (1691), a short tractate which at once made it clear to students that there had arisen in England a critic fit to be ranked with the great Grecians of a former age. Unfortunately the work had a tone of presumptuous confidence which tended to rouse enmity.

In 1690 Bentley had taken deacon's orders; in 1692 he was appointed first Boyle lecturer, a nomination which was repeated in 1694. In the first series of lectures ("A Confutation of Atheism") he tried to frame the Newtonian physics, in opposition to Hobbes, into a proof of the existence of an intelligent Creator. In 1693 he became keeper of the Royal library, and in 1695 a fellow of the Royal Society. During these years he had produced casual literary work for other scholars, and in 1697 Wotton, who was preparing a second edition of his *Ancient and Modern Learning*, asked Bentley to write a paper exposing the spuriousness of the *Epistles of Phalaris*. The Christ Church editor of Phalaris, Charles Boyle, afterwards earl of Orrery, wrote a witty and superficial reply which was hailed by the public as crushing. Bentley therefore rejoined (1699) with the *Dissertation on the Epistles of Phalaris* (*see* PHALARIS).

In the year 1700 Bentley was chosen master of Trinity college, Cambridge, which had fallen from its high estate, and become the haunt of indolent clerics, who cared not at all for learning but much for good living. Bentley, obnoxious as a St. John's man and an intruder, unwelcome as a man of learning whose interests lay outside the walls of the college, proceeded to ride roughshod over their little arrangements. He inaugurated many reforms in usages and discipline, executed extensive improvements in the buildings, and promoted learning both in the college and in the university. But his domineering temper, his contempt for their feelings and rights, drove the fellows in 1710, after ineffectual resistance within the college, to appeal to the bishop of Ely. Only the bishop's death in 1714 prevented Bentley's ejection from the mastership. In 1733 he was again brought to trial before the bishop of Ely (Dr. Greene) by the fellows of Trinity and was sentenced to deprivation, but the college statutes required the sentence to be exercised by the vice-master, who refused to act. Though the feud was kept up till 1738 or 1740 (about 30 years in all) Bentley remained undisturbed.

During these years he published a critical appendix to John Davies's edition of Cicero's *Tusculan Disputations* (1709); emendations on the *Plutus* and *Nubes* of Aristophanes, and on the fragments of Menander and Philemon (1710); *Remarks on a late Discourse of Freethinking* (1712). His *Horace*, written in very great haste at a critical period of the Trinity quarrel, appeared in 1711. Some of its 700 or 800 emendations have been accepted, but the majority of them are now rejected, despite the learning and ingenuity shown in their support. In 1720 appeared his *Proposals for a New Edition of the Greek Testament* in which he proposed, by comparing the text of the Vulgate with that of the oldest Greek mss., to restore the Greek text as received by the Church at the time of the Council of Nice, but the work was never completed. His *Terence* (1726) deals chiefly with the bearing of metrical questions upon emendation, and it is upon this, next to the *Phalaris*, that his reputation mainly rests. To the same year belong the *Fables* of Phaedrus and the *Sententiae* of Publius Syrus. The *Paradise Lost* (1732), is generally regarded as his most unsatisfactory work. It is marred by the same rashness in emendation and lack of poetical feeling as his Horace. He put forward the idea that Milton employed both an amanuensis and an editor, who were to be held responsible for the clerical errors, alterations and interpolations which Bentley professed to detect. Among his minor works may be mentioned the *Astronomica* of Manilius (1739); a letter on the Sigean inscription on a marble slab found in the Troad, now in the British Museum; notes on the *Theriaca* of Nicander and on Lucan; emendations of Plautus (in his copies of the editions by Pareus, Camerarius and Gronovius, edited by Schröder, 1880, and Sonnenschein, 1883). *Bentleii Critica Sacra* (1862), edited by A. A. Ellis, contains the epistle to the Galatians (and excerpts), printed from an interleaved folio copy of the Greek and Latin Vulgate in Trinity college. A collection of his *Opuscula Philologica* was published at Leipzig in 1781. The edition of his works by Dyce (1836–38) is incomplete.

He had married in 1701 Joanna, daughter of Sir John Bernard of Brampton in Huntingdonshire. She died in 1740, leaving a son, Richard, and two daughters; and Bentley himself died of pleurisy two years later. A few Greek mss., brought from Mount Athos, he left to the college library.

Bentley was the first, perhaps the only, Englishman who can be ranked with the great heroes of classical learning. Self-taught, he created his own science; and it was his misfortune that there was no contemporary gild of learning in England by which his power could be measured. The English school of Hellenists, by which the 18th century was distinguished, and which contains the names of R. Dawes, J. Markland, J. Taylor, J. Toup, T. Tyrwhitt, Richard Porson, P. P. Dobree, Thomas Kidd and J. H. Monk, was the creation of Bentley. Even the Dutch school of the same period, though the outcome of a native tradition, was stimulated and directed by the example of Bentley, whose letters to the young Hemsterhuis on his edition of Julius Pollux made him one of

Bentley's most devoted admirers; and the German school of the 19th century did ungrudging homage to his genius as "the founder of historical philology."

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BENTLEY, RICHARD (1794–1871), British publisher, was born in London. His father owned the *General Evening Post* in conjunction with John Nichols. With his brother Samuel (1785–1868), an antiquarian of some repute, he set up a printing establishment, but in 1829 he began business as a publisher in partnership with Henry Colburn in New Burlington street. Colburn retired in 1832 and Bentley continued business on his own account. In 1837 he began *Bentley's Miscellany,* edited for the first three years of its existence by Charles Dickens, whose *Oliver Twist,* with Cruikshank's illustrations, appeared in its pages. Bentley and his son George (1828–95), as Richard Bentley & Son, published works by R. H. Barham, Theodore Hook, Isaac D'Israeli, Judge Haliburton, and others; also the "Library of Standard Novels" and the "Favourite Novel Library." In 1866 the firm took over the publication of *Temple Bar,* with which *Bentley's Miscellany* was afterwards incorporated. After Richard Bentley's death his son, George Bentley, and his grandson, Richard Bentley, junior, continued the business until it was absorbed (1898) by Macmillan & Co.

See *R. Bentley & Son* (Edinburgh, 1886), a history of the firm reprinted from *Le Livre* (Oct. 1885).

BENTON, THOMAS HART (1782–1858), American statesman, was born at Hillsborough, Orange county, North Carolina, on March 14, 1782. His father, an Englishman of refinement and scholarship, died in 1790, leaving the boy under the influence of a very superior mother, from whom he received lessons in book learning, piety and temperance, quite unusual in the frontier country. His home studies, facilitated by his father's fine library, were supplemented by a brief stay at the university of North Carolina (Chapel Hill) in 1799. The family removed, probably in this year, to a large tract of land which had been acquired by the father on the outskirts of the Indian country (at Benton Town, now Leipers Fork) near Franklin, Tenn. The following years, during which Benton was at various times school teacher, farmer, lawyer and politician, were the distinctively formative period of his life. His intense democracy and many features of his boldly cast personality were perfectly representative of the border people among whom he lived; although his education, social standing and force of character placed him above his fellows. In 1809 he served a term as State senator. Between 1815 and 1817 he transferred his interests to St. Louis, Mo., and in 1820 was elected U.S. senator from the new State. His senatorial career of 30 years (1821–51) was one of extreme prominence. A friendship early formed in Tennessee for Andrew Jackson was broken in 1813 by an armed fracas between the principals and their friends, but after the presidential election of 1824 Benton became a Jacksonian Democrat and Jackson's close friend, and as such was long the Democratic leader in the Senate, his power being greatest during Jackson's second term. He continued to be the administration's right-hand man under Van Buren, but gradually lost influence under Polk, with whom he finally broke both personally and politically.

The events of Benton's political life are associated primarily with three things: the second U.S. Bank, westward expansion and slavery. In the long struggles over the bank, the deposits and the "expunging resolution" (*i.e.,* the resolution to expunge from the records of the Senate the vote of censure of President Jackson for his removal of the Government deposits from the bank), Benton led the Jackson Democrats. His opposition to a national bank and insistence on the peculiar virtues of "hard money," whence his sobriquet of "Old Bullion," went back to his Tennessee days. In all that concerned the expansion of the country and the fortunes of the West, no public man was more consistent or more influential than Benton, and none so clear of vision. Reared on the border, and representing a State long the farthermost outpost across the Mississippi in the Indian country, he held the ultra-American views of his section as regarding foreign relations generally, and the "manifest destiny" of expansion westward especially. It was quite natural that he should advocate the removal westward of the Indian tribes, should urge the encouragement of trade with Santa Fe, N.M., and should oppose the abandonment in the Spanish treaty of 1819 of American claims to Texas. He once thought the Rocky mountains the proper western limit of the United States (1824), but this view he soon outgrew. He was the originator of the policy of homestead laws by which the public lands were used to promote the settlement of the West by home-seekers. No other man was so early and so long active for transcontinental railways. But Benton was not a land-grabber, whether in the interest of slavery or of mere jingoism. In the case of Oregon, for instance, he was firmly against joint occupation with Great Britain, but he was always for the boundary of 49° and never joined in the jingo campaign cry of "Fifty-four Forty or Fight." It was he who chiefly aided Polk in withdrawing from that untenable position. He despised pretexts and intrigues. Both in the case of Oregon and in that of Texas, though one of the earliest and most insistent of those who favoured their acquisition, yet in the face of southern and western sentiment he denounced the sordid and devious intrigues and politics connected with their acquisition, and kept clear of these. For the same reason he opposed the Mexican War, though not its prosecution, once begun. In the Texas question slavery was prominent. Toward slavery Benton held a peculiarly creditable attitude. A southerner, he was a slaveholder; but he seems to have gradually learned that slavery was a curse to the South, for in 1844 he declared that he would not introduce it into Texas lands "where it was never known," and in 1849 proclaimed that his personal sentiments were "against the institution of slavery." In the long struggle over slavery in the territories, following 1845, he was for the extreme demands of neither section; not because he was timorous or a compromiser—no man was less of either—but because he stood unwaveringly for justice to both sections, never adopting exaggerated views that must or even could be compromised. The truth is that he was always a westerner before he was a southerner and a Union man before all things else; he was no whit less national than Webster. Hence his distrust and finally hatred of Calhoun, dating from the nullification episode of 1832–33. As the South under Calhoun's lead became increasingly sectional and aggressive, Benton increasingly lost sympathy with her. Though he despised political-inaction Abolitionists, and hated their propaganda as inimical to the Union, he would not therefore close the national mails to Abolition literature, nor abridge the right of petition. No statesman was more prescient of the disunion tendencies of Calhoun's policies, and as early as 1844 he prophetically denounced the treason to the Union toward which the South was drifting. He would not drift with her for the sake of slavery, and this was his political undoing. In 1851 Missouri rejected him in his sixth candidacy for the Senate, after he had been an autocrat in her politics for 30 years. In 1852 he was elected to the House of Representatives, but his opposition to the repeal of the Missouri Compromise caused his defeat in 1854. An unsuccessful campaign for the governorship of Missouri in 1856 ended his political career. He died at Washington on April 10, 1858.

Benton's entire career was eminently creditable, and he is, besides, one of the most picturesque figures in American political history. His political principles—whether as regarded lobbying, congressional jobbing, civil service or great issues of legislation and foreign affairs—were of the highest. He was so independent that he had great dislike for caucuses, and despised party platforms—although he never voted other than the Democratic ticket, even when his son-in-law, J. C. Frémont, was the Republican presidential candidate in 1856; nor would he accept instructions from the Missouri legislature. His career shows no truckling to

self-interest, and on large issues he outgrew partisanship. Although palpably inferior to each of his great senatorial colleagues, Webster, Clay and Calhoun, in some gifts, yet if character, qualities and career be taken in the whole, his were possibly the most creditable of all. Benton was austere, aggressive and vain; besides, he had a fatal deficiency of humour. Nevertheless, he had great influence, which was a deserved tribute to his ability and high character. An indefatigable student, he treated all subjects capably, and especially in questions of his country's history and the exploration of the West had few equals—in the latter none. He acted always with uncalculating boldness, and defended his acts with extraordinary courage and persistence. Benton wrote a *Thirty Years' View . . . of the American Government* (2 vols., 1854–56), characteristic of the author's personality; it is of great value for the history of his time. He also compiled an *Abridgment of the Debates of Congress,* 1789–1850 (16 vols., 1857–61), likewise of great usefulness; and published a bitter review of the Dred Scott decision full of extremely valuable historical details—*Historical and Legal Examination of . . . the Dred Scott Case* (1857). All were written in the last eight years of his life and mostly in the last three.

The best biography is that by W. M. Meigs, *Life of Thomas Hart Benton* (1904). *See* also Theodore Roosevelt's *Thomas Hart Benton* (1887), in the "American Statesmen" series, which admirably brings out Benton's significance as a western man; and Joseph M. Rogers's *Thomas Hart Benton* (1905) in the "American Crisis" series.

BENTON, a city of Illinois, U.S.A., 80 mi. S.E. of St. Louis, the county seat of Franklin county, the leading coal-producing county of the state. It is served by the Chicago and Eastern Illinois, the Illinois Central and the Missouri Pacific railways. The population was 8,219 in 1930 and was 7,372 in 1940 by the federal census. Grain, livestock and fruits are the leading agricultural products. Benton is also the centre of an important petroleum-producing region.

BENTON HARBOR, a city of Berrien county, Michigan, U.S.A., on the St. Joseph river, about 1 mi. from Lake Michigan, with which it is connected by a ship canal, and 1 mi. northeast of St. Joseph. It is served by the Michigan Central, the Pere Marquette, and the Big Four railways, and by steamboat lines. The population in 1940 was 16,668. Benton Harbor and St. Joseph are joined by a wide street, parallel to the canal, lined with docks, factories, and business houses. Their combined population in 1940 was 25,631, and this is doubled in summer by visitors in search of health and recreation at the mineral springs and pleasure resorts. Benton Harbor has a large trade in peaches, grapes, pears, cherries, berries and apples, and operates the largest cash to grower market in the world. The leading industries are fruit-canning and the manufacture of special machinery and all kinds of castings.

The city of Benton Harbor was called Bronson Harbor until 1865.

It was incorporated as a village in 1869, as a city in 1891.

BENUE, a river of the Cameroons and Northern Province of Nigeria in West Africa and the largest and most important affluent of the Niger (*q.v.*), which it joins after a course of over 800m. in a general east to west direction from its source in the mountains of Adamawa. Through the Tuburi marshes there is a water connection between the Benue (Niger) and Shari (Lake Chad) systems.

BEN VENUE, a mountain in south-west Perthshire, Scotland. Principal peaks are 2,393 and 2,386ft. (*See* PERTHSHIRE.)

BENZ, KARL (1844–1929), German engineer, was born at Karlsruhe Nov. 26 1844. In 1879 he constructed a two-stroke engine model of his own, and founded an engine factory. As, however, the group financing him would only deal with fixed engines, he left it. He founded the firm Benz and Co., Rheinische Gasmotorenfabrik, and began to construct fixed engines; then developed a light high-speed four-stroke engine (300 revolutions, $\frac{2}{3}$ H.P.). He discovered the differential, special electrical battery ignition with spark induction, surface carburettor. He completed his first car in 1885, speed 10-16km. per hour, and took out the patent in 1886 (D.R.P. 37435). He sold the first car to the Frenchman, Roger, and then joined the firm of Panhard and Levassor. In England he encountered difficulties owing to the Locomotives Act (not abolished till 1896); and in 1893 he took out a patent for steering gear with triple axle and steering rods tangential to the wheels. Later, he took up his residence in Mannheim. He died on April 3, 1929.

BENZALDEHYDE (oil of bitter almonds) was first isolated in 1803 and was the subject of an important investigation by J. v. Liebig in 1837. It occurs naturally in the form of the glycoside amygdalin ($C_{20}H_{27}NO_{11}$) which is present in bitter almonds, cherries, peaches and the leaves of the cherry laurel; and is obtained from this substance by hydrolysis with dilute acids. (*See* GLYCOSIDES, NATURAL.) It occurs free in bitter almonds, being formed by an enzyme decomposition of amygdalin. It may also be prepared by oxidizing benzyl alcohol (*q.v.*) with concentrated nitric acid; by distilling a mixture of calcium benzoate and calcium formate; by the two Gattermann syntheses (*see* ALDEHYDES), and by the action of chromium oxychloride on toluene dissolved in carbon bisulphide (A. Étard, 1884). It is the simplest of the aromatic aldehydes, having the formula $C_6H_5.CHO$.

Technically it is prepared from toluene, by converting it into benzyl chloride, which is then heated with lead nitrate. $C_6H_5CH_2Cl+Pb(NO_3)_2=2NO_2+PbCl.OH+C_6H_5.CHO$), or, by converting it into benzylidene chloride (benzal chloride), which is heated with aqueous calcium hydroxide under pressure.

$$C_6H_5CHCL_2+Ca(OH)_2=CaCl_2+C_6H_5CHO+H_2O.$$

The direct oxidation of toluene with various metallic oxides (manganese dioxide, ceric oxide, peroxides of nickel and cobalt) in presence of acid leads to benzaldehyde free from chlorinated derivatives. Benzaldehyde, a colourless liquid smelling of bitter almonds, boils at 179.1° C., is only slightly soluble in water, but is readily volatile in steam. It possesses all the characteristic properties of an aldehyde; being readily oxidized to benzoic acid; reducing solutions of silver salts; forming addition products with hydrogen, hydrocyanic acid and sodium bisulphite; and giving an oxime and a hydrazone. On the other hand, it differs from the aliphatic aldehydes in many respects; it does not form an addition product with ammonia but condenses to hydrobenzamide $(C_6H_5.CH)_3N_2$; on shaking with alcoholic potassium hydroxide it undergoes simultaneous oxidation and reduction, giving potassium benzoate and benzyl alcohol (S. Cannizzaro, 1881); and on warming with alcoholic potassium cyanide it condenses to benzoin (*q.v.*).

During the oxidation of benzaldehyde to benzoic acid when exposed to air it has been observed that as much oxygen is rendered "active" as is used up by the substance undergoing oxidation; thus if benzaldehyde is left for some time in contact with air, water and indigosulphonic acid, just as much oxygen is used up in oxidizing the indigo compound as in oxidizing the aldehyde. A. v. Baeyer and V. Villiger (1900) have shown that a per-acid (*q.v.*) $C_6H_5.CO.O.OH$, formed as an intermediate product, oxidizes the indigo compound, being itself reduced to benzoic acid; they have also shown that this peroxide is soluble in benzaldehyde with production of benzoic acid, and it must be assumed that the oxidation of benzaldehyde proceeds as shown in the equations:

$$C_6H_5.CHO+O_2=C_6H_5.CO.O.OH,$$
$$C_6H_5.CO.O.OH+C_6H_5.CHO=2C_6H_5.COOH.$$

The oxime of benzaldehyde ($C_6H_5.CH:N.OH$), formed by the addition of hydroxylamine to the aldehyde, undergoes isomeric change when hydrogen chloride is passed into its ethereal solution, a second modification being produced. The former (known as the α- or *syn*-benzaldoxime) melts at 34–35° C.; the latter (β or *anti*-benzaldoxime) melts at 130° C. and is slowly transformed into the α-form. The difference between the two forms has been explained by A. Hantzsch and A. Werner (1890) on the assumption of a different spatial arrangement. (*See* STEREOCHEMISTRY.) On account of the readiness with which it condenses with various compounds, benzaldehyde is an important synthetic reagent. With aniline it forms benzylidineaniline $C_6H_5.CH:N.C_6H_5$, and with acetone, benzylidineacetone $C_6H_5.CH:CH.CO.CH_3$. Heated with anhydrous sodium acetate and acetic anhydride it gives cinnamic acid (*q.v.*); with dimethylaniline and anhydrous zinc chloride it forms leuco-malachite green $C_6H_5.CH[C_6H_4N(CH_3)_2]_2$; and with

dimethylaniline and concentrated hydrochloric acid it gives dimethylaminobenzhydrol, $C_6H_5{\cdot}CH(OH)C_6H_4N(CH_3)_2$. (*See* DYES, SYNTHETIC.) Its addition compound with hydrocyanic acid gives mandelic acid $C_6H_5{\cdot}CH(OH){\cdot}COOH$ on hydrolysis; when heated with sodium succinate and acetic anhydride, phenyl-*iso*-crotonic acid $C_6H_5{\cdot}CH{:}CH{\cdot}CH_2{\cdot}COOH$ is produced, which on boiling is converted into α-naphthol, $C_{10}H_7{\cdot}OH$. On nitration it yields chiefly meta-nitrobenzaldehyde, crystallizing in needles which melt at 58° C.

Ortho-nitrobenzaldehyde may be obtained by oxidizing ortho-nitrocinnamic acid with alkaline potassium permanganate in the presence of benzene; or from ortho-nitrobenzyl chloride by successively condensing it with aniline, oxidizing the product so obtained to ortho-nitrobenzylidine aniline, and then hydrolysing this compound with an acid. It crystallizes in yellowish needles, which melt at 46° C.

Para-nitrobenzaldehyde crystallizes in prisms melting at 107° C. and is prepared by the action of chromium oxychloride on para-nitrotoluene, or by oxidizing para-nitrocinnamic acid. By the reduction of ortho-nitrobenzaldehyde with ferrous sulphate and ammonia, ortho-aminobenzaldehyde is obtained. This compound condenses in alkaline solution with compounds containing the grouping, CH_2-CO, to form quinoline (*q.v.*) or its derivatives; thus, with acetaldehyde it forms quinoline, and with acetone, α-methylquinoline.

BENZENE, a hydrocarbon discovered in 1825 by Faraday in the liquid produced in the compression of the illuminating gas obtained by distilling certain oils and fats. Its formula is C_6H_6. E. Mitscherlich prepared it in 1834 by distilling benzoic acid with lime; and in 1845 Hofmann discovered it in coal-tar. It was named "benzin" or "benzine" by Mitscherlich, but J. v. Liebig proposed "benzol" (the termination *ol* being suggested by the Lat. *oleum,* oil); the form "benzene" was due to A. W. Hofmann. The word "benzine" is sometimes used in commerce for the coal-tar product, but also for the light petroleum better known as petroleum-benzine; a similar ambiguity is presented by the word "benzoline," which is applied to the same substances as the word "benzine." "Benzene" is the term used by English chemists, "benzol" is favoured in Germany, and "benzole" in France. There is increasing adoption in England of "benzole" for the name of the fraction in which the hydrocarbon benzene is the chief constituent.

Benzene is manufactured from the low-boiling fractions of the coal-tar distillate (*see* COAL TAR). The first successful fractionations of coal-tar naphtha were devised by C. B. Mansfield (1849), who separated a benzol distilling below 100° C. from a less volatile naphtha by using simple dephlegmators. First, the oil was manufactured principally for combustion in the Read Holliday lamp and for dissolving rubber, but the development of the coal-tar colour industry occasioned a demand for benzols of definite purity. In the earlier stages 30%, 50% and 90% benzols were required, the 30% being mainly used for the manufacture of "aniline for red," and the 90% for "aniline for blue." (The term "30% benzol" means that 30% by volume distils below 100°.) A purer benzol was subsequently required for the manufacture of aniline black and other dye-stuffs. The process originally suggested by Mansfield is generally followed, the success of the operation being principally conditioned by the efficiency of the dephlegmator, in which various improvements have been made. The light oil fraction of the coal-tar distillate, which comes over below 140° and consists chiefly of benzene, toluene and the xylenes (*q.v.*) yields on fractionation (1) various volatile impurities such as carbon disulphide, (2) the benzene fraction boiling at about 80° C., (3) the toluene fraction boiling at 100°, (4) the xylene fraction boiling at 140°. The fractions are agitated with strong sulphuric acid to separate bases and thiophenes, and then washed with caustic soda solution to remove phenolic substances. The washed products are then refractionated.

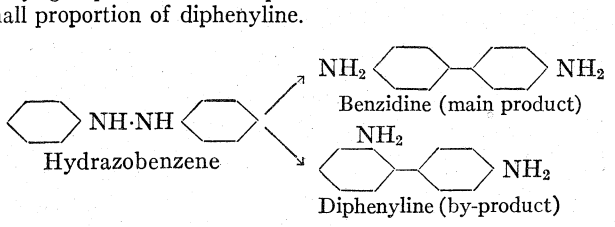
Benzene is a colourless, limpid, highly refracting liquid, having a pleasing and characteristic odour. It may be solidified to rhombic crystals which melt at 5·4° C. Mansfield obtained perfectly pure benzene by freezing a carefully fractionated sample. It boils at 80·4°, and the vapour is highly inflammable, the flame being extremely smoky. Its specific gravity is 0·899 at 0° C. It is very slightly soluble in water, more soluble in alcohol and completely miscible with ether, acetic acid and carbon disulphide. It is an excellent solvent for gums, resins, fats and many other organic materials; sulphur, phosphorus and iodine also dissolve in it. It sometimes separates with crystals of a solute as "benzene of crystallization," as for example with triphenylmethane, thio-p-tolyl urea, tropine, etc.

Benzene is of exceptional importance commercially on account of the many compounds derivable from it, which are exceedingly valuable in the arts. Chemically it is one of the most interesting substances known, since it is the parent of the enormous number of substances belonging to the "aromatic" or "benzenoid" series. The constitution of the benzene ring, the isomerism of its derivatives, and their syntheses from aliphatic or open-chain compounds, are treated in the article CHEMISTRY: *Organic: Homocyclic Division.* A summary of its chemical transformations may be given here, but reference should be made to the articles on the separate compounds for further details.

Passed through a red-hot tube, benzene vapour yields hydrogen, diphenyl, diphenylbenzenes and acetylene; the formation of the last compound is an instance of a reversible reaction, since Berthelot found that acetylene passed through a red-hot tube gave some benzene. Benzene unites with ozone to form the triozonide, which is decomposed by water with the production of glyoxal and hydrogen peroxide. When its vapour mixed with air is passed over vanadium pentoxide benzene is oxidized to p-benzoquinone and maleic anhydride. Hexamethylene (cyclo-hexane or hexahydrobenzene) is produced on passing hydrogen and benzene vapours over reduced nickel at 180°. The reverse change to benzene and hydrogen occurs when hexamethylene is passed over nickel at 280°. Chlorine and bromine form additional products with moist benzene in sunlight. Substitution products are formed with the halogens, but only slowly unless a catalyst, such as iodine, molybdenum chloride or ferric chloride for chlorine, and aluminium bromide for bromine, be present. Benzene is readily nitrated to nitro-benzene, two and even three nitro groups being introduced if some dehydrator such as concentrated sulphuric acid be present. Sulphuric acid gives with benzene mono-, di- and even tri-sulphonic acids.

BENZIDINE is $NH_2{\cdot}C_6H_4{\cdot}C_6H_4{\cdot}NH_2$, an important chemical base of the aromatic or coal-tar group crystallizing in colourless plates that melt at 127°–128° C.; it owes its origin to a noteworthy series of chemical changes arising from the reduction of nitrobenzene in alkaline media. Removal of oxygen from two molecular proportions of nitrobenzene leads to red azobenzene (*see* AZO-COMPOUNDS), $2C_6H_5{\cdot}NO_2 \rightarrow C_6H_5{\cdot}N{:}N{\cdot}C_6H_5$, and addition of hydrogen to azobenzene gives rise to colourless hydrazobenzene, a product which undergoes a singular molecular rearrangement on treatment with mineral acids, and has by analogy the constitution $NH_2{\cdot}C_6H_4{\cdot}C_6H_4{\cdot}NH_2$, being, in fact, di-para-diamino-diphenyl.

The Benzidine Conversion or Rearrangement.—In this conversion the nitrogen atoms part company and the phenyl residues swing round, to join together again mainly, in dipara-positions with respect to the resulting amino-groups thus giving benzidine, and, to a less extent, to bring the para-position of one phenyl group into the ortho-position on the other so as to form a small proportion of diphenyline.



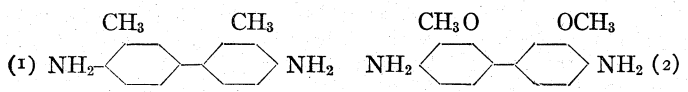
Diphenyline is technically unimportant, but benzidine is employed on a considerable scale in the manufacture of azo-colours having the valuable property of dyeing directly on cotton without the intervention of a mordant (*see* DYES, SYNTHETIC).

Benzidine is manufactured by heating together a mixture of

nitrobenzene (produced by nitrating benzene, *q.v.*), zinc dust and aqueous caustic soda, preferably with addition of alcohol. The colourless stage of the reduction being reached, the alcohol is distilled off, the hydrazobenzene is separated mechanically from zinc and zinc compounds, and dissolved in cold hydrochloric acid. Addition of sodium sulphate to this acid solution precipitates sparingly soluble benzidine sulphate. This salt is suspended in water and decomposed with soda ash, the free benzidine being collected, dried and purified by distillation under reduced pressure.

When cheap electrical energy is available, benzidine is manufactured electrolytically. Nitrobenzene is floated on a strong solution of caustic soda in a one-compartment electrolytic cell and reduced by the nascent hydrogen generated at the cathode; the oxygen simultaneously evolved at the anode is collected and utilized. In order to maintain the hydrazobenzene in the liquid phase a suitable solvent such as o-dichlorobenzene is added. On treating this solution of hydrazobenzene with cold hydrochloric acid, the benzidine conversion takes place and the base is isolated as in the foregoing chemical reduction.

The electrolytic process is also effective in the case of *tolidine* or 2:2′-dimethylbenzidine (1), a base which is also used extensively in colour manufacture.



Another valuable diamine of this series is *dianisidine* or 2:2′-dimethoxybenzidine (2), which gives rise to direct-cotton colours having special tinctorial properties. This technical use of benzidine and its allies is based on their diazotization to bisdiazonium salts, $ClN_2{\cdot}C_6H_4C_6H_4{\cdot}N_2Cl$ (*see* DIAZO-COMPOUNDS), which are then combined with various naphthylaminesulphonic acids and naphtholsulphonic acids giving rise to bisazo dyes which are substantive on unmordanted cotton.

BENZOIC ACID occurs naturally in some resins, especially in gum benzoin (from *Styrax benzoin*), in dragon's blood, and as a benzyl ester in Peru and Tolu balsams. It crystallizes from water in glistening leaflets which melt at 121·4° C. and boil at 249·2° C. Its specific heat is 0·1946. It sublimes readily and is volatile in steam. It is readily soluble in hot water and the ordinary organic solvents. Benzoic acid is the simplest representative of the organic acids in the aromatic series (*see* CHEMISTRY: *Organic*). It may be regarded as derived from the hydrocarbon benzene, C_6H_6, through the replacement of one hydrogen atom by the acidic (carboxyl) group, $-CO{\cdot}OH$; its formula is thus $C_6H_5{\cdot}COOH$. When heated with lime, it is decomposed, benzene being formed; if its vapours are passed over heated zinc dust, it is converted into benzaldehyde (A. Baeyer, 1866). Distillation of its calcium salt gives benzophenone (*q.v.*) with small quantities of other substances, but if the calcium salt be mixed with calcium formate and the mixture distilled, benzaldehyde is produced. By the action of sodium amalgam on an aqueous solution of the acid, benzyl alcohol, tetrahydrobenzoic acid and hexahydrobenzoic acid are formed. The salts of benzoic acid, known as benzoates, are mostly soluble in water. They are decomposed by mineral acids with the production of benzoic acid, and on addition of ferric chloride to their neutral solutions give a reddish-brown precipitate of ferric benzoate. Benzoic acid is usually prepared from toluene, this hydrocarbon being chlorinated to benzotrichloride, $C_6H_5{\cdot}CCl_3$; this is heated with water or aqueous alkali, milk of lime being employed commercially, and the resulting calcium benzoate is then decomposed by mineral acid to yield free benzoic acid. It is also obtained by oxidizing benzaldehyde (*q.v.*), benzyl alcohol, or cinnamic acid. It also arises in many reactions of aromatic substances, as for instance by hydrolysis of benzonitrile; by the action of carbon dioxide on benzene in the presence of aluminium chloride (C. Friedel and J. M. Crafts, 1888); by the action of carbon dioxide on monobrombenzene in the presence of sodium; by passing carbon dioxide into an ethereal solution of phenyl magnesium bromide (*see* GRIGNARD REAGENTS); by condensing benzene and carbonyl chloride in presence of aluminium chloride, the benzoyl chloride formed being subsequently hydrolyzed; and similarly from benzene and chlorformamide with subsequent hydrolysis (*q.v.*) of benzamide. It may also be prepared by boiling benzyl chloride with dilute nitric acid (G. Lunge, 1877), or by fusing sodium benzene sulphonate with sodium formate. Benzoic acid can be extracted from the hippuric acid found in the urine of the herbivorae. This urine is concentrated and the hippuric acid, precipitated by the addition of hydrochloric acid, is then boiled with concentrated hydrochloric acid until hydrolyzed into benzoic and aminoacetic acids.

Benzoic anhydride $(C_6H_5{\cdot}CO)_2O$, prepared by the action of benzoyl chloride on sodium benzoate, or by heating benzoyl chloride with anhydrous oxalic acid (R. Anschütz, 1884), crystallizes in needles, melting at 42° C., and boiling at 360° C. It is insoluble in water but readily soluble in alcohol and ether.

Benzoyl chloride, $C_6H_5{\cdot}COCl$, a typical acid chloride, is formed by distilling a mixture of phosphorus pentachloride and benzoic acid; by the action of chlorine on benzaldehyde, or by passing a stream of hydrogen chloride over a mixture of benzoic acid and phosphoric oxide heated to 200° C. (C. Friedel, 1869.) It is a colourless liquid of very unpleasant smell, which boils at 198° C., and solidifies in a freezing mixture, the crystals obtained melting at −1° C. When triturated with powdered silver nitrate, benzoyl chloride is concerted into benzoyl nitrate $C_6H_5{\cdot}CO{\cdot}ONO_2$ (F. Francis, 1900). This nitrate explodes on heating, but in non-hydroxylic media it serves as a nitrating agent for aromatic substances; it slowly changes into its isomeride meta-nitrobenzoic acid, $NO_2{\cdot}C_6H_4{\cdot}CO_2H$.

Ethyl benzoate, $C_6H_5{\cdot}CO{\cdot}OC_2H_5$, prepared by boiling benzoic acid and alcohol with a small quantity of sulphuric acid for some hours (E. Fischer and A. Speier, 1896), is a colourless liquid of boiling point 213° C.

Benzamide, $C_6H_5{\cdot}CO{\cdot}NH_2$, prepared by the action of benzoyl chloride on ammonia or ammonium carbonate, or from ethyl benzoate and ammonia, crystallizes from water in glistening leaflets which melt at 130° C. and boil at 288° C. (*See* AMIDES.)

Chlor-, brom-, iodo- and fluor-benzoic acids are obtained by oxidizing the corresponding halogenated toluenes, or from the amino acids, or by substitution. Nitration of benzoic acid gives chiefly *meta-nitrobenzoic acid.* The ortho- and para-nitrobenzoic acids are obtained by oxidizing ortho- and para-nitro-cinnamic acids. Ortho-amino-benzoic acid (anthranilic acid):

$NH_2{\cdot}C_6H_4{\cdot}CO_2H$ is closely related to indigo (*q.v.*).

Gum benzoin, which contains from 12 to 20% of benzoic acid, is used in medicine as the essential constituent of benzoated lard, *Adeps benzoatus,* which owes its antiseptic properties to benzoic acid; and in friar's balsam, *Tinctura benzoini composita,* which is an ancient and valuable medicament, still largely used for inhalation in cases of laryngitis, bronchitis and other inflammatory or actually septic conditions of the respiratory tract. It owes its value to the benzoic acid which it contains. A fluid drachm of friar's balsam may be added to a pint of water at a temperature of about 140°, and the resultant vapour may be inhaled from the spout of a kettle or from a special inhaler. Benzoic acid itself, ammonium benzoate and sodium benzoate are all administered internally in doses of from five to 30 grains. The ammonium salt is most often employed, owing to the stimulant character of the ammonium base. The acid itself is a powerful antiseptic. When administered internally, it causes the appearance of hippuric acid in the urine. This is due to its combination in the body (kidney) with glycine. The hippuric acid in the urine acts as a stimulant and disinfectant to the urinary mucous membrane. Benzoic acid is also excreted by the bronchi and tends to disinfect and stimulate the bronchial mucous membrane. Hence the value of friar's balsam. The acid and its salts are antipyretic and were used in Germany instead of salicylates in rheumatic fever. But the most important fact is that ammonium benzoate is largely used—often in combination with urinary anodynes such as tincture of hyoscyamus—as a urinary antiseptic in cases of cystitis (inflammation of the bladder) and pyelitis (inflammation of the pelvis or the kidney).

BENZOIN or **GUM BENJAMIN,** a balsamic resin obtained from *Styrax Benzoin,* a tree of considerable size, native to Sumatra and Java, and from other species of *Styrax.* It is obtained by making incisions in the bark of the trees, and appears to be formed as the result of the wound, not to be secreted normally. There are several varieties of benzoin in commerce: (1) Siam benzoin, which apparently comes from *S. tonkinese* is the finest and most aromatic. The odour of Siam benzoin is partly due to the presence of vanillin, and it contains as much as 38% of benzoic acid but probably no cinnamic acid. (2) Sumatra benzoin occurs only in masses formed of dull red resin enclosing small white masses. It contains about 20% of cinnamic acid in addition to 18 or even more of benzoic. (3) Palembang benzoin, an inferior variety, said to be obtained from *Styrax Benzoin* in Sumatra, consists of greyish translucent resinous masses, containing small white opaque masses. It does not appear to contain cinnamic acid. Large quantities of benzoin are used as incense. Its medicinal uses depend on the contained benzoic acid (*q.v.*). Compound tincture of benzoin is used in treatment of respiratory diseases, etc.

Benzoin, in chemistry, is a colourless, crystalline solid, readily soluble in alcohol and ether, melting at 137° C. and boiling at 343–344° C. It owes its name to the circumstance that it is a polymeride of benzaldehyde, $C_6H_5{\cdot}CHO$, which in turn derives its name from benzoic acid (*q.v.*). This acid was first discovered in *Gum benzoin* (1608) from which material the acid may be obtained by sublimation (*acidum benzoicum ex resina*). It partakes of the structure and properties both of a ketone and an alcohol (*qq.v.*), having the structural formula $C_6H_5{\cdot}CH(OH){\cdot}CO{\cdot}C_6H_5$. It may be prepared by boiling an alcoholic solution of benzaldehyde with potassium cyanide; by reducing benzil ($CH_5{\cdot}CO{\cdot}CO{\cdot}C_6H_5$) with zinc and acetic acid; or by the oxidation of hydrobenzoin

$$C_6H_5{\cdot}CH(OH){\cdot}CH(OH){\cdot}C_6H_5.$$

Owing to the readiness with which it is oxidized, it acts as a reducing agent, giving a red precipitate of cuprous oxide with Fehling's solution in the cold. Chlorine and nitric acid oxidize it to benzil; chromic acid mixture and potassium permanganate, to benzoic acid and benzaldehyde. On heating with zinc dust, desoxybenzoin ($C_6H_5{\cdot}CO{\cdot}CH_2{\cdot}C_6H_5$) is obtained; sodium amalgam converts it into hydrobenzoin; and fuming hydriodic acid at 130° C. gives dibenzyl ($C_6H_5CH_2{\cdot}CH_2{\cdot}C_6H_5$).

BENZOPHENONE is the simplest ketone (*q.v.*) in the aromatic series (*see* CHEMISTRY: *Organic*). It is structurally a diphenyl ketone, having the formula $C_6H_5{\cdot}CO{\cdot}C_6H_5$. It is a dimorphous substance, existing in two crystalline forms, one melting at 26° C and the other at 48° C (Th. Zincke, 1871). It boils at 306.1° C. It may be prepared by distilling calcium benzoate; by condensing benzene with benzoyl chloride in the presence of anhydrous aluminium chloride; by the action of mercury diphenyl on benzoyl chloride, or by oxidizing diphenylmethane with chromic acid. It is reduced by sodium amalgam to *benzhydrol* or *diphenylcarbinol* $C_6H_5.CH(OH).C_6H_5$; a stronger reducing agent, such as hydriodic acid in the presence of amorphous phosphorus converts it into *diphenylmethane* $(C_6H_5)_2.CH_2$. Fusion with potassium hydroxide converts it into benzene, potassium benzoate and triphenylcarbinol. With phenylhydrazine it forms a hydrazone, and with hydroxylamine an oxime, which exists in one form only; if, however, one of the phenyl groups in the oxime be substituted in any way then two stereoisomeric oximes are produced (*cf.* STEREOCHEMISTRY). *Tetramethyldiamino-benzophenone* or *Michler's ketone,* $CO[C_6H_4N.(CH_3)_2]_2$, melting at 178°, is of technical importance in the manufacture of synthetic dyes. It is prepared by the action of carbonyl chloride on dimethylaniline in the presence of zinc chloride.

$$COCl_2+2C_6H_5N(CH_3)_2=2HCl+CO[C_6H_4N(CH_3)_2]_2.$$

(*See* DYES, SYNTHETIC.)

BENZYL ALCOHOL (PHENYL CARBINOL) occurs combined with benzoic acid in Peru balsam, with cinnamic acid in Tolu balsam, with acetic acid in essential oil of jasmine, and also in storax. It is a colourless liquid, with a faint aromatic smell, boiling at 206° C and having the composition $C_6H_5{\cdot}CH_2OH$. It may be synthetically prepared by the reduction of benzoyl chloride; by the action of nitrous acid on benzylamine; by boiling benzyl chloride with an aqueous solution of potassium carbonate, or by the so-called "Cannizzaro" reaction (1881) in which benzaldehyde is shaken up with potassium hydroxide, one half of the aldehyde being oxidized to benzoic acid, and the other half reduced to the alcohol: $2C_6H_5CHO+KOH=C_6H_5COOK+C_6H_5{\cdot}CH_2OH$. On oxidation with nitric acid it is converted into benzaldehyde whilst chromic acid oxidizes it to benzoic acid. If reduced by hydriodic acid and phosphorus at 140° C it gives rise to toluene; toluene and benzoic acid result from its distillation with concentrated alcoholic potassium hydroxide.

BEOTHUK, an American tribe of hunters and collectors, resident chiefly upon the coast of Newfoundland where salmon and shell-fish could be obtained to eke out the supply of deer. Their skill as canoemen was commented upon by several early writers, but they were equally at home in the woods. The scanty material culture was characterized by the use of wood for household utensils; stone implements were well made; snow-shoes were of a peculiar type, and red ochre was extensively employed for painting the body, a habit which probably gave rise to the term "Red" Indian. Political organization was relatively slight, though concentrated action, implying recognized authority, was shown in communal deer drives. The Beothuk were gradually forced into the interior of the island by European fishermen and settlers; reduced in numbers, their doom was sealed when, in the eighteenth century, Micmac hunters, equipped with fire-arms, began to swarm over from the mainland. A few survivors may have escaped to Labrador, but the last known Beothuk died in 1829.

See J. P. Hawley, *The Beothucks or Red Indians* (1915).

BEOWULF. The epic of Beowulf, the most precious relic of Old English, and, indeed, of all early Germanic literature, has come down to us in a single ms., written about A.D. 1000, in the Cottonian collection now at the British Museum. The subject of the poem is the exploits of Beowulf, son of Egtheow and nephew of Hygelac, king of the "Gēatas," *i.e.,* the people, called in Scandinavian records Gautar, from whom a part of southern Sweden has received its present name Götland. The story is:

1. Beowulf, with 14 companions, sails to Denmark, to offer his help to Hrothgar, king of the Danes, whose hall (called "Heorot") has for 12 years been rendered uninhabitable by the ravages of a devouring monster (in human shape) called Grendel, a dweller in the waste, who used nightly to force an entrance and slaughter some of the inmates. Beowulf and his friends are feasted in the long-deserted Heorot. At night the Danes withdraw, leaving the strangers alone. When all but Beowulf are asleep, Grendel enters. One of Beowulf's friends is killed; but Beowulf, unarmed, wrestles with the monster, and tears his arm from the shoulder. Grendel, mortally wounded, escapes from the hall. On the morrow, his bloodstained track is followed until it ends in a distant mere.

2. The Danish king and his followers pass the night in Heorot, Beowulf and his comrades being lodged elsewhere. The hall is invaded by Grendel's mother, who kills and carries off one of the Danish nobles. Beowulf proceeds to the mere, and, armed with sword and corslet, plunges into the water. In a vaulted chamber under the waves, he fights with Grendel's mother, and kills her. In the vault he finds the corpse of Grendel; he cuts off the head, and brings it back in triumph.

3. Richly rewarded by Hrothgar, Beowulf returns to his native land and relates to Hygelac the story of his adventures. The king bestows on him lands and honours, and during the reigns of Hygelac and his son Heardred he is the greatest man in the kingdom. When Heardred is killed in battle with the Swedes, Beowulf becomes king.

4. After Beowulf has reigned prosperously for 50 years, his country is ravaged by a fiery dragon, which inhabits an ancient burial-mound, full of treasure. The royal hall itself is burned to the ground. The aged king, accompanied by 11 chosen warriors, journeys to the barrow. Bidding his companions retire, he takes up his position near the entrance to the mound. The dragon rushes forth, breathing flames. Beowulf is all but overpowered, and the sight is so terrible that his men, all but Wiglaf, son of Weohstan, seek safety in flight. With Wiglaf's aid, Beowulf slays the dragon, but receives his own death-wound. Wiglaf enters the

barrow, and returns to show the dying king the treasures that he has found there. Beowulf names Wiglaf his successor, and ordains that his ashes shall be enshrined in a great mound, placed on a lofty cliff, to be a mark for sailors far out at sea.

5. Amid great lamentation, the hero's body is laid on the funeral pile. The treasures of the dragon's hoard are buried with his ashes; and when the great mound is finished, 12 of Beowulf's most famous warriors ride around it, celebrating the praises of the bravest, gentlest and most generous of kings.

Form of the Poem.—Those portions of the poem that relate the career of the hero in progressive order contain a lucid and well-constructed story, yet the general impression produced by it is that of a bewildering chaos. This effect is due to the multitude and the character of the episodes. A very great part of what the poem tells about Beowulf himself is not presented in regular sequence, but by way of retrospective mention.

Many episodes that have nothing to do with Beowulf himself have been inserted with the seeming intention of making the poem into a sort of cyclopaedia of Germanic tradition. They include many particulars of what purports to be the history of the royal houses, not only of the Gautar and the Danes, but also of the Swedes, the continental Angles, the Ostrogoths, the Frisians and the Heathobeards, besides references to matters of unlocalized heroic story such as the exploits of Sigismund. The Saxons are not named, and the Franks appear only as a dreaded hostile power. Of Britain there is no mention; and though there are some distinctly Christian passages, they are so incongruous in tone with the rest of the poem that they must be regarded as interpolations. There is a curiously irrelevant prologue, telling the story of Scyld, the founder of the "Scylding" dynasty of Denmark, and the virtues of his son Beowulf. If this Danish Beowulf had been the hero of the poem, the opening would have been appropriate; but it seems strangely out of place as an introduction to the story of his namesake. If the mass of traditions which it purports to contain be genuine, the poem is of unique importance as a source of knowledge respecting the early history of the peoples of northern Germany and Scandinavia.

The starting-point of all *Beowulf* criticism is the fact (discovered by N. F. S. Grundtvig in 1815) that one of the episodes of the poem belongs to authentic history. Gregory of Tours, who died in 594, relates that in the reign of Theodoric of Metz (511–534) the Danes invaded the kingdom, and carried off many captives and much plunder to their ships. Their king, Chlochilaicus, was attacked and killed by the Franks, who then defeated the Danes in a naval battle, and recovered the booty. The date of these events is ascertained to have been between 512 and 520. An anonymous history written early in the 8th century (*Liber Hist. Francorum*, cap. 19) gives the name of the Danish king as Chochilaicus, and says that he was killed in the land of the Attoarii. Now it is related in *Beowulf* that Hygelac met his death in fighting against the Franks and the Hetware (the Old English form of Attoarii). The primitive Germanic form of the Danish king's name would be *Hugilaikaz*, which by regular phonetic change became in Old English *Hygelāc*, and in Old Norse *Hugleikr*. It is true that the invading king is said in the histories to have been a Dane, whereas the Hygelac of *Beowulf* belonged to the "Gēatas" or Gautar. But a work called *Liber Monstrorum*, preserved in two mss. of the 10th century, cites as an example of extraordinary stature a certain "Huiglaucus, king of the Getae," who was killed by the Franks, and whose bones were preserved on an island at the mouth of the Rhine. It is therefore evident that Hygelac, and his expedition belong to the region of historic fact. This suggests the possibility that the persons mentioned as belonging to the royal houses of the Danes and Swedes had a real existence. Other points of contact between *Beowulf* and the Scandinavian records confirm the conclusion that the Old English poem contains much of the historical tradition of the Gautar, the Danes and the Swedes.

Of the hero of the poem no mention has been found elsewhere. But the name (the Icelandic form of which is Bjölfr) is genuinely Scandinavian. It was borne by one of the early settlers in Iceland, and a monk named Biuulf is commemorated in the *Liber Vitae* of the church of Durham. As the historical character of Hygelac has been proved, it is not unreasonable to believe that his nephew Beowulf succeeded Heardred on the throne of the Gautar, and interfered in the dynastic quarrels of the Swedes.

On the other hand the combats with Grendel and his mother and with the fiery dragon belong to the domain of pure mythology. That they have been attributed to Beowulf may not be due solely to the general tendency to connect mythical achievements with the name of any famous hero. The Danish king "Scyld Scēfing," whose story is told in the opening lines of the poem, and his son Beowulf, are plainly identical with Sceldwea, son of Sceaf, and his son Beaw, who appear among the ancestors of Woden in the genealogy of the kings of Wessex given in the *Anglo-Saxon Chronicle*. It is a reasonable conjecture that the tales of victories over Grendel and the fiery dragon belong properly to the myth of Beaw. If Beowulf, the champion of the Gautar, had already become a theme of epic song, the resemblance of name might easily suggest the idea of enriching his story by adding to it the achievements of Beaw.

As the name of Beaw appears in the genealogies of English kings, the traditions of his exploits may have been brought over by the Angles, and there is evidence that the Grendel legend was popularly current in this country. In the schedules of boundaries appended to two Old English charters there occurs mention of pools called "Grendel's mere," one in Wiltshire and the other in Staffordshire. The Wiltshire charter that speaks also of a place called *Bēowan hām* ("Beowa's home"), and another Wiltshire charter has a "Scyld's tree" among the landmarks enumerated. The notion that ancient burial mounds were liable to be inhabited by dragons was common in the Germanic world: there is perhaps a trace of it in the Derbyshire place-name Drakelow, which means "dragon's barrow."

The blending of the stories of the mythic Beaw and the historical Beowulf may have been the work of Scandinavian and not of English poets: Prof. G. Sarrazin has pointed out the striking resemblances between the Scandinavian legend of Bödvarr Biarki and that of the Beowulf of the poem. The English epic, which unquestionably derived its historical elements from Scandinavian song, may be indebted to the same source for its general plan, including the blending of history and myth. But considering the late date of the authority for the Scandinavian traditions, the latter may owe some of their material to English minstrels.

Date and Origin.—The forms under which Scandinavian names appear in the poem show that these names must have entered English tradition not later than the beginning of the 7th century. It does not indeed follow that the extant poem is of so early a date; but its syntax is remarkably archaic in comparison with that of the Old English poetry of the 8th century. Although the existing ms. is written in West-Saxon dialect, the phenomena of the language indicate transcription from an Anglian (*i.e.*, a Northumbrian or Mercian) original; and this conclusion is supported by the fact that while the poem contains one important episode relating to the Angles, the name of the Saxons does not occur in it at all. The intercourse of the Angles with Scandinavia, which enabled their poets to obtain new knowledge of the legends of Danes, Gautar and Swedes, may not have ceased until their conversion to Christianity in the 7th century. And even after this event it is probable that down to the end of the 7th century, if not still later, the court poets of Northumbria and Mercia continued to celebrate the deeds of Beowulf and of many another hero of ancient days.

Although the heathen Angles had their own runic alphabet, it is unlikely that any poetry was written down until a generation had grown up trained in the use of the Latin letters learned from Christian missionaries. We cannot determine the date at which some book-learned man, interested in poetry, took down from the lips of a minstrel one of the stories that he had been accustomed to sing. It may have been before 700; much later it can hardly have been, for the old heathen poetry was still in vigorous life. The epic of Beowulf was not the only one that was reduced to writing: a fragment of the song about Finn, king of the Frisians, still survives, and several other heroic poems were possibly writ-

ten down about the same time. As originally dictated, *Beowulf* probably contained the story outlined at the beginning of this article, with the addition of one or two of the episodes relating to the hero himself—among them the legend of the swimming-match. The other episodes were introduced by some later writer, who had heard old heathen songs, the substance of which he preserved by weaving it in an abridged form into the texture of the one great poem which he was transcribing. The Christian passages, which are poetically of no value, may be of any date down to that of the extant ms.

An interesting light on the history of the written text seems to be afforded by the phenomena of the existing ms. The poem is divided into numbered sections, the length of which was probably determined by the size of the pieces of parchment of which an earlier exemplar consisted. Now the first 52 lines, which are concerned with Scyld and his son Beowulf, stand outside this numbering. It may reasonably be inferred that there once existed a written text of the poem that did not include these lines. Their substance, however, is clearly ancient. Many difficulties will be obviated if we may suppose that this passage is the beginning of a different poem, the hero of which was not Beowulf the son of Egtheow, but his Danish namesake. It is true that Beowulf the Scylding is mentioned at the beginning of the first numbered section; but probably the opening lines of this section have undergone alteration in order to bring them into connection with the prefixed matter.

BIBLIOGRAPHY.—The volume containing the *Beowulf* ms. (Vitellius A. xv.) was first described by Humphrey Wanley in 1705, in his catalogue of mss., published as vol. iii. of G. Hickes's *Thesaurus Veterum Linguarum Septentrionalium*. The first edition showing competent knowledge of the language was produced in 1833 by J. M. Kemble. Since then editions have been very numerous. The text of the poem was edited by C. W. M. Grein in his *Bibliothek der angelsächsischen Poesie* (1857), and again separately in 1867. Autotypes of the ms., with transliteration by Julius Zupitza, were issued by the Early English Text Society in 1882. The new edition of Grein's *Bibliothek*, by R. P. Wülker, vol. i. (1883), contains a revised text with critical notes. The most serviceable separate editions are those of M. Heyne (7th ed., revised by A. Socin, 1903), A. J. Wyatt (with English notes and glossary, 1898), and F. Holthausen (vol. i., 1905).

Many English translations of the poem have been published (*see* C. B. Tinker, *The Translations of Beowulf*, 1903). Among these may be mentioned those of J. M. Garnett (6th ed., 1900), a literal rendering in a metre imitating that of the original; J. Earle (1892) in prose; W. Morris (1895) in imitative metre, and almost unintelligibly archaistic in diction; C. B. Tinker (1902) in prose; and Sir Archibald Strong (1925) and C. K. Scott-Moncrieff (1926) in verse.

For the bibliography of the earlier literature on *Beowulf*, and a detailed exposition of the theories therein advocated, *see* R. P. Wülker, *Grundriss der angelsächsischen Litteratur* (1882). The views of Karl Müllenhoff may be best studied in his *Beovulf, Untersuchungen über das angelsächsische Epos* (1889). Much valuable matter may be found in B. ten Brink, *Beowulf, Untersuchungen* (1888). The work of G. Sarrazin, *Beowulf-studien* (1888), contains, amid much that is fanciful, not a little that deserves careful consideration. The many articles by E. Sievers and S. Bugge, in *Beiträge zur Geschichte der deutschen Sprache und Litteratur* and other periodicals, are of the utmost importance for the textual criticism and interpretation of the poem. *See* also R. W. Chambers, *Beowulf, an Introduction to the Poem* (1921). (H. Br.; X.)

BEQUEST, the disposition of property by will. Strictly, "bequest" is used of personal, and "devise" of real property. (*See* LEGACY; WILL OR TESTAMENT.)

BÉRAIN, JEAN (1637–1711), known as "the elder," French draughtsman and designer, painter and engraver of ornament, was born on Oct. 28 1637, at Saint Mihiel (Meuse) and died in Paris on Jan. 24 1711. In 1674 he was appointed *dessinateur de la chambre et du cabinet du Roi*, in succession to Gissey, whose pupil he is believed to have been. After the death of Le Brun he was commissioned to compose and supervise the whole of the exterior decoration of the king's ships. His numerous designs were for the most part engraved under his own superintendence, and a collection of them was published in Paris in 1711 by his son-in-law, Thuret, clockmaker to the king, in three books, *Oeuvre de J. Bérain, Ornements inventés par J. Bérain* and *Oeuvres de J. Bérain contenant des ornements d'architecture*. M. Guilmard in *Les Maîtres ornemanistes*, gives a list of his published works.

His son JEAN BÉRAIN, "the younger" (1678–1726), was his father's pupil, and exercised the same official functions after his death. CLAUDE BÉRAIN, brother of the elder Jean, was still living in 1726. He was engraver to the king, and executed a good number of plates of ornament and arabesque of various kinds.

BÉRANGER, PIERRE JEAN DE (1780–1857), French song-writer, was born in Paris on Aug. 19, 1780. He received very little formal instruction in his childhood in Paris, where as a schoolboy he witnessed the fall of the Bastille. Later he lived at Péronne with an aunt, who taught him to be a stout republican; and from the doorstep of her inn, on quiet evenings, he would listen to the thunder of the guns before Valenciennes, and fortify himself in his passionate love of France and distaste for all things foreign. In 1802, in consequence of a distressing quarrel, he left his father and began life for himself in the garret of his ever memorable song. For two years he did literary hackwork, when he could get it, and wrote pastorals, epics and all manner of ambitious failures. At the end of that period (1804) he wrote to Lucien Bonaparte, enclosing some of these attempts. He was then in bad health, and in the last state of poverty, mitigated only by the friendship of Judith Frère, with whom he had been already more or less acquainted since 1796, and who continued to be his faithful companion until her death, three months before his own, in 1857. She must not be confounded with the Lisette of the songs; the picces addressed to her (*La Bonne Vieille, Maudit printemps,* etc.) are in a very different vein. Lucien Bonaparte interested himself in the young poet, and transferred to him his own pension of 1,000 francs from the Institute; five years later, through the same patronage, although indirectly, Béranger became a clerk in the university at a salary of another thousand. Meanwhile he had written many songs for convivial occasions, and "to console himself under all misfortunes" in 1812, while he was watching by the sick-bed of a friend, it occurred to him to write down the best he could remember. Next year he was elected to the *Caveau Moderne,* and his reputation as a song-writer began to spread. Manuscript copies of *Les Gueux, Le Sénateur,* above all, of *Le Roi d'Yvetot,* a satire against Napoleon, whom he was to magnify so much in the sequel, passed from hand to hand with acclamation; one man sang them to another over all the land of France. He was the only poet of modern times who could altogether have dispensed with printing.

His first collection escaped censure. "We must pardon many things to the author of *Le Roi d'Yvetot,*" said Louis XVIII. The second (1821) lost him his situation in the university, and subjected him to a trial, a fine of 500 francs and an imprisonment of three months. At Sainte Pélagie he occupied a room (it had just been quitted by Paul Louis Courier), warm, well furnished, and preferable in every way to his own poor lodging where the water froze on winter nights. A second imprisonment of nine months followed on the appearance of his fourth collection. The government proposed through Laffitte that, if he would submit to judgment without appearing or making defences, he should be condemned only in the smallest penalty. But his public spirit made him refuse the proposal; and he would not even ask permission to pass his term of imprisonment in a *maison de santé,* although his health was more than usually feeble at the time.

In the revolution of July copies of his song, *Le Vieux Drapeau,* were served out to the insurgent crowd. He had been for long the intimate friend and adviser of the leading men; and during the decisive week his counsels went a good way towards shaping the ultimate result. Béranger, however, refused to present himself at court, and used his favour only to ask a place for a friend, and a pension for Rouget de l'Isle, author of the famous *Marseillaise.* In 1848 he was elected to the Constituent Assembly, but soon obtained leave to resign. This was the last public event of Béranger's life. He continued to polish his songs in retirement, visited by nearly all the famous men of France. He numbered among his friends Chateaubriand, Thiers, Jacques Laffitte, Michelet, Lamennais, Mignet. His correspondence is full of wisdom and kindness, with a smack of Montaigne, and now and then a vein of pleasantry that will remind the English reader of Charles Lamb. He occupied some of his leisure in preparing his

own memoirs, and a treatise, which he never completed, on *Social and Political Morality*. He died on July 16, 1857. At his funeral the streets of Paris were lined with soldiers and full of townsfolk, silent and uncovered. From time to time cries arose: *"Honneur, honneur à Béranger!"* Béranger had little toleration for those erotic poets who are absorbed in singing their own loves and not the common sorrows of mankind, "who forget," to quote his own words, "forget beside their mistress those who labour before the Lord." Hence it is that so many of his pieces are political, and so many, in the later times at least, inspired with a socialistic spirit of indignation and revolt. It is by this socialism that he becomes truly modern and touches hands with Burns. (R. L. S.; X.)

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BERAR, a sub-province of India, formerly the Hyderabad Assigned districts, and administered by the British under certain agreements with the nizam of Hyderabad. From Oct. 1, 1903, the nizam gave a perpetual lease of the tract to the British government, and Berar has since then been administered as a division of the Central Provinces (*q.v.*). Pop. (1941) 3,604,866. Area, 17,809 sq.mi.

BÉRARD, JOSEPH FRÉDÉRIC (1789–1828), French physician and philosopher, was born at Montpellier. His *Doctrine médicale de l'école de Montpellier* (1819) is indispensable to a proper understanding of the principles of the Vitalistic school. From 1823 to 1826 he was professor of medicine at Paris; he was then nominated professor of hygiene at Montpellier. His most important book is his *Doctrines des rapports du physique et du moral* (1823). Bérard held that self-consciousness reveals to us the existence of an immaterial, thinking, feeling and willing subject, the self or soul. Alongside of this there is the vital force, the nutritive power, which uses the physical frame as its organ.

To the *Esprit des doctrines médicales de Montpellier,* published posthumously (1830), the editor, H. Pétiot, prefixed an account of his life and works; *see* also Damiron, *Phil. en France au XIXe siècle* (1834); C. J. Tissot, *Anthropologie générale* (1843).

BERAT, a town of southern Albania on the Semen (or Osum) river, which is unfordable and crossed by a bridge and seven ferries. The river often overflows its banks, leaving stagnant pools which breed fever-bearing mosquitoes. Pop. (1930) 10,403, of whom nearly seven-eighths are Mohammedans, and the remainder Orthodox, with an Orthodox bishop. The town is on the Valona-Koritsa-Monastir route, and lies in a fertile valley producing maize, tobacco, fruit, vines and olives. The citadel is of no military value and is, moreover, waterless. The surrounding district is very barbarous. In the 13th century it fell under Sicily and then Naples, and was ruled in the 14th and 15th centuries by the Musaki family. Later it became Turkish. In the 18th century Ibrahim of Berat headed the league of Muslims which unsuccessfully revolted against Ali Pasha (1788–1822). Berat was occupied by the Austrians during World War I and in 1918 by the Italians, who again occupied it in April 1939.

BERAUN: *see* BEROUN.

BERBER. A town of 17,000 inhabitants in the Northern province of the Anglo-Egyptian Sudan. The town is on the right bank of the Nile 1,140 ft. above sea level in 18° 1′ N., 33° 59′ E., and 216 mi. by rail northeast of Khartoum. Berber was the starting point of the caravan route 242 mi. long across the Nubian desert to the Red sea at Suakin. The caravan route was superseded in 1906 by a branch railway which runs east to the Red sea from the mouth of the Atbara river. Berber lost its importance to the larger town of Atbara (pop. 30,000) which grew up at the railway junction. The town of Berber, which is old, is built of mud brick. Before its conquest by Egypt in 1820 its rulers owed allegiance to the kings of Sennar. The Mahdists sacked it May 26, 1884, and its ruins within the ramparts remain uninhabited. The new town has spread northward.

The Northern province, whose capital is at Ed Damer near the confluence of the Nile and Atbara rivers, comprises nearly 1,000 miles of the Nile between the sixth cataract and Wadi Halfa and a vast tract of the surrounding desert. The largest tribes are the Jaalin, Ababda (*q.v.*), Shagia (*q.v.*) and Danagla. The riverain crops are dura, wheat, cotton and pulses, which are irrigated by the flood or by pumps or waterwheels.

The former province of Berber has been incorporated into Northern province. (C. B. T.)

BERBERA, chief town and port of the British Somaliland protectorate, N.E. Africa, 155 mi. S. of Aden, in 10° 26′ N., 45° 4′ E. Berbera is at the head of a deep inlet, the only completely sheltered haven on the south side of the Gulf of Aden. The harbour is 11–13 fathoms deep at the entrance, decreasing to 5 fathoms near shore. Ocean-going steamers find ample accommodation. The town is built in two divisions—the native town, to the east; the new town, laid out by the Egyptians (1875–77), to the west. The majority of the better-class houses are of rubble, one-storied and flat-roofed. The water-supply is brought to the town by an aqueduct from the hills some 8 mi. distant. The permanent population was estimated (1936) at 20,000; but from October to April it rises to 30,000 or more by the arrival of caravans from Ogaden and Dolbahanta. The traders bring with them tents on the backs of camels and these are pitched near the native town. Their merchandise consists of sheep and goats, gum and resin, skins and ostrich feathers. Imports are mostly cotton goods, dates, rice and sugar. Direct trade is almost entirely with Aden. Berbera is said to have been founded by the Ptolemies among the *Barbari* of the adjacent coast lands. It fell subsequently into the possession of Arabs and was included in the Mohammedan state of Adel. At the time of the visit to the town of R. F. Burton and J. H. Speke (1854) it was governed by its own sheiks. In 1870 it was claimed by the khedive Ismail, but was not permanently occupied by Egypt until 1875. In 1884 it passed into the possession of Great Britain. (*See* SOMALILAND: *British.*)

BERBERINE, an optically inactive alkaloid, isolated in 1826 by Chevallier and Pierre Pelletan. It has been found in a number of unrelated plant species, most abundantly in the root-bark of golden seal (*Hydrastis*) and barberry (*Berberis*). It is usually accompanied by other alkaloids, notably hydrastine, berbamine, canadine (*l*-tetrahydroberberine), palmatine and oxyacanthine. Berberine is one of the few known coloured alkaloids. It crystallizes from water in silky yellow needles, from chloroform or acetone in reddish-yellow tablets containing one molecule of solvent; crystallized from ether, it melts at 144° C. The salts are not formed by simple combination with the acid like most alkaloids, but with loss of a molecule of water, and are properly known as berberinium compounds: thus, berberinium chloride, $C_{20}H_{17}NO_4{\cdot}Cl+2H_2O$. Addition of nitric acid to a solution of berberine or its salts precipitates the characteristic nitrate as pale yellow needles. Reduction of berberine gives the colourless tetrahydroberberine (racemic canadine). Berberine belongs to the isoquinoline group of alkaloids (*q.v.*), and its complex molecular structure was elucidated largely through the investigations of W. H. Perkin, Jr., in the period 1899–1925. It was synthesized in 1925 independently by Perkin, J. N. Rây and Robert Robinson, and by Ernst Spaeth and Herbert Quietensky. It has little use in medicine, although Warma (1934) reported excellent results in the treatment of "Oriental sore" by local injection. Berberis extracts are used to some extent as bitter tonics; their alleged value against malaria is now completely discredited. (L. F. SL.)

BERBERS, the name of the various branches of the indigenous "Libyan" race of North Africa. Since the dawn of history the Berbers have occupied the tract between the Mediterranean and the Sahara from Egypt to the Atlantic. The origin of the name is doubtful. Some derive it from the word βάρβαροι (barbarians), employed first by the Greeks and later by the Romans. Others attribute it to the Arab conquerors. Tribal titles, *Barabara* and *Beraberata,* appear in Egyptian inscriptions of 1700 and 1300 B.C., and the Berbers were known to the Egyptians as "Lebu," "Mashu-

asha," "Tamahu," "Tehennu" and "Kahaka"; a long list of names is found in Herodotus; and the Romans called them Numidae, Gaetuli and Mauri, terms derived respectively from the Greek *νομάδες* (nomads), the name Gued'oula, of a great Berber tribe, and the Hebrew *mahur* (western). In regard to the ethnic relations of the Berbers, on the monuments of Egypt their ancestors are pictured with the comparatively blond features which many of them still display. Though considerable individual differences of type may be found in every village, the Berbers are distinctively a "white" race. Dark hair and brown or hazel eyes are the rule; blue-eyed blonds are found, but their frequency has been considerably overstated. The invaders who have most affected the Berber race are the Arabs, but the two races, with a common religion, often a common government, and the same tribal groupings, have failed to amalgamate to any great extent. The Berber is straightforward, honest, by no means averse to money-making, but not unscrupulous in the methods which he employs to this end, and trustworthy.

Government.—The Berber's village is his state, and the government is vested in an assembly, the *Jemáa,* formed of all males old enough to observe the fast of Ramadan. By them are determined all matters of peace or war, legislation, taxation and justice. The executive officer is the *Amin,* a kind of mayor, elected from some influential family in which the dignity is often in practice hereditary. He owes his position to the good-will of his fellows, receives no remuneration, and resigns as soon as he loses the confidence of the people. By him are appointed certain *Temman* (sing. *Tamen*) who act as overseers, though without executive powers, in the various quarters of the village. The poorest Berber has as great a voice in affairs as the richest. The undue power of the *Jemáa* is checked by vendetta and a sort of lynch law, and by the formation of parties (*sofs*), within or without the assembly, for trade, political and other purposes. The Berbers are a warlike people who have never been completely subjugated. Every boy on reaching 16 is brought into the *Jemáa* and given weapons which he carries till he is sixty. Though each village is absolutely independent as far as its internal affairs are concerned, two or more are often connected by administrative ties to form an *Arsh* or tribe. A number of these tribes form a *Thakebilt* or loose confederation. The Taureg organization, owing to their peculiar circumstances of life, is monarchical. Wars are declared by special messengers; the exchange of sticks or guns renders an armistice inviolable. In some tribes a tablet, on which is inscribed the name of every man fit to bear arms, is placed in the mosque. The Berbers, though Mahommedans, do not observe the prescribed ablutions; they break their fast at Ramadan; and eat wild boar's flesh and drink fig brandy. Saints, both male and female, are paid more reverence by Berbers than by Arabs. Around their tombs their descendants settle, and thus sacred villages, often of considerable size, spring up. Almost every village, too, has its saint or prophet, and disputes as to their relative sanctity and powers cause fierce feuds. The hereditary caste known as Marabouts are frequently in open opposition to the absolute authority of the *Jemáa.* They are possessed of certain privileges, such as exemption from the chief taxes and the duty of bearing arms. They often take a foremost part in tribal administration, and are frequently called upon to perform the office of arbitrators in questions of disputed policy, etc. In the *Jemáa,* too, the Marabout at times takes the place of honour and keeps order. The Berbers are very superstitious. Their social tendencies are distinctly communistic; property is often owned by the family in common, and a man can call upon the services of his fellow villagers for certain purposes, as the building of a house. Provision for the poor is often made by the community.

Customs and Industries.—In some districts there are peculiar customs, such as the wearing of small silver nose-rings, seen in El-Jofra. The Berbers' weapons are those of the Arab: the long straight sword, the slightly curved and highly ornamented dagger and the long gun. Their villages, however, are often of substantial appearance: with houses of untrimmed stones, occasionally with two storeys, built on hills, and invariably defended by a bank, a stone wall or a hedge. Sometimes their homes are mere huts of turf or of clay tiles, with mortar made from lime and clay or cow-dung. The sloping roof is covered with reeds, straw or stones. The living room is on the right, the cattle-stall on the left. The dwelling is surrounded by a garden or small field of grain. The second storey is not added till a son marries. In the villages of the western Atlas the greater part of the upper storey consists of a sort of rough verandah. In this district the natives spend the winter in vaults beneath the houses, and, for the sake of warmth, the tenements are built very close. Agriculture, which is carried on in the mountain districts by means of laboriously constructed terraces, is antiquated in its methods. The plough, often replaced on the steeper slopes by the hoe, is similar to that depicted in ancient Egyptian drawings, and hand irrigation is usual. A sickle, toothed like a saw, is used for reaping. Corn is trodden by oxen, and kept in osier baskets narrowing to the top, or clay granaries.

The Berbers have many industries. They mine and work iron, lead and copper. They have olive presses and flour mills and their own millstone quarries, and build mills for the Arabs. They make lime, tiles, woodwork for the houses, domestic utensils and agricultural implements. They weave and dye several kinds of cloth, tan and dress leather and manufacture oil and soap. Without the wheel the women produce a variety of pottery utensils, often of very graceful design and decorated with patterns in red and black. Whole tribes, such as the Beni-Sliman, are occupied in the iron trade; the Beni-Abbas made firearms before the French conquest, and even cannon are said to have been made by boring. Before it was proscribed by the French, the manufacture of gunpowder was general. The native jewellers make excellent ornaments in silver, coral and enamel. In some places wood-carving has been brought to considerable perfection; and native artists engrave on metal both by etching and the burin. The Berbers are keen traders and, after the harvest, hawk small goods, travelling great distances.

A Berber woman has in many ways a better position than her Arab sister. True, her birth is regarded as an event of no moment, while that of a boy is celebrated by great rejoicings, and his mother acquires the right to wear on her forehead the *tafzint,* a mark which only the women who have borne an heir can assume. Her husband buys and can dismiss her at will. She has most of the hard work to do, and is little better than a servant. When she is old and past work, especially if she has not been the mother of a male child, she is often abandoned. But she has a voice in public affairs; she has laws to protect her, manages the household and goes unveiled; she has a right to the money she earns; she can inherit under wills, and bequeath property, though to avoid the alienation of real property, succession to it is denied her. But most characteristic is the Berber woman's right to enter into a sacred bond or agreement, represented by the giving of the *anaya.* This is some symbolic object, stick or what not, which passes between the parties to a contract, the obligations under which, if not fulfilled by the contracting parties during their lives, become hereditary. Female saints, too, are held in high honour; and the Berber is monogamous. Among many Berber tribes the eldest daughter's son succeeds. A religious corporation, the *Savia Kartas,* has been ruled over by a woman, the chief's wife. The Berbers consult their women in many matters. Only one woman is really held in low esteem, the *kuata* or "go-between," though her services are only employed in the respectable task of arranging marriages. Berber women are intelligent and hard-working, and, when young, very pretty and graceful. The Berbers do not admire fat women. Among the Kabyles the adulteress is put to death, as are those women who have illegitimate children, the latter suffering with their mothers.

Language.—The Berber language is still spoken by millions of people from Egypt to the Atlantic and from the Mediterranean to the Sudan, and place-names in the Canary Islands and other remains of the aboriginal language there prove it to have been the native tongue. The Berber tongue shows some affinity with Semitic in the construction both of its words and sentences but is quite distinct from the Semitic languages; and the dialects show but slight differences from the long-extinct Hamitic speech

from which all are derived. The Berber language is still essentially one. The Berbers have a writing of their own, peculiar and little used or known, the antiquity of which is proved by monuments and inscriptions ranging over the whole of north Africa. A collection of the various signs of the alphabet has shown thirty-two letters, four more than Arabic. Among the peculiar grammatical features of Berber may be mentioned two numbers (no dual), two genders and six cases, and verbs with one, two, three and four radicals and imperative and aorist tense only. The Berber tongue is most common in Morocco and the western Sahara.

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BERBICE, one of the three "counties" of British Guiana associated with the river of the same name (*see* GUIANA).

BERCEO, GONZALO DE (*c.* 1180–*c.* 1246), the earliest Castilian poet whose name is known to us, was born at Verceo, a village in the province of Logroño. In 1221 he became a deacon and was attached, as a secular priest, to the Benedictine monastery of San Millan de la Cogolla, in the diocese of Calahorra. He wrote upwards of 13,000 verses, all on devotional subjects. His best work is a life of St. Oria; others treat of the life of St. Millan, of St. Dominic of Silos, of the Sacrifice of the Mass, and the Miracles of Our Lady. Berceo uses the *cuaderna via* (single-rhymed quatrains, each verse being of 14 syllables); he lacks imagination and taste, but he combines directness of vision and a power of selection with a passionate devotion that gives him the supremacy over his French contemporary, Gautier de Coinci, from whom most of his legends of the Virgin are borrowed.

See Comte de Paymaigre, *Les vieux auteurs castillans* (1888), I., pp. 267–300; R. Becker, *Gonzalo de Berceos Milagros und ihre Grundlagen* (Strasbourg, 1910).

BERCEUSE, a cradle-song, the German *Wiegenlied,* a musical composition with a quiet rocking accompaniment. The word is derived from the French for a "lullaby," from *berceau,* a cradle.

BERCHEM or **BERGHEM, NICOLAES** (1620–1683), a Dutch painter, born at Haarlem, and died on Feb. 18, 1683, at Amsterdam. He received instruction from his father (Pieter Claesz van Haarlem) and from the painters Claes Moyaert, Jan Wils and Pieter de Grebber. He seems to have worked in Italy, and most of his numerous landscapes are southern landscapes in bright sunshine. They were in great demand, as were also his etchings and drawings. His finest pictures are at the Amsterdam Museum and at the Hermitage, Leningrad. There are examples in the National Gallery and the Wallace and Dulwich collections in London; in Vienna, Berlin and elsewhere.

BERCHTA, a fairy in South German mythology (English, Bertha), at first a benevolent spirit, later regarded as a witch. In Pagan times she ranked as a minor deity.

BERCHTESGADEN, a town in south-eastern Bavaria, Germany, beautifully situated at a height of 1,700 ft., on the Untersberg. Pop. (1933) 3,919. It is celebrated for its mines of rock-salt and for its charm as a summer resort. Here Adolf Hitler built a securely guarded mountain villa, reached only by an elevator and tunnel cut in the rock. To it he often retired for rest and meditation on his future diplomatic and military moves.

BERCHTOLD VON UND ZU UNGARSCHITZ, LEOPOLD, COUNT (1863–1942), Austro-Hungarian statesman, was born April 18, 1863, and entered the Austro-Hungarian Foreign Office 1893. In 1903 he went as councillor of legation to St. Petersburg (now Leningrad) and in Dec. 1906 was appointed ambassador there. With the Russian court and the aristocratic society of St. Petersburg he maintained the best relations, but failed entirely in his efforts to accommodate the obviously increasing differences between Russian and Austro-Hungarian policy. He took a leading part in the negotiations preceding the crisis caused by the annexation of Bosnia-Hercegovina, which aimed at securing common action of the two Powers in the Balkan question. It was at his château of Buchlov, in Moravia, that the fateful conference took place between Izvolski and Aehrenthal (Sept. 15, 1908). In March 1911 Count Berchtold was recalled from Russia, and on Feb. 17, 1912, he was, against his own will, appointed Aehrenthal's successor as foreign minister in the Austro-Hungarian Government.

His efforts were directed toward securing the position of Austria-Hungary in the Balkan peninsula. At this time he considered possible a peaceful solution of the Balkan question by agreement with Russia and the Western Powers. But the obvious efforts of Russian statesmen to weaken the influence of Austria-Hungary in the Balkans, the aggressive activities of the Serbs and the ambiguous behaviour of Bulgaria forced him to change his attitude, especially as he failed to receive from the Western Powers the support which he had sought.

During the three Balkan wars, Oct. 1912 to Aug. 1913, Berchtold's attitude was characterized by weakness and indecision. He repeatedly took steps toward active intervention, but drew back when the Entente Powers used threats, and the other members of the Triple Alliance intervened with counsels of moderation in Vienna. His efforts at the close of the third Balkan War to secure a revision of the Treaty of Bucharest (Aug. 10, 1913), which was unfavourable to Bulgaria, were as unsuccessful as his attempt to secure an accommodation between Bulgaria and her rivals by way of direct negotiation. The prestige of Austria-Hungary in the Balkans noticeably declined. Serbia's endeavours to extend her power to the Adriatic and to win recruits for the ideal of Great Serbia among the kindred Slav races of Austria-Hungary became more and more evident. For these reasons, at the conferences at the Ballplatz which followed the murder of the Archduke Francis Ferdinand, the heir to the throne, on June 28, 1914, Berchtold maintained the view that a definitive settlement with Serbia was essential, even at the risk of war with Russia and France.

After the outbreak of World War I he directed his efforts to inducing Italy and Rumania to carry out their obligations and to securing new allies for the Central Powers. These efforts were, for the most part, unsuccessful. Turkey alone joined the Central Powers. Rumania and Italy declared their neutrality; even Bulgaria dragged out the negotiations, though Berchtold offered great concessions in return for her active intervention on the side of Austria-Hungary and Germany. Italy's demands for compensation were acknowledged in principle by Berchtold, under pressure from Germany, but he embarked on the negotiations with hesitation, and to the day of his resignation (Jan. 13 1915) he refused to listen to any proposal for the cession of Austrian territory. In March 1916 Berchtold was appointed Oberstthofmeister (lord high steward) to the heir to the throne, Charles Francis Joseph, whom he subsequently served as Oberst-

kämmerer (lord high chamberlain). After the fall of the dynasty he took no further part in politics. His death at Sopron, Hungary, was announced Nov. 21, 1942. (*See* AUSTRIA.) (A. F. P.)

BERCK, bathing resort, north France, department of Pas-de-Calais, 25 mi. S. of Boulogne by rail. Pop. (1936) 16,700. It comprises two parts—Berck-Ville, the fishing village, 1½ mi. from the shore, and Berck-Plage, with a fine sandy beach. The latter is a favourite resort for children, and there are several sanatoria. Herrings form the staple of the active fishing trade. Boat-building and fish-curing are carried on.

BERDIANSK, a port on the Sea of Azov in the Mariupol district of the Ukrainian S.S.R. Lat. 46° 48′ N., long. 36° 44′ E. Pop. (1939) 51,664. It has a breakwater extending 1,073 yards enclosing water 9½–15 ft. deep: a canal has been dredged from the harbour to the roads, and a mole was constructed (1863) as a protection against the heavy surf when the south wind blows. There are salt lagoons in the neighbourhood. Its exports are wheat, barley, linseed, hemp, wool and skins, and its imports hardware, fruit, oil and naphtha. It has manufactures of bricks and tiles, tallow and macaroni.

BERDICHEV, the chief town of the Berdichev district of the Ukrainian Soviet Socialist Republic. Lat. 49° 52′ N., long. 28° 30′ E. Pop. (1939) 66,306. It is a railway junction, and centre for the exchange of skins, iron and wooden wares, salt fish, grain, cattle and horses. Small industries—tobacco, soap, leather and bricks—are carried on, and fairs are held. In the treaty of demarcation between the Poles and Lithuanians in 1546, Berdichev was assigned to Lithuania. After the capture of Bar, 1768, Pulaski, the leader of the Polish confederacy of Bar fled to Berdichev, which was captured by the Russians after a 25 days' siege. Later the town belonged to the Radziwill family. A fortified Carmelite monastery was founded here in 1627, was plundered by the Zaporogian Cossacks under Chmielnicki in 1647, and disestablished 1864. The Cathedral of the Assumption was completed in 1832.

BEREA, a town of Madison county, Kentucky, U.S.A., in the foot-hills of the Cumberland mountains, at the edge of the blue-grass region, 95m. S.E. of Louisville, on the Louisville and Nashville railroad. The population in 1940 was 2,176. Three miles south is the gap through which Daniel Boone passed on his expedition from North Carolina into the Kentucky wilderness. The history of the town is bound up with that of Berea college, which was founded (1855) to promote "the spiritual and material welfare of the mountain region of the South." Instruction is provided (for students over fifteen years of age) through a full college course. Tuition is free, and expenses are kept at a minimum. The annual enrolment is about 2,500. The campus of 140ac. extends along a picturesque ridge, 1,070ft. above sea-level. The lands used for instruction include 50ac. of gardens, 494ac. in farms, and a forest reserve of 5,600 acres. All the work is done by the students, and is a part of the educational scheme. The college supplies water, electric light, ice, fire protection and other services to the village. Berea has been a pioneer in developing unconventional educational methods to meet the needs of its students, and its library serves isolated schools and families, teachers and clergymen, over a wide radius.

BEREKHIAH NAQDAN, Jewish fabulist, author of a Hebrew collection of *Fox Fables.* As his title implies (*Naqdan,* punctuator of the biblical text), Berekhiah was also a grammarian. Most authorities place him in the 13th century, but J. Jacobs has identified him with Benedictus le Puncteur, an English Jew of the 12th century.

BERENGARIUS (d. 1088), mediaeval theologian, born at Tours, was educated in the famous school of Fulbert of Chartres. Later, as director of the cathedral school of his native city, he taught with such success as to attract pupils from all parts of France, and powerfully contributed to diffuse an interest in the study of logic and metaphysics, and to introduce the dialectic development of theology. The earliest of his writings of which we have any record is an *Exhortatory Discourse* to the hermits of his district, written at their own request and for their spiritual edification. It shows a clear discernment of the dangers of the ascetic life, and a deep insight into the significance of the Augustinian doctrine of grace. Sometime before 1040 Berengarius was made archdeacon of Angers. It was shortly after this that rumours began to spread of his heretical views regarding the sacrament of the Eucharist. Transubstantiation, he held, was contrary to reason, unwarranted by Scripture, and inconsistent with the teaching of men like Ambrose, Jerome and Augustine. He did not conceal this conviction from his scholars and friends, and through them the report spread widely that he denied the common doctrine respecting the Eucharist. His old school companion, Adelmann, archdeacon of Liége, wrote to him letters of expostulation in 1046 and 1048; and Bishop Hugo of Langres, wrote (about 1049) a refutation of the views which Berengarius had expressed to him in conversation. Berengarius was not affected by their exhortations, and hearing that Lanfranc, the most celebrated theologian of his day, strongly approved the doctrine of Paschasius and condemned that of "Scotus Eriugena" (really Ratramnus), he wrote to him a letter expressing his surprise and urging him to reconsider the question. Lanfranc, who was then in Rome (1050), brought the letter to the notice of Leo IX. with the result that Berengarius was excommunicated and ordered to appear before the Council of Vercelli which was to be held later on in the year. Before it assembled he was cast into prison, and only when it was too late were the bishop of Angers and other powerful friends able to procure his release. At the council of Tours (1054) he found a protector in the papal legate, the famous Hildebrand, who, satisfied with the fact that Berengarius did not deny the real presence of Christ in the sacramental elements, succeeded in persuading the assembly to be content with a general confession from him that the bread and wine, after consecration, were truly the body and blood of the Lord, without requiring him to define how. At the 1059 council of Rome, Berengarius signed a formula of faith drawn up by Cardinal Humbert and defining the real presence in an extremely realistic manner; but on returning to France he continued to attack the doctrine of transubstantiation, apparently without objection from either his civil or ecclesiastical superiors. Finally, Hildebrand, now Pope Gregory VII., summoned him to Rome, and, in the council of 1078, tried once more to obtain a declaration of his orthodoxy by means of a confession of faith drawn up in general terms; but in the council of the following year Berengarius was forced to acknowledge a change of the bread into the body of Christ which was born of the Virgin Mary, and that the change was *non tantum per signum et virtutem sacramenti, sed in proprietate naturae et veritate substantiae* (not merely by sign and virtue of the sacrament but in the own nature and truth of substance). He was kindly dismissed by the pope not long after, with a letter recommending him to the protection of the bishops of Tours and Angers, and another pronouncing anathema on all who should do him any injury or call him a heretic. Berengarius again recalled his confession, but at the council of Bordeaux (1080), made a final retraction. He passed the rest of his life in retirement and prayer on the island of St. Côme, near Tours, where he died in 1088. He left behind him a number of followers.

The position of Berengarius in the Eucharist controversy rested on his theory that dialectic was *par excellence* the instrument for discovering truth, a theory which concerned the whole question of the relation between faith and reason and which meant that reason was to be the criterion in matters of faith. His objections to transubstantiation were chiefly metaphysical. Accidents, he argued, cannot exist without their substance, even by the power of God, and therefore, if the accidents of bread are present on the altar, their substance, and not that of the body of Christ, will be there. Besides, if Christ is present, and bread alone is seen, there is deception, for Christ, who is God, represents Himself other than He actually is. Again, if Christ is in heaven, as the Scriptures say, He cannot be on earth or on many altars, since nobody can be in different places at the same time. Moreover, we know that the body of Christ after the resurrection became incorruptible; therefore, it cannot be broken with the teeth or daily re-created. This reasoning Berengarius supports by the Bible and the Fathers.

He seems, however, to have admitted the real presence in the Eucharist, for he allowed that, after the consecration the elements undergo a *conversio,* not inasmuch as they lose the *esse* that they have, but in the sense of acquiring something else, that something being the real and invisible body of Christ which constitutes the *res sacramenti.*

The position of Berengarius was not entirely new, for in the 9th century, Ratramnus, a monk of Corbie, had rejected the substantial change in the elements and Eriugena had regarded the Eucharist as merely a memorial. As far as the Church was concerned, the debates with Berengarius led to a clearer exposition of the nature of the change in the sacrament, and an enrichment of the terminology applicable to Eucharistic dogma.

BIBLIOGRAPHY.—The *De sacr. coena adv. Lanfr. liber* of Berengarius was edited by A. F. and F. T. Vischer (1834). His letter to Adelmann is to be found in Martène—Durand: *Thes. nov. anecd.,* iv. 113 (1917). *See* also the collection of texts in Sudendorf: *Berengarius Turoniensis* (Hamburg, 1850) and the refutations of Berengarius in the works of Adelmann, Lanfranc and Guitmand in Migne's *Patrol. Lat.;* J. Schnitzer, *Berengar v. Tours, sein Leben und seine Lehre* (Munich, 1890); M. Grabmann, *Die Gesch. der Schol. Methode,* v. i. (Freiburg, 1909); R. Heurtevent: *Durand de Troarn et les Origines de l'Hérésie bérengarienne* (1912); A. Harnack: *Hist. of Dogma.*

BÉRENGER, ALPHONSE MARIE (1785–1866), known as Bérenger de la Drôme, French lawyer and politician, was born at Valence and entered the magistracy. In 1818 he published *La Justice criminelle en France,* attacking the special courts which were the main instruments of the Reaction and demanding a return to the old customary law and the institution of trial by jury. In 1828 he was elected to the chamber. As president of the parliamentary commission for the trial of the ministers of Charles X. in 1830 he secured a sentence of imprisonment in place of the death penalty. He helped to frame the new criminal code, based on humanitarian principles, which was issued in 1835. He secured, in 1832, the right, so important in French procedure, of juries to find "extenuating circumstances." Under Louis Philippe, Bérenger received many honours (including a peerage, of which he was deprived in 1848). After the Revolution of 1848 his political career ended, but his legal activity continued, and he became president of one of the chambers of the court of cassation. In the interest of the reform of the criminal law and especially the reclamation of young criminals he visited England; publishing the result of his study as *La Répression pénale, comparaison du système pénitentiaire en France et en Angleterre* (1855). His son, René Bérenger (1830–1915), vice-president of the Senate from 1894 to 1897, was also interested in prison reform.

BERENICE or **BERNICE,** the Macedonian forms of the Greek Pherenice, the name of (A) five Egyptian and (B) two Jewish princesses.

(A) 1. BERENICE, daughter of Lagus, wife of an obscure Macedonian soldier and subsequently of Ptolemy Soter, with whose bride, Eurydice, she came to Egypt as a lady-in-waiting. Her son, Ptolemy Philadelphus, was recognized as heir over the heads of Eurydice's children. So great was her ability and her influence that Pyrrhus of Epirus gave the name Berenicis to a new city. Her son Philadelphus decreed divine honours to her on her death. *See* Theocritus, *Idylls,* xv. and xvii.

2. BERENICE, daughter of Ptolemy Philadelphus, wife of Antiochus Theos of Syria, who, according to agreement with Ptolemy (249), had divorced his wife Laodice and transferred the succession to Berenice's children. On Ptolemy's death, Antiochus repudiated Berenice and took back Laodice, who, however, at once poisoned him and murdered Berenice and her son. The prophecy in Daniel xi. 6 seq. refers to these events.

3. BERENICE, the daughter of Magas, king of Cyrene, and the wife of Ptolemy III. Euergetes. During her husband's absence on an expedition to Syria she dedicated her hair to Venus for his safe return and placed it in the temple of the goddess at Zephyrium. The hair having by some unknown means disappeared, Conon of Samos, the mathematician and astronomer, explained the phenomenon in courtly phrase by saying that it had been carried to the heavens and placed among the stars. The name *Coma Berenices,* applied to a constellation, commemorates this incident. Callimachus celebrated the transformation in a poem, of which only a few lines remain, but there is a fine translation of it by Catullus. Soon after her husband's death (221 B.C.) she was murdered at the instigation of her son Ptolemy IV.

4. BERENICE, also called CLEOPATRA, daughter of Ptolemy X., married as her second husband Alexander II., grandson of Ptolemy VII. He murdered her three weeks afterwards.

5. BERENICE, daughter of Ptolemy Auletes, eldest sister of the great Cleopatra. The Alexandrines placed her on the throne in succession to her father (58 B.C.). She married Seleucus Cybiosactes, but soon caused him to be slain and married Archelaus, who had been made king of Comana in Pontus (or in Cappadocia) by Pompey. Auletes was restored and put both Berenice and Archelaus to death in 55 B.C.

(B) 1. BERENICE, daughter of Salome, sister of Herod I., and wife of her cousin Aristobulus, who was assassinated in 6 B.C. She was accused of complicity in his murder. By Aristobulus, she was the mother of Herod Agrippa I. Her second husband, Theudion, uncle on the mother's side of Antipater, son of Herod I., having been put to death for conspiring against Herod, she married Archelaus. Subsequently she went to Rome and enjoyed the favour of the imperial household.

2. BERENICE, daughter of Agrippa I., king of Judaea, and born probably about A.D. 28. She was first married to Marcus, son of Alexander, head magistrate of the Jews in Alexandria. On his early death she was married to her father's brother, Herod of Chalcis, after whose death (A.D. 48) she lived for some years with her brother, Agrippa II. Her third husband was Polemon, king of Cilicia, but she soon deserted him and returned to Agrippa, with whom she was living in 60 when Paul appeared before him at Caesarea (Acts xxvi.). During the devastation of Judaea by the Romans she fascinated Titus whom, along with Agrippa, she followed to Rome as his promised wife (A.D. 75). When he became emperor (A.D. 79) he dismissed her to her own country. Her influence had been exercised vainly on behalf of the Jews in A.D. 66, but the burning of her palace alienated her sympathies. For her influence *see* Juvenal, *Satires,* vi., and Tacitus, *Hist.,* ii. 2.

BERENICE, an ancient seaport of Egypt, on the west coast of the Red sea, in 23° 56′ N., 35° 34′ E. Built at the head of a gulf, the *Sinus Immundus,* or Foul bay, of Strabo, it was sheltered on the north by Ras Benas. The port is now nearly filled up, has a sand-bar at its entrance and can be reached only by small craft. Remnants of a temple's sculptures and inscriptions preserve the name of Tiberius and figures of deities, including a goddess of the emerald mines. Berenice was founded by Ptolemy II. (285–247 B.C.), and named in honour of his mother. It probably replaced an older town, which had long served as the entrepôt of trade between India, Arabia and Upper Egypt. From it a road with watering stations leads north-west across the desert to the Nile at Coptos. In the neighbourhood of Berenice are the emerald mines of Mount Zabara and Saket.

BERESFORD, CHARLES WILLIAM DE LA POER BERESFORD, 1ST BARON (1846–1919), British admiral, second son of the Rev. John de la Poer Beresford, later 4th marquis of Waterford, was born at Philipstown, King's County, on Feb. 10, 1846, and died on Sept. 6, 1919. He entered the "Britannia" as a naval cadet in 1859. He rose steadily in the navy and in May 1877 was appointed commander of the "Thunderer." From 1879–81 he was in command of the royal yacht "Osborne." He had served under Prince Alfred, duke of Edinburgh, in the "Galatea" in 1868, and in 1875 accompanied the prince of Wales (Edward VII.) on his tour to India. He entered Parliament in 1874 as member for Waterford, and held his seat until 1880; but he was principally known at this period as a sportsman and as a personal friend of the prince of Wales.

At the Egyptian crisis of 1882 he was in command of the gunboat "Condor" in the Mediterranean, and became a popular hero in England in connection with his share of the bombardment of Alexandria (July 11), when he took the leading part in engaging and silencing Fort Marabout in that operation. He was then sent ashore by Captain John (afterwards Lord) Fisher to restore order, which he did with complete efficiency. For this service he was promoted captain, and in Aug. 1884 he was sent to Egypt to

act on the staff of Lord Wolseley in the expedition for the relief of Khartum. He commanded the naval brigade at Abu Klea, Abu Kru, and Metemmeh, and with the naval steamer "Safieh" rescued Sir Charles Wilson and his party, who had been wrecked on returning from Khartum (Feb. 4 1885).

On his return home he became M.P. for East Marylebone, and was made 4th naval lord of the Admiralty under Lord George Hamilton in the Salisbury ministry of 1886, but resigned in Jan. 1888, on account of disagreement with the government's naval programme. Lord Charles was an advocate of the big navy programme, and his criticisms of the government had much to do with the passing of the Naval Defence Act, 1889. In that year he resumed active service afloat, becoming a rear-admiral in 1897. He sat in Parliament for York (1897–1900), and for Woolwich (1902–03). In 1903 he again returned to active service, commanding first the Mediterranean fleet, and then the Channel fleet, retiring in 1909. He became a full admiral in 1906.

During the tenure of the Admiralty by Sir John Fisher (Lord Fisher), he was often in disagreement with the Board, and as soon as he hauled down his flag in March 1909, he attacked the whole policy of the Board of Admiralty in a document addressed to the prime minister. This document was referred to a subcommittee of the Committee of Imperial Defence, which reported, in Aug. 1909 in a sense generally adverse to Lord Charles. He re-entered Parliament as member for Portsmouth in 1910, holding the seat until Jan. 1916, when he went to the House of Lords as Baron Beresford. He was placed on the retired list in 1911, and in 1912 published a book entitled *The Betrayal*, in which he expressed his views on the naval question. *Memories* (1914) is an entertaining book, in which very little is said of the long controversy between him and Lord Fisher. As a flag-officer Lord Charles was extremely popular in the fleet, and showed great energy and ability. Indeed, he was one of the most popular figures in public life. On his death on Sept. 16, 1919, the peerage conferred on him in 1916 became extinct.

BERESFORD, JOHN (1738–1805), Irish statesman, was born on March 14, 1738, a younger son of Sir Marcus Beresford who, having married Catherine, sole heiress of James Power, 3rd earl of Tyrone, was created earl of Tyrone in 1746. After the death of the earl in 1763, Beresford's mother successfully asserted her claim *suo jure* to the barony of La Poer. John Beresford was educated at Trinity college, Dublin, was called to the Irish bar, and entered the Irish parliament as member for Waterford in 1760. He was admitted of the privy council in 1768, and became one of the commissioners of revenue in 1770. In 1780 he became first commissioner of revenue, a position which gave him powerful influence in the Irish administration. He introduced some useful reforms in the machinery of taxation; and he was the author of many improvements in the architecture of the public buildings and streets of Dublin. He was first brought into conflict with Grattan and the popular party, in 1784, by his support of the proposal that the Irish parliament in return for the removal of restrictions on Irish trade should be bound to adopt the English navigation laws. In 1786 he was sworn a member of the English privy council, and the power which he wielded in Ireland through his numerous dependants and connections grew to be so extensive that a few years later he was spoken of as the "king of Ireland." He was a vehement opponent of the increasing demand for relief of the Roman Catholics; and opposed the nomination of Lord Fitzwilliam as lord lieutenant in 1795 for the purpose of carrying out a conciliatory policy. One of Fitzwilliam's first acts was to dismiss Beresford, who appealed to Pitt, and went in person to London to lay his complaint before the English ministers. There is little doubt that the recall of Lord Fitzwilliam (*q.v.*), which was followed by such momentous consequences in the history of Ireland, was, as the viceroy himself believed, mainly due to Beresford's dismissal. There had been a misunderstanding on the point between Pitt and Fitzwilliam. The latter, whose veracity was unimpeachable, asserted that previous to his coming to Ireland, he had informed the prime minister of his intention to dismiss Beresford, and that Pitt had raised no objection. In a letter to Lord Carlisle, justifying his action, Fitzwilliam mentioned that malversation had been imputed to Beresford. Beresford sent a challenge to Fitzwilliam, but the combatants were interrupted on the field and Fitzwilliam then made an apology.

When Lord Camden replaced Fitzwilliam in the viceroyalty in March 1795 Beresford resumed his former position. On the eve of the rebellion in 1798 his letters to Lord Auckland gave an alarming description of the condition of Ireland and he counselled strong measures of repression. When first consulted by Pitt on the question of the union Beresford appears to have disliked the idea; but he soon became reconciled to the policy and warmly supported it. After the union Beresford continued to represent Waterford in the imperial parliament, and he remained in office till 1802, taking an active part in settling the financial relations between Ireland and Great Britain. He died near Londonderry on Nov. 5, 1805. His son, John Claudius, kept a riding school in Dublin, which acquired an evil reputation as the chief scene of the floggings by which evidence was extorted of the conspiracy which came to a head in 1798. He took a prominent part in the Irish House of Commons, where he unsuccessfully moved the reduction of the proposed Irish contribution to the imperial exchequer in the debates on the Act of Union, of which, unlike his father, he was to the last an ardent opponent.

See Edward Wakefield, *An Account of Ireland* (1812); *Correspondence of the Right Hon. John Beresford*, ed. W. Beresford (1854); Earl Stanhope, *Life of William Pitt* (1861); W. E. H. Lecky, *History of Ireland in the Eighteenth Century*, vols. iii., iv., v. (1892).

BERESFORD, WILLIAM CARR BERESFORD, VISCOUNT (1768–1854), British general and Portuguese marshal, illegitimate son of the first marquis of Waterford, was born on Oct. 2 1768. He entered the British army in 1785, and while in Nova Scotia with his regiment in the following year lost the sight of one eye by a shooting accident. He first distinguished himself at Toulon in 1793, receiving two years later the command of the 88th regiment (Connaught Rangers). He made his reputation under Sir David Baird in Egypt (1799–1803) and South Africa (1805). From South Africa he was despatched to South America. He had little difficulty in capturing Buenos Aires with only a couple of regiments. But this force was wholly insufficient to hold the colony. Under the leadership of a French *émigré*, the chevalier de Tiniers, the colonists attacked Beresford, and at the end of three days' hard fighting he was compelled to capitulate. After six months' imprisonment he escaped, and reached England in 1807, and at the end of that year he was sent to Madeira, occupying the island in the name of the king of Portugal. After six months in Madeira as governor and commander-in-chief, he was ordered to join Sir Arthur Wellesley's army in Portugal. He was first employed as commandant in Lisbon, but accompanied Sir John Moore on the advance into Spain, and took a conspicuous part in the battle of Corunna (*see* PENINSULAR WAR). In Feb. 1809 Beresford was given the task of reorganizing the Portuguese army. In this task, by systematic weeding-out of inefficient officers and men, he succeeded beyond expectation. By the summer of 1810 he had so far improved the *morale* and discipline of the force that Wellington brigaded some of the Portuguese regiments with English ones, and at Busaco Portuguese and English fought side by side.

In the spring of 1811 Wellington was compelled to detach Beresford from the Portuguese service. The latter was next in seniority to Gen. (Lord) Hill, who had gone home on sick leave, and on him, therefore, the command of Hill's corps now devolved. Unfortunately Beresford never really gained the confidence of his new troops. At Campo Mayor his light cavalry brigade got out of hand, and a regiment of dragoons was practically annihilated. He invested Badajoz with insufficient forces, and on the advance of Soult he was compelled to raise the siege and offer battle at Albuera. His personal courage was even more than usually conspicuous, but to the initiative of a junior staff officer, Col. (afterwards Viscount) Hardinge, rather than to Beresford's own generalship, was the hardly won victory to be attributed. Beresford then went back to his work of reorganizing the Portuguese army. He was present at the siege of Badajoz and at the battle of Salamanca, where he was severely wounded (1812). In 1813 he was

present at the battle of Vitoria and at the battles of the Pyrenees, while at the battle of the Nivelle, the Nive and Orthez he commanded the British centre, and later he led a corps at the battle of Toulouse. At the close of the Peninsular War he was created Baron Beresford of Albuera and Cappoquin, with a pension of £2,000 a year, to be continued to his two successors.

In 1819 the revolution in Portugal led to the dismissal of the British officers in the Portuguese service. In 1823 Beresford's barony was made a viscounty, and when the duke of Wellington formed his first cabinet in 1828 he gave Beresford the office of master-general of the ordnance. In 1830 Beresford retired from politics, and for some time was occupied in a heated controversy with William Napier, the historian of the Peninsular War, who had severely criticized his tactics at Albuera. On this subject Wellington's opinion of Beresford is to the point. The duke had no illusions as to his being a great general, but he thought very highly of his powers of organization, and he went so far as to declare, during the Peninsular War, that, in the event of his own death, he would on this ground recommend Beresford to succeed him. The last years of Beresford's life were spent at Bedgebury, Kent. He died on Jan. 8, 1854.

BEREZINA, a river in the White Russian S.S.R., a tributary of the Dnieper. It rises in the marshes of Borizov and flows south for 350 mi. (250 mi. navigable), for the most part through low-lying but well-wooded country. It is linked with the Black sea and the Baltic, and is important for commerce, but is subject to severe floods. It was just above Borizov that Napoleon's army forced the passage of the Berezina, with enormous losses, on Nov. 26–28, 1812, during the retreat from Moscow.

BEREZOVO, a town in the Uralsk area of the Russian Soviet Federated Socialist Republic on the left bank of the Sosva river, 26 mi. above its junction with the Ob river. Lat. 63° 52′ N., Long. 64° 54′ E. Population 4,706. Alt. 100 ft. Average rainfall per annum 18.4 in. Av. temp. Jan. 10.7° F., July 61.3° F. As early as 1593 the Cossacks had established a trading post for furs (fox, ermine, squirrel, bear, reindeer, hares and sable) and this trade, except in sable, now goes on, together with dried and salted fish. It was burnt down in 1719 and 1808. It was a place to which political exiles were sent: among them were Prince Menshikov, the favourite of Peter the Great and Catherine I., who died here 1729, his enemy Prince Dolgoruki and his family, exiled 1730, and Mary Menshikov, once betrothed to Peter II.

BEREZOVSK, a mining centre in the Sverdlovsk district of the Uralsk area, Russian S.F.S.R., 8 mi. N.E. of Sverdlovsk (formerly Ekaterinburg). Population 8,032. The gold mines have been worked here since 1747. It has koustar (peasant) leather and wooden industries.

BERG (*Ducatus Montensis*), a former duchy of Germany, on the right bank of the Rhine, bounded on the north by the duchy of Cleves, on the east by the countship of La Marck and the duchy of Westphalia, and south and west by the bishopric of Cologne. Its area was about 1,120sq.m. The district was raised in 1108 to the rank of a countship, but did not become a duchy till 1380, after it had passed into the possession of the Jülich family. In 1423 the duchy of Jülich fell to Adolf of Berg, and in 1437 the countship of Ravensberg was united to the duchies. The male line of the dukes of Jülich-Berg-Ravensberg became extinct in 1511, and the duchy passed by marriage to John III. (d. 1539), duke of Cleves and count of La Marck, whose male line became extinct with the death of John William, bishop of Münster, in 1609. The question of succession led to a prolonged contest, which was one of the causes of the Thirty Years' War. It was settled in 1614 by a partition.

Berg was bestowed by Napoleon on Joachim Murat, who bore the title of grand-duke of Berg. The Congress of Vienna awarded it to Prussia.

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BERGAMASK or **BERGOMASK** (from the town of Bergamo in North Italy), a clumsy rustic dance (*cf.* Shakespeare, *Midsummer Night's Dream,* v. 360) copied from the natives of Bergamo, reputed to be very awkward in their manners.

BERGAMO, an episcopal see in Lombardy, Italy (ancient *Bergomum*), capital of the province of Bergamo, at the foot of the Alps, at the junction of the Brembo and the Serio, 33½ mi. N.E. of Milan by rail. Population (1936) town, 73,534; commune, 86,043.

The older Città Alta, on a hill (1,200 ft.), fortified by the Venetians, is linked by funicular railway to the newer Città Bassa below. The fine Romanesque church of S. Maria Maggiore (1137–1355) has a baroque interior and interesting works of art. The Cappella Colleoni, has a richly sculptured polychrome façade, and fine tombs of Bartolommeo Colleoni and his daughter Medea, executed (1470–1476) by Giovanni Antonio Amadeo, who also worked at the Certosa di Pavia. The adjacent market-place (now Piazza Garibaldi) contains the Gothic Palazzo Vecchio or Broletto; close by is a small baptistery of 1340, rebuilt in 1898. The lower town contains an important picture-gallery of north Italian masters. The musician Gaetano Donizetti was born here. Bergamo and the surrounding district have numerous cotton, silk, linen, wool, blanket and button factories. Railways radiate to Lecco, Ponte della Selva, Usmate (for Monza or Seregno), Treviglio (on the main line from Milan to Verona and Venice), and (via Rovato) to Brescia, and steam tramways to Treviglio, Sarnico and Soncino. The ancient Bergomum was the tribal centre of the Orobii; it became a Roman municipality and after destruction by Attila, was the capital of a Lombard duchy. From 1264 to 1428 it was under Milan, but then became Venetian, and remained so until 1797. (*See* P. Pesenti, *Bergamo,* 1910.)

BERGAMOT, OIL OF, an essential oil obtained from the rind of the fruit of the *Citrus bergamia.* The bergamot tree is small, with leaves and flowers like those of the bitter orange, and a round fruit nearly 3in. in diameter, having a thin, lemon-yellow, smooth rind. The tree is cultivated in southern Calabria, whence the entire supply of bergamot oil is drawn. Machinery is mostly used to express the oil from the fruit, which is gathered in November and December. The oil, which on standing deposits a stearoptene, bergamot camphor or bergaptene, is a limpid greenish-yellow fluid of a specific gravity of 0·882 to 0·886, and its powerful but pleasant odour is mainly due to the presence of linalyl acetate, or *bergamiol,* which can be prepared artificially by heating linalol with acetic anhydride. The chief use of bergamot oil is in perfumery. The word apparently is derived from the Italian town Bergamo. The name Bergamot, for a variety of pear, is supposed to be a corruption of the Turkish *beg-armudi* (prince's pear).

BERGDAMA, a Negro people inhabiting the northern half of south-west Africa, calling themselves *≠nukhoin* ("black people"). Their original language is unknown, for they all now speak the language of the Nama Hottentots, to whom they have long been subject. Some of them keep sheep and goats, and cultivate various crops, but the majority still lead a hunting and collecting life. They are divided into small patriarchal groups which are politically independent of one another. They worship a supreme being known as *||gamab,* and an important part is played in their domestic cult by the sacred fire.

See H. Vedder, *Die Bergdama* (1923).

BERGEDORF, a town of Germany, in the territory of Hamburg, on the river Bille, 10m. S.E. of Hamburg. Pop. (1933) 19,481. It produces vegetables and fruit for the Hamburg markets, and has manufactures of glass, asbestos and enamel. It received civic rights in 1275, belonged to Lübeck and Hamburg conjointly from 1420 to 1868, and in the latter year was purchased by Hamburg.

BERGEN, city and seaport, west Norway, in lat. 60° 23′ N., forming a separate county (*amt*). Pop. (1938) 106,500. It is beautifully situated on the broad Byfjord, and partly on a promontory between the excellent harbour (Vaagen) and the Puddefjord. The city is isolated landward by the two Lungegaard lakes and their pleasure parks and rises from the fjord in an amphitheatre, with red and yellow houses in wood and stucco. The settlement (formerly Björgvin), founded by King Olaf in 1070–

1075, grew rapidly and figured prominently in the mediaeval civil wars. The Hanseatic merchants established in Bergen their most active northern "Kontor"; some of the buildings from the prosperous 15th and 16th centuries remain, notably the one housing an authentic Hanseatic museum. Disastrous fires in 1702, 1855, and 1916 led after 1916 to the reconstruction of the central part of the town. A new road was built from the old German quay, the ancient warehouses and dark courts began to disappear, and a garden suburb was laid out at Finbergaasen. Broad open spaces help guard against further fire. However, in the German invasion of April 1940, and the subsequent disturbances, Bergen suffered from bombings and fire probably more seriously than any other Norwegian town.

As a port, Bergen ranks second only to Oslo, and in normal times maintains regular steamship connections with Newcastle, Rotterdam, Hamburg, and New York. Here originates most of the coastal shipping to northern ports. Quays are extensive, with engineering and shipbuilding yards, six patent slips, and three dry docks. Among the important industries are weaving, distilling, paper manufacture, pottery, tobacco, ropes. Fish products are the chief export.

Although the town is not rich in notable architecture, it can boast the Romanesque nave of Mariakirke (Church of St. Mary), and the cathedral of Bergen, rebuilt in the 16th century. Interesting also are Bergenhus fort, the adjoining Håkonshallen and Rosenkrantz tower of the 12th and 13th centuries. Besides the Hanseatic museum, there is the Vestlandske fishery and industrial museum and the archaeological and natural history collections of the Bergen museum. The Art gallery contains the Rasmus Meyer collection of Norwegian paintings and furniture. Edvard Grieg and Ole Bull are probably the most distinguished native sons. Bergen is a natural centre for the tourist trade, easily accessible and lying amidst picturesque scenery. Close by is the old *stave* church at Fantoft, and the railway to Oslo is itself both an engineering and a scenic triumph. (F. D. S.)

BERGEN-OP-ZOOM, a town in the province of North Brabant, Holland, on both sides of the small river Zoom, near its confluence with the east Scheldt, 38½ mi. by rail E. by N. of Flushing. It communicates with Antwerp (20 mi. S.) and with the islands of Tholen and Duiveland to the northwest. Pop. (1940) 25,078. It is an old town. It was taken by the Normans in 880. In the 13th century Count Gerhard of Wesemael surrounded it with walls and built a castle. In the 15th century it prospered greatly through its fisheries and its cloth-trade. In 1576 the town joined the United Netherlands, and was fortified. In 1588 it was successfully defended against the duke of Parma, and in 1605 was suddenly attacked by Du Terail. In 1622 the Spaniards again failed to take the town. In the 17th century the fortifications were strengthened by Coehoorn, and in 1725 further extended. In 1747 the town was taken by the French, under Löwendahl. Restored at the end of the war, it was again taken by the French under Pichegru in 1795. The English failed to take it from the French, who surrendered the place later by the treaty of peace.

The lordship of Bergen-op-Zoom after the union of the Low Countries with the Empire in 924, was an hereditary fief of the Empire, and the succession of its lords may be traced from Henry (1098–1125), who also held Breda. In 1533 it was raised to a margraviate by Charles V., and was held by various families until in 1799 it passed to the royal house of Bavaria, by whom it was renounced in favour of the Batavian republic in 1801. Bergen-op-Zoom has a town hall and an academy of design and architecture. The remains of the castle of the margraves has been converted into barracks. A considerable trade is carried on in anchovies and oysters caught in the Scheldt as well as a large sugar beet industry. Germans captured the town in 1940.

BERGERAC, town of France, capital of an arrondissement in the department of Dordogne, on the right bank of the river Dordogne 60 mi. E. of Bordeaux on the railway to Cahors. Pop. (1936) 15,174. The site commands one of the important valleys opening out from the Plateau Central on to Bordeaux. The river is made navigable to this point by means of a large dam. On the edge of the difficult plateau country, Bergerac early embraced Protestantism and suffered severely from religious wars, and from the revocation of the Edict of Nantes (1685). Wine of fine quality is grown in the district and is sent to Libourne and Bordeaux for export. There is trade in grain, brandy and salmon of the Dordogne; and chestnuts are largely exported to England. Bergerac is the seat of a sub-prefect and has tribunals of first instance and of commerce. Its fortifications were destroyed in 1621.

BERGHAUS, HEINRICH (1797–1884), German geographer, was born at Kleve on May 3, 1797, and joined the staff of the Prussian trigonometrical survey in 1816. He carried on a geographical school at Potsdam in company with Heinrich Lange, August Petermann, and others, and long held the professorship of applied mathematics at the Bauakademie. His greatest achievement was the *Physikalischer Atlas* (Gotha, 1838–48), in which work, as in others, his nephew HERMANN BERGHAUS (1828–90) was associated with him. He also had a share in the reissue of the great *Stieler Handatlas* (produced by Adolf Stieler in 1817–23), and in the production of other atlases. His written works included *Allgemeine Länder- und Völkerkunde* (Stuttgart, 1837–40), *Grundriss der Geographie in fünf Büchern* (1842), *Die Völker des Erdballs* (Leipzig, 1845–47), *Was man von der Erde weiss* (1856–60), and various large works on Germany. In 1863 he published *Briefwechsel mit Alexander von Humboldt* (Leipzig). He died at Stettin on Feb. 17, 1884.

BERGISCH GLADBACH, a town in Rhenish Prussia, Germany, 8 mi. N.E. of Cologne. Pop. (1939), 22,132. It is finely situated and is a resort as well as a business centre. The manufactures include paper, wire-netting, fireclay and lime.

BERGIUS, FRIEDRICH (1884–), German chemist, was born Oct. 11, 1884, at Goldschmieden near Breslau. He studied at the universities of Breslau, Leipzig, and Berlin and at the technical schools in Karlsruhe and Hanover. Later he founded a private technical research laboratory in Hanover and devoted himself chiefly to the study of the influence of high pressure on chemical actions. This is described in his book *The Use of High Pressure in Chemical Actions* (1913). These studies led up to his work in connection with the conversion of coal into liquid products. Through the action of hydrogen under high pressure and at high temperature, he succeeded in converting a high percentage of coal-dust into oil direct, without first obtaining intermediate products. An experiment plant was erected at Rheinau near Mannheim. Bergius was awarded the Nobel prize for chemistry, 1931, jointly with Carl Bosch.

BERGK, THEODOR (1812–1881), German philologist, was born at Leipzig. After studying there under G. Hermann, and holding posts at Halle, Neustrelitz, Berlin and Cassel, he succeeded K. F. Hermann as professor of classical literature at Marburg (1842). In 1852 he went to Freiburg, and in 1857 returned to Halle. In 1868 he resigned his professorship, and settled down to study and literary work in Bonn. Bergk's literary activity was very great, but his reputation mainly rests upon his work in connection with Greek literature and the Greek lyric poets. His *Poetae Lyrici Graeci* (1843, 5th ed. 1900, etc.), and *Griechische Literaturgeschichte* (1872–87), completed by G. Hinrichs and R. Peppmüller, are standard works. He also edited Anacreon (1834), the fragments of Aristophanes (1840), Aristophanes (3rd ed., 1872), Sophocles (2nd ed., 1868), a lyric anthology (4th ed. 1890, re-ed. E. Diehl 1923). Among his other works may be mentioned: *Augusti Rerum a se gestarum Index* (1873); *Inschriften römischer Schleudergeschosse* (1876); *Zur Geschichte und Topographie der Rheinlande in römischer Zeit* (1882); *Beiträge zur römischen Chronologie* (1884). His *Kleine philologische Schriften* have been edited by Peppmüller (1884–86).

See Sandys, *Hist. of Class. Schol.* iii 146 (1908).

BERGLER, STEPHAN (*c.* 1680–*c.* 1740), German classical scholar, was born at Kronstadt in Transylvania and died at Bucharest. After studying at Leipzig, he went to Amsterdam, where he edited Homer and produced indices to the *Onomasticon* of Julius Pollux for Wetzstein the publisher. Subsequently, at Hamburg, he assisted Johann Albert Fabricius (*q.v.*) with his *Bibliotheca*

Graeca and his edition of Sextus Empiricus. He became secretary to the prince of Wallachia, in whose library he discovered the introduction and the first three chapters of Eusebius's *Demonstratio Evangelica*. In addition to writing numerous articles for the Leipzig *Acta Eruditorum*, Bergler edited the *editio princeps* of the Byzantine historiographer Genesius (1733); the letters of Alciphron (1715), including 75 hitherto unpublished, and Aristophanes (published by Burman 1760). He also translated Herodian into Latin (1759).

BERGMAN, TORBERN OLOF (1735–1784), Swedish chemist and naturalist, was born at Katrineberg, Vestergötland, Sweden, on March 20, 1735. He was educated at the University of Uppsala, and, after taking his degree, began to teach mathematics and physics at the university, publishing papers on the rainbow, the aurora, the pyroelectric phenomena of tourmaline, etc. In 1767 he became professor of chemistry and mineralogy. He died at Medevi on Lake Vetter on July 8, 1784. Bergman's most important chemical paper is his *Essay of Elective Attractions* (1775), a study of chemical affinity. In methods of chemical analysis, both by the blowpipe and in the wet way, he effected many improvements and made considerable contributions to mineralogical and geological chemistry, and to crystallography. He also made observations of the transit of Venus in 1761, and published a *Physical Description of the Earth* in 1766.

His works were collected and printed in 6 vols. as *Opuscula Physica et Chemica* in 1779–90, and were translated into French, German and English.

BERGMANN, ERNST VON (1836–1907), a German surgeon of Russian birth, was born at Riga on Dec. 16, 1836, and educated at Dorpat, where he was professor of surgery from 1871 to 1878. In 1878 he removed to the University of Würzburg, and in 1882 succeeded Langenbeck at Berlin. He had seen army service in the Prussian army in 1866 and 1870–71, and in the Russian army in 1877–78, and was one of the greatest surgeons of his time. In 1886 he introduced steam sterilization and in 1891 began to use aseptic methods. His principal contributions are in cranial surgery, on which his work *Die chirurgische Behandlung der Hirnkrankheiten* (1888; 3rd ed. 1899) is a classic.

See A. Buchholz, *Ernst von Bergmann* (Leipzig, 1911).

BERGSCHRUND, a gaping crack in the upper part of a snowfield or a glacier. It is near the rock wall and roughly parallel to the rock-face of the upper edge of the glacier basin. It usually extends downwards to the solid rock beneath the glacier, and at the bottom of the huge crevasse thus formed there are blocks of ice and large pieces of rock from the rock wall and from the floor. It is caused by the snow mass moving bodily away from the rock face either when being compacted by its own weight or when moving down hill as a glacier.

BERGSON, HENRI (1859–1941), French philosopher, was born Oct. 18, 1859, in Paris, of Anglo-Jewish parents. After a brilliant career at the Lycée Condorcet, he hesitated for some time between literature and science. He became naturalized as a Frenchman, and entered the École Normale Supérieure, where he was the contemporary of Jaurès. He taught philosophy first at the Lycées of Angers and Clermont, and then in Paris at the Lycée Henri IV., the École Normale Supérieure and the Collège de France. In 1918 he succeeded Émile Ollivier at the Académie Française. From that time he gave up teaching and devoted himself to politics and to international affairs, as head of a mission to America, and after the World War as president of the committee of intellectual co-operation. In 1928, he was awarded the Nobel Prize for Literature for 1927.

Bergson's Philosophy.—An account of the appointments held by him is, however, of small importance as compared with the development of his mind, revealed in the books which gained him a world reputation. He was one of the most highly esteemed students of philosophy of his time. Bergson the philosopher was not, like Hegel, Schopenhauer and Spencer, the creator of a great system, conceived as a whole in youth, and gradually expressed in later life. There is, nevertheless, in his philosophy one outstanding idea which is said to have come to him during a walk at Clermont-Ferrand, when he was 25 years old. Since Plato, philosophy had consisted in eliminating duration, in regarding time as an illusion and finite being and eternity as one, and Bergson asked himself whether, on the contrary, the being, of which the philosopher took cognizance by reflection, might not be one which endured, might not be time itself. For the phrase of Descartes, "Je suis une chose qui pense," he substituted "Je suis une chose qui dure," and for the *sub specie aeternitatis* of Spinoza, a *sub specie durationis*. As he substituted durational for non-temporal values, so for static values he substituted values of motion and change. This was the true Bergsonian revolution, which may be related to the German and English historical and evolutional philosophies characteristic of the 19th century.

All Bergson's work is thus concerned with duration and movement. He does not proceed by general speculation. Each of his books is a study of one particular question, and this illustrates his second characteristic, originality of method. In his opinion, philosophy, like science, can only progress by disregarding general theories and universal systems, and devoting attention to particular problems, each of which demands its own point of view. The solution of any one of these does not necessarily involve an analogous solution of the others. Bergsonism implies continued striving after a precise adaptation to reality. The aim of each of his works is the elucidation of a detailed problem, though each is also part of a general philosophy, the philosophy of duration and change. For him, the true nature of things is apprehended by intuition; but those who only recognize the scientific interpretation offered by the intelligence discover in Bergsonism an apotheosis of intuition and of mystical values and a depreciation of intelligence, mistaking the true substance of his theories.

The *Essai sur les données immédiates de la conscience* (1889), which was Bergson's thesis for the doctorate, is primarily an attempt to establish durational values, where the necessary illusions of the mind situate the appearances of space, and thence to proceed towards an original solution of the problem of free will which was at that time the principal occupation of French philosophers. *Matière et mémoire* (1896) contains a detailed consideration of the problem of aphasia leading to a profound study of the means, namely, the memory, by which existence is made continuous. In *L'évolution créatrice* (1907) he studies the whole problem of existence. Whilst Spencer merely supported evolution by evidence derived from fragments of the evolved, Bergson takes as his material the essential motion of the being changing, or rather of the being which is itself both change and movement. This is his most famous and influential work, and that which most fully expresses his ideas as to the secret of the universe.

An important part of Bergson's philosophy is to be found in his minor works, such as the essay *Le rire* (1900), his lectures at Oxford entitled *La perception du changement* (1911) and the volume *Durée et simultanéité* (1922), in which he discusses Einstein's theories. His later publications are the articles collected under the title *L'énergie spirituelle* (1919); *Les deux sources de la morale et de la religion* (1932); and *La Pensée et le Mouvant* (1935). He died Jan. 4, 1941 at Paris.

His lectures at the Collège de France were models of clearness and grace of expression and enjoyed great popularity. It was, however, probably as a master at the Lycée Henri IV. that his influence was most strongly felt. His style is modelled on that of the great philosophers, restrained and concise, like that of Condillac and at the same time full of colour and imagery, like that of Plato and Bacon. (*See* PHILOSOPHY.) (A. T.)

BERGUES, town of France, department of Nord, at the junction of the Colme canal with those of Dunkirk and Furnes (in Belgium), 5m. S.S.E. of Dunkirk by rail. Pop. (1936) 3,839. The town has a fine 16th century belfry restored in the 19th century. The church of St. Martin is a Gothic brick building of the 17th century with a modern façade. The town hall (19th century), contains a municipal library and an interesting collection of pictures.

BERHAMPORE, a town of British India, the headquarters of Murshidabad district, in Bengal, situated on the left bank of

the river Bhagirathi, 6 mi. below Murshidabad city. Pop. (1941) 41,558. Berhampore was fixed upon after the battle of Plassey as the site of the chief military station for Bengal; and a huge square of barracks was erected in 1767. There was committed the first overt act of the mutiny of 1857. No troops are now stationed there, and the barracks have been utilized for civil purposes. The town contains a college. In the municipality of Berhampore is included the remnant of the once important, but now decayed, city of Cossimbazar (*q.v.*).

BERHAMPUR, a town of British India, in the province of Orissa. Pop. (1931) 37,750. It is the headquarters of Ganjam district, and is situated about 9 mi. from the sea. It is a station on the East Coast railway, which connects Calcutta with Madras. The military cantonment was transferred elsewhere in 1906. There is some weaving of silk cloth, rice mills and a tannery, and export trade in sugar. The town contains Kallikota college, an industrial school and the Jubilee hospital. The college, originally founded by the Government, is now maintained by the rajah of Kallikota.

BERI-BERI, so called from the Sinhalese word meaning weakness, is a disease that for a long time was a heavy handicap to tropic and semi-tropic enterprise. It was endemic in India, Malaya, China, Japan, the Philippines, and South America. Isolated cases occurred on the high seas and were known even in Dublin. Its symptoms are neuritic and polyneuritic: inanition, gastric irritation, emaciation, swelling of legs, chest, and face, burning pains, muscular wastage, paralysis, disturbance of the heart's action. It was at one time believed to be due to malarial poisoning or infection, but no bacillus could be discovered. In the year 1890, from careful observation of native habits and movements in Sarawak, Dr. Charles Hose became convinced that it had a connection with diet. Though every effort to locate some micro-organism failed, the more closely the problem was studied the more certain it appeared that this hypothesis was right. A new stage in the attempt to unravel the mystery was reached when it was found that men working many months in the forest or on plantations far away from home and eating imported polished rice went down with the disease, whilst their women folk and others at home, living on their own freshly-husked supplies, were immune. The idea that weevils or mould might be responsible naturally suggested itself. That, however, was difficult to reconcile with the fact that outbreaks were usually worse at the very season when importations were freshest. But the association was established by the recovery of the sufferers when their diet was changed from the imported to the home-grown newly-husked rice. Experiments on monkeys and fowls with imported polished rice resulted in all the symptoms of beri-beri and recovery when the native article was substituted. During the '90s, Capt. E. R. Rost of the Indian Medical Service, studying the problem in Burmah, suspected the existence of a germ which he said he found in rice and Jowari grain, and Mr. John Foreman, in his account of the Philippines then just taken over from Spain by the United States, noted that many deaths occurred from "acute indigestion due to eating too plentifully of new rice" and that many who recovered from cholera "became victims of a disease known as beri-beri." In various directions, therefore, the trouble was more or less directly traced to diet. When home on furlough in 1899 Dr. Hose submitted a paper to Mr. Strangeways, demonstrator of pathology at Cambridge—an abstract of which appeared in the *Medical Review,* June 1901—and in 1905 again in the laboratories at Cambridge, with the encouragement of Dr. Duckworth and others, he pursued researches which still seemed to point to the weevil or fermentation as the cause. These researches were laid before the British Medical Association meeting at Leicester in the latter year. Controversy as to the etiology of the disease grew in interest. It occupied the attention of the London and Liverpool schools of tropical medicine. In 1909 and 1911, however, Drs. Henry Fraser and A. T. Stanton in *Etiology of Beriberi* (studies from the Institute of Medical Research, Federated Malay States) explained how investigations made by De Haan, Chamberlain, and Eijkmann had shown that a substance so minute that there are only ten grains in a ton of rice was absent from the milled and polished article. That particle Dr. Casimir Funk, of the Lister Institute, isolated and called vitamin. So the food theory prevailed, and the conclusion was recorded in Manson's *Tropical Diseases:* "We now know that beri-beri is a sequel of a diet into which enters, as the principal element . . . rice from which the entire pericarp and germ have been removed, and that in this pericarp and germ there is a substance essential to the proper nutrition of the nervous system of man and of many other warm-blooded vertebrates."

But the last word has not yet been said on the subject, as may be gathered from (1) the experience of the Americans in the Philippines (from which in 1911 President Taft said the disease had been almost eliminated by the substitution of unpolished for polished rice), for a recent American visitor (Katherine Mayo: *The Isles of Fear; the Truth about the Philippines,* 1925) reports that it has again become a scourge as the result of the inefficient Filipino medical work, (2) the account of beri-beri outbreaks in Singapore given by Dr. G. E. Brooke so late as 1919 (*One Hundred Years of Singapore*), when he said that "the remarkable periodicity, with maxima about every four years, pointed more towards a bacterial origin than to a deficiency in vitamins," though he admitted that experience had proved that "ordinary polished rice has some connection (probably bacterial) with the disease," and (3) Dr. H. H. Woollard (*Journal of Anatomy,* April 1927, on *The Nature of the Structural Changes in Nerve Endings in Starvation and Beri-beri*) says there are several points relating to the pathology of the disease that have not been adequately decided. "Most authors who have considered the relation of beri-beri to inanition record their opinion that inanition alone does not produce beri-beri. In this inability to reproduce the disease by starvation alone those who see a close parallel between beri-beri and the various forms of toxic neuritis find their best ground for believing that beri-beri is a similar disease." From an examination of the literature of the subject he says: "It is obvious that the findings in the beri-beri animal present a close parallel with the changes that occur in an animal that is deprived of all food. . . . It is true that, save for Eijkmann, observers are accustomed to confirm the idea that the polyneuritis is peculiar to beri-beri. The experimental cases are not comparable to what occurs in the chronic cases in man, as presumably there the time allows of far-reaching degeneration of the nerves." This seems to show that, the origin of the disease having been settled, early treatment by restoration of the necessary vitamins to the food reduces the possibility of complication to a minimum. Is, then, the vitamin, if administered in time, an antitoxin or is it merely a stimulant? (C. H.)

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BERING, VITUS JONASSEN (1681–1741) Danish navigator, was born at Horsens, Jutland, in 1681, and died on Bering Island, Dec. 8, 1741. Joining the Danish navy early, he went in 1703, on a voyage to the East Indies; the following year he entered the Russian navy, and served in the war against Sweden. In 1724 Peter the Great appointed Bering to conduct an expedition to northeastern Siberia, with the object of discovering whether Asia and America were divided. This expedition set forth from St. Petersburg (Leningrad) on Feb. 5, 1725, after the death of Peter, and proceeding by land across Siberia to Kamchatka, built a ship and sailed on July 13, 1728, from the mouth of the Kamchatka river along the northeastern coast of Siberia as far as 67°N. Deciding that Asia and America were not connected and that it would be inadvisable to sail further north,

Bering turned back, and returning by the way he came, arrived in St. Petersburg again in March 1730. But the result of his journey was considered unsatisfactory, and he persuaded the Empress Anne to send him on a second expedition in 1733. The members of this party arrived in detachments at Okhotsk, confusion and quarrels among the officers and obstructive policy of the local authorities in Siberia delayed matters, and it was not until 1740 that the two boats, the "St. Peter" and the "St. Paul" left Okhotsk, reaching Petropavlovsk on Oct. 6. From this harbour they sailed on June 4, 1741, Bering in the "St. Peter" and his lieutenant, Chirikov in the "St. Paul." The two ships soon separated, and Bering sailed southeast, in search of Gamaland, which he failed to find, and almost parallel to the Aleutian Islands without knowing it. Soon after sighting the volcano of St. Elias in Alaska, he landed on an island now known as Kayak Island, thus discovering America from the east. On the return voyage Bering was taken ill, the ship lost her bearings in a fog, and the expedition was obliged to spend nine months on an uninhabited island, afterwards called Bering Island, near Kamchatka, where Bering died in December, a month after they had landed.

See P. Lauridsen, *Russian Explorations, 1725–1743. Vitus Bering: the Discoverer of Bering Strait,* trans. by J. E. Olson (Chicago, 1889); F. A. Golder, *Bering's Voyages* (bib.) pub. by the Amer. Geog. Assoc. (1922, 1925); L. Stejneger, *Georg Wilhelm Steller* (1936).

BERING ISLAND, SEA AND STRAIT. These are named after the explorer Vitus Bering. The island (also called Avatcha), which was the scene of his death, lies in the south-western part of the sea, off the coast of Kamchatka, being one of the Commander or Komandor group, belonging to Siberia. It is 69m. long and 28m. in extreme breadth, the area is 615 sq. miles. The extreme elevation is about 300 feet. The smaller Copper island lies near. The islands are treeless; the population is about 650. Bering sea continues the Pacific ocean northwards and is demarcated from it by the Aleutian islands. It is bounded on the east by Alaska, and on the west by the Siberian and Kamchatkan coast. Its area is about 886,000 sq. miles. In the north and east it has numerous islands (St. Lawrence, St. Matthew, Nunivak and the Pribiloff group) and is shallow; in the south-west it reaches depths of 2,150 fathoms at least. The seal-fisheries are important (*see* BERING SEA ARBITRATION). The sea connects with the Arctic Ocean by Bering strait, at the narrowest part of which East cape (Deshnev) in Asia approaches within about 56m. of Cape Prince of Wales on the American shore, and is here 24 fathoms deep. North and south of these points the coasts on both sides rapidly diverge. The strait contains two small islands known as the Diomede islands. These granite domes, lacking a harbour, lie over a mile apart, and the boundary line between the possessions of Russia and the United States passes between them. They are occupied by about 80 Eskimos, who from early times have been middlemen between Asia and America. They call the western island Nunárbook and the eastern Ignálook.

The climate is severe. From November to May the temperature of the air is below 32° and in summer it hardly surpasses 46·5°; in winter indeed it is sometimes well below zero. The ice found in this sea is usually of local origin and not derived from the Polar basin; it develops mostly on the coasts and in shallow waters. The ice limit usually runs from the Eastern Aleutian Islands past St. Paul northward to latitude 60° N., thence following the coast of Kamchatka southward. As a result of this the areas of the greatest depths remain ice-free. In July, August and September the ice limit usually retreats north of the Bering Strait, because south winds drive a strong current with rather warmer water from the Pacific northwards. This current was much used by the whale fishers of the 19th century and is also taken advantage of by Polar expeditions, in order to reach the north coast of North America.

Isai Ignatiev went east from the Kolyma river in 1646, and Simon Dezhnev in 1648 followed his route and prolonged it, rounding the East or Dezhnev cape, and entering the strait. The post of Anadyrsk was founded on the river Anadyr, and an overland way gradually opened up. A Russian named Popov first learnt a rumour of the existence of islands east of Cape Dezhnev, and of the proximity of America, and presently there followed the explorations of Vitus Bering. In 1731 the navigator Michael Gvosdev was driven by storm and followed the Alaskan coast for two days. Under Bering on his last voyage (1741) was Commander Chirikov of the "St. Paul" who explored the Alaskan coast. Lieutenant Waxel and Georg Wilhelm Steller, a naturalist, left at the head of Bering's party after his death, founded the important fur trade of these waters. Michael Novidiskov (1745) and his successors continued it. Captain James Cook, working from the south, explored the sea and strait in 1778.

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BERING SEA ARBITRATION. The seal fishery dispute between Great Britain and the United States, which was closed by this arbitration, arose in the following circumstances. In 1867 the U.S. Government had purchased from Russia all her territorial rights in Alaska and the adjacent islands. The boundary between the two powers, as laid down by the treaty for purchase, was a line drawn from the middle of Bering strait southwest to a point midway between the Aleutian and Komandorski islands dividing Bering sea into two parts, of which the larger was on the American side of this line. This portion included the Pribiloff islands, which are the principal breeding-grounds of the seals frequenting those seas. By certain acts of Congress, passed between 1868 and 1873, the killing of seals was prohibited upon the islands of the Pribiloff group and in "the waters adjacent thereto" except upon certain specified conditions. No definition of the meaning of the words "adjacent waters" was given in the act. As early as 1872 the operations of foreign sealers attracted the attention of the U.S. Government, but any precautions then taken seem to have been directed against the capture of seals on their way through the passages between the Aleutian islands, and no claim to jurisdiction beyond the three-mile limit appears to have been put forward. On March 12, 1881, however, the acting secretary of the U.S. treasury, in answer to a letter asking for an interpretation of the words "waters adjacent thereto" in the acts of 1868 and 1873, stated that all the waters east of the boundary line were considered to be within the waters of Alaska territory. In March 1886 this letter was communicated to the San Francisco customs by the secretary of the treasury, for publication. In the same summer three British sealers, the "Carolena," "Onward" and "Thornton," were captured by an American revenue cutter 60 mi. from land. They were condemned by the district judge on the express ground that they had been sealing within the limits of Alaska territory. Diplomatic representations followed, and an order for release was issued, but in 1887 further captures were made and were judicially supported upon the same grounds.

The Conflicting Claims.—The respective positions taken up by the two Governments in the controversy which ensued may be thus indicated. The United States claimed as a matter of right an exclusive jurisdiction over the sealing industry in Bering sea; they also contended that the protection of the fur seal was, upon grounds both of morality and interest, an international duty, and should be secured by international arrangement. The British Government repudiated the claim of right, but were willing to negotiate upon the question of international regulation. Between 1887 and 1890 negotiations were carried on between Russia, Great Britain and the United States with a view to a joint convention. Unfortunately the parties were unable to agree as to the principles upon which regulation should be based. The negotiations were wrecked upon the question of pelagic sealing. Inasmuch as the seal nurseries were upon islands belonging either to the United States or Russia, the prohibition of pelagic sealing would have excluded Canada from the industry. The United States, nevertheless, insisted that such prohibition was indispensable on the grounds—(1) that pelagic sealing involved the destruction of females necessary for breeding stock; (2) that it was unnecessarily wasteful, inasmuch as a large proportion of the seals so killed were lost. On the other hand, it was contended by Great Britain

that in all known cases the extermination of seals had been the result of operations upon land, and had never been caused by sealing exclusively pelagic. The negotiations came to nothing, and the United States fell back upon their claim of right. In June 1890 it was reported that certain American revenue cutters had been ordered to proceed to Bering sea. Sir Julian Pauncefote, the British ambassador at Washington, having failed to obtain an assurance that British vessels would not be interfered with, laid a formal protest before the U.S. Government.

Thereupon followed a diplomatic controversy, in the course of which the United States developed the contentions which were afterwards laid before the tribunal of arbitration. The claim that Bering sea was *mare clausum* was abandoned, but it was asserted that Russia had formerly exercised therein rights of exclusive jurisdiction which had passed to the United States, and they relied *inter alia* upon the ukase of 1821, by which foreign vessels had been forbidden to approach within 100 Italian miles of the coasts of Russian America. It was pointed out by Great Britain that this ukase had been the subject of protest both by Great Britain and the United States, and that by treaties similar in their terms, made between Russia and each of the protesting powers, Russia had agreed that their subjects should not be troubled or molested in navigating or fishing in any part of the Pacific ocean. The American answer was that the Pacific ocean did not include Bering sea.

Treaty of Arbitration.—In Aug. 1890 Lord Salisbury proposed that the question at issue should be submitted to arbitration. This was ultimately assented to by the secretary of State, James G. Blaine, on the understanding that certain specific points, which he indicated, should be laid before the arbitrators. On Feb. 29, 1892, a definitive treaty was signed at Washington. Each power was to name two arbitrators, and the president of the French Republic, the king of Italy, the king of Norway and Sweden were each to name one. The points submitted were as follows:—(1) What exclusive jurisdiction in the sea now known as Bering sea, and what exclusive rights in the seal fisheries therein, did Russia assert and exercise prior to and up to the time of the cession of Alaska to the United States? (2) How far were her claims of jurisdiction as to the seal fisheries recognized and conceded by Great Britain? (3) Was the body of water now known as Bering sea included in the phrase "Pacific Ocean," as used in the treaty of 1825 between Great Britain and Russia, and what rights, if any, in Bering sea were held exclusively exercised by Russia after the said treaty? (4) Did not all the rights of Russia as to jurisdiction and as to the seal fisheries in Bering sea east of the water boundary, in the treaty between the United States and Russia of March 30, 1867, pass unimpaired to the United States under that treaty? (5) Had the United States any and what right of protection over, or property in, the fur seals frequenting the islands of Bering sea when such seals are found outside the three-mile limit? In the event of a determination in favour of Great Britain the arbitrators were to determine what concurrent regulations were necessary for the preservation of the seals, and a joint commission was to be appointed by the two powers to assist them in the investigation of the facts of seal life. The question of damages was reserved for further discussion, but either party was to be at liberty to submit any question of fact to the arbitrators, and to ask for a finding thereon. The tribunal was to sit at Paris. The treaty was approved by the Senate on March 29, 1892, and ratified by the President on April 22.

The Arbitration Tribunal.—The sittings of the tribunal began in February and ended in August 1893. The interest of the proceedings lies in the second of the two claims put forward on behalf of the United States. This claim cannot easily be stated in language of precision; it is indicated rather than formulated in the last of the five points specially submitted by the treaty. But its general character may be gathered from the arguments addressed to the tribunal. It was suggested that the seals had some of the characteristics of the domestic animals, and could therefore be the subject of something in the nature of a right of property. They were so far amenable to human control that it was possible to take their increase without destroying the stock. Sealing upon land was legitimate sealing; the United States being the owners of the land, the industry was a trust vested in them for the benefit of mankind. On the other hand, pelagic sealing, being a method of promiscuous slaughter, was illegitimate; it was *contra bonos mores* and analogous to piracy. Consequently the United States claimed a right to restrain such practices, both as proprietors of the seals and as proprietors and trustees of the legitimate industry. It is obvious that such a right was a novelty hitherto unrecognized by any system of law. The American counsel argued that the determination of the tribunal must be grounded upon "the principles of right," that "by the rule or principle of right was meant a moral rule dictated by the general standard of justice upon which civilized nations are agreed, that this international standard of justice is but another name for international law, that the particular recognized rules were but cases of the application of a more general rule, and that where the particular rules were silent the general rule applied." The practical result of giving effect to this contention would be that an international tribunal could make new law and apply it retrospectively. The American contention was successfully combated by Sir Charles Russell, the leading counsel for Great Britain.

Decision of the Tribunal.—The award, which was signed and published on Aug. 15, 1893, was in favour of Great Britain on all points. The question of damages, which had been reserved, was ultimately settled by a mixed commission appointed by the two powers in Feb. 1896, the total amount awarded to the British sealers being $473,151.26. Pelagic sealing continued until 1911, when the practice was abolished by a treaty signed by the United States, Great Britain, Russia and Japan.

BÉRIOT, CHARLES AUGUSTE DE (1802–1870), Belgian violinist and composer, was born at Louvain, Feb. 20, 1802, and died at Brussels, April 8, 1870. Although not definitely a pupil of Viotti or Baillot he was much influenced by both. He played in the principal musical centres of Europe, and held appointments at the courts of Belgium and France. From 1843 to 1852 he was violin professor at the Brussels conservatoire.

BERJA, a town of southern Spain, in the province of Almeria. Pop. (1940), 7,291 (mun., 12,480). Despite the lack of a railway Berja has a considerable trade. The lead of the Sierra de Gádor mines, which seem to be now exhausted, was until recently sent from here by road to Adra (10 mi.) for export, and the town is also a collecting centre for ore produce of the sheltered valleys of the Sierras.

BERKELEIANISM denotes the philosophical views of Bishop Berkeley (*q.v.*), and is commonly used as synonymous with subjective Idealism. (*See* also IDEALISM; KNOWLEDGE, THEORY OF.)

BERKELEY, GEORGE (1685–1753), Irish bishop and philosopher, the eldest son of William Berkeley (an officer of customs), was born on March 12, 1685, in a cottage near Dysert Castle, Thomastown, Ireland. He passed from the school at Kilkenny to Trinity college, Dublin (1700). During his career at Dublin the works of Descartes and Newton were superseding the older textbooks, and the doctrines of Locke's *Essay* were eagerly discussed. Thus he "entered on an atmosphere which was beginning to be charged with the elements of reaction against traditional scholasticism in physics and in metaphysics" (A. C. Fraser). He became a fellow in 1707. His interest in philosophy led him to take a prominent share in the foundation of a society for discussing the new doctrines, and is further shown by his *Common Place Book* (first discovered and published in 1871), which throws much light on the growth of his ideas and enables us to understand the significance of his early writings. We find here the consciousness of creative thought focused in a new principle which is to revolutionize speculative science. The new principle (nowhere in the *Common Place Book* explicitly stated) may be expressed in the proposition that no existence is conceivable (and therefore possible) which is not either conscious spirit or the ideas (*i.e.* objects) of which such spirit is conscious. In the language of a later period this principle may be expressed as the absolute synthesis of subject and object; no object exists apart from mind. Mind is, therefore, prior both in thought and

in existence, if for the moment we assume the popular distinction. Berkeley thus diverted philosophy from its beaten track of discussion as to the meaning of matter, substance, cause, and preferred to ask first whether these have any significance apart from the conscious spirit. In the pursuit of this enquiry he rashly invaded other departments of science, and much of the *Common Place Book* is occupied with a polemic, as vigorous as it is ignorant, against the fundamental conceptions of the infinitesimal calculus.

In 1707 Berkeley published two short mathematical tracts; in 1709, in his *Essay towards a New Theory of Vision,* he applied his new principle for the first time, and in the following year stated it fully in *A Treatise concerning the Principles of Human Knowledge,* Part 1. In these works he attacked the existing theories of externality which to the unphilosophical mind is proved by visual evidence maintaining that, on ultimate analysis, nature is conscious experience, and forms the sign or symbol of a divine, universal intelligence and will.

In 1711 Berkeley delivered his *Discourse on Passive Obedience* in which he deduces moral rules from the intention of God to promote the general happiness, thus working out a theological utilitarianism, which may be compared with the later expositions of Austin and J. S. Mill. From 1707 he had been engaged as college tutor; in 1712 he paid a short visit to England, and in April 1713 he was presented by Swift at court. His abilities, his courtesy and his upright character made him a universal favourite. While in London he published his *Three Dialogues between Hylas and Philonous* (1713), a more popular exposition of his new theory; for exquisite facility of style these are among the finest philosophical writings in the English language. In November he became chaplain to Lord Peterborough, whom he accompanied on the continent, returning in Aug. 1714. He travelled again in 1715–20 as tutor to the only son of Dr. St. George Ashe (?1658–1718, bishop successively of Cloyne, Clogher and Derry). In 1721, during the disturbed state of social relations consequent on the bursting of the South Sea bubble, he published anonymously an *Essay towards preventing the Ruin of Great Britain,* which shews the intense interest he took in practical affairs. In the same year he returned to Ireland as chaplain to the duke of Grafton, and was made divinity lecturer and university preacher. In 1722 he was appointed to the deanery of Dromore, a post which seems to have entailed no duties, as we find him holding the offices of Hebrew lecturer and senior proctor at the university. The following year Miss Vanhomrigh, Swift's Vanessa, left him half her property. It would appear that he had only met her once at dinner. In 1724 he was nominated to the rich deanery of Derry, and immediately began to devote himself to his scheme of founding a college in the Bermudas, and extending its benefits to the Americans. He obtained from government a promise of £20,000, and after four years of preparation sailed in Sept. 1728, accompanied by some friends and by his wife, daughter of Judge Forster, whom he had married in August. Three years of quiet retirement and study were spent in Rhode Island, but the promised grant was not forthcoming, and Berkeley was compelled to give up his cherished plan. Soon after his return he published the fruits of his studies in *Alciphron, or the Minute Philosopher* (1732), a finely written work in the form of dialogue, critically examining the various forms of freethinking in the age, and bringing forward in antithesis to them his own theory, which shews all nature to be the language of God. In 1734 he was raised to the bishopric of Cloyne. The same year, in his *Analyst,* he attacked the higher mathematics as leading to freethinking; this involved him in a hot controversy. The *Querist,* a work concerned with practical social reform, appeared in three parts, 1735, 1736, 1737. In 1744 was published the *Siris,* partly occasioned by the controversy as to the efficacy of tar-water in cases of small-pox, but rising far above the circumstances of its origin, to an exposition of the principles of Berkeleian metaphysics. In 1751 his eldest son died, and in 1752 he removed with his family to Oxford for the sake of his son George, who was studying there. He died suddenly on Jan. 14, 1753, and was buried in Christ Church, Oxford.

Berkeley's theory, briefly stated, is this: External things are produced by the will of the divine intelligence; they are caused, and caused in a regular order; there exist in the divine mind archetypes, of which sense experience may be said to be the realization in our finite minds. Our belief in the permanence of something which corresponds to the association in our minds of actual and possible sensations means belief in the orderliness of nature; and *that* is merely assurance that the universe is pervaded and regulated by mind. Physical science is occupied in endeavouring to decipher the divine ideas which find realization in our limited experience, in trying to interpret the divine language of which natural things are the words and letters, and in striving to bring human conceptions into harmony with the divine thoughts. Instead, therefore, of fate or necessity, or matter, or the unknown, a living, active mind is looked upon as the centre and spring of the universe, and this is the essence of the Berkeleian metaphysics.

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BERKELEY, the name of an ancient English family remarkable for its long tenure of the feudal castle built by the water of Severn upon the lands from which the family takes its name, and for the fact that a Berkeley fought the last private battle on English soil. It traces an undoubted descent from Robert (d. 1170) son of Harding. In the age of chivalry the lords of Berkeley were notable warriors. Thomas, the first hereditary baron, who succeeded to the Berkeley lands in the last quarter of the 13th century, had ridden on the barons' side at Evesham, followed the king's wars for half a century of his long life, flying his banner at Falkirk and at Bannockburn, in which fight he was taken by the Scots. His seal of arms is among those attached to the famous letter of remonstrance addressed by the barons of England to Pope Boniface VIII. Maurice, his son, joined the confederation against the two Despensers, and lay in prison at Wallingford until his death in 1326, the queen's party gaining the upper hand too late to release him. But as the queen passed by Berkeley on her way to seize Bristol she gave back the castle, which had been kept by the younger Despenser, to Thomas, the prisoner's heir, who, with Sir John Mautravers, soon received in his hold the deposed king, Edward II., brought thither secretly. The chroniclers agree that Thomas of Berkeley had no part in the murder of the king, whom he treated kindly. It was when Thomas was away from the castle that Mautravers and Gournay made an end of their charge. Thomas of Berkeley fought at Crécy and Calais, bringing six knights and 32 squires to the siege in his train, with 30 mounted archers and 200 men on foot.

Being by his mother a nephew of Roger Mortimer, earl of March, the paramour of Queen Isabel, Maurice Berkeley, who had been taken prisoner at Poitiers, married Elizabeth, daughter of Hugh Despenser, the younger of Edward II.'s favourites and the intruder in Berkeley Castle. With his son and heir Thomas of Berkeley, one of the commissioners of parliament for the deposing of Richard II. and a warden of the Welsh marches who harried Owen of Glendower, the direct male line of Robert fitz Harding failed. On this Thomas's death in 1417 Elizabeth, his daughter and heir, and her husband, Richard Beauchamp, earl of Warwick, the famous traveller, statesman and jouster, seized Berkeley Castle. Earl and countess only withdrew after James

Berkeley, the nephew and male heir, had livery of his lands by the purchased aid of Humphrey of Gloucester. But the Beauchamps returned more than once to vain attacks on the stout walls of Berkeley, and a quarrel of two generations ended with the pitched battle of Nibley Green. Fought between the retainers of William, Lord Berkeley, son of James, and those who followed Thomas Talbot, Viscount Lisle, grandson of the illustrious Talbot and great-grandson of the countess of Warwick, this was the last private battle on English ground between two feudal lords. Young Lisle was shot under the beaver by an arrow, and the feud ended with his death, all claims of his widow being settled with an annuity of £100.

See John Smyth, *Lives of the Berkeleys,* compiled *c.* 1618, edited by Sir John Maclean (1883–85); J. H. Round, Introduction to the Somerset Domesday, V.C.H. series; G. E. C[okayne], *Complete Peerage;* Jeayes's *Descriptive Catalogue of the Charters and Muniments at Berkeley Castle* (1892); *Dictionary of National Biography; The Red Book of the Exchequer;* Chronicles of Roger of Wendover, Matthew Paris, Adam of Murimuth, Robert of Gloucester, Henry of Huntingdon, etc. (Rolls Series); British Museum Charters, etc.

BERKELEY, MILES JOSEPH (1803–1889), English botanist; born at Biggin Hall, Northamptonshire; educated at Rugby and Christ's college, Cambridge. He became incumbent of Apethorpe in 1837 and vicar of Sibbertoft, near Market Harborough, in 1868. He soon was recognized as the leading British authority on fungi and plant pathology. Some 6,000 species of fungi were credited to him, but his *Introduction to Cryptogamic Botany,* published in 1857, his *Gleanings of British Algae,* in 1833, and his papers on "Vegetable Pathology" in the *Gardener's Chronicle,* in 1854 and onward, show a broad grasp of the whole domain of physiology and morphology as understood in those days. His pioneer investigations on the potato murrain, caused by *Phytophthora infestans,* on the grape mildew, to which he gave the name *Oidium Tuckeri,* and on the pathogenic fungi of wheat rust, hop mildew, and various diseases of cabbage, pears, coffee, onions, tomatoes, etc., were important in results bearing on the life history of these pests. Berkeley was the founder of British mycology, and his most important work on that subject is contained in the account of native British fungi in Sir W. Hooker's *British Flora* (1836), in his *Introduction to Cryptogamic Botany* (1857), and in his *Outlines of British Fungology* (1860). His herbarium at Kew, which contains over 9,000 specimens, and is enriched by numerous notes and sketches, forms one of the most important type series in the world. He died at Sibbertoft July 30, 1889.

A list of his publications will be found in the *Catalogue of Scientific Papers* of the Royal Society, and sketches of his life in *Proc. Roy. Soc.,* xlvii (1890); *Ann. Bot.,* iii (1889) and *ibid.,* xi (1897).

BERKELEY, SIR WILLIAM (*c.* 1608–1677), British colonial governor in America, was born in or near London, England, about 1608, the youngest son of Sir Maurice Berkeley, and brother of John, first Lord Berkeley of Stratton, one of the proprietors of the Carolinas. He graduated at Oxford in 1629, and in 1632 was appointed one of the royal commissioners for Canada, and on his return was appointed a gentleman of the privy chamber by Charles I. In 1638 he produced a tragi-comedy entitled *The Lost Lady.* In Aug. 1641 he was appointed governor of Virginia and took up his duties the following year. His first term as governor, during which he seems to have been extremely popular, was notable principally for his religious intolerance and his expulsion of the Puritans, who were in a great minority. During the Civil War in England he remained loyal to the king, and offered an asylum in Virginia to Charles II. and the loyalists. On the arrival of a parliamentary fleet in 1652, however, he retired from office and spent the following years quietly on his plantation. On the death, in 1660, of Samuel Matthews, the last parliamentary governor, he was chosen governor by the Virginia assembly, and was soon recommissioned by Charles II. The second period of his governorship was a stormy one. Serious frontier warfare with the Indians was followed (1676) by Bacon's Rebellion (*see* VIRGINIA), brought on by Berkeley's misrule. His cruelty and barbarity in punishing the rebels did not meet with the approval of Charles II. Berkeley was called to England in 1677 ostensibly to report on the condition of affairs in the colony, and a lieutenant-governor (Herbert Jeffreys) was put in his place. Berkeley sailed in May, but died soon after his arrival, at Twickenham, and was buried there on July 13, 1677. In addition to the play mentioned he wrote *A Discourse and view of Virginia* (1662); reprinted, Norwalk, Conn. (1914).

BERKELEY, market town, Gloucestershire, England, near the river Severn at the commencement of its estuary, on the G.W. and L.M.S. railways. Pop. (1931) 989. It lies on a slight rise in the rich pastoral vale to which it gives name, celebrated for its dairies and "double Gloucester" cheese. The manor of Berkeley, whence the family of Berkeley (*q.v.*) takes its name, is said to have been owned by a nunnery before the Conquest. Charters and fairs were granted to the Berkeley family in the 13th and 14th centuries, and there are references to the settlement as a borough. The corporation was dissolved in 1885.

The town has an Early English and Decorated church and a grammar school. It was the birthplace of Dr. Edward Jenner (1749), who is buried in the church. To the south-east is Berkeley castle, baronial fortress and seat of the former earls of Berkeley. There is some trade in coal, timber, malt and cheese. The manufacture of cloth, for which Berkeley was formerly noted, had already declined by the 16th century. The Berkeley and Gloucester canal, navigable for vessels of 500 tons, connects Gloucester with the docks at Sharpness, avoiding the difficult navigation of the upper part of the Severn estuary.

BERKELEY, a city of California, U.S.A., on the east shore of San Francisco bay, in the northern part of Alameda county, directly opposite the Golden Gate and adjoining Oakland. It is served by the Southern Pacific and the Santa Fe railways; electric trains travel over the San Francisco-Oakland bay bridge from Berkeley. The area is 8·6 square miles. The population was 56,036 in 1920, of which about a fifth were foreign-born, and was 82,109 in 1930 and 85,547 in 1940 by federal census.

There were 159 major industrial plants, employing 3,441 persons in 1937 and producing $43,173,018 worth of goods; 618 service establishments (1939); 1,134 retail stores (1939); 552 wholesale establishments, with 5,160 proprietors and employees (1940). Principal products are soaps, printers' inks, serums, gasoline engines, coconut oil, pumps, fertilizer, margarine and mayonnaise, ketchup and pickles, steel tanks, tanned leather and fine printing.

In addition to the University of California, the largest university in the world, Berkeley contains many commercial and private schools and three theological seminaries. The Berkeley Baptist Divinity school, the Pacific Unitarian School for the Ministry, and the Pacific School of Religion (undenominational); also the California state schools for the deaf and blind, 15 elementary public schools, 3 junior high schools and 2 high schools.

The city was named in honour of George Berkeley, bishop of Cloyne (1685–1753), author of the poem "Verses on the Prospect of Planting Arts and Learning in America," which contains the famous line "Westward the course of empire takes its way." The site for Berkeley was a part of the Spanish grant to the Peralta family and later was held by American pioneers. Settlement as a town began when the University of California moved there in 1873. In 1890 it was still a quiet village with a population of 5,101, but it grew to 13,214 in 1900 and 40,434 in 1910. In 1909 a city charter was secured, providing for initiative, referendum and recall and establishing a commission form of government, which was superseded in 1923 by the council-manager form.

BERKHAMSTED (GREAT BERKHAMSTED), urban district, Hertfordshire, England, on the main line of the L.M.S.R., 28 mi. N.W. of London. Pop. (1938) 10,250. Area 3.2 sq.mi. It lies in the narrow valley of the Bulbourne and is close to the Grand Junction canal. The name "Great Berkhamsted" is given to distinguish it from Little Berkhamsted near Hatfield in the same county. Berkhamsted (Beorhhamstede, Berchehamstede) was undoubtedly of some importance in Saxon times since there were 52 burgesses there at the time of the conquest. The town rose to importance with its castle, which is thought to have been built by Robert, count of Mortain, and when the castle fell into ruin after 1496 the town also began to decay. In 1618, however, the bur-

gesses received an incorporation charter which was retained until the 18th century. Before the 13th century the burgesses held a weekly market on Sunday but in 1218 it was changed to Monday. Roofing tiles were manufactured as early as the 13th century, and in Elizabeth's reign the making of malt was the chief industry. The church of St. Peter is an early foundation built in mixed styles. The poet William Cowper was born in the rectory in 1731. The grammar school dates from 1523. Of the castle some earthworks and wall-fragments remain. Straw-plaiting is the chief and oldest industry, and there are chemical works and some manufacture of small wooden wares. It is to some extent a residential outpost of London. The Foundling hospital (founded 1739) was transferred there from Redhill, Surrey, in 1935.

BERKSHIRE (abbreviated Berks), a southern county of England, bounded N. by Oxfordshire and Buckinghamshire, E. by Surrey, S. by Hampshire and W. by Wiltshire. Area 725 sq.mi. Its entire northern boundary is formed by the River Thames, in the basin of which practically the whole county is included. The key to the structure of the county is to be found in a consideration of the chalk which dominates south-east England. The chalk is folded along east-west lines, here represented by an anticline running through Kingsclere and Ham and along the Vale of Pewsey, where the anticline is orographically weak. The centre of the county is occupied by the broad-backed Berkshire or White Horse downs, which are related to the Marlborough downs on the west, and to the Chilterns beyond the Goring gap. These represent the worn edge of the chalk rising from the London basin and from its western extension, the Vale of Kennet. The Eocene clays of this structural basin occur in patches on the downs and once covered most of the chalk. Below 500ft. they help to form interfluvial plateaux, and become definitively continuous below the junction of the Lambourn and the Kennet east of Newbury. The Reading beds are exposed in and take their name from the brickfields about Reading. The London clay is found throughout the south of the county, while the Bagshot beds occur in the Kennet valley and in the extreme south-east. Among the more superficial deposits we note the clay-with-flints, typically developed on the summits and slopes of the Berkshire downs and making arable cultivation and settlement possible. Plateau and valley gravels are widely distributed, and a good deal of alluvium, including fairly thick beds of peat, occurs at intervals near the River Kennet between Hungerford and Reading. The scarped slopes to the south, the Sydmonton range, send few tributaries to the Kennet. These hills are mainly outside the county, but their highest point, Inkpen Beacon (nearly 1,000ft.), which is one of the highest portions of the chalk in England, falls in Berkshire. The River Enborne, rising there, and flowing east parallel to the Kennet until turning north to join it, is for a considerable distance the county boundary. The Kennet naturally receives more contributions from the dip-slope of the Berkshire downs, and of these tributaries the Lambourn is the chief, probably because it follows a slight syncline of the chalk. From Newbury to Lambourn the valley furnishes a line of approach into the heart of the downs. Towards the west the Kennet valley almost meets the Vale of Pewsey beyond the confines of the county near Savernake, and forms an east-west lowland route of great historic importance, composed of two entirely different structural portions.

Another important route is provided by the Goring gap, where the Thames breaks from the Oxford valley between the Ilsley downs and the Chilterns to join the Kennet, probably the main headwater of the original Thames, at Reading. The north and east of the county are entirely in the Thames valley. In the north face of the escarpment of the Berkshire downs we find the lower chalk with a hard bed, Totternhoe stone. At the foot of the chalk escarpment is the upper greensand with a narrow crop towards the west which is broken up into patches eastwards. Looking northward from the chalk hills, the low-lying ground is occupied successively by the gault clay, the Kimmeridge clay, and finally by the Oxford clay, which extends beyond the Thames into Oxfordshire. This low-lying tract is relieved by an elevated ridge of Corallian beds, between the Kimmeridge clay and the gault. It extends from near Faringdon past Abingdon to Cumnor and Wytham hills. These hills fill a deep northward bend of the Thames and overlook the city of Oxford. Between this line of hills and the Berkshire downs is the famous Vale of White Horse (*q.v.*) traversed by the small River Ock. Between Reading and Windsor the Thames makes a large bend to the north, and is bordered by low hills. The only tributary of any size in this flat part of the county is the Loddon, south of Reading. In the extreme south-east, however, there is a sandy plateau forming part of Bagshot heath, over 400ft. in elevation and extending into Surrey.

The distribution of prehistoric remains in the area emphasizes the importance of the unit from which Berkshire was to evolve. The gravel beaches of the Thames have yielded palaeolithic flint tools of various types, but there is not much occupational evidence. From Neolithic times on, however, the Berkshire downs assume great importance. They lie on the north-east outskirts of Salisbury plain, an early focus, and have easy connections with the whole of the open chalk lands of the south. A distribution map of the remains of the Beaker folk and of the men of the full bronze age shows the outstanding position of the chalk and of the old Ridgeway running east from White Horse hill. The hill-top camps are also concentrated on the Berkshire downs (*e.g.*, Uffington castle, Membury and Alfred's castle) with Grimsbury (*e.g.*) farther south and Walbury near Inkpen Beacon. The slopes of the downs are dotted besides with short dykes and barrows of various kinds. The almost complete absence of prehistoric earthworks in the east and north of the county illustrates the avoidance of the damp forested lowlands. Belgic tribes occupied the region between the Thames and the south coast during the two centuries preceding the Christian era, and the Atrebates settled in Berkshire with their capital at Silchester. The choice of this site in the iron age and by the Romans (*Calleva Atrebatum*) indicates the valley-ward spread of some elements of the upland population. The chief Roman roads within the county are portions of those from Caerleon via Cirencester and Bath to Silchester, crossing the Kennet at Newbury, and from Chichester via Silchester to London. Besides these, for which we have evidence in the Antonine Itinerary, there are several other roads claimed to be of Roman date. The Icknield Way followed the ancient Ridgeway from Goring to White Horse hill. The miscellaneous evidences of the Roman period are fairly evenly distributed over the county. Several villas have been found near the Thames from Abingdon to Maidenhead.

Of the Saxon invasion we know little, but there are graveyards at (*e.g.*) Reading, Frilford and Shefford. The earliest known settlements, "Hams," were near the rivers, but the essential base of operations in the "colonizing" of the area, which is supposed to have taken place from the central upland of Hants and Wilts, was the open land of the Berkshire downs, emergent from the forested lowlands. This chalk-land had been the centre of life for centuries, and formed the nucleus for the county of Berkshire. The origin of the county, thus explained, is comparable with that of most of the southern English counties, and contrasts with the origin of the Midland counties (*e.g.*, Bedfordshire, *q.v.*) round castles on the waterways. That the Thames forms the county boundary along the entire northern side is explicable when we realize this. Eastward the boundaries were pushed as far as Windsor forest, while in the south the Kennet valley was naturally occupied together with some of the downs bordering Hampshire on the north. Berkshire remained a part of Wessex, in spite of the encroachment of its northern neighbour, until 779, when Offa, ruler of Mercia, seems to have annexed the whole county to his kingdom. In 853, however, after the defeat of the Mercians by the Northmen on the lower Thames, it once more became part of Wessex.

At the time of the Norman invasion Berkshire formed part of the earldom of Harold, and supported him staunchly at the battle of Hastings. This loyalty was punished by very sweeping confiscations, and at the time of the Domesday survey no estates of any importance were in the hands of Englishmen. When Alfred divided the country into shires, this county received the name of Berrocscir, as Asser says, "from the wood of Berroc, where the box-

tree grows most plentifully." At the time of the survey it comprised 22 hundreds; at the present day there are only 20, of which 11 retain their ancient names. Many parishes have been transferred from one hundred to another, but the actual boundary of the county is practically unchanged. Parts of the parishes of Shilton and Langford formed detached portions of the shire, until included in Oxfordshire in the reign of William IV. Portions of Combe and Shalbourne parishes have also been restored to Hampshire and Wiltshire respectively, while the Wiltshire portion of Hungerford has been transferred to Berkshire. The county was originally included in the see of Winchester, but in A.D. 909 it was removed to the newly-formed see of "Wiltshire," afterwards united with Sherborne. In 1075 the seat of the bishopric was removed to Salisbury, and in 1836, by an order in council, Berkshire was transferred to the diocese of Oxford. The archdeaconry is of very early origin, and is co-extensive with the county. Formerly it comprised four rural deaneries, but the number was later increased to nine. Much of the early history of the county is recorded in the *Chronicles* of the abbey of Abingdon, which at the time of the survey was second only to the Crown in the extent and number of its possessions. It was perhaps largely due to the great influence of the abbey and the large amount of land it possessed, that few other religious foundations succeeded in establishing themselves in the neighbourhood. Another great Benedictine abbey, of which there are scanty remains, was that of Reading. About 1160 a priory for Austin Canons was founded at Ploughley.

The more settled conditions which followed Norman rule saw an increase of settlement and population throughout the county, though there were frequent interruptions, as during the disorders of Stephen's reign, when Wallingford was the scene of the final treaty in 1153. A serious blow to the agricultural life of the county, as to the rest of England, was inflicted by the Black Death in 1348. The rearing of sheep must always have been the chief occupation of the open down and heath lands, and even after the valley-ward movement of the population considerable numbers of people must have continued to lead a pastoral life on the high downs. An interesting point is that the population of the royal manor of Lambourn, only one of several of that name, was, in 1086, nearly double that of Newbury. The woollen industry, developing especially after the emancipation of labour consequent upon the Black Death and the Peasants' Revolt, had already been established at Reading in the time of Henry I., and at Newbury from the early 13th century. At first this trade was confined to the export of raw material, but the reign of Edward III. saw the introduction of the clothing industry, for which the county afterwards became famous. This began to decline in the 17th century, and in 1641 the Berkshire clothiers complained of the state of their trade.

The use of the Kennet-Pewsey valley-way goes back at least to the later middle ages, and there are many bits of evidence, especially referring to Hungerford, to show how important the route was in the 15th century and later. The road probably then ran south on the river from Hungerford to Newbury. This route, during the Civil War, was naturally a thoroughfare from the parliamentary centres to the west, battles being fought near Newbury in 1643 and 1644. The famous Bath road was not made until 1746. The road traffic between London and Bristol was then at its height, and it was later suggested that water transit, then so popular throughout the country, should be used. The Kennet and Avon canal, projected in 1794, was completed in 1810. For some time it served to carry goods along this east-west route, but in 1847 it was superseded by the railway from Reading to Hungerford, which was extended to Devizes the following year. About 1900 this line was developed as a main route between Westbury and Newbury. A main G.W. railway line crosses the county from east-west by Maidenhead, Reading, the Goring gap and Didcot to Swindon. North-south lines run from Oxford via Didcot to Newbury and Hampshire, and south from Reading; while the Lambourn Valley light railway runs north-west to Lambourn from Newbury. Wide water-communications are afforded by the Thames. The immense increase of motor traffic after World War I led to an improvement of main roads. There were 1,540 mi. of roads in 1943. Public schools are Radley, Wellington and Bradfield colleges, and the Sandhurst Royal Military college. Besides the royal castle of Windsor there are many large country residences. Reading has a university, chartered in 1926.

The county is mainly agricultural. About 67½% of the total area was under cultivation in 1939, a large proportion of this being in permanent pasture, as much attention is paid to dairy-farming. Butter and cheese are largely produced, and the making of condensed milk is a branch of the industry. Many sheep are pastured on the downs (75,710 in 1939), important sheep-markets being held at the small town of East or Market Ilsley; and an excellent breed of pigs is named after the county. The parts about Faringdon are specially noted for them. Wheat (31,037 ac.) is the principal grain crop, although a considerable acreage (18,349) is under oats. Turnips and swedes are largely cultivated, and apples and cherries are grown. The Vale of White Horse is especially productive, and Camden speaks of the great crops of barley grown in the district. A modern tendency is toward the planting of conifers in place of the slower growing oak in the woodland and upon the heathland. The primitive oak woodland is developed equally well on clays, sands and plateau gravels, but there is surprisingly little primitive beech woodland on the chalk, though there are numerous plantations on the downs and occasional "hangers" on the scarp slopes. In 1941 the National Trust owned 973 acres in the county.

The manufactures of the county are not important, mat and matting and sail cloth being the principal ones. The only manufacturing centre of note is Reading, which is principally famous for its biscuit factories. The manufacture of clothing is carried on at Abingdon; but the ancient woollen industry of the county is long extinct. Engineering works and paper mills are established at various places; and boat-building is carried on at Reading and other riverside stations. There are extensive seed warehouses and testing grounds near Reading; and the Kennet and Windsor ales are in high repute.

The area of the county, including the county borough of Reading, is 725 sq.mi., with a population (est. 1938) of 328,250. The population of the administrative county was then 227,850, but the rural nature of the county and its proximity to London made it particularly suitable as a reception area for World War II evacuees, whose influx raised the population by 30% between Sept. 1939 and Feb. 1942.

There were, in 1943, 20 hundreds, one urban (Wantage) and 11 rural districts, and 184 civil parishes. There are three county divisions, Abingdon, Newbury and Windsor, each returning one member, while the parliamentary borough of Reading returns one member. Berkshire is in the Oxford circuit, and assizes are held at Reading. It has one court of quarter sessions and is divided into 12 petty sessional divisions. The municipal boroughs are Abingdon, Maidenhead, Newbury, New Windsor, Reading, the county town and a county borough, Wallingford and Wokingham. Other towns are Faringdon, Hungerford, Lambourn and Sandhurst. The villages of Bray, Cookham and Tilehurst are residential towns.

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BERKSHIRE HILLS, the name applied to the highlands of western Massachusetts, are a part of the Appalachian system, and a continuation of the Green mountains of Vermont. The Berkshire country is among the most beautiful regions in the United States. It is a rolling highland dominated by long, wooded ridges, remarkably even-topped in general elevation (about 1,500 ft.), and intersected and broken by deep valleys. The chief streams are the Deerfield and Westfield in the east and the Hoosac and Housatonic in the west. About a score of the summits are over

2,000 ft. above sea-level, and of these the highest are Greylock, or Saddleback (3,505 ft.) and Mt. Williams (3,040 ft.), in the extreme north-west corner of the State. Because of its numerous charming lakes, the district is often called the Lake Region of America, partly from the comparableness of its scenic beauties with the English lake country. The Berkshires have been, for many years, a favourite holiday resort.

BÊRLAD, the capital of the department of Tutova, Rumania, on the River Bêrlad, which waters the high plains of eastern Moldavia, and on the Galatz-Jassy railway. Pop. (1930) 26,189, of whom about one-fourth were Jews. Bêrlad possesses a few good modern buildings, including a fine hospital administered by the St. Spiridion foundation of Jassy. There are manufactures of soap and candles and some trade in timber and farm produce; also a large annual horse-fair. Near by are traces of a Roman camp.

BERLAGE, HENDRIK PETRUS (1856–1934), Dutch architect, received his technical training at Amsterdam and Zürich and eventually settled at The Hague. As his career progressed he broke away from the Renaissance and Gothic styles which he had originally followed and finally succeeded in expressing the conception of beauty prevailing in his own time. Under the influence of these new ideas architecture in Holland reached an important stage of development. The chief characteristics of Berlage's style are simplicity of form, severity of line and a preference for brick as a material. In later years he was actively concerned with urban extension, and in this connection became architectural adviser to the cities of Amsterdam, The Hague and Rotterdam.

BERLICHINGEN, GOETZ or **GOTTFRIED, VON** (1480–1562), called "Goetz of the Iron Hand," German knight, was born at the castle of Jagsthausen now in Württemberg. In 1497 he entered the service of Frederick IV., margrave of Brandenburg-Ansbach, and in 1498 fought for the emperor Maximilian I., in Burgundy, Lorraine and Brabant, and next year in Switzerland. About 1500 he raised a company of freelances, and at their head took part in various private wars. In 1505, while assisting Albert IV., duke of Bavaria, at the siege of Landshut, his right hand was shot away, and an iron one was substituted which is still shown at Jagsthausen. In spite of this, "Goetz of the Iron Hand" continued his feuds, their motive being mainly booty and ransom. In 1512 an attack near Forchheim on merchants returning from Leipzig fair, caused him to be put under the ban of the empire by Maximilian, and he was only released from this in 1514 upon a promise to pay 14,000 gulden. In 1516 he raided Hesse and held to ransom Philip IV., count of Waldeck, and in 1518 was again placed under the ban. He fought for Ulrich I., duke of Württemberg, when he was attacked by the Swabian League in 1519. In violation of the terms of capitulation of Möckmühl, he was held prisoner and handed over to the citizens of Heilbronn, but owing to the efforts of Sickingen and Georg von Frundsberg, was released in 1522. When the Peasants' War broke out in 1525 Goetz was compelled by the rebels of the Odenwald district to act as their leader. For his part in the rebellion he was acquitted by the imperial chamber (Oct. 17 1526). But the Swabian League seized the opportunity of paying off old scores against him. Lured to Augsburg under promise of safe conduct, he was treacherously seized (Nov. 28 1528) and kept a close prisoner for two years. In 1530 he was liberated. He appears to have remained quietly at his castle of Hornberg on the Neckar until 1540. In 1542 he fought against the Turks in Hungary and in 1544 accompanied Charles V. when he invaded France. He returned to Hornberg where he died on July 23 1562. He was twice married and left three daughters and seven sons. The counts von Berlichingen-Rossach, of Helmstadt near Heidelberg, one of the two surviving branches of the family, are his descendants. The other branch, that of the Freiherrn von Berlichingen-Jagsthausen, is descended from Goetz's brother Hans. Goethe's play "Goetz von Berlichingen" marked an epoch in the history of German drama.

See R. Pallmann, *Der historische Goetz von Berlichingen* (1894); F. W. G. Graf von Berlichingen-Rossach, *Geschichte des Ritters Goetz von Berlichingen und seiner Familie* (Leipzig, 1861). Goetz's *Autobiography,* valuable as a record of his times, was first published by Pistorius at Nuremberg (1731), and again at Halle (1886).

BERLIN, IRVING (1888–), adopted name of Israel Baline, American song writer, was born in Russia, May 11, 1888, and was brought to the United States in 1893. He left home at 14 to earn his living, finding employment as a singing waiter in various Chinatown and Bowery cabarets in New York. There he began to write song lyrics and compose melodies. The increasing popularity of his songs enabled him in 1919 to open a music publishing business. In 1920, in partnership with Sam Harris, he built the Music Box theatre in New York city, for which he wrote a number of highly successful revues. "Alexander's Ragtime Band" (1911), "Everybody's Doin' It" (1911) and several other compositions gave him international renown as the pioneer of ragtime music. Its subsequent evolution into jazz owes much to his later work, such as "Pack Up Your Sins" (1922) and "Everybody Step" (1921), characterized by complex work, rhythms and intricate melody. His songs "Always," "All Alone," "Remember," "What'll I Do?" (all 1925) and "Russian Lullaby," "What Does It Matter?" (both 1926) were universally popular. In 1933 he composed the musical score for Moss Hart's lively satirical revue, *As Thousands Cheer.*

See Alexander Woollcott's *The Story of Irving Berlin* (1925).

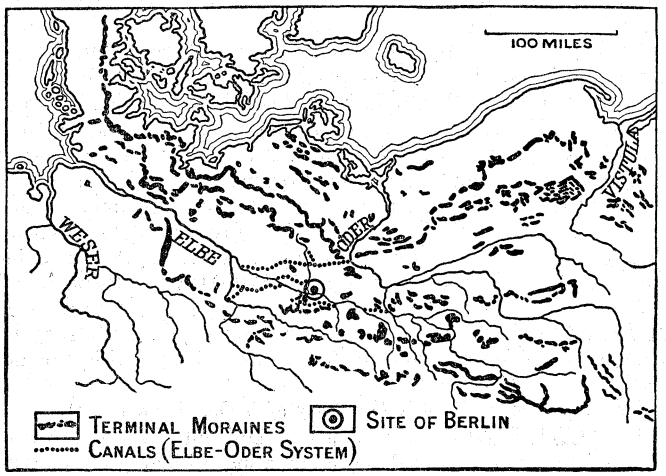
BERLIN, ISAIAH (1725–99), an eminent rabbi of Breslau; author of notes on the Talmud stimulating critical study of that work.

BERLIN, capital and largest city of the German Reich, and also of the *Land* of Prussia. It is the seat of the parliament (*Reichstag*) and the Prussian diet (*Landtag*), and of the state offices of the German realm, except the supreme court of Justice (*Reichsgericht*), which is fixed at Leipzig. The city lies in a flat sandy plain, 110ft. above sea-level, on both banks of the navigable Spree, which intersects it from south-east to north-west. The highest point in the immediate neighbourhood is the Kreuzberg (200ft.), a hill in the southern suburb of Schöneberg, which commands a fine view of the city. In the middle ages, while Brandenburg was the capital of the Mark, Berlin was of very moderate importance at the junction of the Havel and Spree farther east, and by each river it was possible to approach the Oder and by the united one Brandenburg and the Elbe.

Growth of the City.—In 1646 the Great Elector (Frederick William) married a Dutch princess, and during his reign Brandenburg became a Protestant refuge and a field for Dutch energy. Important canal construction was undertaken and the name of the Friedrich Wilhelm canal from the Oder to the Spree commemorates an achievement of the Great Elector. These canal tracks were marked out by nature in the surface features of the country. The passing away of the great ice sheets has left on the northern plain of Europe long east to west lines of low hills formed of terminal moraines. The rivers follow the east to west troughs between moraines until they break through to the north at weak spots in the successive lines. (*See* Map.) These east and west courses were organized into the great canal communication system which emphasized the focal position of Berlin. Thenceforward Berlin gathered traffic to itself by an elaborate system of roads, canals and, later, railways, and thus became a new power, which, through the German empire, was to dominate the northern plain. In considering the focal position of Berlin it is important to emphasize also that it was situated not only on the east to west route but at the focus of the morainic lines of hills as well. (*See* Map.)

With the consolidation of the German empire, after the Franco-Prussian War of 1870–71, Berlin grew enormously. Housing, drainage and water supplies, which had previously been notoriously bad, were now greatly improved. Streets became well paved and lighting improved, while the Congress of Berlin in 1878 gave added status to the city. The great international railway lines, which developed after 1870, tended to focus here as well. By the beginning of the 20th century Berlin was a first-rate modern city. Almost equidistant from the remotest frontiers of Prussia, from north to south and from east to west, its situation had been

the principal determining factor in its rapid rise to the position of the greatest industrial and commercial city on the Continent, and the third largest city in the world. The oldest part of Berlin, the city and Alt-Kölln, built along the arms of the Spree, is, together with that portion of the town lying immediately west, the centre of business activity. The west end and the south-west are the residential quarters; the north-west is largely occupied by



MAP SHOWING HOW BERLIN IS SITUATED AS REGARDS THE NATURAL CONFIGURATION OF THE SURROUNDING TERRAIN

It lies at the focal point of low hills which were once the terminal moraines of glaciers. The rivers Oder, Weser and Elbe run from east to west in the troughs between the hills, while troughs in other directions made the construction of a canal system a simple matter. To this work, begun in 1616, and to the facilities offered by the same natural features for road, and later, railway construction, Berlin largely owes its position today as the most important city in Northern Central Europe

academic, scientific and military institutions; the north is the seat of machinery works; the north-east of the woollen manufactures; the east and south-east of the dyeing, furniture and metal industries, and the south of railway works.

In 1870 Berlin was practically bounded on the south by the Landwehr canal, but it has since extended far beyond, and the Tempelhofer Feld, where military reviews were held, then practically in the country, is now surrounded by houses. The Landwehr canal, leaving the Spree near the Schlesische Tor (gate), and rejoining it at Charlottenburg, is flanked by fine boulevards and crossed by many bridges. The object of this canal was to relieve the congestion of the water traffic in the heart of Berlin. It was superseded in 1906 by the Teltow canal to the south, which leaves the Spree above Berlin at Köpenick, and, running south of Rixdorf, Südende and Gross-Lichterfelde, enters the Havel at Teltow. In 1914 a ship canal to Stettin was begun, and in Sept. 1923 a new harbour, called the "West Harbour," was opened; here 68 large ships from the Elbe could be loaded simultaneously. The boundaries of the city remained the same from 1860 to 1920, although in 1912 an association of the city and its suburbs was formed and the whole was called "Greater Berlin." A law passed in 1920, however, made this whole area one municipality. Area 341 sq.mi. An idea of the rapid growth of the city may be gathered from the population statistics. It has been estimated that the figure in 1688 was only 8,000. In 1816 it was 197,717; in 1871, 826,341; in 1905, 2,033,900; in 1933, 4,236,416 and in 1939, 4,332,242. Part of this phenomenal rise was due to extension of boundaries.

Streets and Public Buildings.—The social and official life of the capital centres round Unter den Linden, which runs from the former royal palace to the Brandenburger Tor. This street, one of the finest and most spacious in Europe, nearly a mile in length, its double avenue divided by a favourite promenade, planted with lime trees, presents Berlin life in all its aspects. South of Unter den Linden lies the Friedrichstadt, with its parallel lines of straight streets—the official quarter of the capital—which extends to the busy Leipzigerstrasse, running from the Potsdamer Platz to the Dönhoffplatz. This street and Unter den Linden are crossed at right angles by the Friedrichstrasse, 2 mi. long, and form the chief shopping centres. The establishment of the imperial government in Berlin naturally brought with it the erection of a large number of public buildings, and the great prosperity of the country (1870–1914), as well as the enhanced national feeling, enabled them to be built on a fine scale. First in importance is the Reichstagsgebäude, in which the federal council (*Bundesrat*) and the imperial parliament (*Reichstag*) held their sittings before Hitler's rise to power. The library is exceedingly rich in works on constitutional law. A house was also built for the Prussian parliament (*Landtag*) in the Albrechtstrasse. Other buildings included the patent office on the site of the old ministry of the interior, the ministry of posts (with post museum) at the corner of the Mauerstrasse and Leipzigerstrasse, the central criminal court in Moabit, the courts of first instance on the Alexanderplatz, the ministry of police and the *Reichsversicherungsamt*, the centre for the great system of state insurance. In addition to these, many buildings were restored and enlarged, chief among them being the armoury (*Zeughaus*), the war office and the ministry of public works, while the royal mews (*Marstall*) was entirely rebuilt. At the Schloss end of Unter den Linden are the cathedral, a sumptuous, though somewhat clumsy, Renaissance building erected in 1893, and the museums, university, library, opera and the former palace of the Crown Prince, now a gallery of modern pictures. The Kaiser Friedrich museum, standing between two arms of the Spree, is a building of the Italian baroque style, built in 1904.

The former royal palace is a huge quadrangular building with four courts. The Weisse-Saal within was used for court pageants. In 1921 the Schloss museum of pottery, silver and furniture was opened in this palace. After 1919, much of the former palace was used for government offices. The Opernhaus and Schauspielhaus are state supported theatres of old standing. There are many private play-houses.

After 1933, under the direction of Adolf Hitler's favourite architect, Professor Albert Speer, a grandiose building program was undertaken "to ornament Berlin with those streets, structures and public works which will make it a city that will stand for a thousand years, worthy of the immeasurable future of a nation of a thousand years' history." A broad avenue continuing the Unter den Linden westward through the Tiergarten and Charlottenburg became part of an "east-west axis." It connected the centre of the city with the new automobile super-highways (*Reichsautobahn*) which converge at the capital, but which also circle the outskirts of Berlin so that through traffic will not congest the overcrowded city. Among the most imposing new structures were the Reich Chancellory (Hitler's residence) in the Wilhelmstrasse, Goering's gigantic air force (luftwaffe) office building in the Leipzigerstrasse, the huge Reichsbank to the southeast on the banks of the Spree, and to the south the Tempelhof airport, the largest in Europe. Here before World War II more than 100 great transcontinental aeroplanes were arriving and departing every 24 hours. A sport field and great concrete stadium seating 100,000 spectators was built in West Berlin for the Olympic games of 1936, with a powerful radio transmitting station near by.

University and Schools.—The Friedrich Wilhelm university was founded in 1809, when Prussia had lost her celebrated University of Halle, which Napoleon had included in his newly created kingdom of Westphalia. It was as a weapon of war, as well as a nursery of learning, that Frederick William III. and those associated with its origin called it into existence. Wilhelm von Humboldt, Fichte, Neander, Savigny, Hegel, Niebuhr and others began to make its fame, and they were followed by many world-renowned successors, including Bopp, Schelling, Richter, the brothers Grimm. The great names of still later days are innumerable, but one may instance Virchow, du Bois Reymond, von Ranke, Curtius, Lipsius, Kiepert, Helmholtz, van't Hoff, Koch, E. Fischer, Waldeyer, Mommsen, Harnack, Penck, de Vries.

There are 29 Gymnasien (classical schools), 46 Realgymnasien (modern), 23 Oberrealschulen, 1 Progymnasium, Berlin Mariendorf, 2 Realprogymnasien and 41 Realschulen (commercial) in Berlin; institutions of university rank include the technical high

BERLIN









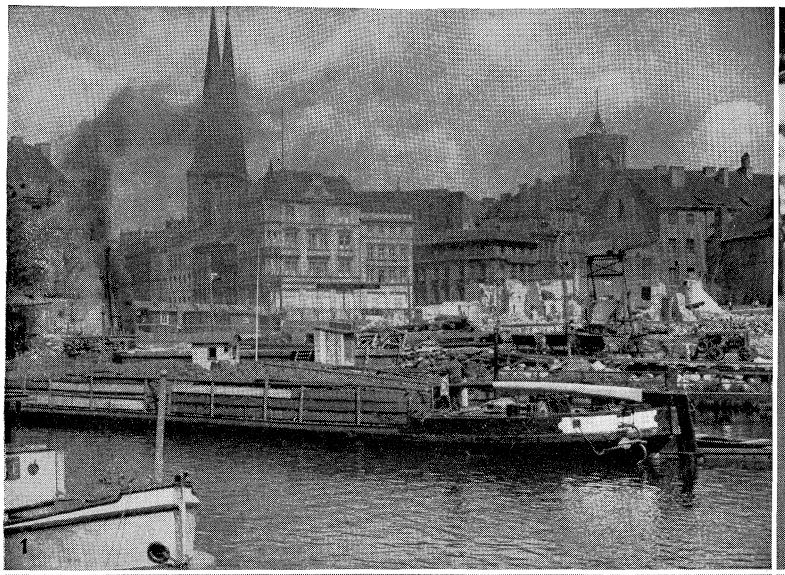


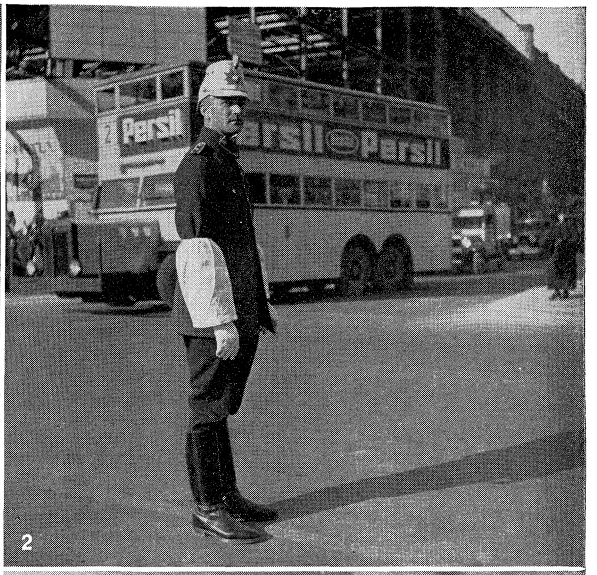
PHOTOGRAPHS, (1, 2, 4, 5) PIX FROM PUBLIX, (3) SCHALL-PIX FROM PUBLIX

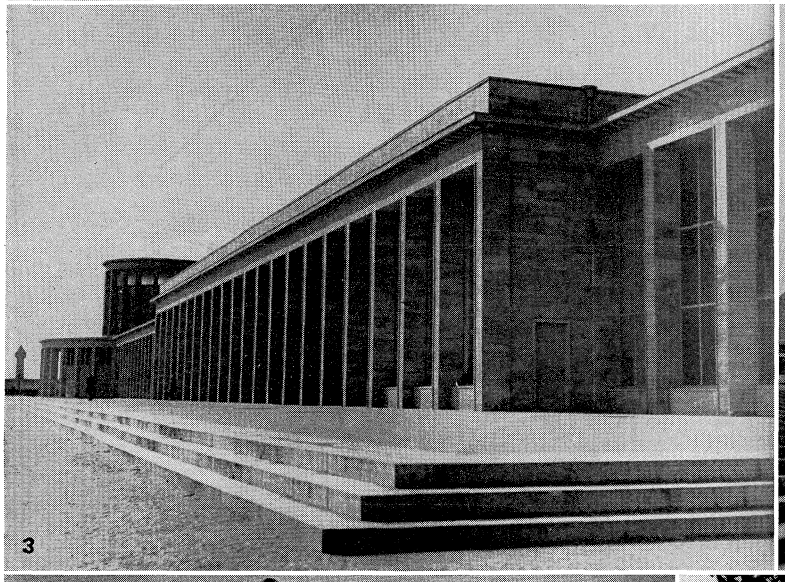
BUILDINGS OF GERMANY'S CAPITAL

1. The River Spree, with the Kurfürsten bridge and the dome of the cathedral in the distance
2. Unter den Linden, Berlin's principal thoroughfare
3. Statue of Frederick the Great at the end of Unter den Linden. The State Opera house is at the left
4. The massive building of the reich air ministry
5. The chancellery on Wilhelmstrasse built by Adolf Hitler

BERLIN

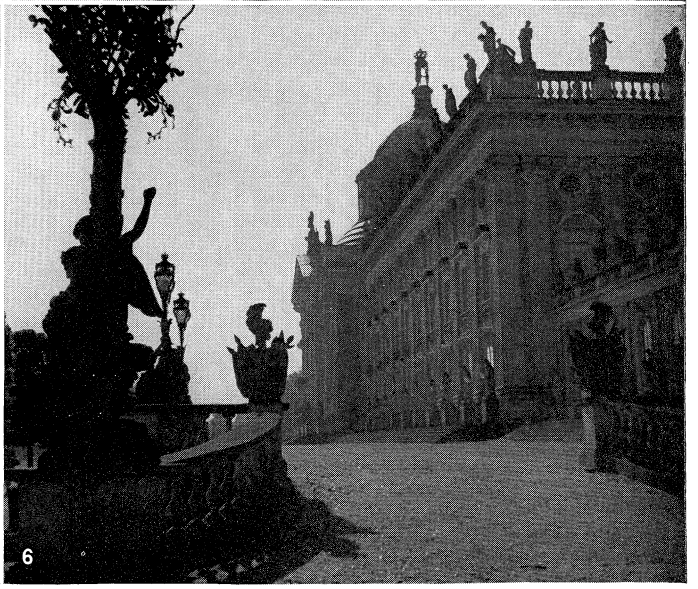












PHOTOGRAPHS, (1, 3, 4) PIX FROM PUBLIX, (2, 5, 6) SCHALL-PIX FROM PUBLIX

VIEWS OF BERLIN AND POTSDAM

1. The old section of Berlin along the river front
2. Traffic policeman on duty in Berlin
3. Exposition halls in the fair grounds near the Funkturm (radio tower)
4. The French cathedral on the Gendarmenmarkt
5. View from the Schloss museum on Unter den Linden, with the Arsenal in the right background
6. The Stadtschloss at Potsdam

school at Charlottenburg, highly equipped for all scientific work, the school of mines, the agricultural college, the veterinary college, the seminary for oriental languages and the high school for music. Leibnitz founded in 1700 the Royal Academy of Sciences, one of the most important of learned societies. Among the public monuments Rauch's statue of Frederick the Great, in Unter den Linden, is one of the most celebrated, while Begas' statue of William I. is enormous. A second group of monuments on the Wilhelmplatz commemorates the generals of the Seven Years' War; and a third in the neighbourhood of the opera-house the generals who fought against Napoleon I. On the Kreuzberg a Gothic monument in bronze was erected by Frederick William III. to commemorate the victories of 1813–15; and in the centre of the Königsplatz stands a lofty column in honour of the triumphs of 1864, 1866 and 1870–71. Literature, science and art are represented in different parts of the city by statues and busts of Rauch, Schinkel, Thaer, Beuth, Schadow, Winckelmann, Schiller, Hegel and Jahn. On the Königsplatz, near the east-west axis and in front of the Reichstag building, is the bronze statue of Bismarck, unveiled in 1901. From the south side of the Königsplatz, crossing the Tiergarten and intersecting the avenue from the Brandenburg gate to Charlottenburg, runs the broad Siegesallee, adorned by thirty-two groups of marble statuary representing Hohenzollern rulers, the gift of the emperor William II. to the city. The Tiergarten park has statues of Queen Louisa, Goethe and Lessing.

Environs.—On the east, north and west the city was surrounded at a distance of some 5 mi. from its centre by a thick belt of pine woods, the Jungfernheide, the Spandauer Forest and the Grunewald, the last-named stretching away in a south-westerly direction as far as Potsdam and fringing the beautiful chain of Havel lakes. After the opening of the circular railway in 1871 these districts were developed and a "villa colony" was built at the edge of the Grunewald between the station West-end and the Spandauer Bock. From these beginnings, owing mainly to the expansion of the important suburb of Charlottenburg, has resulted a complete transformation of the eastern part of the Grunewald into a picturesque villa suburb, which is connected by the Kurfürstendamm with the city. The former fishing villages on the shores of the lakes, notably the Wannsee, are now an important residential area.

Administration.—The rapid growth of the suburbs, which were independent communities, necessitated the adoption of certain main lines of procedure, applicable both to them and to Berlin, in order to prevent conflicting action on the part of the authorities on one side and the other. This led, in 1911, to the creation of Greater Berlin, as, in the first instance, an association of the city with the more important outlying districts for special objects. It embraced the City of Berlin and the towns of Charlottenburg, Schöneberg, Neukölln, Wilmersdorf, Lichtenberg and the administrative circles of Teltow and Niederbarnim. Its objects were to institute a common control of streets, roadways and the elevated railway, also of building and street alignment plans, the uniform co-ordination of police regulations and the acquisition of large tracts of forest and of land for building. This special union came into force on April 1, 1912. It soon became manifest, however, that, beyond co-operation for special purposes, a further co-ordination of the administrations of these places was requisite. It was not until the year 1920 that it was possible, after long negotiations, to form a new municipality of Berlin, embracing all the suburbs under a single united administration. A law to this effect was carried through the Prussian Constituent Assembly on April 27, 1920, and was put into force on October 1 of the same year. This law effected the centralization of Berlin and all its suburbs into one uniform municipal region (*Stadtbezirk*), but, nevertheless, left large powers of local self-administration to the individual communes (*Gemeinden*). The water-supply is mainly derived from works on the Müggel and Tegeler lakes, the river water being carefully filtered. The city is divided into twelve radial systems, each with a pumping station, and the drainage is forced through mains to sewage farms. In 1915 the city purchased the Berlin electrical works.

The city is very richly endowed with charitable institutions for the relief of pauperism and distress. In addition to the municipal support of the poor-houses there are large funds derived from bequests for the relief of the poor. The hospital organization is also well appointed. State, municipal and private charity join hands in the relief of sickness. Of the municipal hospitals the largest is the Virchow hospital, situate in Moabit and opened in 1906; then comes that of Friedrichshain, while the state controls six (not including the prison infirmaries), of which the renowned Charité in the Luisenstrasse is the principal.

Industry, Trade and Commerce.—The old wool industry has become much extended and now embraces products such as shawls, carpets, hosiery, etc. Its silk manufactures, formerly so important, have, however, gradually gone back. It is particularly in the working of iron, steel and cloth and in the by-products of these that Berlin excels. The manufacture of machinery shows an enormous development. Among the chief articles of manufacture and production are railway plant, sewing machines, bicycles, steel pens, chronometers, electric and electric-telegraph plant, bronze, chemicals, soap, lamps, linoleum, china, pianofortes, furniture, gloves, buttons and artificial flowers. It has extensive breweries. Berlin is also the great centre and the chief market for speculation in corn and other cereals which reach it by water from Poland, Austria and Russia, while in commerce in spirits it rivals Hamburg. It is also a large publishing centre and has become a serious rival to Leipzig. Berlin has markets conveniently situated at various accessible places within the city, of which the central market near the Alexanderplatz is the most important. The central cattle market and slaughter-houses for the inspection and supply of the fresh meat consumed in the metropolis is in the north-east on the Ringbahn.

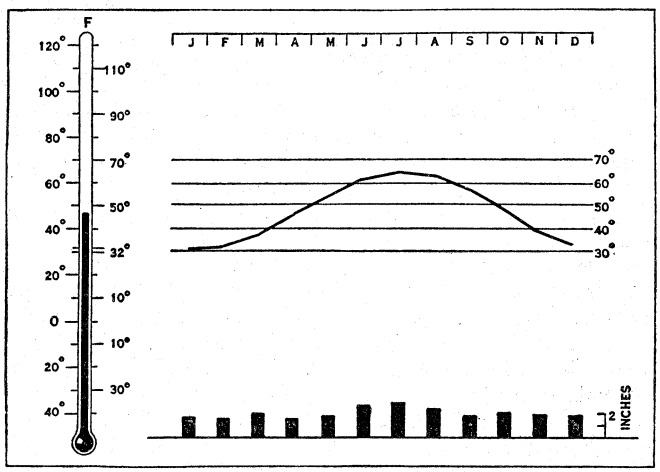
Communications.—Berlin is the centre of the German network of railways. No fewer than twelve main lines concentrate upon it. Internal communication is provided for by the Ringbahn, or outer circle, which was opened in 1871, and by a well-devised system which connects the termini of the main lines. The through traffic coming from east and west is carried by the Stadtbahn, or city railway, which also connects with and forms an integral part of the outer circle. This line runs through the heart of the city. Originally a private enterprise, it has been owned by the State since 1878. Lying apart from the system are the Lehrter Bahnhof for Hamburg and Bremen, the Stettiner for Baltic ports, and the Görlitzer, Anhalter and Potsdamer termini for traffic to the south. The North and South Tube, begun before 1914, was opened in 1923. Later it was connected with a subway system running east and west under Unter den Linden and extending far into the suburbs.

HISTORY

Berlin is a comparatively young town. When the Saxon North Mark was founded in the 12th century by Albert the Bear, after successful wars against the indigenous Slavs, it comprised at first only a little land on the east bank of the Elbe. It was only gradually that Albert's successors penetrated farther into the districts of the upper Havel and the Spree, and only at the beginning of the 13th century that the first towns were founded in these districts. It can hardly be doubted that the choice of this particular site for the foundation of the two towns directly contiguous to one another was due to the wish to safeguard the important crossing of the Spree. Berlin grew up south of the Spree, Kölln north of it, on the island formed by the two arms of the river. The two towns must have been founded at about the same date. The first mention of Berlin in the records which have been preserved occurs in 1230; Kölln appears to be a little older. The charter and administration of the two towns was at first totally separate, even though they had a common civil government and common courts of justice from 1307 onwards. Only in 1709 were they completely amalgamated.

It was soon found that the situation of the two new towns was advantageous for commerce to the east and north-east, and they quickly became prosperous. Their military importance as bases for the German dominion became secondary when the fron-

tiers of the Mark were extended farther to the north and east. Their rapid commercial growth brought an increasing need to enter into closer and permanent relations with the commercial cities of northern Germany, which at this period were growing up rapidly. They joined the great Hanseatic League, which was formed in the latter half of the 13th century, and embraced all important towns in northern Germany. They were soon among the leading cities of the Mark of Brandenburg and were thus



GRAPH OF THE WEATHER OF BERLIN. THE THERMOMETER SHOWS THE MEAN ANNUAL TEMPERATURE, AND THE CURVE THE NORMAL MONTHLY TEMPERATURE. THE COLUMNS INDICATE THE NORMAL PRECIPITATION FOR EACH MONTH

involved in the many internal struggles resultant on the change of dynasties and the antagonisms which arose between princes, nobles, and cities after the extinction of the Ascanian line in the 14th century. Neither the Wittelsbachs, to whom the Emperor Louis the Bavarian granted the province, nor the house of Luxemburg, their successors, were able to establish their authority securely in this district, and the cities of Berlin and Kölln thus long remained almost wholly independent, especially as their connection with the Hanseatic League (*q.v.*) put them in a strong position, even towards their own sovereign prince. In 1391 they received complete judicial authority within their walls.

Conditions changed only after 1415, when the Hohenzollerns had permanently established their rule in the Mark and set about subjecting to their own sway all independent powers still surviving. The Elector Frederick I. was still engaged principally with the recalcitrant local nobility, but his successor Frederick II. (1440–70) aimed at incorporating the large cities also more closely into his territory. He subdued Berlin and Kölln, although not without a sharp struggle, partly by exploiting the antagonisms existing within the cities themselves between the dominant families, the patricians, and the guilds of artisans. After his victory he deprived the cities of part of their old privileges, in particular of the right of concluding independent alliances with other towns. He built a fortress in Kölln on the site later occupied by the royal palace, and his successor made this spot his principal seat. From the end of the 15th century Berlin-Kölln was the permanent residence of the Hohenzollerns and the capital of the Electorate of Brandenburg.

In the 15th and 16th centuries the two towns were comparatively small in area and population. In 1654 their united population was only about 10,000. At that time also they played a comparatively subordinate part in the history of the Electorate and could not challenge any comparison with the wealth and repute of the great old commercial cities of Germany, such as Nuremberg, Augsburg, Strasburg, Frankfort or Cologne. They suffered severely, moreover, from sacks and forced levies during the Thirty Years' War.

It was only with the growing power of the Electors of Brandenburg from the 17th century onwards that the extent and importance of their place of residence began to grow likewise. The Great Elector, Frederick William (1640–88), laid out extensive fortifications, founded in the immediate neighbourhood three more small towns, Friedrichwerder, Dorotheenstadt and Friedrichstadt, which soon amalgamated with the two older towns introducing good paving and lighting in the main streets. By settling here some of the Huguenots who had left France on account of the religious persecutions of Louis XIV. he brought into the population of the city important new elements, whose influence on commerce and industry was considerable. At the end of the 17th century there were over 5,000 French Huguenots in the area of the present Berlin, the total population being about 25,000. By completing the construction of the canal between the Spree and the Oder he opened up greater facilities for shipping and commerce.

His successor, Frederick I., the first king of Prussia, amalgamated the four towns into a single municipality, the city of Berlin, and, in the new palace built by Andreas Schlüter, gave it the first non-ecclesiastical building of any architectural importance. Almost adjoining this he built the Arsenal, laid out the plans on which this quarter of the modern town developed, and erected the beautiful monument to his father (by Schlüter) which is still one of the ornaments of Berlin. He encouraged education by founding the Academy of Science (Akademie der Wissenschaften). Under the two kings who succeeded him the city expanded in all directions. Frederick William I. had the old fortifications razed, thus making further expansion possible. Frederick the Great adorned the city with a number of new buildings, among which the Opera deserves chief mention. He also turned the Tiergarten into a large park. It was only under him that the transformation of Berlin into a modern great city began. The population, which had numbered about 70,000 at his accession, had risen by the end of the 18th century to 172,000. Even the temporary occupation of the town by the Austrians and the Russians during the Seven Years' War was unable to check its development.

Berlin passed through a difficult period at the beginning of the 19th century, when it was occupied by the French after the Battle of Jena and the King was obliged to transfer his seat temporarily to Königsberg, in Prussia. This was, however, only a short break, which was followed by a period of renewed and rapid prosperity after the fall of Napoleon and the restoration and enlargement of the state of Prussia. Berlin was now the capital of the second largest German state, the centre of a European world power, and as Prussia's influence over the development of Germany grew in the following decades, so did Berlin rise higher and higher above the other German towns. The foundation of the University in 1809 and the erection of the old Museum by Schinkel (1824–28) gave the town new centres for its intellectual life. By the middle of the 19th century the position of Berlin in Prussia was already such that, after the outbreak of the revolution of 1848, the course of the subsequent struggles were mainly determined by the sequence of events in Berlin.

Of decisive importance for the further development of Berlin was the construction of the German railway system, which began about the middle of the 19th century. As Berlin was the capital of Prussia, and after 1871 also of the German *Reich,* it was made the terminus or meeting point of the most important railway lines. The Borsig machinery factories which were established in the first half of the 19th century were the starting point of great industrial prosperity.

During World War II many leading Berlin landmarks, like the east-west highway through the Tiergarten, were camouflaged with wire netting strung on high poles and covered with foliage to deceive enemy aviators. Strong anti-aircraft guns and searchlights were set up, and Goering boasted that his luftwaffe would never allow enemy bombers to come over the reich. Nevertheless, after the Germans had heavily bombed Britain, the British were able to retaliate by bombing the nazi capital more than 30 times in 1940 alone. The targets were power and electric plants, railway stations, the great Siemens and Halske electrical works, the Tempelhof airfield, and the Spandau aeroplane factory. Much heavier raids were made in 1942 and 1943, when numerous buildings in the heart of Berlin were seriously damaged or destroyed, including Goering's air ministry.

BIBLIOGRAPHY.—There is no really good history of Berlin. O. Schwebel, *Geschichte der Stadt Berlin* (1888) is popular. *See* also F. Holtze, *Geschichte der Stadt Berlin* (1906) and *Geschichte der Stadt Berlin,* compiled by the "Verein für Geschichte Berlins" for the International Historical Congress, 1908 (bibl.). (E. BRA.; S. B. F.)

BERLIN, a city of Coos county, New Hampshire, U.S.A., the metropolis of the northern part of the state, on the Androscoggin river, 100 mi. N.W. of Portland. It is served by the Grand Trunk and the Boston and Maine railways. At an altitude of 1,013 ft., it is in the heart of the White mountains, 16 mi. from the base of Mt. Washington. The population was 8,886 in 1900; 16,104 in 1920 (more than a third foreign born) and 19,084 in 1940 by federal census. Water power facilities and vast supplies of timber have combined to develop large pulp and paper mills, bituminized fibre conduit and artificial leather plants. The total manufacturing pay roll for 1940 was about $4,000,000, with average earnings for all workers of about $1,200. Retail sales were more than $7,000,000 in 1940.

Berlin was settled in 1821, incorporated as a town in 1829 and chartered as a city in 1897.

BERLIN, a city of Green Lake county, Wisconsin, U.S.A.; on the Fox river, 84 mi. N.W. of Milwaukee; served by the Chicago, Milwaukee, St. Paul and Pacific railroad. The population in 1940 was 4,247. It is in an excellent dairy country and ships large quantities of milk. There are granite quarries near by. The city has a variety of manufactures, including gloves, shoes, leather products and fur coats.

BERLIN, a four-wheeled carriage with a separate hooded seat behind, detached from the body of the vehicle; so called from having been first used in Berlin. It was designed about 1670, by a Piedmontese architect in the service of the elector of Brandenburg. It was used as a travelling carriage, and Swift refers to it in his advice to authors "who scribble in a berlin." As an adjective, the word is used to indicate a special kind of goods, originally made in Berlin, of which the best known is Berlin wool. A Berlin warehouse is a shop for the sale of wools and fancy goods (*cf.* Italian warehouse). The spelling "berlin" is also used by Sir Walter Scott for the "birlinn," a large Gaelic rowing-boat.

BERLIN, CONGRESS AND TREATY OF. The events that led up to the assembling of the Congress of Berlin, the outcome of which was the treaty of July 13, 1878, are described elsewhere (*see* EUROPE: *History;* TURKEY: *History;* RUSSO-TURKISH WARS). Here it must suffice to say that the object of the Congress was to revise the terms of the Treaty of San Stefano (March 3, 1878) by which the Russo-Turkish War had been ended and which seemed to make Russia permanently arbiter of the fate of the Balkan peninsula.

The Congress met, under the presidency of Prince Bismarck, at Berlin on June 13. The principal plenipotentiaries of the other Powers represented were Lord Beaconsfield and Lord Salisbury for Great Britain, Count Andrássy for Austria-Hungary, Prince Gorchakov for Russia, and Alexander Catheodory Pasha for Turkey. The basis of the conferences had, of course, been settled beforehand, and the final act of the congress was signed on July 13.

The Treaty of Berlin consists in all of 65 articles, of which it will be sufficient to note those which have had a special bearing on subsequent international developments. So far as they affect the territorial boundaries fixed by the treaties of Paris and San Stefano it will be sufficient to refer to the sketch map in the article EUROPE: *History.* By Art. I. Bulgaria was "constituted an autonomous and tributary principality under the suzerainty of H.I.M. the Sultan"; it was to have "a Christian government and a national militia." Art. II. fixed the boundaries of the new state. Arts. III. to XII. provide for the election of a prince for Bulgaria, the machinery for settling the new constitution, the adjustment of the relations of the new Bulgarian Government to the Ottoman empire and its subjects (including the question of tribute). By Art. XIII. a province was formed south of the Balkans which was to take the name of "Eastern Rumelia," and was to remain "under the direct military and political control of H.I.M. the Sultan, under conditions of administrative autonomy." It was to have a Christian governor-general. It is to be noted that the sultan retained the right of fortifying and occupying the Balkan passes (Art. XV.) and all his rights and obligations over the railways (Art. XXI.).

Art. XXV., which the events of 1908 brought into special prominence, runs as follows: "The provinces of Bosnia and Hercegovina shall be occupied and administered by Austria-Hungary. The government of Austria-Hungary, not desiring to undertake the administration of the sanjak of Novi-Bazar, . . . the Ottoman administration will continue to exercise its functions here. Nevertheless . . . Austria-Hungary reserves the right of keeping garrisons and having military and commercial roads in the whole of this part of the ancient vilayet of Bosnia."

By Art. XXVI. the independence of Montenegro was definitively recognized and by Art. XVIII. she received certain accessions of territory, including a strip of coast on the Adriatic, but under conditions which tended to place her under the tutelage of Austria-Hungary. By Art. XXXIV. the independence of Serbia was recognized, subject to conditions (as to religious liberty, etc.) set forth in Art. XXXV. Art. XXXVI. defined the new boundaries. By Art. XLIII. the independence of Rumania was recognized. Subsequent articles define the conditions and the boundaries. Arts. LII. to LVII. deal with the question of the free navigation of the Danube. The Danube commission, on which Rumania was to be represented, was maintained in its functions (Art. LIII.) and provision made for the further prolongation of its powers (Art. LIV.).

Art. LVIII. ceded to Russia the territories of Ardahan, Kars and Batoum, in Asiatic Turkey. By Art. LIX. "H.M. the emperor of Russia declares that it is his intention to constitute Batoum a free port, essentially commercial."

By Art. LXI. "the Sublime Porte undertakes to carry out, without further delay, the improvements and reforms demanded by local requirements in the provinces inhabited by the Armenians, and to guarantee their security against the Circassians and Kurds." It was to keep the powers informed periodically of "the steps taken to this effect." Art. LXII. made provision for securing religious liberty in the Ottoman dominions.

Finally, Art. LXIII. declares that "the Treaty of Paris of March 30, 1856, as well as the Treaty of London of March 13, 1871, are maintained in all such of their provisions as are not abrogated or modified by the preceding stipulations."

For the full text of the treaty in the English translation *see* E. Hertslet, *Map of Europe by Treaty,* vol. iv. p. 2759 (No. 530); for the French original see *State Papers,* vol. lxix. p. 749. (W. A. P.)

BERLIN DECREE, an order issued by Napoleon on Nov. 21, 1806, forbidding the importation of British goods, and even excluding from the harbours under his control any neutral vessel which had touched at a British port. (*See* CONTINENTAL SYSTEM.)

BERLIOZ, HECTOR (1803–1869), French musical composer, was born at Côte-Saint-André, near Grenoble, on Dec. 11, 1803. His father, a doctor in good practice, wished his son to follow the same profession, and Hector studied medicine for a time, though he disliked it intensely. He had no early formal musical education, though he studied harmony and counterpoint surreptitiously, but without much real profit until the hearing of a Haydn quartet gave him inspiration and understanding. He was sent to Paris in 1822 to complete his medical studies, and from there he announced his revolt to his father, who cut off supplies and left the young man to fend for himself. Meanwhile he had had some lessons in composition from Lesueur, then a professor at the Paris Conservatoire. He entered himself as a student in 1823, but found the teaching and the atmosphere alien to his rebellious genius. Lesueur seems to have been the only teacher for whom he felt genuine respect.

His life at this period was hard, and he had to support himself by singing in the chorus of the Théâtre Gymnase. He had composed a mass performed at the church of St. Roch, and now wrote other works including a cantata named *La Mort d'Orphée,* the ms. of which was only discovered in 1923; but none of them had any success. He left the Conservatoire in 1825, to devote himself to

a systematic study of the works of Beethoven, Gluck, Weber and other masters. Success came at last with his cantata, *La Mort de Sardanapale* (1830), for which he was awarded the *prix de Rome*. The terms of the prize provided for three years study abroad, the first two to be spent in Italy. There he wrote an overture to *King Lear; Le Retour à la vie,* a continuation of an earlier symphonic work, *Episode de la vie d'un artiste,* the lovely song, *La Captive* and other works. Before the two years were up he begged leave to return to Paris.

The reason was partly nostalgia for a city which he always dearly loved, though he found little appreciation there, and partly his passion for the famous Irish actress, Henrietta Smithson, who was then playing Shakespearian parts in Paris. The *Episode de la vie d'un artiste,* had been inspired by her, and the performance of this work, with its continuation, at the Paris Conservatoire in 1832 caused her to regard Berlioz more favourably than before. It also won the praise of Paganini, who said to the composer: "Vous commencez par où les autres ont fini." Berlioz married Henrietta in 1833. The union was by no means a happy one, and difficulties were aggravated by poverty. She was compelled by an accident to leave the stage, and no place as professor or conductor was available for Berlioz, in rebellion against the correctness of the French school and a pioneer of the romantic movement. He was obliged to support himself and his family by acting as musical critic, which left him little time for composition. Yet the period between his marriage with Henrietta and their stormy separation in 1840 was rich in production. To these seven years belong the dramatic symphonies, *Harold en Italie, Symphonie funèbre et triomphale,* and *Roméo et Juliette;* the opera *Benvenuto Cellini* (1837); and the *Requiem,* commissioned by the French Government for performance in memory of those who fell at Constantine, Algeria.

Berlioz was given the Legion of Honour, and began to write (1838) for the *Journal des Débats,* to which he contributed at intervals until 1863. There he conducted his polemic against the conservative critics of the day. But official musical Paris remained obdurate. He was invited to visit Germany, where Robert Schumann, who had analysed the *Episode* in the *Neue Zeitschrift für Musik,* had prepared the way for him. Henrietta declined to accompany him, and the miserable breach followed. Berlioz supported her until her death in 1854, but there was no renewal of affection. The visit to Germany was delayed until 1842, but was a triumphal success. In all the great musical centres Berlioz was received with enthusiasm. But in Paris he conducted the works of other composers. In 1846 his cantata, *La Damnation de Faust,* was played in Paris, but was coldly received. He paid visits to Austria (1845), Russia (1847), and England (four times between 1847–55), but recognition abroad did not compensate him for apathy at home. *Benvenuto Cellini* was played, at the invitation of Liszt, at Weimar in 1852, and in London in 1853; and the oratorio-trilogy, *L'Enfance du Christ* in Weimar in 1855. The *Hymne à la France* was written for an industrial exhibition in 1844; the *Damnation de Faust* in 1845; the *Te Deum* for the Paris Exhibition of 1855; the short opera, *Béatrice et Bénédict* was produced at Baden in 1862; and *Les Troyens à Carthage* had a short run at the Théâtre Lyrique in Paris in 1863.

After the death of his first wife in 1854, Berlioz married a mediocre singer, Martin Recio, who rather hindered than helped him, since she demanded leading parts in his productions. But he was inconsolable at her death in 1862. The failure of *Les Troyens* in 1863 was a further blow. He had a great reception in Vienna (1866) and St. Petersburg (1867), but his health was failing and he died in Paris in 1869. He had been admitted to the *Académie Française* in 1856, and in 1852 had received the one official post of his lifetime—the librarianship of the Conservatoire.

The human story of Berlioz places him among the great Romantics, and is interesting apart from his achievement of bringing romanticism into the domain of music. His *Mémoires* (begun in London in 1848 and finished in 1865) show him as a boy in despair over the despair of Dido, and his breath is taken away at Virgil's "Quaesivit coelo lucem ingemuitque reperta." At the age of 12 he is in love with "Estelle," whom he meets 50 years afterwards. The scene is described by himself (1865) with minute fidelity—a scene which Flaubert must have known by heart when he wrote its parallel in the novel *L'Education sentimentale.* The man—old, isolated, unspeakably sad, with the halo of public fame burning round him—meets the woman—old also, a mother, a widow, whose beauty he had worshipped when she was 18. In a frame of chastened melancholy and joy at the sight of Estelle, Berlioz goes to dine with Patti and her family. Patti, on the threshold of her career, shows him unmistakable affection. What would he not have given for such a demonstration from Estelle! "I was enchanted," he writes, "but not moved. The fact is that the young, beautiful, dazzling, famous virtuoso who at the age of 22 has already seen musical Europe and America at her feet, does not win the power of love in me; and the aged woman, sad, obscure, ignorant of art, possesses my soul as she did in the days gone by, as she will do until my last day." The music of Berlioz disclosed something in addition to the pure romance of Schumann—something that places him nearer in kind to Wagner. The power of Beethoven's symphonies had made a deep impression on Berlioz in his youth, and the "poetical idea" in Beethoven's creations ran riot in his mind. He thus became one of the most ardent and enlightened pioneers of what is now known as "programme music." Technically he was a brilliant musical colourist, often extravagant, but with the extravagant emotionalism of genius. He was a master of the orchestra; indeed, his treatment of the orchestra and his invention of unprecedented effects of *timbre* give him a unique position in musical history; he had an extraordinary gift for the use of the various instruments, and himself propounded a new ideal for the force to be employed, on an enormous scale. The ideal orchestra sketched out in his *Traité d'Instrumentation* (1844) was of proportions which can only be described as gigantic. This work, hardly appreciated during his lifetime, has had great influence on the later composers of all schools; and sufficient testimony to its value is afforded by the fact that within recent years it has been translated into German and brought up to date by none other than Richard Strauss (Peters ed., 1906).

Among Berlioz's purely literary works may be mentioned especially the essays on Weber, Gluck and Beethoven in the *Voyage musical en Allemagne et en Italie* (1845), while others are *Soirées d'orchestre* (1853), *Les Grotesques de la musique* (1859) and *A travers chants* (1862).

The critical edition of the complete compositions of Berlioz (published by Breitkopf and Härtel) is in ten series. I. Symphonies: *Fantastique,* op. 14; *Funèbre et triomphale,* op. 15, for military band and chorus; *Harold en Italie,* op. 16, with viola solo; *Roméo et Juliette,* with chorus and soli. II. Overtures (ten, including the five belonging to larger works). III. Smaller instrumental works of which only the Funeral March for *Hamlet* is important. IV. Sacred music: the *Grande Messe des Morts,* op. 5; the *Te Deum,* op. 22; *L'Enfance du Christ,* op. 25, and four smaller pieces. V. Secular cantatas, including *Huit scènes de Faust,* op. 1; *Lélio, ou le retour à la vie,* op. 146 (sequel to *Symphonie fantastique*), and *La Damnation de Faust,* op. 24. VI. Songs and lyric choruses with orchestra, 2 vols. VII. Songs and lyric choruses with pianoforte, 2 vols., including arrangements of the orchestral songs. VIII. Operas: *Benvenuto Cellini; Les Troyens* (five acts in two parts, *La Prise de Troie* and *Les Troyens à Carthage*); Recitatives for the dialogue in Weber's *Freischütz.* IX. Arrangements, including the well-known orchestral version of Weber's *Invitation à la danse.* X. Fragments and new discoveries.

BIBLIOGRAPHY.—Adolphe Jullien's books on Berlioz, *Hector Berlioz, la vie et le combat* (1882) and *Hector Berlioz, sa vie et ses oeuvres* (1888) first gave a careful account of the details of his life. *See* also J. Tiersot, *Hector Berlioz et la société de son temps* (1904); A. Boschat, *Histoire d'un romantique: Berlioz* (3 vols., 1906–13); *Le Faust de Berlioz* (1910), and *Une Vie Romantique* (1920); R. Rolland, *Musiciens célèbres* (1909); W. H. Hadow, *Studies in Modern Music* (1st series, 1908); E. Newman, *Musical Studies* (1905); A. W. Locke, *Music and the Romantic Period in France* (1920).

BERM, edge, border of river, a narrow ledge of ground. In parts of Egypt the whole area reached by the Nile is included in the berm. In military phraseology the berm is the space between

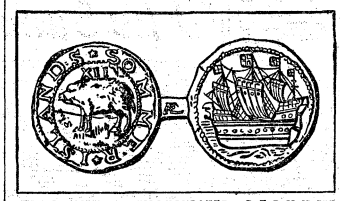
the base of a rampart and the ditch, and was useful to prevent earth rolling into the ditch. As it formed a passage-way military engineers decided to discontinue its construction. A *Berm-bank* is the bank of a canal opposite the towing path.

BERMONDSEY, a metropolitan borough of London, England, bounded north and east by the Thames; southeast by Deptford, southwest by Camberwell, and west by Southwark. Pop. (1938) 97,420. The name appears in Domesday, the suffix designating the former insular, marshy character of the district, while the prefix is generally taken to indicate the name of a Saxon overlord, Beormund. Bermondsey was in favour with the Norman kings as a place of residence, and there was a palace there, perhaps from pre-Norman times. A Cluniac monastery was founded in 1082, and Bermondsey Cross became a favoured place of pilgrimage. The foundation was erected into an abbey in 1399, and Abbey road recalls its site. It is a district of poor streets, inhabited by a labouring population employed in leather, textile, metal, chemical, electrical and other works, and in the docks and the wharves bordering the river. The parish of Rotherhithe or Redriff has long been associated with a seafaring population. A tunnel connecting it with the opposite shore of the river was opened in June 1908. The neighbouring Thames tunnel was opened in 1843, but, as the tolls were insufficient to maintain it, was sold to the East London Railway Co. in 1865. The Herold institute, a branch of the Borough polytechnic, Southwark, gives instruction in the leather trade. Southwark park, in the centre of the borough, is 63 ac. in extent. The borough council consists of a mayor, 9 aldermen and 54 councillors. Since 1918 Bermondsey sends two members to parliament, one for the Rotherhithe and one for the West Bermondsey division. Area 2.7 sq.mi.

BERMUDA RIG, the lofty, triangular, or leg-of-mutton mainsail of modern racing yachts. The rig was used originally on the small craft of the Bermuda islands, where it had been brought to a high state of efficiency before it came into general use on yachts. In its original form it consisted of a tall mast, raking well aft, and a loose-footed sail with a sprit to hold it out instead of a boom. As developed for yacht use the mast was lengthened considerably, being well stayed, often with two sets of spreaders on the mast to obtain the desired strength, and the foot of the sail shortened. This was to give a long "leading edge" to the sail, the ratio of height (or hoist) to foot being sometimes as high as 2.5 to 1 on small yachts. On larger yachts the difficulty of properly staying extremely long masts has kept this ratio down, so that from 2 to 1 or 1.5 to 1 is more common in yachts over 50 ft. long. The sail is very efficient on the wind, it being possible to get a more uniform surface than in a gaff sail, where the gaff and boom are at different angles due to the former swinging off more than the latter. Whether or not the rig is indigenous to Bermuda is not certain. It probably originated in Holland, whence England derived much of her sea lore. However, it has been used in Bermuda from the early days of that colony, and was also seen on Chesapeake bay, in the early days of the American Colonies. The sail, in its modified form, did not come into general use on yachts outside of Bermuda until after 1918. It is sometimes called the marconi or jib-headed rig. (H. L. St.)

BERMUDAS, a group of islands in the Atlantic ocean, forming a British colony, in 32° 15′ N. and 64° 50′ W., about 580 mi. E. by S. from Cape Hatteras on the American coast. The group, consisting of small islands and reefs (which mark the extreme northern range of the coral-building polyps), is of oval form, measuring 22 mi. from N.E. to S.W.; the area is about 19 square miles. The largest is Great Bermuda, or Main Island, 14 mi. long and about a mile in average width, enclosing on the east Harrington sound, and on the west the Great and Little sounds, thickly studded with islets, and protected on the north by the islands of Watford, Boaz, Ireland and Somerset. In 1940 the United States was granted on 99-year lease naval and air bases on the E. coast and on Great bay. The rest of the Bermuda islands lie N.E. of Main Island and form a semicircle round Castle harbour. There are a few deep passages between the cays encircling the islands.

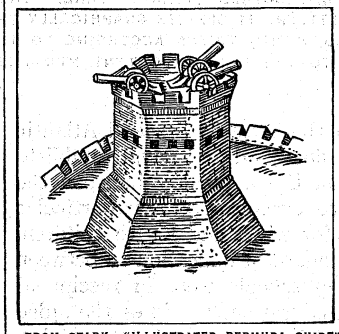
Geology.—The Bermudas are composed of aeolian limestones (*see* BAHAMAS) forming irregular hills of some 200–250 ft. These limestones consist chiefly of blown shell-dust, very irregularly stratified, as is usually the case with such deposits. When freshly cut the rock is soft, but the action of the sea covers it with a hard crust and often destroys stratification. The surface is often irregularly honeycombed. The reefs are ridges of aeolian limestone plastered over with thin layers of corals and other calcareous organisms. The very remarkable "serpuline atolls" are encrusted with convoluted tubes of serpulae and *Vermetus*, together with barnacles, mussels, nullipores, corallines and some true encrusting corals. They probably rest upon foundations of aeolian rock. The Bermudas were formerly much more extensive than now and they may possibly be upon the summit of a submerged volcano. There are evidences of small oscillations of levels, but none of great elevation or depression.



FROM STARK, "ILLUSTRATED BERMUDA GUIDE"

HOG MONEY USED IN SOMERS ISLAND, BERMUDAS, *c.* 1616–24
The coinage consisted of silvered copper pieces, value 2d., 3d., 6d., and 1s., and was probably the first struck in North America

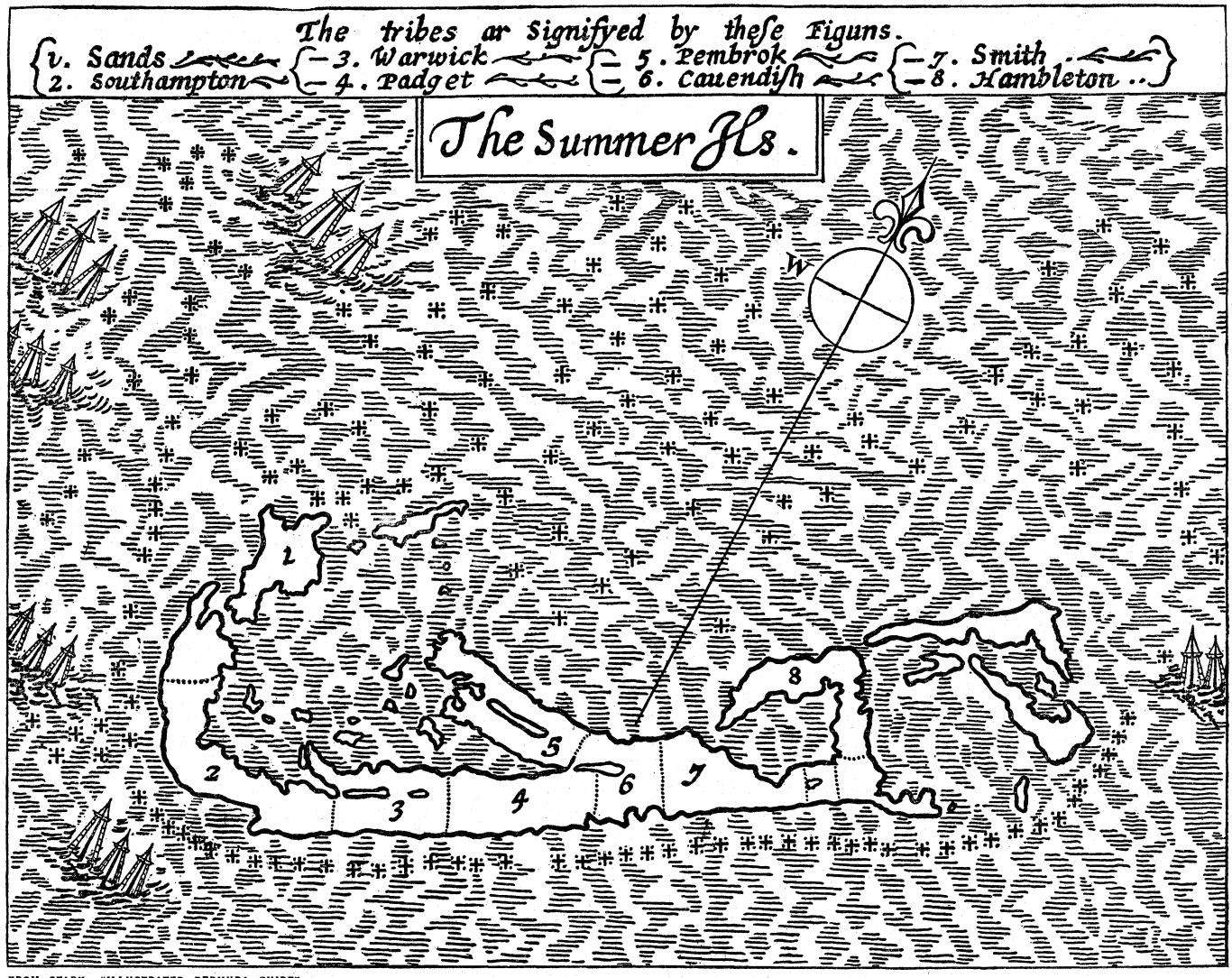
Soil, Climate, etc.—The surface soil is a friable red earth, which is also found in ochreous strata throughout the limestone. It is generally mixed with vegetable matter and coral sand. There are no streams or wells of fresh water, which is supplied only by rain collected and stored in tanks. The climate is mild and healthful. The maximum temperature is about 94° F., the minimum 49° F., the mean annual 71° F. The rainfall on the average is 58 in. per year. The commonest tree is the so-called "Bermuda-cedar," really a strongly-scented species of juniper, which furnishes timber for small vessels. Some inlets are fringed with mangrove; the prickly pear grows luxuriantly in the most barren districts; and sage bush springs up profusely. Citron, sour orange, lemon and lime grow wild, and the loquat, imported from China, grows well. Farming lands produce vegetables, such as potatoes, celery, carrots and tomatoes, for the most part consumed domestically. Lily flowers and bulbs are exported, principally to the United States. A fine quality of arrowroot is produced, and small quantities of the castor-oil plant, aloe, tobacco, coffee, indigo and cotton are also grown. While sufficient dairy cattle are kept to meet the local demand for fresh milk, only a small proportion of the meat supply is produced locally and must be procured from the United States and Canada. Indigenous mammals are very few, and the only reptiles are a small lizard and the green turtle. Birds, of about ten species, abound. Insects are comparatively few, but ants swarm destructively in the heat. Fish are plentiful, but fisheries as a whole are not developed.



FROM STARK, "ILLUSTRATED BERMUDA GUIDE"

WARWICK FORT IN THE BERMUDAS, CONSTRUCTED IN 1614 BY RICHARD MORE, GOVERNOR OF THE ISLES AND COLONY IN 1612

Government and Population.—The laws of the colony are enacted by a legislature consisting of the governor, the legislative council of nine members (three officials and six nominated non-officials) and the house of assembly of 36 members (of whom four are elected by each of the nine parishes). The governor is assisted by an executive council of four official and three unofficial members. A number of the departments of government are controlled by executive boards, composed of unofficials nominated by the governor, with the head of the department acting in an advisory capacity only. At least 85% of the revenue of the colony is derived from tourist trade, most visitors coming from the United States. At the census of March 26, 1939, the civil population amounted to 30,814; the estimated civil population in 1942 was 32,857. The capital is Hamilton, centrally situated on the inner part of the Great sound; it was founded in 1790 and incorporated in 1793, and its civil popula-



FROM STARK, "ILLUSTRATED BERMUDA GUIDE"

CHART OF "THE STILL VEXED BERMOOTHES" (SHAKESPEARE, "THE TEMPEST") DRAWN IN 1618, TWO YEARS AFTER SHAKESPEARE'S DEATH, BY ONE NORWOOD, A SETTLER. IT DEPICTS GRAPHICALLY THE TOLL TAKEN OF SHIPPING IN THOSE WIND-SWEPT SEAS, AND SHOWS THE MAIN ISLAND DIVIDED INTO TRIBES ACCORDING TO THE INSTRUCTIONS OF THE VIRGINIA COMPANY. THESE "TRIBES" OR PARISHES WERE ASSIGNED TO THE MOST IMPORTANT MEMBERS OF THE COLONY, AND THEIR NAMES PERSIST TO THE PRESENT DAY

tion at the 1939 census was 1,863.

Bermuda is the headquarters of the West Indies and Atlantic squadron of the British navy, the dockyard and naval establishment being at Somerset. Education is compulsory between the ages of 7 and 13, but is not free except in a few particular cases. There are separate schools for white and Negro children, but there is no difference in the standard of education as between the races. At the end of 1941, 29 schools were in receipt of grants from the colony's board of education. In six of the aided schools there are secondary education subjects in the higher forms, and two other schools receiving no state aid also provide secondary education. A Rhodes scholarship (of £400) is awarded to Bermuda each year, and the government also provides scholarships for higher education. There are some 120 mi. of good roads. Motor traffic is restricted to vehicles owned by the government and municipalities; cars required in construction of U.S. bases are permitted outside leased areas. A light standard-gauge railway, 22 mi. in length, connects both ends of the island to Hamilton. English currency is used.

History.—The discovery of the Bermudas resulted from the shipwreck of Juan Bermudez, a Spaniard on a voyage from Spain to Cuba with a cargo of hogs, early in the 16th century. Henry May, an Englishman, was wrecked there in 1593, and Sir George Somers in 1609. Sir George, from whom the islands took the alternative name of Somers islands, was the first to establish a settlement. In 1612 the Bermudas were granted to an offshoot of the Virginia company of 120 persons, 60 of whom, under Henry More, proceeded to the island. The government of the colony passed to the British crown in 1684. At first the staple export was tobacco, but the industry declined in the 18th century. The first newspaper, the *Bermuda Gazette,* was published in 1784. During World War II the economic situation of the colony underwent drastic change. In 1940 the population was greatly augmented by many evacuees from Britain and establishment of an important censorship base. Tourist traffic ceased after the United States entered the war, but was compensated for by the arrival of workers on the American bases and naval and military personnel to man them. An international conference on the problem of European refugees was held in Bermuda in 1943.

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BERNARD, SAINT (1090–1153), abbot of Clairvaux, was born at Fontaines, near Dijon, in France. His father, a knight named Tecelin, perished on crusade; and his mother Aleth, of the noble house of Mon-Bar, died while he was yet a boy. The lad's disposition directed him to the Church. His desire to enter a monastery was opposed by his relations, who sent him to study at Châlons in order to qualify for high ecclesiastical preferment. Bernard's resolution was not, however, shaken, and he joined the community which Robert of Molesmes had founded at Citeaux in 1098, carrying with him his brothers and many of his relations

and friends. The little community, which had seemed on the point of extinction for lack of novices, thus gained a sudden new life, and grew so rapidly that it was soon able to send out offshoots. One of these daughter monasteries was Clairvaux, founded in 1115, and of this Bernard was appointed abbot.

Though nominally subject to Citeaux, Clairvaux soon became the most important Cistercian house, owing to the fame and influence of Bernard. His saintly character and his power as a preacher soon drew crowds of pilgrims to Clairvaux. His miracles were noised abroad, and sick folk were brought to be healed by him. Before long the abbot was drawn into the affairs of the great world. When, in 1124, Honorius II. became pope, Bernard was already reckoned among the greatest of French churchmen; he now shared in important ecclesiastical discussions, and papal legates sought his counsel. Thus in 1128 he was invited by Cardinal Matthew of Albano to the synod of Troyes, where he obtained the recognition of the new order of Knights Templars, the rules of which he is said to have drawn up. The European importance of Bernard, however, began with the death of Pope Honorius II. (1130) and the disputed election that followed. In the synod convoked by Louis the Fat at Étampes in April 1130 Bernard successfully asserted the claims of Innocent II. against those of Anacletus II., and henceforth became the most influential supporter of his cause. While Rome itself was held by Anacletus, France, England, Spain and Germany declared for Innocent, who, though banished from Rome, was—in Bernard's phrase—"accepted by the world." The pope travelled from place to place, with the abbot of Clairvaux at his side; he stayed at Clairvaux itself, and he went with Bernard to parley with the emperor Lothair III. at Liége.

In 1133, the year of the emperor's first expedition to Rome, Bernard was in Italy. He accompanied Innocent to Rome and successfully resisted the proposal to reopen negotiations with Anacletus, who, with the support of Roger of Sicily, was too strong to be coerced. Lothair, though crowned by Innocent in St. Peter's, could do nothing to establish him in the Holy See so long as his own power was sapped by his quarrel with the house of Hohenstaufen; so, in the spring of 1135, Bernard went to Bamberg and succeeded in persuading Frederick of Hohenstaufen to submit to the emperor. In June he was back in Italy, taking a leading part in the Council of Pisa, by which Anacletus was excommunicated. In northern Italy the effect of his preaching was immense; Milan itself surrendered to his eloquence, submitted to Lothair and to Innocent, and tried to force Bernard, against his will, into the vacant see of St. Ambrose. In 1137, the year of Lothair's last journey to Rome, Bernard was in Italy again, agitating with success against the antipope. Anacletus died on Jan. 25, 1138; on March 13 the cardinal Gregory was elected his successor, assuming the name of Victor. Bernard's crowning triumph was the abdication of the new antipope, the result of his personal influence, and he was now free to return to his monastery.

Clairvaux itself had meanwhile (1135–36) been transformed outwardly into a more suitable seat for an influence that overshadowed that of Rome. How great this influence was is shown by the outcome of Bernard's contest with Abélard (*q.v.*).

One result of Bernard's fame was the growth of the Cistercian order. Between 1130 and 1145, 93 monasteries in connection with Clairvaux were either founded or affiliated from other rules. In 1145 a former monk of Clairvaux—another Bernard, abbot of Acquae Silviae, near Rome, was elected pope as Eugenius III. This was a triumph for the order; to the world it was a triumph for Bernard, who complained that all who had suits to press at Rome applied to him, as though he himself had become pope. (*Ep.* 239.)

Having healed the schism within the Church, Bernard next attacked the enemy without. In Languedoc the preaching of Henry of Lausanne was drawing thousands from the faith. In June 1145 Bernard travelled in the south, and by his preaching did something to stem the flood of heresy. Far more important, however, was his activity in the following year, when, at the pope's command, he preached a crusade. The effect was extraordinary. At the great meeting at Vezelay, on March 21, as the result of his sermon, King Louis VII. of France took the cross, together with a host of all classes. Bernard next travelled through northern France, Flanders and the Rhine provinces, everywhere rousing wild enthusiasm; at Spires, on Christmas day, he succeeded in persuading Conrad, king of the Romans, to join the crusade.

The lamentable outcome of the movement (*see* CRUSADES) was a hard blow to Bernard. The news of the disasters to the crusading host first reached him at Clairvaux, where Pope Eugenius, driven from Rome by the revolution associated with the name of Arnold of Brescia, was his guest. An effort was made to retrieve the disaster by organizing another expedition. At the invitation of Suger, abbot of St. Denis, Bernard attended the meeting at Chartres convened for this purpose, where he himself was elected to conduct the new crusade. He was saved from this task, for which he was wholly unfit, by the intervention of the Cistercian abbots, who forbade him to undertake it.

Bernard was now ageing, broken by his austerities and by ceaseless work, but his mental energy remained undimmed. He continued to take an active interest in ecclesiastical affairs, and his last work, the *De Consideratione,* shows no sign of failing power.

The age in which Bernard lived recognized in him the embodiment of its ideal: that of mediaeval monasticism. The world had no meaning for him save as a place of banishment and trial, in which men are but "strangers and pilgrims." (Serm. i., Epiph. n. 1; Serm. vii., Lent. n. 1); the way of salvation had been marked out once for all, and the function of theology was but to maintain the traditional landmarks. With the subtleties of the schools he had no sympathy, and the dialectics of the schoolmen quavered into silence before his terrible invective. Yet, within the limits of his mental horizon, his vision was clear. His life proves with what merciless logic he followed out the principles of the Christian faith, as he conceived it; and it is impossible to say that he conceived it amiss. For all his zeal he was by nature neither a bigot nor a persecutor. Even when preaching the crusade he interfered at Mainz to stop the persecution of the Jews. As for heretics, "the little foxes that spoil the vines," these "should be taken, not by force of arms, but by force of argument," though, if any heretic refused to be thus taken, he considered "that he should be driven away, or even a restraint put upon his liberty, rather than that he should be allowed to spoil the vines" (Serm. lxiv.). He was troubled by the mob violence which made the heretics "martyrs to their unbelief," but oblivious to the precedent of the Pharisees, he ascribed the steadfastness of these "dogs" in facing death to the power of the devil (Serm. lxvi. on Canticles ii. 15).

This is Bernard at his worst. At his best he displays a nobility of nature, a wise charity and a genuine humility, that make him one of the most complete exponents of the Christian life. Hence his enduring influence. The author of the *Imitatio* drew inspiration from him; the Reformers saw in him a mediaeval champion of their favourite doctrine of the supremacy of grace; his works have been reprinted in countless editions. This is perhaps due to the fact that the source of his own inspiration was the Bible. He was saturated in its language and in its spirit; and this saved him from the grosser aberrations of mediaeval Catholicism. He accepted the teaching of the Church as to the reverence due to Our Lady and the saints, but they were overshadowed in his mind by his idea of the grace of God and the moral splendour of Christ; "from Him do the Saints derive the odour of sanctity; from Him also do they shine as lights" (*Ep.* 464).

The cause of Bernard's popular success as a preacher can only imperfectly be judged by the sermons that survive. These were all delivered in Latin, evidently to congregations more or less on his own intellectual level. Like his letters, they are full of quotations from the Bible, and they have all the qualities likely to appeal to men of culture. "Bernard," wrote Erasmus in his *Art of Preaching,* "is an eloquent preacher, much more by nature than by art; he is full of charm and vivacity, and knows how to reach and move the affections." The same is even more true of the

letters. They are written on a large variety of subjects to people of the most diverse stations and types; and they help us to understand the adaptable nature of the man, which enabled him to appeal as successfully to the unlearned as to the learned.

Bernard's works fall into four categories:—(1) *Letters,* of great interest and value for the history of the period. (2) *Treatises*: (*a*) dogmatic and polemical, *De gratia et libero arbitrio,* (*c.* 1127) following the lines laid down by St. Augustine: *De baptismo aliisque quaestionibus ad mag. Hugonem de S. Victore: Contra quaedam capitala errorum Abaelardi ad Innocentem II* (in justification of the action of the synod of Sens); (*b*) ascetic and mystical, *De gradibus humilitatis et superbiae,* his first work (*c.* 1121); *De diligendo Deo* (*c.* 1126); *De conversione ad clericos,* an address to candidates for the priesthood; *De Consideratione,* written *c.* 1148 at the pope's request for the edification and guidance of Eugenius III; (*c*) about monasticism, *Apologia ad Gulielmum,* written *c.* 1127 to William, abbot of St. Thierry; *De laude novae militiae ad milites templi* (*c.* 1132–36); *De precepto et dispensatione,* an answer to questions on monastic discipline addressed to him by the monks of St. Peter at Chartres (some time before 1143); (*d*) on ecclesiastical government, *De moribus et officio episcoporum,* written *c.* 1126 for Henry, bishop of Sens; the *De Consideratione* mentioned above; (*e*) a biography, *De vita et rebus gestis S. Malachiae, Hiberniae episcopi,* written at the request of the Irish abbot, Congan, with the aid of materials supplied by him, and important for the ecclesiastical history of Ireland in the 12th century. (3) *Sermons.* (4) *Hymns.* Many hymns ascribed to Bernard survive, *e.g., Jesu dulcis memoria, Jesus rex admirabilis, Jesu decus angelicum,* which are included in the Roman breviary. Many have been translated and are used in Protestant churches.

Bibliography.—St. Bernard's works were first published in anything like a complete edition at Paris in 1508, edited by André Bocard; the first critical and complete edition is that of J. Mabillon, *Sancti Bernardi opp.* etc. (1667, improved and enlarged in 1690, and again, by Massuet and Texier, in 1719), reprinted by J. P. Migne, *Patrolog. lat.* (1859). There is an English translation of Mabillon's edition, including, however, only the letters and the sermons on the Song of Songs, with the biographical and other prefaces, by S. J. Eales (London, 1889–95). *See* further Leopold Janauschek, *Bibliographia Bernardina* (Vienna, 1891).

The principal source for the life of St. Bernard is the *Vita Prima,* compiled by various contemporary writers. It is included in Migne, *Patrolog. lat.* clxxxv pp. 225–416, which also contains the abridgments or amplifications, by later hands, of the *Vita Prima,* known as the *Vita Secunda, Tertia* and *Quarta.* For a critical study of these sources *see* G. Hüffer, *Der heilige Bernhard von Clairvaux* (Münster, 1886), and E. Vacandard, *Vie de Saint Bernard* (1895).

Among modern works on St. Bernard are S. J. Eales, *St. Bernard, abbot of Clairvaux* (1890) ("Fathers for English Readers" series); R. S. Storrs, *Bernard of Clairvaux: the Times, the Man and His Work* (1893); Comte d'Haussonville, *Saint Bernard* (1906).

BERNARD (OF CHARTRES) (d. *c.* 1130), not to be confused with Bernard of Tours (*Silvestris*), was a scholastic philosopher, described by John of Salisbury as *perfectissimus inter Platonicos nostri saeculi.* About 1117, he was teaching at Chartres, which was then the centre of Platonism and Humanism. In 1119 he became chancellor of the Church of Chartres. Bernard left no writings, but from the *Metalogicus* of John of Salisbury we know that he was deeply interested in the study of the classics and that he was a Platonic realist. Apart from God and the Divine ideas, he held that the original principles of all things were created matter and *formae nativae,* the latter being meant as a reconciliation between Plato and Aristotle. William of Conches and Gilbert de la Porree were friends of Bernard. (*See* Scholasticism.)

Bibliography.—E. Gilson, "Le platonisme de B. de Chartres" in *Rev. Néo-Scol.* (1923); A. Clerval, *Les Écoles de Chartres* (1895); R. L. Poole, *Illustrations of the Hist. of Med. Thought* (1920) and "The Masters of the Schools at Paris and Chartres" in *Eng. Hist. Rev.* (1920); Hauréau, Hist. de la Philos. Scol., 1 and *Mémoires de l'Académie des Inscriptions* (1884).

BERNARD, CHARLES DE, whose full name was Pierre Marie Charles de Bernard du Grail de la Villette (1804–1850), French writer, was born at Besançon. After studying for the law, and then taking to journalism, he was encouraged by Balzac (whose *La Peau de chagrin* he reviewed) to settle in Paris and write; and the result was a series of remarkable pictures of provincial society and the Parisian *bourgeoisie.* The best of these are *Le Noeud gordien* (1838), containing among other short stories *Une Aventure de magistrat,* from which Sardou drew his comedy of the *Pommes du voisin; Gerfaut* (1838), considered his masterpiece; *Les Ailes d'Icare* (1840); *La Peau du lion* (1841) and *Le Gentilhomme campagnard* (1847).

His *Oeuvres complètes* (1850) include also his poetry and two comedies written in collaboration with "Léonce" (C. H. L. Laurençot, 1805–62). In W. M. Thackeray's *Paris Sketch-book* ("On some fashionable French novels") there is an admirable criticism of Bernard. *See* also an essay by Henry James in *French Poets and Novelists* (1884).

BERNARD, CLAUDE (1813–1878), French physiologist, was born on July 12, 1813, in the village of Saint-Julien near Villefranche. He received his early education in the Jesuit school of that town, and then proceeded to the college at Lyons, which, however, he soon left to become assistant in a druggist's shop. His leisure hours were devoted to the composition of a vaudeville comedy, *La Rose du Rhône;* and the success it achieved moved him to attempt a prose drama in five acts, *Arthur de Bretagne.* At the age of 21 he went to Paris, armed with this play and an introduction to Saint-Marc Girardin, but the critic urged him to take up the study of medicine, and in due course he became interne at the Hôtel-Dieu. He worked under the great physiologist, F. Magendie, who was physician to the hospital, became his deputy in 1848, and in 1855 succeeded him as full professor. Some time previously he had been chosen the first occupant of the newly-instituted chair of physiology at the Sorbonne. There no laboratory was provided for his use, but Louis Napoleon, after an interview with him in 1864, remedied the deficiency, at the same time building a laboratory at the natural history museum in the Jardin des Plantes, and establishing a professorship, which Bernard left the Sorbonne to accept in 1868—the year in which he was admitted a member of the institute. He died in Paris on Feb. 10, 1878, and was accorded a public funeral—an honour never before bestowed by France on a man of science.

Claude Bernard's first important work was on the functions of the pancreas gland, the juice of which he proved to be of great significance in the process of digestion. A second investigation (perhaps his most famous) was on the glycogenic function of the liver; in the course of this he was led to the conclusion, which throws light on the causation of diabetes, that the liver, in addition to secreting bile, is the seat of an "internal secretion," by which it prepares sugar at the expense of the elements of the blood passing through it. A third research resulted in the discovery of the vaso-motor system. While engaged, about 1851, in examining the effects produced in the temperature of various parts of the body by section of the nerve or nerves belonging to them, he noticed that division of the cervical sympathetic gave rise to more active circulation and more forcible pulsation of the arteries in certain parts of the head, and a few months afterwards he observed that electrical excitation of the upper portion of the divided nerve had the contrary effect. In this way he established the existence of vaso-motor nerves—both vaso-dilatator and vaso-constrictor. The study of the physiological action of poisons was also a favourite one with him, his attention being devoted in particular to curare and carbon monoxide gas. The full exposition of his views, and even the statement of some of the original facts, can only be found in the 17 vols. of his published lectures. He also published *Introduction à la médecine expérimentale* (1865) and *Physiologie générale* (1872).

An English *Life of Bernard,* by Sir Michael Foster, was published in London in 1899.

BERNARD, JACQUES (1658–1718), French Protestant minister and publicist, settled in Holland, where he was pensionary minister of Gouda, then minister at Leyden, and from 1706 professor of philosophy and mathematics there. He published *Lettres historiques* from 1692 to 1698, after which date the work, which gave an account of contemporary events, was continued by others. He compiled vols. xx to xxv of the *Bibliothèque universelle,* begun by Le Clerc, and succeeded Bayle as editor of the *Nouvelles de la république des lettres* (1699–1710

and 1716–18). He also collected and edited the *Actes et négociations de la paix de Ryswic* (1698).

BERNARD, JEAN-JACQUES (1888–), French dramatist, born at Enghien on July 30, 1888. The son of Tristan Bernard, he was at first strongly influenced by the latter's mocking and sceptical humour. This is noticeable in his two one-act plays *Le Voyage à deux* and *La Joie du Sacrifice,* and still more in the collection of stories entitled *L'Epicier,* which he published in 1913. Probably during World War I J.-J. Bernard became aware of his true personality; his most marked characteristic is a subtle and sympathetic feeling for the secret sufferings of mankind—for pain which not merely shrinks from revealing itself to the outside world, but does not even always succeed in attaining to full consciousness of itself. *Le Feu qui reprend mal,* the play by which the author made his name, is typical in this respect. It gives a moving representation of the unconfessed retrospective jealousy which smoulders in the heart of a returned prisoner of war. Bernard's most significant plays are, however, *Martine* (1922), *L'Invitation au voyage* (1924) and *L'Ame en peine* (1926)—three delicate character studies of women, which mark the principal stages in the development of the author's subtle and original talent. In his *L'Ame en peine* Bernard has perceived the possibility of an unconscious, inexplicable connection between souls destined never to be aware of one another, but between whom exists a scheme of vibrations leading to hidden interdependencies. He arrives at these conclusions by a profound research into the almost subconscious feelings which crystallize about a purely intellectual conception, having no tangible reality. His dialogue is remarkable for its restraint and precision, and has justly been compared with that of Marivaux. (G. Ml.)

BERNARD, JOHN HENRY (1860–1927), archbishop of Dublin, was born in India on July 27, 1860, the son of a civil engineer. He was educated privately, and at Trinity college, Dublin, of which he became a fellow. From 1888–1911, he was Archbishop King's lecturer in divinity. Dr. Bernard was a select preacher at Oxford and Cambridge on various occasions, and was closely associated with the English High Church party. He became dean of St. Patrick's in 1902, and in 1911 bishop of Ossory. In 1915 he was translated to Dublin. Some time before his election to the see of Dublin, he had delivered an address to his synod, in which he called on churchmen to prepare for a newer and better Ireland, where a better understanding would be compelled by common sacrifice and common sorrow in the World War. During the troubles of the years that followed, Archbishop Bernard worked for the unity of Ireland, and in 1919 he became provost of Trinity. He was the author of the *Liber Hymnorum,* a collection of Irish hymns, of *Notes and Commentaries on the Pastoral Epistles,* and an edition of Kant's *Critical Philosophy.* Bernard died on Aug. 29, 1927.

Work: *A Critical and Exegetical Commentary on the Gospel According to St. John* (1928).

BERNARD, MONTAGUE (1820–1882), English international lawyer, the descendant of a Huguenot family, was born at Tibberton Court, Gloucestershire, and educated at Sherborne school and Trinity college, Oxford, being called to the bar at Lincoln's Inn in 1846. He was interested in legal history and in church questions, and was one of the founders of the *Guardian.* In 1852 he was elected to the new professorship of international law and diplomacy at Oxford, where he undertook a good deal of non-collegiate work. He was a member of several royal commissions; in 1871 he went as one of the high commissioners to the United States, and signed the treaty of Washington, and in 1872 he assisted Sir Roundell Palmer before the tribunal of arbitration at Geneva. In 1874 he resigned his professorship, but as member of the University of Oxford commission of 1876 he was mainly responsible for bringing about the compromise between the university and the colleges. Bernard's reputation as an international lawyer was widespread, and he was an original member of the Institut de Droit International (1873). His published works include *An Historical Account of the Neutrality of Great Britain during the American Civil War* (1870), and lectures on international law and diplomacy.

BERNARD, SIMON (1779–1839), French general of engineers, was born at Dôle, educated at the École Polytechnique, and entered the army in the corps of engineers. He rose rapidly, and served (1805–12) as aide-de-camp to Napoleon. After the emperor's fall he emigrated to the United States, where, being made a brigadier-general of engineers, he executed extensive military works for the government, notably at Fortress Monroe (Va.), and around New York, and did a large amount of the civil engineering connected with the Chesapeake and Ohio canal and the Delaware breakwater. He returned to France after the revolution of 1830, was made a lieutenant-general by Louis Philippe, and in 1836 served as minister of war.

BERNARD, TRISTAN (1866–), French dramatist and novelist, was born in Besançon on Sept. 17, 1866. Before he began to write plays he published stories, sketches, etc., in the *Revue Blanche* and in various short-lived periodicals on which his writings conferred temporary popularity. His first dramatic writings were one-act comedies; *Le Fardeau de la Liberté* (1897), *Le seul Bandit du Village* (1898), *L'Anglais tel qu'on le parle* (1899), *Daisy* (1902), etc., which owe their value to a unique mixture of broad, vaudeville comedy and mocking humour. His dramatic production, which was abundant, must be divided into two classes; it includes amusing vaudevilles such as *Le Danseur Inconnu* (1907), *Le Petit Café* (1911) and *Les Deux Canards* (1913), and satires of a more ambitious character, in which mordant irony and relentless observation not only of the absurdities of the bourgeoisie, but human weakness in all its forms, is expressed in classic and close-knit dialogue. The most remarkable examples of the second class are *Monsieur Codomat* (1907), *Le Prince Charmant* (1914) and *La Volonté de l'Homme* (1917). *Triplepatte,* one of his most successful plays, occupies an intermediate place between the two series. After World War I Tristan Bernard mainly wrote vaudevilles. Mention must not be omitted of his two novels, *Les Mémoires d'un Jeune Homme Rangé* (1899) and its sequel *Le Mari Pacifique* (1901). The mediocrity and weakness of will of the present generation have perhaps never been more mercilessly analyzed.

BERNARDIN OF SIENA, ST. (1380–1444), Franciscan preacher, was born of a noble family. His parents died in his childhood, and on the completion of his education, he spent some years in the service of the sick in the hospitals and thus caught the plague, of which he nearly died. In 1402 he entered the Franciscan order in the strict branch called Observant, of which he became one of the chief promoters (*see* FRANCISCANS). Shortly after his profession, the work of preaching was laid upon him, and for more than 30 years he preached with wonderful effect all over Italy, and played a great part in the religious revival of the beginning of the 15th century. In 1437 he became vicar-general of the Observant branch of the Franciscans. He refused three bishoprics. He died in 1444, and was canonized in 1450.

The first edition of his works, for the most part sermons, that, in a striking manner, reflect the life of the people, was printed at Lyons in 1501; later ones in 1636, 1650, and 1745. Specimens are to be found in Miss A. Harrison's *Examples of S. Bernardino* (1926). His life will be found in the Bollandists; a good modern biography has been written by Paul Thureau-Dangin (1896), and translated into English by Gertrude von Hügel (1911).

BERNAU bei BERLIN, a town in the northeast of the district of Berlin, Germany, in the Prussian province of Brandenburg. Pop. (1939) 14,988. Cabinetmaking is practised and general suburban industries (gloves, silk, buttons, etc.) are carried on.

BERNAUER, AGNES (d. 1435), daughter of an Augsburg baker, was secretly married about 1432 to Albert (1401–60), son of Ernest, duke of Bavaria-Munich. Ignorant of the marriage, Ernest urged his son to marry and reproached him with his connection with Agnes. Albert then declared she was his lawful wife; and subsequently, during his absence, she was seized by order of Duke Ernest and condemned to death for witchcraft. On Oct. 12, 1435, she was drowned in the Danube near Straubing. This story lived long in the memory of the people, and has afforded material for several dramas. Adolf Böttger, Friedrich Hebbel and Otto Ludwig have each written a play entitled *Agnes Bernauer.*

BERNAY, town of France, capital of an arrondissement, department of Eure, on the left bank of the Charentonne, 31 mi. W.N.W. of Evreux, on the railway between that town and Lisieux. Pop. (1936) 6,582. Bernay grew up round the Benedictine abbey founded by Judith of Brittany in 1013, and early in the 13th century was the seat of a viscount. The town was besieged by Du Guesclin in 1378; it was taken several times by the English during the first half of the 15th century, and by de Coligny in 1563. The fortress was razed in 1589. The Abbey church underwent restoration in the 17th century and now serves for municipal and legal purposes. The church of Ste Croix dates from the 14th and 15th centuries; that of Notre Dame de la Couture, which preserves some good stained glass, from the 14th, 15th and 16th centuries. The region is well wooded and the town contains many wooden houses. The surrounding woods were sold to the British Government during World War I. Among the industrial establishments of the place are manufactories of cotton and woollen goods, bleacheries and dye-works. Large numbers of Norman horses are sold in Lent, at the fair known as the *Foire fleurie.*

Bernay has a sub-prefecture, tribunals of commerce and of first instance, and a board of trade arbitration.

BERNAYS, JAKOB (1824–1881), German philologist and philosophical writer, was born at Hamburg, of Jewish parents, on Sept. 11, 1824, and died at Bonn, May 26, 1881. Jakob studied from 1844 to 1848 at Bonn under Ritschl. In 1853 he accepted the chair of classical philology at the Jewish Theological college at Breslau, where he formed a friendship with Mommsen. In 1866, Bernays returned to Bonn as extraordinary professor and chief librarian.

His chief works, which deal mainly with the Greek philosophers, are:—*Die Lebensbeschreibung des J. J. Scaliger* (1855); *Über das Phokylidische Gedicht* (1856); *Die Chronik des Sulpicius Severus* (1861); *Die Dialoge des Aristoteles im Verhältniss zu seinen übrigen Werken* (1863); *Theophrastos' Schrift über Frömmigkeit* (1866); *Die Heraklitischen Briefe* (1869); *Lucian und die Cyniker* (1879); *Zwei Abhandlungen über die Aristotelische Theorie des Dramas* (1880). The last of these was a re-publication of his *Grundzüge der verlorenen Abhandlungen des Aristoteles über die Wirkung der Tragödie* (1857), which aroused considerable controversy. *See* notices in *Biographisches Jahrbuch für Alterthumskunde* (1881), and *Allgemeine deutsche Biographie,* xlvi. (1902); art. in *Jewish Encyclopaedia;* also Sandys, *Hist. of Class. Schol.* iii. 176 (1908).

Michael Bernays (1834–1897), brother of the above, was born at Hamburg on Nov. 27, 1834, and died at Carlsruhe on Feb. 25, 1897. He was a professor at Leipzig and (1873–89) at Munich.

Among his principal works are: *Zur Kritik und Geschichte des Goetheschen Textes* (1866); *Briefe Goethes an G. A. Wolf* (1868); *Zur Enstehungsgeschichte des Schlegelschen Shakespeare* (1872); an introduction to Hirzel's collection entitled *Der junge Goethe* (1875); a revised edition of Voss's translation of the *Odyssey,* etc. From his literary remains were published *Schriften zur Kritik und Litteraturgeschichte* (1895–99). A collection of his letters was published in 1907.

BERNBURG, country town in the *Land* of Anhalt, Germany, on the Saale, half-way between Halle and Magdeburg, formerly the capital of the duchy of Anhalt-Bernburg. Pop. (1939) 42,237. It consists of four parts, the Altstadt or old town, the Bergstadt (hill town), the Neustadt (new town) and the suburb of Waldau. The Bergstadt, which contains the moated castle, formerly the ducal residence, was fortified by Otto III. in the 10th century. The new town was founded in the 13th. For a long period the different parts were under separate municipalities, the new town uniting with the old in 1560, and the Bergstadt with both in 1824. Prince Frederick removed the ducal residence to Ballenstedt in 1765. Bernburg produces agricultural machinery, salt and saltpetre, paper and cardboard, and has chemical and lead-smelting works. Market-gardening is also extensively carried on, and there is a large river traffic in agricultural produce.

BERNCASTEL-CUES, town, Rhine province, Germany, on a bend of the winding Moselle, north-east of Trier. Population 3,000. It originally belonged to the chapter of Trier and has a ruined castle. It is a famous centre of wine production.

BERNE, the largest of the Swiss cantons, after Grisons. It extends from beyond the Jura to the snow-clad ranges over against the Valais. Area, 2,657 sq.mi., of which over 100 sq.mi. are occupied by glaciers. It is mainly watered by the river Aar (*q.v.*), with its affluents, the Saane (left) and the Emme (right); the Aar forms the two lakes of Brienz and Thun (*qq.v.*). Three divisions are usually distinguished: (1) The *Oberland* or highlands, which includes the snowy Alps culminating in the Finsteraarhorn, 14,026 ft., and the Jungfrau, 13,669ft., as well as the famous summer resorts of Grindelwald, Mürren, Interlaken, Meiringen, Kandersteg, Thun and the fine pastoral valley of the Simme. (2) The *Mittelland* or midlands, comprising the valley of the Aar below Thun, that of the Emme, the outliers of the high Alps and the open country around the town of Berne. (3) The *Seeland* (lakeland) and the Jura, extending from Bienne across the Jura to Porrentruy, in the extreme north-west of Switzerland. The Oberland and Mittelland form the "old" canton, the Jura having been acquired only in 1815, and differing from the rest of the canton in being French-speaking and Roman Catholic. The population, mainly German-speaking Protestants, numbered 726,263 in the 1941 census. The capital is Berne (*q.v.*), while the other important towns are Bienne, Burgdorf, Delsberg (Delémont), Porrentruy, Thun and Langenthal (*q.v.*). The canton is divided into 30 administrative districts, and contains 507 communes. The existing constitution dates from 1893, but in 1906 the direct popular election of the executive of nine members (hitherto named by the legislature) was introduced. The legislature or *grossrat* is elected for four years (like the executive). The *obligatory referendum* obtains in the case of all laws, and of decrees relating to an expenditure of over half a million francs, while 12,000 citizens have the right of *initiative* in the case of legislative projects, and 15,000 may demand the revision of the cantonal constitution. The two members sent by the canton to the federal *ständerat* (Council of States) are elected by the *grossrat,* while the 31 members sent, on the basis of the census of 1941, to the federal *nationalrat* (national council) are chosen by a popular vote.

In the Alpine portions of the canton the breeding of cattle is the chief industry; next come the elaborate arrangements for summer travellers (the *Fremdenindustrie*). The cheese of the Emme valley is locally much esteemed. Other industries in the Alpine region are wood-carving (at Brienz) and wine manufacture (around Lakes Bienne and Thun). The *Mittelland* is mainly agricultural. Watchmaking is the principal industry of the Jura, Bienne and St. Imier being the chief centres of this industry. Iron mines are also worked in the Jura, while the Heimberg potteries, near Thun, produce a locally famous ware, and there are quarries and tile factories.

The canton of Berne is composed of the various districts acquired by the town of Berne (*q.v.*). The more important, with dates of acquisition, are the following: Laupen (1324); Hasli and Meiringen (1334); Thun and Burgdorf (1384); Unterseen and the Upper Simme valley (1386); Frutigen, etc. (1400); Lower Simme valley (1439–49); Interlaken, with Grindelwald, Lauterbrunnen and Brienz (1528, on the suppression of the Austin Canons of Interlaken); Saanen or Gessenay (1555); Köniz (1729), and the Bernese Jura with Bienne (1815, from the bishopric of Basle). But certain regions previously won were lost in 1798: Aargau (1415); Aigle and Grandson (1475); Vaud (1536); and the Pays d'En-Haut or Château d'Oex (1555). From 1798 to 1802 the *Oberland* formed a separate canton (capital, Thun) of the Helvetic republic. From 1803 to 1814 the canton of Berne was one of the six "directorial" cantons of the confederation.

BERNE, capital of the Swiss canton of the same name (Ger. *Bern;* Ital. *Berna*), and political capital of the Swiss confederation, picturesquely situated on a peninsula, 1,800ft. above sea, surrounded, save on the west, by the river Aar. Five lofty bridges cross the river, leading to the extensive residential quarters. The existence of the ancient castle of Nydeck, at the eastern end of the peninsula, guarding the passage over the Aar, probably induced Berchtold V., duke of Zäringen, to found Berne in 1191 as a military post on the frontier between the Alamannians (German-speaking) and the Burgundians (French-speaking). Thrice the walls which protected the town were moved westwards, in 1256, 1346 and 1622. After the extinction of the Zäringen dynasty (1218) Berne became a free imperial city. Its independence was finally secured by the victories of Dornbühl (1298) over Fribourg

and the Habsburgs and of Laupen (1339) over the neighbouring Burgundian nobles. In 1353 it entered the Swiss confederation as its eighth member. It soon took the lead in the confederation. In 1528 Berne accepted the religious reformation, and henceforth became one of its chief champions in Switzerland. In the 18th century the town governed 52 bailiwicks (acquired between 1324 and 1729), the Bernese patricians being thus extremely powerful. Two attempts to break down this monopoly, in 1723 and 1749, failed, but the whole system was swept away by the French in 1798, and, though partially revived in 1815, came to an end in 1831. From 1815 to 1848 it shared with Zürich and Lucerne the supreme rule (which shifted from one to the other every two years) in the Swiss confederation, while in 1848 a Federal law made Berne the sole political capital. Population (1941), 129,331; and (1930), 111,783, of whom 102,444 were German-speaking inhabitants, while 95,600 were Protestants, 13,280 were Catholics and 1,039 were Jews. The arcades (*Lauben*) and the elaborately ornamented fountains are noteworthy, as well as the two remaining towers of the old walls of the *Käfigturm* and the *Zeitglockenturm* (famous for its 16th-century clock). The principal mediaeval building in Berne is the (now Protestant) *Münster*, begun in 1421 though not completed till 1611. The tower, rising conspicuously above the town, was restored in 1889–93. The Federal Houses of Parliament (*Bundeshaus*) date in their oldest portion from 1852–57; in the east wing from 1888–92. The central part with the session rooms was built in 1894–1902. This group of buildings, occupying a remarkable site on the edge of the bluff above the Aar, also contains the offices of the Federal executive and administration, besides the central seat of the National Bank (created in 1907). The town hall dates from 1406, while some of the houses belonging to the old gilds are of interest. The town library (with which the university library was incorporated in 1905) contains many mss. and rare printed books. Museums include the historical (archaeological and mediaeval), the natural history, the art (mainly modern Swiss pictures), and the Alpine (in which are collections relating to the Swiss Alps). The University of Berne, founded in 1834, had 2,185 students in 1940. The old fortifications (*Schanzen*) have been converted into promenades, which command wonderful views of the snowy Alps of the Bernese Oberland. Just across the Nydeck bridge is the famous bear pit. Bears, which are supposed to have given the town its name, have been maintained there since 1513; certainly a bear is shown on the earliest known seal (1224). The industries of Berne include chocolate-making and engine-building. Its main activities are political and administrative, and it has become the seat of various international associations (postal, telegraph, railway, copyright, etc.).

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BERNERS, JOHN BOURCHIER, 2ND BARON (*c.* 1469–1533), English translator of Froissart and one of the founders of the Tudor prose style, was born probably at Tharfield, Hertfordshire, England. His father was killed at Barnet in 1471, and he inherited his title in 1474 from his grandfather, John Bourchier, who was a descendant of Edward III. In 1484 he was implicated in a premature attempt to place Henry, duke of Richmond (afterwards Henry VII.), on the throne, and fled in consequence to Brittany. In 1497 he helped to put down an insurrection in Cornwall and Devonshire, raised by Michael Joseph, a blacksmith, and from this time was in high favour at court. He accompanied Henry VIII. to Calais in 1513, and was a captain of pioneers at the siege of Thérouanne. In the next year he was again sent to France as chamberlain to the king's sister Mary on her marriage with Louis XII., but he soon returned to England. In 1516 he became lord chancellor. In 1518 he was sent to Madrid to negotiate an alliance with Charles of Spain. He sent letters to Henry chronicling the bull-fights and other doings of the Spanish Court, and to Wolsey complaining of the expense to which he was put in his position as ambassador. In the next year he returned to England, and with his wife Catherine Howard, daughter of the duke of Norfolk, was present in 1520 at the Field of the Cloth of Gold. But his affairs were greatly embarrassed. Perhaps in the hope of repairing his fortune, he accepted the office of deputy of Calais, where he spent the rest of his life in comparative leisure, though still harassed by his debts, and died on March 16, 1533.

His translation of *Syr Johan Froyssart of the Cronycles of England, France, Spayne, Portyngale, Scotland, Bretayne, Flaunders; and other places adjoynynge* was undertaken at the request of Henry VIII., and was printed by Richard Pynson in two volumes dated 1523 and 1525. Two romances from the French followed: *The Boke of Duke Huon of Burdeux* (printed 1534? by Wynkyn de Worde, reissued and modernized in 1601), and *The Hystory of the Moost noble and valyaunt knight Arthur of lytell brytayne* (ed. E. V. Utterson 1814). His other two translations, *The Castell of Love* (printed 1540) from the *Carcel de Amor* of Diego de San Pedro, and *The Golden Boke of Marcus Aurelius* (completed six days before his death, printed 1534), from a French version of Antonio Guevara's book, are in a different manner. *The Golden Boke* gives Berners a claim to be a pioneer of Euphuism, although Lyly was probably acquainted with Guevara not through his version, but through Sir Thomas North's *Dial of Princes*, in which the new style was much better developed. *The Golden Boke* was the most popular of all Berners's translations, and went through 14 editions in the next 50 years. It caught the fashionable taste of the time.

A biographical account of Berners is to be found in Sir Sidney Lee's introduction to *Huon of Burdeux* (Early English Text Society, 1882–87). Among the many editions of his translation of Froissart may be mentioned that in the "Tudor Translations" (1901), with an introductory critical note by Professor W. P. Ker. *See* also a smaller edition (1895) by G. C. Macaulay, and Baron Kervyn de Letterhove's *Froissart* (1857).

BERNERS (BARNES or **BERNES), JULIANA** (b. 1388?), English writer on hawking and hunting, is said to have been prioress of Sopwell nunnery near St. Albans, and daughter of Sir James Berners, who was beheaded in 1388. The only documentary evidence regarding her, however, is the statement at the end of her treatise on hunting in the *Boke of St. Albans*, "Explicit Dam Julyans Barnes in her boke of huntyng" (edition of 1486), and the name is changed by Wynkyn de Worde to "dame Julyans Bernes." There is no such person to be found in the pedigree of the Berners family, and there is a gap in the records of the priory of Sopwell between 1430 and 1480.

The first and rarest edition was printed in 1486 by an unknown schoolmaster at St. Albans. Wynkyn de Worde's edition (folio 1496) was adorned by three woodcuts and included a "Treatyse of fysshynge wyth an Angle," not contained in the St. Albans edition. It contains three treatises, on hawking, hunting, and heraldry. That on heraldry is derived mainly from a work (1441) by Nicholas Upton, and those on hawking and hunting mainly from an early 14th century work on *Venerie de Twety*.

J. Haslewood, who published a facsimile of the edition of Wynkyn de Worde (1811, folio), with a biographical and bibliographical notice, examined the author's claims. He assigned to her little else in the *Boke* except part of the treatise on hawking and the section on hunting. An older form of the treatise on fishing was edited in 1883 by T. Satchell from a ms. in possession of Mr. A. Denison. A facsimile, entitled *The Book of St. Albans,*

with an introduction by William Blades, appeared in 1881. During the 16th century the work was very popular, and was many times reprinted.

BERNHARD OF SAXE-WEIMAR, DUKE (1604–1639), a celebrated general in the Thirty Years' War, the eleventh son of John, duke of Saxe-Weimar, was born in Weimar on Aug. 16 1604. At the outbreak of the Thirty Years' War he took the field on the Protestant side. When Gustavus Adolphus landed in Germany Bernhard joined him, and for a short time he was colonel of the Swedish life guards. After the battle of Breitenfeld he accompanied Gustavus in his march to the Rhine, and between this event and the battle of the Alte Veste Bernhard commanded numerous expeditions in almost every district from the Moselle to Tirol. At the Alte Veste he displayed the greatest courage, and at Lützen, when Gustavus was killed, Bernhard immediately assumed the command, killed a colonel who refused to lead his men to the charge, and finally by his furious energy won the victory at sundown. At first as a subordinate to his brother William, who as a Swedish lieutenant-general succeeded to the command, but later as an independent commander, Bernhard continued to push his forays over southern Germany; and with the Swedish General Horn he made in 1633 a successful invasion into Bavaria, which was defended by the imperialist general Arldinger. In that year he acquired the duchy of Würzburg, installing one of his brothers as *Stadthalter* and returning to the wars. A stern Protestant, he exacted heavy contributions from the Catholic cities which he took, and his repeated victories caused him to be regarded by German Protestants as the saviour of their religion. But in 1634 Bernhard suffered the great defeat of Nördlingen, in which the flower of the Swedish army perished. In 1635 he entered the service of France, which had intervened in the war. In his great campaign of 1638 he won the battles of Rheinfelden, Wittenweiher, and Thann and captured successively Rheinfelden, Freiburg, and Breisach, the last reputed one of the strongest fortresses in Europe. Bernhard had in the first instance received definite assurances from France that he should be given Alsace and Hagenau, Würzburg having been lost in the *débâcle* of 1634, and he hoped to make Breisach the capital of his new duchy. But he died on July 18 1639, at the beginning of the campaign, and the governor of Breisach was bribed to transfer the fortress to France. The duke was buried at Breisach, his remains being subsequently removed to Weimar.

See J. A. C. Hellfeld, *Geschichte Bernhards des Grossen, Herzogs v. Saxe-Weimar* (Jena, 1747); B. Röse, *Herzog Bernhard d. Grosse von Saxe-Weimar* (Weimar, 1828–29); Droysen, *Bernhard v. Weimar* (Leipzig, 1885).

BERNHARDI, FRIEDRICH VON (1849–1930), German soldier and writer, was born in St. Petersburg, Nov. 22, 1849, the son of the diplomat, Theodor von Bernhardi (1802–1887), and he entered the German army in time to take part in the Franco-Prussian War. From 1891 to 1894 he was German military attaché at Berne, and later he took charge of the military history department of the General Staff in Berlin. In 1907 he was given command of the VII. Army Corps, but he retired in 1909 and turned his whole attention to writing on military subjects. Following Treitschke, Bernhardi held that war must come, that Germany must conquer or fall and that she is entitled therefore to secure victory at any cost. His gospel of force, thus proclaimed outside his own country, was a factor (possibly exaggerated at the time) in creating a belief that Germany was in an aggressive mood. His chief book was *Deutschland und der nächste Krieg* (1912), the translation of which into English caused a great sensation. In 1915 he served on the eastern front, but in 1918 received a command in the west, and took part in the battle of Armentières. After the World War, in 1921, he published *Deutschlands Heldenkampf 1914–18.*

BERNHARDT, SARAH (ROSINE BERNARD) (1845–1923), French actress, was born in Paris on Oct. 22 1845, of mixed French and Dutch parentage, and of Jewish descent. She was, however, baptized at the age of 12 and brought up in a convent. At 13 she entered the Conservatoire, where she gained the second prize for tragedy in 1861 and for comedy in 1862. Her *début* was made at the Comédie Française on Aug. 11 1862, in a minor part in Racine's *Iphigénie en Aulide.* In 1867 she made her first definite successes at the Odéon, as Cordelia in a French translation of *King Lear,* as the queen in Victor Hugo's *Ruy Blas,* and above all, as Zanetto in François Coppée's *Le Passant* (1869). After the Franco-German War she left the Odéon for the Comédie Française. From that time she steadily increased her reputation, especially by her performances of Phèdre in Racine's play (1874) and of Dona Sol in Victor Hugo's *Hernani* (1877). In 1879 she had a famous season at the Gaiety in London. By this time her position as the greatest actress of her day was securely established. Her power of emotional acting, the magnetism of her personality and the beauty of her *voix d'or,* made the public tolerant of her caprices. In 1880, after a breach with the Comédie Française, she began her series of world tours. She went first to London, and in 1880 and 1881 to Denmark, America, and Russia, with *La Dame aux Camélias* as the principal attraction. In 1882 she married in London Jacques Damala, who was an actor known by the stage name Daria, but she separated from him at the end of the following year. After a fresh triumph in Paris with Sardou's *Fédora* at the Vaudeville she became proprietress of the Porte St. Martin, where she produced, among other plays, Jean Richepin's *Nana Sahib* (1883), Sardou's *Théodora* (1884) and *La Tosca* (1887), Jules Barbier's *Jeanne d'Arc* (1890) and Sardou and Moreau's *Cléopâtre* (1890).

She made several tours, including visits to America in 1886–87 and 1888–89. Between 1891 and 1893 she again visited America (North and South), Australia, and the chief European capitals. In Nov. 1893 she opened the Renaissance with *Les Rois* by Jules Lemaitre, which was followed by *Sylvestre* and Morand's *Izeyl* (1894), Sardou's *Gismonda* (1894) and Edmond Rostand's *La Princesse lointaine* (1895). In 1895 she also appeared with conspicuous success as Magda in a French translation of Sudermann's *Heimat.* For the next few years she visited London almost annually, and America in 1896. In that year she made a success with an adaptation of Alfred de Musset's *Lorenzaccio.* In Easter week of 1897 she played in a religious drama, *La Samaritaine,* by Rostand. In Dec. 1896 a fête was organized in Paris in her honour. Early in 1899 she removed to the Théâtre des Nations, a larger house, which she opened with a revival of *La Tosca.* In the same year she made the experiment of a French production of *Hamlet,* in which she took the title part. And in 1900 she played the Duc de Reichstadt in Rostand's *L'Aiglon.* Of the successful productions of her later years perhaps none was more remarkable than her impersonation of La Tisbé in Victor Hugo's romantic drama *Angelo* (1905). In Jan. 1914, the Legion of Honour was conferred upon her. During the World War, although she could no longer walk or stand unaided (an accident having led to the amputation of her leg in 1915) she played at the Front, toured in America (1917) and went to London, where, in 1922, she played a young man's part in Verneuil's *Daniel.* She died in Paris on March 26, 1923.

She was the author of a prose sketch, *Dans les Nuages* (1878); plays, *Adrienne Lecouvreur, Un Coeur d'Homme* (pub. 1911); *L'Aveu* (1888); a novel, *Petite Idole* (1920); Eng. trans. *The Idol of Paris* (1921); *The Art of the Theatre* (trans. 1924).

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BERNHARDY, GOTTFRIED (1800–1875), German philologist and literary historian, was born of Jewish parents at Landsberg in Brandenburg. In 1825 he became extraordinary professor at Berlin, and in 1829 went to Halle, where he became chief librarian of the university in 1844.

The most important of Bernhardy's works were his histories (or sketches) of Greek and Roman literature: *Grundriss der römischen Literatur* (5th ed., 1872); *Grundriss der griechischen Literatur* (pt. i., Introduction and General View, 1836; pt. ii., Greek Poetry, 1845; pt. iii., Greek Prose Literature, was never published). A fifth edition of pts. i. and ii., by R. Volkmann, began in 1892. Other works by Bernhardy are: *Eratosthenica* (1822); *Wissenschaftliche Syntax der griechischen Sprache* (1829, suppts. 1854, 1862); *Grundlinien zur Encyklopädie der Philologie* (1832); the monumental edition of the Lexicon of Suidas (1834–53); and an edition of F. A. Wolf's *Kleine Schriften* (1869). *See* Volkmann, *G. Bernhardy* (1887).

BERNI, FRANCESCO (*c.* 1497–1536), Italian poet, was born at Lamporecchio, in Bibbiena, a district lying along the Upper Arno. In his 19th year he went to Rome, trusting to obtain some assistance from his uncle, the Cardinal Bibbiena, but he was obliged to accept a situation as clerk to Ghiberti, datary to Clement VII. The duties of his office were exceedingly irksome to the poet, but he made himself celebrated at Rome as the most witty and inventive member of a club of literary men, who devoted themselves to light and sparkling effusions. So strong was the admiration for Berni's verses that mocking or burlesque poems have since been called *poesie bernesca.* About the year 1530 he was relieved from his servitude by obtaining a canonry in the cathedral of Florence. In that city he died in 1536, according to tradition poisoned by Duke Alessandro de' Medici for having refused to poison the duke's cousin, Ippolito de' Medici; but considerable obscurity rests over this story. Berni stands at the head of Italian comic or burlesque poets, but perhaps he owes his greatest fame to the recasting (*Rifacimento*) of Boiardo's *Orlando Innamorato,* a task which he completed with such success that general opinion pronounced decisively in favour of the revision over the original. To each canto he prefixed a few stanzas of reflective verse in the manner of Ariosto, and in one of these introductions he gives us the only certain information we have concerning his own life. The first edition of the *Rifacimento* was printed posthumously in 1541 and a partial translation into English verse was published by W. S. Rose (1823).

BERNICIA, the northern of the two English kingdoms which were eventually united in the kingdom of Northumbria. Its territory is said to have stretched from the Tyne northward, ultimately reaching the Forth, while its western frontier was gradually extended at the expense of the Welsh. The chief royal residence was Bamburgh, and near it was the island of Lindisfarne, afterward the see of a bishop. The first king of whom we have any record is Ida, who is said to have obtained the throne about 547. Aethelfrith, king of Bernicia, united Deira to his own kingdom, probably about 605, and the union continued under his successor Edwin, son of Aelli, king of Deira. Bernicia was again separated from Deira under Eanfrith, son of Aethelfrith (633–634), after which date the kings of Bernicia were supreme in Northumbria.

See Bede, *Hist. Eccles.* ii, 14, iii, 1, 14; Nennius, s. 63; Simeon of Durham, i, 339.

BERNINI, GIOVANNI LORENZO (1598–1680), Italian architect and sculptor, was born at Naples on Dec. 7, 1598, and died there on Nov. 28, 1680. He studied under his father and found a patron in Maffeo Barberini, afterward Pope Urban VIII, whose palace he designed. He was put in charge of the building operations at St. Peter's, and was made director of improvements in the city. Bernini designed many of the early masterpieces of the baroque style in Rome, and exercised a great influence on contemporary architecture. Louis XIV, when he contemplated the restoration of the Louvre, invited him to submit designs but did not accept them. His most famous achievements are the colonnade of St. Peter's, the façade of the Barberini palace, and the arsenal at Civita Vecchia. His best piece of sculpture is "Apollo and Daphne" in the Borghese palace. Two works by him in England are a bust of Mr. Baker (?) in the Victoria and Albert museum, London, and a marble group of "Neptune and Glaucus" at Brocklesbury park, Lincs. For the general character of his work as a sculptor *see* SCULPTURE: *Baroque.*

See Stanislas Fraschetti, *Il Bernini* (Milan, 1900).

BERNIS, FRANÇOIS-JOACHIM DE PIERRES DE (1715–1794), French cardinal and statesman, was born at St. Marcel-d'Ardèche on May 22, 1715. He was French ambassador in Venice (1751–55), and assisted in the foundation of the league on behalf of Maria Theresa against Frederick the Great of Prussia. He became secretary for foreign affairs on June 27, 1757, but owing to his attempts to counteract the spendthrift policy of the marquise de Pompadour (*q.v.*) and her creatures, he fell into disgrace and was in Dec. 1758 banished to Soissons by Louis XV, where he remained in retirement for six years. In the previous November he had been created cardinal by Clement XIII. In 1764, Bernis was recalled, but declined office and was appointed archbishop of Albi. In 1769 he was present at the conclave which resulted in the election of Clement XIV, and became French ambassador in Rome, where he spent the remainder of his life. He helped to bring about the suppression of the Jesuits and acted with greater moderation than is generally allowed. He lost his influence under Pius VI, who was friendly to the Jesuits, and the French Revolution, to which he was hostile, reduced him almost to penury; the court of Spain, however, came to his relief with a handsome pension. He died at Rome on Nov. 3, 1794. His *Mémoires et lettres 1715–58* (1878) are still interesting to the historian.

See Frédéric Masson's prefaces to the *Mémoires et lettres,* and *Le Cardinal de Bernis depuis son ministère* (1884); E. et J. de Goncourt, *Mme. de Pompadour* (1888); and Charles Sainte-Beuve, *Causeries,* v. viii.

BERNOULLI or **BERNOUILLI,** the name of a Swiss family of scientists and mathematicians who made their home in Basle.

(1) JACQUES BERNOULLI (1654–1705), mathematician, after concluding his studies at the University of Basle, travelled in England, France and Holland. He constructed his *Universal Tables on Dialling* at Bordeaux and returned in 1682 to Basle, where he opened a public seminary for experimental physics. In 1687 he became professor of mathematics in the university and later its rector. Jacques Bernoulli was the first to solve Leibnitz's problem of the isochronous curve. He proposed the problem of the catenary or curve formed by a chain suspended by its two extremities, accepted Leibnitz's construction of the curve and solved more complicated problems relating to it. He determined the "elastic curve," which is formed by an elastic plate or rod fixed at one end and bent by a weight applied to the other, and which he showed to be the same as the curvature of an impervious sail filled with a liquid. In 1696 he offered a reward for the solution of the problem of isoperimetrical figures, which led to a quarrel with his brother Jean whose solution he declined.

Jacques Bernoulli's mathematical works are: *Ars Conjectandi; opus posthumum: accedunt tractatus de Seriebus Infinitis, et epistola (Gallice scripta) de Ludo Pilae Reticularis* (Basiliae, 1713); *Jacobi Bernoulli Basiliensis Opera* (Genevae, 1744).

(2) JEAN BERNOULLI (1667–1748), studied under his brother Jacques at Basle and then worked under the marquis de l'Hôpital in Paris. He spent ten years as professor of mathematics at Groningen, and in 1705 succeeded his brother Jacques in the chair of mathematics at the university of Basle. Like his brother he was a great mathematician. Among his independent discoveries were the exponential calculus, and the line of swiftest descent, which he was the first to determine, pointing out at the same time the relation which this curve bears to the path described by a ray of light passing through strata of variable density.

Jean Bernoulli's writings were collected and published under the title of *Johannis Bernoulli Operi Omnia* (Lausan. et Genev.); his correspondence with Leibnitz appeared under the title of *Gul. Leibnitii et Johannis Bernoulli Commercium Philosophicum et Mathematicum* (Lausan. et Genev., 1745).

(3) NICOLAS BERNOULLI (1695–1726), eldest son of the preceding, was for three years professor of jurisprudence of Berne. He and his brother Daniel were appointed professors of mathematics in the Academy of St. Petersburg, but within eight months of the appointment Nicolas died. Some of his mathematical papers are published in his father's works.

(4) DANIEL BERNOULLI (1700–1782), younger brother of the preceding, spent seven or eight years at St. Petersburg as professor of mathematics and then returned to Basle, where in 1733 he became professor of anatomy and botany and afterwards of experimental and speculative philosophy. His most important work is his *Hydrodynamica* (1738), in which the equilibrium, the pressure, the reaction and varied velocities of fluids are considered both theoretically and practically. One of these problems deals with an ingenious mode of propelling vessels by the reaction of water ejected from the stern. Daniel Bernoulli gained or shared no less than ten prizes of the Academy of Sciences of Paris. The first, for a memoir on the construction of a clepsydra for measuring time exactly at sea, he gained at the age of 24; the second, for one on the physical cause of the inclination of the planetary orbits, he divided with his father; and the third, for a communication on the tides, he shared with Euler, Colin Maclaurin and another competitor. The problem of vibrating cords, which had been some time before resolved by Brook Taylor (1685–1731) and d'Alembert, became the subject of a discussion between Bernoulli and his friend Euler. In one of his early investigations he gave a demonstration of the problem of the parallelogram of forces. His labours in the decline of life were chiefly directed to the doctrine of probabilities in reference to practical purposes, and in particular to economic subjects.

Several of Daniel Bernoulli's investigations are contained in the earlier volumes of the *Comment. Acad. Petropol.;* and his separately published works are:—*Dissertatio Inauger. Phys. Med. de Respiratione* (Basil., 1721); *Positiones Anatomico-Botanicae* (Basil., 1721); *Exercitationes quaedam Mathematicae* (Venetiis, 1724); *Hydrodynamica* (Argentorati, 1738); E. T. Bell, *Men of Mathematics* (1937).

BERNOULLI NUMBERS or **BERNOULLIAN NUMBERS,** a series of fundamental rational numbers occurring in many branches of mathematics, first introduced by Jacques (James, Jacob) Bernoulli in a posthumous work *de Arte Conjectandi,* etc. (Basle, 1713). These numbers have been investigated with unabated vigour ever since. Although the nth Bernoulli number has nearly always been denoted by the symbol B_n there is unfortunately no uniformity among writers as to the actual value of B_n. In what follows the Bernoulli numbers are defined so that $B_0=1$, $B_1=-\frac{1}{2}$, $B_2=\frac{1}{6}$, $B_3=0$, $B_4=-\frac{1}{30}$, ...

Several simple definitions of Bernoulli numbers can be given. Each represents a different field of application and suggests generalizations in different directions. Historically the first of these, as given by Bernoulli himself, is

$$(1)\qquad 1^k+2^k+3^k+\ldots+(N-1)^k$$
$$=\frac{1}{k+1}\left\{B_0N^{k+1}+B_1\binom{k+1}{1}N^k+\ldots+B_k\binom{k+1}{k}N\right\},\text{ where}$$
$$\binom{n}{m}=\frac{n!}{m!(n-m)!}$$

A more common definition is the following symbolic one

$$(2)\qquad B_n=(B+1)^n \qquad (n>1)$$

where, after expanding the binomial, the exponents of B are degraded to subscripts. Thus, for example, for $n=4$

$$B_4=(B+1)^4=B_4+4B_3+6B_2+4B_1+B_0.$$

This does not determine B_4 but expresses B_3 in terms of earlier B's. This is the simplest of a host of recursion formulae which have been proposed for the calculation of the B's. Most of these may be derived from the general formula

$$f(x+B+1)-f(x+B)=f'(x)$$

where $f(x)$ is any polynomial or formal power series, $f'(x)$ its derivative, and where the above convention about powers of B holds. Any recursion formula expressing B_n in terms of previous B's may be used to express B_n as a determinant.

Generating Functions.—Another common definition of B_n is by means of one of the generating functions

$$(3)\qquad \frac{x}{e^x-1}=\sum_{n=0}^{\infty}B_nx^n/n!,\quad x\cot x=\sum_{n=0}^{\infty}(-1)^nB_{2n}x^{2n}/(2n)!$$

Another definition of B_n, this time as a direct formula, is

$$(4)\qquad B_{2n}=\frac{2(-1)^{n-1}(2n)!}{(2\pi)^{2n}}\left(1+\frac{1}{2^{2n}}+\frac{1}{3^{2n}}+\frac{1}{4^{2n}}+\ldots\right).$$

This striking result is due to Euler who thus made (in 1748) an independent discovery of Bernoulli numbers. It was used by S. E. Serebrennikov in computing B_{184}. It also shows that although the early Bernoulli numbers are comparatively small, the numbers $|B_{2n}|$ tend to infinity with more than exponential rapidity. In fact for large n

$$|B_{2n}|=4\,n^n(\pi e)^{-n}\sqrt{\pi n}\qquad\text{(approximately).}$$

Bernoulli Polynomials $B_n(x)$.—Each of the above definitions of B_n is easily extended to an important polynomial of degree n usually denoted by $B_n(x)$ and introduced originally by Bernoulli. These definitions are, in order:

$$(1')\quad 1^k+2^k+3^k+\ldots+(N-1)^k=\{B_{k+1}(N)-B_{k+1}(0)\}/(k+1)$$

$$(2')\qquad (B+x)^n=B_n(x)$$

$$(3')\qquad x\,e^{xt}/(e^x-1)=\sum_{n=0}^{\infty}B_n(t)\,x^n/n!$$

$$(4')\qquad B_n(x)=-n!\sum_{m=-\infty}^{\infty}{}'\,(2\pi im)^{-n}\,e^{2\pi imx}\quad(0<x<1)$$

An independent definition of $B_n(x)$ may be given by the relations:

$$B_0(x)=1,\ B^1{}_n(x)=n\,B_{n-1}(x)$$
$$B_n(1)-B_n(0)=\begin{cases}1 \text{ if } n=1\\ 0 \text{ if } n>1.\end{cases}$$

This gives in fact still another useful approach to Bernoulli numbers which may be defined now as $B_n=B_n(0)$. The first Bernoulli polynomials are:

$$B_0(x)=1,\ B_1(x)=x-\tfrac{1}{2},\ B_2(x)=x^2-x+\tfrac{1}{6}$$
$$B_3(x)=x^3-\tfrac{3}{2}x^2+x/2,\ B_4(x)=x^4-2x^3+x^2-\tfrac{1}{30}.$$

These polynomials $B_n(x)$ are possessed of a number of interesting and useful properties such as

$$B_n(x+1)-B_n(x)=nx^{n-1}$$
$$B_n(1-x)=(-1)^n\,B_n(x)$$
$$B_n(kx)=k^{n-1}\sum_{r=0}^{k-1}B_n\left(x+\frac{r}{k}\right)$$

If the function $f(x)$ can be expressed in a series of Bernoulli polynomials:

$$f(x)=\frac{C_0B_0(x)}{0!}+\frac{C_1B_1(x)}{1!}+\frac{C_2B_2(x)}{2!}+\ldots$$

then the general coefficient C_n is given by $f^{(n-1)}(1)-f^{(n-1)}(0)$. This statement is equivalent to the celebrated Euler-Maclaurin summation formula. (*See* CALCULUS OF DIFFERENCES.)

Arithmetical Properties of B_n.—These are the subject of numerous interesting but often difficult investigations. Some of these properties are still imperfectly understood. Perhaps the most famous number-theoretic property of B_n is the von Staudt-Clausen theorem to the effect that

$$B_{2n}=A_n-\frac{1}{p_1}-\frac{1}{p_2}-\ldots-\frac{1}{p_k}$$

where A_n is an integer and $p_1, p_2, \ldots, p_k$ are those primes which exceed by 1 a divisor of $2n$. For example

$$B_{12}=-\frac{691}{2730}\quad 1-\frac{1}{2}-\frac{1}{3}-\frac{1}{5}-\frac{1}{7}-\frac{1}{13}.$$

This striking theorem has many applications.

Bernoulli numbers occur in many problems in number theory, the most famous of which is Fermat's last theorem [*q.v.*]. A theorem of E. E. Kummer states that if p is an odd prime not dividing the numerators of $B_2, B_4, \ldots, B_{p-1}$, then $x^p+y^p=z^p$ cannot be solved in positive integers x, y, z. Much of the 20th century work on Bernoulli numbers has been connected with Fermat's last theorem. Papers by H. S. Vandiver should be consulted on this subject.

Tables of Bernoulli Numbers.—Many engineering handbooks, collected mathematical tables, and textbooks on infinite series have short tables of the first dozen Bernoulli numbers. These are sufficient for routine applications of these numbers. More extensive tables are needed for number theory work or for calculations of extreme accuracy. In spite of the great number of formulae proposed for calculating B_n only a few actual calculations have been made. These may be given the following tabular description.

Name	Range of n in B_{2n}	Date
J. Bernoulli	1–5	1712
L. Euler	1–15	1781
Dr. Rothe	1–31	1840
J. C. Adams	1–62	1877
S. E. Serebrennikov	1–92	1905, 1907
D. H. Lehmer	91–110	1936

J. W. L. Glaisher has given a 10-place table of the common logarithms of B_{2n} for $n\leq 250$ together with their natural values to nine significant figures. This table, which was computed from (4), has been reprinted by H. T. Davis who gives also values of $B_n(x)-B_n$ for $2\leq n\leq 8$ and for $0\leq x\leq 1$ at intervals of .01 to ten decimals.

BIBLIOGRAPHY.—H. T. Davis, *Tables of the Higher Mathematical Functions*, vol. 2 (Bloomington, 1935), contains extensive tabular and bibliographical material on Bernoulli numbers. *See* also N. Nielsen, *Traité Élémentaire des Nombres de Bernoulli* (Paris, 1923); N. E. Nörlund, *Differenz-enrechnung* (Berlin, 1924); J. Peters, *Zehnstellige Logarithmentafel* vol. 1, p. 83 (Berlin, 1922); S. E. Serebrennikov, *Zapiski*, Imperial Academy of Sciences, Physical-Mathematical Division, Series VIII, vol. 16 (1905) no. 10, vol. 19 (1907) no. 4; H. S. Vandiver, *Amer. Math. Soc. Trans.* vol. 51, pp. 502–531 (1942); D. H. Lehmer, *Duke Math. Journal* vol. 2, pp. 460–464 (1936); J. V. Uspensky and M. A. Heaslet, *Elementary Number Theory*, chap. 9 (New York 1939); J. W. L. Glaisher, *Cambridge Phil. Soc. Trans.*, vol. 12, p. 384.

(D. H. LR.)

BERNSTEIN, AARON (1812–1884), Jewish scientist, author and reformer, a native of Danzig. Bernstein took an active share in the movement for synagogue reform in Germany. He was the author of two delightful Ghetto stories, *Vögele der Maggid* and *Mendel Gibbor*, being one of the originators of this *genre* of modern fiction. He also wrote *History of Revolution and Reaction in Germany* (3 vols., 1883–1884) a collection of important political essays. He died on Feb. 12, 1884, in Berlin.

BERNSTEIN, EDUARD (1850–1932), German politician and writer, was born in Berlin, Jan. 6, 1850. In 1872 he joined the Social Democrats and from 1881–90 edited, with Bebel, the *Sozialdemokrat* in Zürich, and later in London, where he lived in exile until 1901. In 1902 he entered the Reichstag as deputy for Breslau. He was best known as the author of "Revisionism," a changed conception of Marxism, based on the belief that the class struggle was diminishing in intensity. This he argued from figures which appeared to show that the number of small fortunes, and consequently of the middle-class, was on the increase. He was therefore regarded as the chief right wing Socialist leader, but when the split in the party occurred in March 1916, his pacifist convictions forced him to associate with the Independents. He rejoined the Majority Socialists, however, in 1919. Bernstein's works include: *Die Voraussetzungen des Sozialismus und die Aufgaben der Sozialdemokratie* (first pub. 1899, latest ed., 1920); *Zur Geschichte und Theorie des Sozialismus* (1901, 1904); *Sozialismus und Demokratie in den grossen Englischen Revolution* (1922); *Erinnerungen eines Sozialisten* (1918); *Die deutsche Revolution, ihre Entstehung, ihr Verlauf und ihr Werk* (1921).

BERNSTEIN, HENRY (1876–), French dramatist, was born in Paris on June 20, 1876. His early plays, *Le Marché* (1900) and *Le Détour* (1902) in particular, owe something to the school of the *Théâtre Libre;* it was only in *La Rafale* (1906) that what may be called his first distinctive manner emerged. The plays which belong to this period depend entirely for their effect on action and situation and have no literary appeal; they do not present any spiritual conflict, but an opposition of human wills and forces which the spectator follows with the breathless interest he would give to an exciting contest. These characteristics may be noted in *Le Voleur* (1907), and still more in *Israël* (1908) and *Samson* (1910). At this time Bernstein found an admirable interpreter of his plays in Lucien Guitry. *L'Assaut* (1912) and *Le Secret* (1913) (one of his best plays) show evidence of a desire to create less rudimentary characters and devote more attention to their presentation and analysis of their motives. *Le Secret* is thus akin to the plays which he wrote in the post-war period, following on his strange *Judith* (1922), *La Galerie des Glaces* (1925), *Félix* (1926), and above all *Le Venin* (1927). Adopting the technique of a younger generation he endeavours to express its mental unrest and thus contributes to the *théâtre de l'inquiétude* which was the creation of a later school of dramatic authors. These later plays of Bernstein are a remarkable proof of the dramatist's ability to adapt himself to the fashion and spirit of the age, but he will probably be remembered best for the plays of his first manner, which were a more genuine expression of his genius, and excellent of their kind.

BERNSTORFF, ANDREAS PETER, COUNT VON (1735–1797), Danish statesman, was born in Hanover on Aug. 28 1735. His career was determined by his uncle, Johann Hartwig Ernst Bernstorff, who sent his nephew to study in the German and Swiss universities and travel for some years in Italy, France, England, and Holland, to prepare himself for a statesman's career. In 1758 he entered the Danish foreign office, was created count in 1767, and was dismissed with his uncle in 1770. He re-entered the service after Struensee's fall at the end of 1772, working at first in the finance and economic departments, and also taking an especial interest in agriculture. The improvements he introduced in the tenures of his peasantry anticipated in some respects the agricultural reforms of the next generation.

In April 1773 Bernstorff was transferred to the ministry of foreign affairs, where his first official act was to conclude the negotiations which had long been pending with the grand-duke Paul as duke of Holstein-Gottorp. The result was the exchange-treaty of June 1 (May 21, O.S.), 1773, confirming the previous treaty of 1767 (*see* BERNSTORFF, J. H. E.). This was followed by the treaty of alliance between Denmark and Russia of Aug. 12, 1773, which was partly a mutually defensive league and partly an engagement between the two states to upset the new constitution recently established in Sweden by Gustavus III., when the right moment for doing so should arrive. Though the preliminaries of this treaty had been definitely settled in his uncle's time, there can be no doubt that he regarded this anti-Swedish policy as the correct one for Denmark. It is also pretty certain that the anti-Swedish alliance was Russia's price for compounding the Gottorp difficulty.

Starting from the hypothesis that Sweden was "Denmark-Norway's most active and irreconcilable enemy," Bernstorff logically included France, the secular ally of Sweden, among the hostile powers with whom an alliance was to be avoided, and drew near to Great Britain as the natural foe of France, especially during the American War of Independence, and this, too, despite the irritation occasioned in Denmark-Norway by Great Britain's masterful interpretation of the expression "contraband." Bernstorff was much inclined, the same winter, to join a triple alliance between Great Britain, Russia, and Denmark-Norway, proposed by England for the purpose of compelling the Bourbon powers to accept reasonable terms of peace. But he was overruled by the crown prince Frederick, who thought such a policy was hazardous, and the Russian chancellor Nikita Panin proposed an armed league, to embrace all the neutral powers, for the purpose of protecting neutral shipping in time of war. This league was very similar to one proposed by Bernstorff himself in Sept. 1778 for enforcing the principle "a free ship makes the cargo free"; but as now presented by Russia he rightly regarded it as directed exclusively against England. He acceded to it unwillingly (July 9 1780); but he had previously, by a separate treaty with England, on July 4, come to an understanding with that power as to the meaning of the expression "contraband of war." Bernstorff was ultimately sacrificed to the resentment of the Russian government (Nov. 13 1780). He retired to his Mecklenburg estates but, on the fall of Guldberg four years later, was recalled to office (April 1784). The new government held the mean between Struensee's extravagant cosmopolitanism and Guldberg's stiff conservatism. In the emancipation of the serfs Bernstorff took a leading part.

Meanwhile, as Bernstorff had predicted, the Russian neutrality project had resulted in a breach between Great Britain and Russia. Then came Gustavus III.'s sudden war with Russia in 1788. Bernstorff took care that the assistance rendered to Russia under treaty obligations should be as trifling as possible, to avoid offending Great Britain and Prussia. On the outbreak of the French Revolution, Bernstorff condemned on principle any interference in the domestic affairs of France, and he was persuaded that Denmark's safest policy was to keep clear of every anti-French coalition. His neutrality treaty with Sweden (March 17 1794), for protecting their merchantmen by combined squadrons, was extremely beneficial to the Scandinavian powers, both commercially and politically. Taught by the lesson of Poland, he had, in fact, long since abandoned his former policy of weakening Sweden. Bernstorff's great faculties appeared, indeed, to mature and increase with age, and his death on June 21 1797, was regarded in Denmark as a national calamity.

See Christian Ulrich Detley von Eggers. *Denkwürdigkeiten aus dem Leben des Grafen A. P. Bernstorff* (1800); Aage Friis, *A. P. Bernstorff og O. Höegh-Guldberg* (1899); and *Bernstorfferne og Danmark* (1903).

BERNSTORFF, CHRISTIAN GÜNTHER, COUNT VON (1769–1835), Danish and Prussian statesman and diplomatist, son of Count Andreas Peter von Bernstorff, was born at Copenhagen on April 3, 1769. He began his career in 1787, as attaché to the representative of Denmark at the opening of the Swedish diet. In 1789 he went as secretary of legation to Berlin, where his maternal uncle, Count Leopold Friedrich zu Stolberg, was Danish ambassador; he was soon chargé d'affaires, and in 1791 minister plenipotentiary. He was ambassador at Stockholm from 1794 until May 1797, when he was summoned to Copenhagen to act as substitute for his sick father, on whose death (June 21) he succeeded as secretary of state for foreign affairs and privy councillor. In 1800 he became head of the ministry. He remained responsible for the foreign policy of Denmark until May 1810, a fateful period which saw the battle of Copenhagen (April 2, 1801), the bombardment of Copenhagen and capture of the Danish fleet in 1807. After his retirement he remained without office until his

appointment in 1811 as Danish ambassador at Vienna. He remained here, in spite of the fact that for a while Denmark was nominally at war with Austria, until, in January 1814, on the accession of Denmark to the coalition against Napoleon, he publicly resumed his functions as ambassador. He accompanied the emperor Francis to Paris, and was present at the signature of the first peace of Paris. With his brother Joachim, he represented Denmark at the congress of Vienna and, as a member for the commission for the regulation of the affairs of Germany, was responsible for some of that confusion of Danish and German interests which was to bear bitter fruit later in the Schleswig-Holstein question. He again accompanied the allied sovereigns to Paris in 1815, returning to Copenhagen the same year. In 1817 he was appointed Danish ambassador at Berlin, his brother Joachim going at the same time to Vienna. In the following year Prince Hardenberg made him the formal proposition that he should transfer his services to Prussia, which, with the consent of his sovereign, he did.

It was, therefore, as a Prussian diplomat that Bernstorff attended the congress at Aix-la-Chapelle (Oct. 1818), at the close of which he returned to Berlin as minister of state and head of the department of foreign affairs. Bernstorff was by training and temperament opposed to the Revolution, and he was initiated into his new duties as a Prussian minister by the reactionary Ancillon. He is accused of having subordinated the particular interests of Prussia to the European policy of Metternich and the "Holy Alliance." It is true that Bernstorff supported the Carlsbad decrees, and the Vienna Final Act; he was also the faithful henchman of Metternich at the congresses of Laibach, Troppau and Verona. On the other hand, he took a considerable share in laying the foundations of the customs union (*Zollverein*), which was destined to be the foundation of the Prussian hegemony in Germany. In his support of Russia's action against Turkey in 1828 also he showed that he was no blind follower of Metternich's views. In the crisis of 1830 his moderation in face of the warlike clamour of the military party at Berlin did much to prevent the troubles in Belgium and Poland from ending in a universal European conflagration. In the spring of 1832 the state of his health compelled him to resign the ministry of foreign affairs to Ancillon. He died on March 28, 1835.

See J. Caro in *Allgem. Deutsch. Biog. s.v.;* H. von Treitschke, *Deutsche Geschichte* (Leipzig, 1874–94); C. Ringhoffer, *Ein Dezennium preussischer Orientpolitik . . . 1821–30* (1897).

BERNSTORFF, JOHANN HARTWIG ERNST, COUNT VON (1712–1772), Danish statesman, who came of a very ancient Mecklenburg family, was the son of Joachim Engelke, Freiherr von Bernstorff, chamberlain to the elector of Hanover, and was born on May 13, 1712. His maternal grandfather, Andreas Gottlieb Bernstorff (1640–1726), had been one of the ablest ministers of George I. He was introduced into the Danish service by his relations, the brothers Plessen, who were ministers of state under Christian VI. From 1744 to 1750 he was ambassador in Paris. Shortly after his return from Paris he became (1751) foreign minister. He occupied for twenty-one years the highest position in the government, and in the council of state his opinion was decisive. But his chief concern was ever with foreign affairs. A friendly alliance with a relatively weak Sweden was the cardinal point of Bernstorff's policy. But his plans were traversed again and again by unforeseen complications, the failure of the most promising presumptions, the perpetual shifting of apparently stable alliances. During the Seven Years' War he succeeded in preserving the neutrality of Denmark, despite the existence of a subsidy-treaty with the king of Prussia, and the suspicions of England and Sweden. It was through his initiative, too, that the convention of Kloster-Seven was signed (Sept. 10, 1757), and on May 4, 1758, he concluded a treaty with France, whereby, in consideration of Denmark's holding an army-corps of 24,000 men in Holstein till the end of the war, to secure Hamburg, Lübeck and the Gottorp part of Holstein from invasion, France, and ultimately Austria also, engaged to bring about an exchange between the king of Denmark and the cesarevitch as regards Holstein. But the course of the war made this compact inoperative. Austria hastened to repudiate her guarantee to Denmark in order not to offend the new emperor of Russia, Peter III., and one of Peter's first acts on ascending the throne was to declare war against Denmark. The coolness and firmness of Bernstorff saved the situation. He placed the best French general of the day at the head of the well-equipped Danish army. But at this juncture Peter III. was overthrown. Bernstorff recognized the impotence of the French monarchy after the Seven Years' War, and in 1763 exchanged the French for the Russian alliance, which was cemented by the treaty of April 28, 1765, under which Catherine II. undertook to cede the Gottorp portion of Holstein in exchange for the counties of Oldenburg and Delmenhorst. For his part in this treaty Bernstorff was created count. On the accession of Christian VII., in 1766, Bernstorff's position became very precarious. Though Bernstorff ruled Denmark for twenty years, he never learnt Danish. His last act was a further *rapprochement* with Russia by the treaty of Dec. 13, 1769, which stipulated that any change in the Swedish constitution should be regarded by Denmark and Russia as a *casus belli* against Sweden, and that in the event of such a war Denmark should retain all the territory conquered from Sweden. This treaty proved to be a great mistake on Denmark's part. Nine months later, on Sept. 13, 1770, Bernstorff was dismissed as the result of Struensee's intrigues, and retired to his German estates, where he died on Feb. 18, 1772. Bernstorff was not only one of the ablest but one of the noblest and most conscientious statesmen of his day. The motto he chose on receiving the order of the Daneborg was "Integritas et rectum custodiunt me" (Integrity and right guard me), and throughout a long life he kept to it.

See Poul Vedel, *Den aeldre Grev Bernstorffs ministerium* (1882); *Correspondance ministérielle du Comte J. H. E. Bernstorff*, ed. Vedel (1882); Aage Friis, *Bernstorfferne og Danmark* (1899).

BERNSTORFF, JOHANN HEINRICH, COUNT VON (1862–1939), German diplomatist, was born in London Nov. 14 1862, the son of the Prussian diplomatist, Count Albrecht von Bernstorff, who was Prussian minister and German ambassador in London, 1854–61 and 1862–73. He entered the diplomatic service in 1899, was secretary of legation successively at Belgrade, Dresden, St. Petersburg and Munich, and (1902–06) councillor of the embassy in London. He then went as consul-general to Cairo, whence he proceeded as German ambassador in 1908 to Washington, and remained there until America's declaration of war against Germany in April 1917. He made great efforts to facilitate mediation by President Wilson, but he did not receive the support he expected from authoritative quarters in Berlin. On the American declaration of war he returned to Germany and was sent as ambassador to Constantinople, where he was employed until 1918.

In various publications, and in his reminiscences on his term of office as ambassador in Washington, he endeavoured to prove that Germany, if she had followed the proper policy, could have avoided war with America. This statement of his views excited much controversy in his own country. When the revolution broke out in 1918 Bernstorff left the diplomatic service, but later took an active part in parliamentary politics as a member of the Democratic party in the reichstag, and also maintained a close connection with international affairs, as chairman of the German League of Nations Union until 1933.

After Hitler's advent he went into exile at Geneva, Switzerland, where he died Oct. 6, 1939.

See his *My Three Years in America* (1920) and *Memoirs of Count Bernstorff* (1936).

BEROSSUS, a priest of Bel at Babylon, who translated into Greek the standard Babylonian work on astrology and astronomy, and compiled (in three books) the history of his country from native documents, which he published in Greek in the reign of Antiochus II. (250 B.C.). His works have perished, but extracts from the history have been preserved by Josephus and Eusebius. Eusebius probably derived them not directly from Berossus, but through the medium of Alexander Polyhistor and Apollodorus. The extracts containing the Babylonian cosmology, the list of the antediluvian kings of Babylonia, and the Chaldaean story of the Deluge have been shown by the decipherment of the cuneiform texts to have faithfully reproduced the native legends.

All attempts to harmonize the scheme of dynasties thus ascribed to Berossus with the list given us in the so-called dynastic tablets discovered by Dr. Pinches have been failures. All that seems certain is that Berossus arranged his history so that it should fill the astronomical period of 36,000 years, beginning with the first man and ending with the conquest of Babylon by Alexander the Great.

BIBLIOGRAPHY.—*See* J. P. Cory, *Ancient Fragments* (1826, ed. by E. R. Hodges, 1876); Fr. Lenormant, *Essai de commentaire des fragments cosmogoniques de Bérose* (1872); A. von Gutschmid in the *Rheinisches Museum* (1853); George Smith in *T.S.B.A.*, iii., 1874, pp. 361–79; Th. G. Pinches in *P.S.B.A.*, 1880–81.

BEROUN, a town of Bohemia, favourably situated in a widening of the Beroun valley 27 mi. southwest of Prague. The fertility of the basin in which it lies and the location on one of the important approaches to Prague contributed to its early development, especially during the period of patronage by Charles IV, but the same factors caused it to be frequently sacked and devastated. The modern prosperity is based upon industrial activities handling local produce, notably sugar-refining, flour-milling, brewing and the manufacture of textiles; it shares in the iron, cement and lime manufactures of Beroun valley. Pop. (1930) 13,143.

BERRY, the name of a family which acquired large industrial interests in South Wales and important properties in the newspaper and publishing business. There were three brothers, sons of Alderman J. M. Berry of Merthyr Tydvil, Henry Seymour, 1st Lord Buckland (1877–1928), William Ewert (b. 1879), created baronet in 1921 and Baron Camrose in June, 1929, and James Gomer (b. 1883), created baronet in 1928. Lord Buckland, who was chairman of Guest, Keen and Nettlefolds, and a generous benefactor of his native town, Merthyr Tydvil, was killed in a riding accident in 1928. Sir William Berry devoted his energies mainly to newspaper work. He founded the *Advertising World* in 1901, and became a working journalist, contributing largely to the newspaper which he directed. After he became connected with the *Sunday Times,* of which he was editor-in-chief from 1915 onward, he acquired, either alone or with his brother, Gomer Berry, other important newspaper and publishing interests. The brothers acquired a controlling interest in the *Financial Times, The Graphic,* Cassell's publishing firm, Kelly's Directories, and groups of newspapers and periodicals, including the Hulton interests and the Amalgamated Press; in 1927 they acquired the *Daily Telegraph.* In 1928 there was keen rivalry between the Berrys, on behalf of Allied Newspapers Ltd. and Allied Northern Newspapers Ltd., and Lord Rothermere, on behalf of the *Daily Mail* group, for the control of the provincial press in various centres.

BERRY, CHARLES ALBERT (1852–1899), English nonconformist divine, was born at Bradshawgate, Leigh, Lancashire. In 1875 he became pastor of St. George's Road Congregational church, Bolton, and in 1883 pastor of the church at Queen street, Wolverhampton, with the supervision of nine dependent churches in the neighbourhood. In 1887 he went to America, and was invited to succeed Beecher in what was then the best-known pulpit in the United States. Berry, however, felt that his work lay in England and declined the invitation. In 1892 he took part in a conference at Grindelwald on the question of Christian reunion and subsequently, with Hugh Price Hughes and Alexander Mackennal of Bowdon, conducted a campaign throughout England, introducing the ideas and principles of Free Church federation. He was the first president of the Free Church congress. He played an effective part in expressing the popular desire for peace between England and America in reply to President Cleveland's message on the Venezuelan boundary dispute. In 1896 he was elected chairman of the Congregational Union of England and Wales.

BERRY, CHARLES FERDINAND, DUKE OF (1778–1820), younger son of Charles X. of France, left France during the Revolution, with his father, then comte d'Artois, and served in the army of Condé from 1792 to 1797. He afterward joined the Russian army and in 1801 took up his residence in England, where he remained for 13 years. During that time he married an Englishwoman, Anna Brown, by whom he had two daughters, afterward the baronne de Charette and the comtesse de Lucinge-Faucigny. The marriage was cancelled for political reasons in 1814, when the duke set out for France. His frank, open manner gained him some favour with his countrymen, and Louis XVIII named him commander in chief of the army at Paris on the return of Napoleon from Elba. He retired to Ghent during the Hundred Days. In 1816 he married the princess Caroline Ferdinande Louise (1798–1870), eldest daughter of King Francis I of Naples. On Feb. 13, 1820, he was mortally wounded when leaving the opera house at Paris with his wife, by a saddler named Louis Pierre Louvel. Seven months after his death the duchess gave birth to a son, who received the title of duke of Bordeaux but is known in history as the comte de Chambord. A daughter, afterward duchess of Parma, was born in 1819.

CAROLINE LOUISE duchess of Berry was compelled to follow Charles X to Holyrood after July 1830, but it was with the resolution of returning speedily and making an attempt to secure the throne for her son. From England she went to Italy, and in April 1832 she landed near Marseilles but, receiving no support, made her way toward the loyal districts of Vendée and Brittany. Her followers were defeated, and after remaining concealed for five months in a house in Nantes she was betrayed to the government and imprisoned in the castle of Blaye. Here she gave birth to a daughter, the fruit of a secret marriage contracted with an Italian nobleman, Count Ettore Lucchesi-Palli (1805–64). The announcement of this marriage deprived the duchess of the sympathies of her supporters. She was no longer an object of fear to the French government, who released her in June 1833. She set sail for Sicily and, joining her husband, lived in retirement till her death, at Brunnensee, in Switzerland, April 16, 1870.

See Chateaubriand, *Mémoires touchant la vie et la mort du duc de Berry* (1820); Imbert de Saint-Amand, *La duchesse de Berry* (1888–91).

For the duchess *see* H. N. Williams, *A Princess of Adventure* (1911); G. Poinsot, *La Vie Romanesque de la duchesse de Berry* (1913); E. Dejean, *La Duchesse de Berry et les monarchies européennes, août 1830–décembre 1833* (1913); J. Dubreton, *La Princesse captive. La duchesse de Berry, 1832–1833* (with portrait, 1925).

BERRY, EDWARD WILBER (1875–1945), American palaeontologist, was born in Newark, N.J., on Feb. 10, 1875. He was educated privately and from 1897 until 1905 he conducted a newspaper in Passaic, N.J. In 1905 he studied at the Johns Hopkins university, where in 1906 he was appointed assistant in palaeontology and in 1917 was made their first professor of palaeontology. In 1910 he became geologist in the United States geological survey. From 1929 until his retirement in 1942 he was dean of the college of arts and sciences at Johns Hopkins. He made geological history and the geological distribution of the angiosperms his chief fields of research. He died Sept. 20, 1945, at Stonington, Conn.

Among his publications are *Lower Cretaceous of Maryland* (1911); *Upper Cretaceous of Maryland* (1916); *Eocene Floras of Southeastern North America* (1916); *Tree Ancestors* (Baltimore, 1923); *The Middle and Upper Eocene Floras of Southeastern North America* (Washington, 1924); *A Late Tertiary Flora from Bahia, Brazil* (with Arthur Hollick, Baltimore, 1924); *The Flora of the Repley Formation* (Washington, 1925); *Contributions to the Geology and Palaeontology of South America* (with Frank M. Swartz, Baltimore, 1925); *Fossil Leaves from Beaver County* (Norman, Okla., 1926) and *Paleontology* (1929).

BERRY, JOHN, DUKE OF (1340–1416), third son of John II, king of France and Bonne of Luxemburg, was born on Nov. 30, 1340, at Vincennes. He was created count of Poitiers in 1356 and was made the king's lieutenant in southern France, though the real power rested chiefly with John of Armagnac, whose daughter Jeanne he married in 1360. The loss of his southern possessions by the treaty of Bretigny was compensated by the fiefs of Auvergne and Berry, with the rank of peer of France. The duke went to England in 1360 as a hostage for the fulfilment of the treaty of Bretigny, returning to France in 1367 on the pretext of collecting his ransom. On his return he received the province of Languedoc. The peasant revolt of the *Tuchins* and *Coquins,* as the insurgents were called, was suppressed with great harshness, and the duke exacted from the states of Languedoc assembled at Lyons a fine of £15,000. He fought at Rosebeke in 1382 against the Flemings and helped to suppress the Parisian revolts. The repression

in 1383 was followed by a series of heavy fines on the chief cities of France, and, says Froissart, "the whole went into the pockets of the duke of Berry and the duke of Burgundy, for the young king was under their governance." By a series of delays Berry caused the failure of the naval expedition prepared at Sluys against England in 1386, and a second accusation of military negligence led to the disgrace of the royal princes and the temporary triumph of the *marmousets,* as the advisers of the late king were nicknamed. Charles VI visited Languedoc in 1389–90 and enquired into his uncle's government. The duke was deprived of the government of Languedoc, and his agent, Bétizac, was burned. When in 1401 he was restored, he delegated his authority in the province, where he was still hated, to Bernard d'Armagnac. In 1396 he negotiated a truce with Richard II of England, and his marriage with the princess Isabella of France. He tried to mediate between his brother Philip the Bold of Burgundy and his nephew Louis, duke of Orleans, and later between John "sans Peur" of Burgundy and Orleans. He broke with John after the murder of Orleans, though he tried to prevent civil war, and only finally joined the Armagnac party in 1410. In 1413 he resumed his role of mediator, and was for a short time tutor to the dauphin. He died in Paris on June 15, 1416, leaving vast treasures of jewellery, objects of art, and especially of illuminated mss., many of which have been preserved. He decorated the Sainte Chapelle at Bourges; he built the Hôtel de Nesle in Paris, and palaces at Poitiers, Bourges, Mehun-sur-Yèvre and elsewhere.

See also L. Raynal, *Histoire du Berry* (Bourges, 1845); "Jean, duc de Berry," in S. Luce, *La France pendant la guerre de Cent Ans* (1890), vol. i.; Toulgoët-Tréanna, in *Mém. de la Soc. des antiquaires du centre,* vol. xvii. (1890). His beautiful illuminated *Livre d'heures* was reproduced (Paris, fol. 1904) by P. Durrieu.

BERRY or **BERRI,** a former province of France, absorbed in 1790 in the departments of Cher, corresponding roughly with Haut-Berry, and Indre, representing Bas-Berry. Berry is the *civitas* or *pagus* Bituricensis of Gregory of Tours. It had been amalgamated with Aquitaine under Augustus with Bourges, as the capital of Aquitania Prima. In 475 Berry came into possession of the west Goths, from whom it was taken (*c.* 507) by Clovis. The first count of Berry, Chunibert (d. 763), was created by Waifer, duke of Aquitaine, from whom the county was wrested by Pippin the Short, who made it his residence and left it to his son Carloman, on whose death it fell to his brother Charlemagne. The chief authority within the province eventually passed to the viscounts of Bourges, who, while owning the royal suzerainty, preserved a certain independence until 1101, when the viscount Odo Arpin de Dun sold his fief to the Crown. Berry was part of the dowry of Eleanor, wife of Louis VII., and on her divorce and remarriage with Henry II. of England it passed to the English king. Its possession remained, however, a matter of dispute until 1200, when Berry reverted by treaty with John of England to Philip Augustus, and the various fiefs of Berry were given as a dowry to John's niece, Blanche of Castile, on her marriage with Philip's son Louis (afterwards Louis VIII.). Philip Augustus established an effective control over the administration of the province by the appointment of a royal *bailli.* In 1360 Berry was created into a duchy for John, son of John II. of France. Thenceforward it was held as an appanage of the French crown, usually by a member of the royal family closely related to the king. In 1601 it was finally reabsorbed in the royal domain.

BERRYER, ANTOINE PIERRE (1790–1868), French advocate, was the greatest Legitimist advocate of his time. Admitted advocate in 1811, he followed Louis XVIII. to Ghent during the Hundred Days of 1815. On his return he advocated moderation in the treatment of the Bonapartists. He was associated with his father and Dupin in the defence of Marshal Ney, and undertook alone the defence of Generals Cambronne and Debelle. He also stood out as a bold advocate for the freedom of the press, and opposed the rigorous repression exercised by the police department. After the revolution of 1830 he was elected to the Chamber, and championed the cause of the duchess of Berry, but when she landed in the south of France to attempt to set her son, the duke of Bordeaux (afterwards known as the comte de Chambord) on the throne, he tried to dissuade her from the attempt. Berryer then started for Switzerland; he was arrested and brought to trial, but immediately acquitted. In 1833 he pleaded for the liberation of the duchess, and made a memorable speech in defence of Chateaubriand, besides defending various Legitimist journalists in the courts. He also defended Louis Napoleon in 1840 after the affair of Boulogne.

Berryer was a member of the National Assembly after the revolution of 1848, and continued to fight in the Legitimist cause. He protested against the *coup d'état* of Dec. 2, 1851, and with this great speech his parliamentary career ended, but 12 years later he appeared as a deputy to the Corps Législatif. In 1865 he visited London as the guest of Lord Brougham. At a banquet given in his honour by the benchers of the Temple and Lincoln's Inn famous speeches were delivered by Brougham and Alexander Cockburn on the ethics of advocacy, when Brougham supported what may be called the absolute and Cockburn the qualified or moderate theory. Antoine Berryer died at Augerville on Nov. 29, 1868.

BERSAGLIERI, the name given to the rifle battalions of the Italian army (from Italian *bersaglio,* a mark). The first Bersagliere units were raised in 1836, and by the time of the Crimean War they numbered ten battalions. Their resplendent uniform combined with their excellent record in the various Italian campaigns from the Crimea down to the World War to render them perhaps the most famous and certainly the most popular corps in the army. After the war they were converted into cyclist units, and the number of battalions was fixed at twelve.

BERSERKER, in Scandinavian mythology, the name of the twelve sons of Berserk, grandson of the eight-handed Starkadder and Alfhilde (from the "sark" or shirt of bearskin worn by them). Berserk was famed for the reckless fury with which he fought, always going into battle without armour. In Old Norse the term *berserker* was later applied to the bodyguards of several of the Scandinavian heroes.

BERT, PAUL (1833–1886), French physiologist and politician, was born at Auxerre (Yonne). He was appointed professor of physiology successively at Bordeaux (1866) and the Sorbonne (1869). In 1874 he was elected to the Assembly, where he sat on the extreme left, and in 1876 to the chamber of deputies. He was one of the most determined enemies of clericalism, and an ardent advocate of "liberating national education from religious sects, while rendering it accessible to every citizen." In 1881 he was minister of education and worship in Gambetta's short-lived cabinet, and created a sensation by a lecture on modern Catholicism, delivered in a Paris theatre, in which he ridiculed the fables and follies of the chief religious tracts and handbooks that circulated especially in the south of France. Early in 1886 he was appointed resident-general in Annam and Tongking, and died of dysentery at Hanoi, Nov. 11, of that year. But he was more distinguished as a man of science than as a politician or administrator. His classical work, *La Pression barométrique* (1878), embodies researches that gained him the biennial prize of 20,000 francs from the Academy of Sciences in 1875, and is a comprehensive investigation on the physiological effects of air-pressure, both above and below the normal. His earliest researches, which provided him with material for his two doctoral theses, were devoted to animal grafting and the vitality of animal tissue. After about 1880 he produced several elementary text-books of scientific instruction, and also various publications on educational and allied subjects.

BERTANI, AGOSTINO (1812–1886), Italian revolutionist, took part in the insurrection of 1848 and, as medical officer, organized the ambulance service for the Roman republic of 1849. He joined as surgeon the Garibaldian corps in the war of 1859. Upon the arrival of Garibaldi at Naples, Bertani was appointed secretary-general of the dictator, in which capacity he reorganized the police, abolished the secret service fund, founded 12 infant asylums, suppressed the duties upon Sicilian products, prepared for the suppression of the religious orders, and planned the sanitary reconstruction of the city. Entering Parliament in 1861, he opposed the Garibaldian expedition, which ended at Aspromonte, but nevertheless tended Garibaldi's wound with affectionate devo-

tion. In 1866 he organized the medical service for the 40,000 Garibaldians, and in 1867 fought at Mentana. In Parliament he became leader of the extreme left, and his chief work as deputy was an inquiry into the sanitary conditions of the peasantry, and the preparation of the sanitary code adopted by the Crispi administration.

BERTAT, Negroes of the Shangalla group of tribes, mainly agriculturists, known to the Arabs as *Jebalain.* They occupy the valleys of the Yabus and Tumat, tributaries of the Blue Nile. They are shortish and very black, with projecting jaws, broad noses and thick lips. By both sexes the hair is worn short or the head shaved; on cheeks and temple are tribal marks in the form of scars. The huts of the Bertat are circular, the floor raised on short poles. Their weapons are the spear, throwing-club, sword and dagger, and the *kulbeda* or throwing-knife. Blocks of salt are the favourite form of currency. Gold washing is practised. Nature worship still struggles against Mohammedanism. Among them are Arab communities governed by their own sheiks, while the *meks* or rulers of the Bertat speak Arabic, and show traces of foreign blood.

See Koeltlitz, "The Bertat," *Journal of the Anthropological Institute,* xxxiii. 51; *Anglo-Egyptian Sudan,* edited by Count Gleichen (1905).

BERTAUT, JEAN (1552–1611), French poet, was born at Caen in 1552. He figures with Desportes in the disdainful couplet of Boileau on Ronsard:

> Ce poète orgueilleux, trébuché de si haut,
> Rendit plus retenus Desportes et Bertaut.

He wrote light verse to celebrate the incidents of court life in the manner of Desportes, but his verse is more fantastic and fuller of conceits than his master's. He was successively councillor of the parlement of Grenoble, secretary to the king, almoner to Marie de' Medici, abbot of Aulnay, and finally, in 1606, bishop of Sées. After his elevation to the bishopric he ceased to produce the light verse in which he excelled, though he prepared a new edition of his *Recueil de quelques vers amoureux* (1602) in 1606. His works were edited by M. Ad. Chenevières in 1891.

BERTH, originally a nautical term, probably connected with the verb "to bear," first found in literature at the end of the 16th century, with the alternative spelling "birth." Its primary meaning is "sea-room," whether on the high seas or at anchor. Hence the phrase "to give a wide berth to," meaning "to keep at a safe distance from."

From meaning sea-room for a ship at anchor, "berth" comes to mean also the position of a ship at her moorings ("to berth a ship"). The word further means any place on a ship allotted for a special purpose, where the men mess or sleep, or an office or appointment on board, whence the word has passed into colloquial use with the meaning of a situation or employment. From the Icelandic *byrdi,* a board, is also derived the ship-building term "berth," meaning to board, put up bulk-heads, etc.

BERTHELOT, MARCELLIN PIERRE EUGÈNE (1827–1907), French chemist and politician, was born at Paris on Oct. 29, 1827, being the son of a doctor. In 1851 he became a member of the staff of the Collège de France as assistant to A. J. Balard, his former master, and about the same time he began his lifelong friendship with Ernest Renan. In 1854 he made his reputation by his doctoral thesis, *Sur les combinaisons de la glycérine avec les acides,* which described a series of beautiful researches in continuation and amplification of M. E. Chevreul's classical work. In 1859 he was appointed professor of organic chemistry at the École Supérieure de Pharmacie, and in 1865 he accepted the new chair of organic chemistry, which was specially created for his benefit at the Collège de France. He became a member of the Academy of Medicine in 1863 and ten years afterwards entered the Academy of Sciences, of which he became perpetual secretary in 1889 in succession to Louis Pasteur. He was appointed inspector-general of higher education in 1876, and after his election as life senator in 1881 he continued to take an active interest in educational questions, especially as affected by compulsory military service. In the Goblet ministry of 1886–87 he was minister of public instruction, and in the Bourgeois cabinet of 1895–96 he held the portfolio for foreign affairs. His scientific jubilee was celebrated in Paris in 1901. He died suddenly, immediately after the death of his wife, on March 18, 1907, at Paris, and with her was buried in the Panthéon.

He vigorously opposed the generally accepted belief that the formation of organic substances required the intervention of vital activity. His investigations on the synthesis of organic compounds were published in numerous papers and books, including *Chimie organique fondée sur la synthèse* (1860) and *Les Carbures d'hydrogène* (1901). Again he held that chemical phenomena are not governed by any peculiar laws special to themselves, but are explicable in terms of the general laws of mechanics that are in operation throughout the universe; and this view he developed, with the aid of thousands of experiments, in his *Mécanique chimique* (1878) and his *Thermochimie* (1897). This branch of study naturally conducted him to the investigation of explosives, and on the theoretical side led to the results published in his work *Sur la force de la poudre et des matières explosives* (1872), while on the practical side it enabled him to render important services to his country as president of the scientific defence committee during the siege of Paris in 1870–71 and subsequently as chief of the French explosives committee.

His other works include: *Les Origines de l'alchimie* (1885); *Introduction à l'étude de la chimie des anciens et du moyen âge* (1889); publishing translations of various old Greek, Syriac, and Arabic treatises on alchemy and chemistry (*Collection des anciens alchimistes grecs,* 1887–88, and *La Chimie au moyen âge* (1893); *Science et philosophie* (1886), which contains a well-known letter to Renan on "La Science idéale et la science positive"; *La Révolution chimique, Lavoisier* (1890); *Science et morale* (1897), and numerous articles in *La Grande Encyclopédie,* which he helped to establish.

BERTHELOT, PHILIPPE (1866–1934), French diplomat, son of the great chemist, Marcellin Berthelot, was born on Oct. 9, 1866, at Sèvres. Entering the diplomatic service in 1889, he went, in 1904, to the Foreign Office, where, in 1913, he became assistant-director in the political and commercial department. In this position he did much good work during the days preceding the outbreak of the World War in 1914. During the war he acted as liaison officer between the Allied staffs, and he was a prominent figure at the subsequent peace conferences. In 1919 he was promoted head of the political department, and in the following year became secretary-general to the ministry of foreign affairs with the rank of an ambassador. A year later he became involved in the crisis that overwhelmed the Industrial Bank of China, and was accused in the Chamber of having used his position to assist the bank, of which his brother was a leading director. He resigned on Dec. 27, 1921. In March 1922 he was arraigned before a *Conseil de Discipline,* presided over by M. Poincaré, and was sentenced to ten years' suspension from the service. In May 1924, when the embassy in London fell vacant, his name was among those mentioned for the post. When M. Herriot assumed office in Feb. 1925, it was decided that M. Berthelot might be permitted to take advantage of the amnesty law; and on April 28 he was reappointed to the secretary-generalship. In the following August he accompanied M. Briand to London to resume discussions on the Security Pact, and he was a co-delegate with Briand at the Locarno Conference. At the close of that year he conducted important negotiations with M. Chicherin for a resumption of Franco-Russian relations. A month later, Jan. 1926, owing to a reorganization in the Foreign Office, the virtual control of the political directorate passed into his hands. He had been made a Grand Officer of the Legion of Honour in Dec. 1925. His policy, as he himself voiced it, has always been to be "a faithful practiser of a policy of close union with England and of *rapprochement* with Germany." He died Nov. 22, 1934.

BERTHIER, PIERRE ALEXANDRE, prince of Neuchâtel (1753–1815), marshal of France and chief of the staff under Napoleon I., was born at Versailles on Feb. 20, 1753. During the Revolution, as chief of staff of the Versailles national guard, he protected the aunts of Louis XVI. from popular violence, and aided their escape (1791). In the war of 1792 he was chief of staff to Marshal Lückner, and fought in the Argonne campaign of Dumouriez and Kellermann. He served in the Vendéan War of 1793–95, and was in the next year made a gen-

eral of division and chief of staff (*major-général*) to the army of Italy, which Bonaparte had recently been appointed to command. His power of work, accuracy and quick comprehension, combined with his long and varied experience and his complete mastery of detail, made him the ideal chief of staff to a great soldier; and in this capacity he was Napoleon's most valued assistant for the rest of his career. He accompanied Napoleon throughout the brilliant campaign of 1796, and was left in charge of the army after the peace of Campo Formio. In this post he organized the Roman republic (1798), after which he joined his chief in Egypt, serving there until Napoleon's return. He assisted in the *coup d'état* of 18th Brumaire, afterwards becoming minister of war for a time. In the campaign of Marengo he was the nominal head of the Army of Reserve, but the first consul accompanied the army and Berthier acted in reality, as always, as chief of staff to Napoleon. At the close of the campaign he was employed in civil and diplomatic business. When Napoleon became emperor, Berthier was at once made a marshal of the empire. He took part in the campaigns of Austerlitz, Jena and Friedland, and was created duke of Valengin in 1806, sovereign prince of Neuchâtel in the same year and vice-constable of the empire in 1807. In 1808 he served in the Peninsular War, and in 1809 in the Austrian War, after which he was given the title of prince of Wagram. Berthier married a niece of the king of Bavaria. He was with Napoleon in Russia in 1812, Germany in 1813, and France in 1814, fulfilling, till the fall of the empire, the functions of "major-general" of the *Grande Armée*. He abandoned Napoleon to make his peace with Louis XVIII. in 1814, and accompanied the king in his solemn entry into Paris. During Napoleon's captivity in Elba, Berthier, whom he informed of his projects, was much perplexed as to his future course, and, being unwilling to commit himself, fell under the suspicion both of his old leader and of Louis XVIII. On Napoleon's return he withdrew to Bamberg, where he died on June 1, 1815. According to some accounts he was assassinated by members of a secret society; others say that, maddened by the sight of Russian troops marching to invade France, he threw himself from his window and was killed. Berthier was not a great commander; but his title to fame is that he understood and carried out his master's directions to the minutest detail. His *Mémoires* were posthumously published (1827).

See M. Strich, *Marschall Alexander Berthier und sein Ende* (1908).

BERTHOLLET, CLAUDE LOUIS (1748–1822), French chemist, was born at Talloire, near Annecy, Savoy, on Dec. 9, 1748. He studied first at Chambéry and afterwards at Turin, where he graduated in medicine. He settled in Paris in 1772. In 1785 he declared himself an adherent of the Lavoisierian school, though he did not accept Lavoisier's view of oxygen as the only and universal acidifying principle, and he took part in the reform in chemical nomenclature carried out by Lavoisier and his associates in 1787. Among the substances of which he investigated the composition were ammonia, sulphuretted hydrogen and prussic acid, and his experiments on chlorine, which he regarded, not as an element, but as oxygenated muriatic (oxymuriatic) acid, led him to propose it as a bleaching agent in 1785. He also prepared potassium chlorate and attempted to use it in the manufacture of gunpowder as a substitute for saltpetre. During the French Revolution he served on many technical committees. After 1794 he was teacher of chemistry in the polytechnic and normal schools of Paris, and in 1795 he took an active part in remodelling the Academy as the Institut National. In the following year he and Gaspard Monge were chosen chiefs of a commission charged with selecting in Italy the choicest specimens of ancient and modern art for the national galleries of Paris; and in 1798 he was one of the band of scientific men who accompanied Napoleon to Egypt, there forming themselves into the Institute of Egypt on the plan of the Institut National. On the fall of the Directory he was made a senator and grand officer of the Legion of Honour; under the empire he became a count; and after the restoration of the Bourbons he took his seat as a peer. In the later years of his life he had at Arcueil, where he died on Nov. 6, 1822, a well-equipped laboratory, which became a centre frequented by some of the most distinguished scientific men of the time, their proceedings being published in three volumes, between 1807 and 1817, as the *Mémoires de la société d'Arcueil*. Berthollet's most remarkable contribution to chemistry was his *Essai de statique chimique* (1803), the first systematic attempt to grapple with the problems of chemical physics. His speculations, in particular his insistence on the influence of the relative masses of the acting substances in chemical reactions, have exercised a dominating influence on the modern developments of the theory of chemical affinity, of which, far more than T. O. Bergman, whom he controverted, he must be regarded as the founder.

BERTHON, EDWARD LYON (1813–1899), English inventor, was born in London, on Feb. 20, 1813, the son of an army contractor. He first studied medicine, then travelled abroad for some years, and in 1841 entered Magdalene college, Cambridge. He took orders in 1845, and held livings at Fareham and then at Romsey. Always interested in engineering, he made a model of a steamboat with a two-bladed propeller some years before he went to Cambridge, but the Admiralty at that time ridiculed the idea, which was fully worked out by Francis Smith in 1838. At Cambridge he produced what is usually known as "Berthon's log," in which the suction produced by the water streaming past the end of a pipe projected below a ship is registered on a mercury column above. At Fareham he was able to carry on experiments with his log, which was tested on the Southampton to Jersey steamboats; but the British Admiralty gave him no encouragement, and it remained uncompleted. He next designed some instruments to indicate the trim and rolling of boats at sea; but the idea for which he is chiefly remembered was that of the "Berthon Folding Boat" in 1849. This invention was again adversely reported on by the Admiralty. In 1873, encouraged by Samuel Plimsoll, he again applied himself to perfecting his collapsible boat, eventually accepted by the Admiralty. Some of these boats were taken by Sir George Nares to the Arctic, others were sent to General Gordon at Khartum, and others again were taken to the Zambezi by F. C. Selous. Berthon died on Oct. 27, 1899.

BERTILLON, LOUIS ADOLPHE (1821–1883), French statistician, was born in Paris. A doctor by profession, he was one of the founders of the school of anthropology of Paris and was appointed professor of demography there in 1876; he also held the post of director of the statistical office of Paris. His principal work is *Démographie figurée de la France* (1874).

His son JACQUES BERTILLON (1851–1922), French statistician, was principal of the office of statistics, and in 1885 the director of the "Annales de Démographie." He wrote *La Statistique humaine en France* (1880).

ALPHONSE BERTILLON (1853–1914), brother of Jacques, French anthropologist, invented the system of identification of criminals, known as Bertillonage, by means of anthropometry (*q.v.*), which he described in his *Photographie judiciaire* (1890). He was officially appointed in 1894 to report on the handwriting of the *bordereau* in the Dreyfus case, and was a witness for the prosecution before the *cour de cassation* on Jan. 18, 1899.

BERTIN, a family of distinction in the history of French journalism. LOUIS FRANÇOIS BERTIN (1766–1841), known as Bertin *aîné,* was born in Paris on Dec. 14, 1766, and practised journalism during the Revolution. After the 18th Brumaire he founded the *Journal des Débats*. He was suspected of royalist tendencies by the consulate and was exiled in 1801. He returned to Paris in 1804 and resumed the management of the paper, the title of which had been changed by order of Napoleon to that of *Journal de l'Empire*. After the Restoration he supported the monarchy until 1823, when the *Journal des Débats* became the recognized organ of the constitutional opposition. Bertin's support was, however, given to the July monarchy after 1830. He died Sept. 13, 1841. LOUIS FRANÇOIS BERTIN DE VAUX (1771–1842), the younger brother of Bertin *aîné,* took a leading part in the conduct of the *Journal des Débats,* to the success of which his powers of writing greatly contributed. He entered the chamber of deputies in 1815, was made councillor of state in 1827, and a peer of France in 1830. The two sons of Bertin *aîné,*

EDOUARD FRANÇOIS (1797–1871) and LOUIS MARIE FRANÇOIS (1801–54), were directors in succession of the *Journal des Débats.*

BERTINORO, OBADIAH, Jewish commentator of the Mishnah, died in Jerusalem about 1500. He much improved the status of Jews in Palestine. His commentary on the Mishnah was translated by Surenhusius (Latin ed., Amsterdam 1698–1703).

BERTINORO, episcopal see, Emilia, Italy, province of Forlì, 8 mi. S.E. direct of Forlì and 5½ mi. S. of the station of Forlimpopoli, and 800 ft. above sea-level. Pop. (1936) town, 1,580, commune 9,341. On the Apennine foothills, it commands a good view towards the lower Po, and its castle built by Barbarossa stood frequent sieges. Polenta, 2½m. to the south of it, was the birthplace of Francesca da Rimini. The castle is almost entirely ruined, but the Lombard church of S. Donato, with Byzantine capitals, is interesting.

See C. Ricci, "Della Chiesa e castello di Polenta" in *Atti e Memorie della Deputazione di Storia patria per le provincie di Romagna,* Ser. iii., vol. ix. (Bologna, 1891), i. *seq.*

BERTOLD (1442–1504), elector and archbishop of Mainz, son of George, count of Henneberg, was made archbishop of Mainz in 1484. He was an enemy of clerical abuses and a careful administrator of his diocese. Immediately after his election as archbishop he began to take a leading part in the business of the empire, and in 1486 was very active in securing the election of Maximilian as Roman king. During the reign of the emperor Frederick III. he had brought the question of administrative reform before the diet, and after Frederick's death, when he had become imperial chancellor, he was the leader of the party which pressed the necessity for reform upon Maximilian at the diet of Worms in 1495. He continued the struggle at a series of diets, and urged the Germans to emulate the courage and union of the Swiss cantons. He gained a temporary victory when the diet of Augsburg in 1500 established a council of regency (*Reichs-regiment*), and in 1502 persuaded the electors to form a union to uphold the reforms of 1495 and 1500. Bertold died on Dec. 21, 1504. He was a man of great ability and resourcefulness, and as a statesman who strove for an ordered and united Germany was far in advance of his age.

See J. Weiss, *Berthold von Henneberg, Erzbischof von Mainz* (Freiburg, 1889).

BERTOLD VON REGENSBURG (*c.* 1220–1272), an outstanding preacher of his day, was a native of Regensburg (Ratisbon), where he became a Franciscan. From about 1250 onwards his fame as a preacher spread over all Germany, for the earnestness and straightforward eloquence with which he insisted that true repentance came from the heart, that pious pilgrimages and absolution were mere outward symbols, appealed to all classes. He died in Regensburg on Dec. 13, 1272. His German sermons, which reflect the life of the people, form the chief monuments of Middle High German prose; his Latin ones are written in a clear and direct style. The former were edited by F. Pfeiffer and J. Strobl (2 vols., 1862–80, reprinted 1906) and also exist in a modern German version by F. Göbel (4th ed. 1906); the latter were edited by G. Jakob (1880).

See C. W. Stromberger, *Bertold von Regensburg, der grösste Volksredner des deutschen Mittelalters* (1877); E. Bernhardt, *Bruder Bertold von Regensburg* (1905); A. E. Schönbach, *Studien zur Geschichte der altdeutschen Predigt* (Publications of the Vienna Academy, 1900, 1904, and 1906).

BERTRAM, CHARLES (1723–1765), English literary impostor, was a teacher of English at Copenhagen. He announced his discovery of a ms. written by Richard of Westminster which corrected and supplemented the *Itinerarium* of Antoninus in Britain, and produced a forgery which was generally accepted as genuine until 1866, when the imposture was exposed in the *Gentleman's Magazine.* The document was included in Bertram's *Britannicarum Gentium Historiae Antiquae Scriptores Treo* (1757).

BERTRAND, HENRI GRATIEN, COMTE (1773–1844), French general, friend and confidant of Napoleon I., was born at Châteauroux on March 28, 1773, and died there on Jan. 31, 1844. At the outbreak of the Revolution he entered the army as a volunteer. During the expedition to Egypt, Napoleon named him colonel (1798), then brigadier-general, and after Austerlitz his aide-de-camp. His life was henceforth closely bound up with that of Napoleon, who had the fullest confidence in him and made him (1813) grand marshal of the court. Bertrand directed the building of the bridges by which the French army crossed the Danube at Wagram (1809). In 1813, after the battle of Leipzig, his efforts preserved the army from destruction. He accompanied Napoleon to Elba in 1814, returned with him in 1815, held a command in the Waterloo campaign and accompanied Napoleon to St. Helena. He returned to France after Napoleon's death. Louis XVIII. allowed him to retain his rank, and he was elected deputy in 1830. In 1840 he was sent to bring Napoleon's remains to France.

BERTRAND, JACQUES-LOUIS-NAPOLEON ("ALOYSIUS") (1807–1841), French author, was born on April 20, 1807, in Piedmont. His father was French, his mother Italian. In 1815 the family went to live in Dijon, and he was educated at the college there. His early work, done as a member of the Société d'Etudes, was mostly concerned with Burgundy and Dijon and their history, and the early poems in *La Volupté* are of a similar type. In 1828 he became *gérant* of the *Provincial,* a monarchist and Catholic paper, his contributions to which brought him to the notice of Victor Hugo and Sainte-Beuve. He went to Paris in Nov. 1828, and we hear of him at the salons of Hugo and Sainte-Beuve and their circle, especially on one evening when he made a great impression by reciting the *Sire de Maupin.* During this visit to Paris he showed the mss. of *Gaspard de la Nuit* to Sainte-Beuve. Then he went back to Dijon, contributed to the *Spectateur* till it was suppressed under the Ordonnances, and after the revolution of 1830 became editor of the *Patriote de la Côte d'Or,* a liberal and revolutionary paper. He went back to Paris in 1832, where his mother and sister joined him, and they lived in great poverty. He did some journalistic work, failed to get some plays produced, and refused various posts that were offered him. Renduel the publisher bought *Gaspard de la Nuit,* but never published it. By this time Bertrand was desperately ill with consumption; from Sept. 1838 onwards he was in and out of hospital continuously, and he died on April 29, 1841, and was buried at Vaugirard.

Sainte-Beuve describes Bertrand as "a tall young man of 21 with a yellow complexion, very lively little black eyes, a face mocking and sharp, a little wretched perhaps, and a long silent laugh." *Gaspard de la Nuit,* a very rare book, has always been highly valued by a small circle of initiates, and was professedly Baudelaire's model for the *Petits Poèmes en Prose.* The book consists of a series of short sketches, "engravings after imaginary pictures," written in carefully-balanced paragraphs, usually single sentences.

See C. C. Sprietsma, *Louis Bertrand* (1926, bibl.) and the *Fortnightly Review,* vol. 92.

BERTRAND, LOUIS (1866–1941), French author, was born at Spincourt (Meuse) on March 20, 1866, and lived in Algiers from 1891 to 1900. He was received into the Académie Française on Nov. 26, 1926. In a series of novels and other works, Bertrand depicted the civilization of north Africa. Important examples of his novels are *Le Sang des Races* (1899), *Pépète le bien-aimé* (1904). Other works are *La Fin du Classicisme et le Retour a l'Antique* (1897); *Saint Augustin* (1913); *Louis XIV* (1929); *La Méditerranée* (1929); *Les Martyrs Africains* (1930); and *Le Livre de Consolation* (1934). Bertrand believed in the renaissance of North African culture and the revitalizing of French civilization through mutual contacts. He died Dec. 6, 1941.

BERULLE, PIERRE DE (1575–1629), French cardinal and statesman, was born at Sérilly, near Troyes, on Feb. 4, 1575. He was educated by the Jesuits and at the University of Paris. He assisted Cardinal Duperron in his controversy with the Protestant Philippe de Mornay, founded the Congregation of the French Oratory in 1611, and introduced the Carmelite nuns into France. Bérulle obtained the necessary dispensations from Rome for Henrietta Maria's marriage to Charles I., and acted as her chaplain during the first year of her stay in England. In 1626, as French ambassador to Spain, he concluded the treaty of Monzon. After the reconciliation of Louis XIII. with his mother,

Marie de' Medici, through his agency, he was appointed a councillor of state, but had to resign this office owing to his Austrian policy which was opposed by Richelieu. His treatise, *Des Grandeurs de Jésus,* was a favourite book with the Jansenists. He died on Oct. 2, 1629. His works, edited by P. Bourgoing (1644) were reprinted by Migne in 1857.

See Abbé M. Houssaye, *M. de Bérulle et les Carmélites; Le Père de Bérulle et l'oratoire de Jésus; Le Cardinal de Bérulle et Richelieu* (1872–76); H. Sidney Lear, *Priestly Life in France in the Seventeenth Century* (1873).

BERVIC, CHARLES CLÉMENT (1756–1822), said to be the greatest French engraver, was born in Paris on May 23, 1756. His family name was Balvay, but he preferred to use Bervic, his father's surname. He showed early talent for drawing, and for a while studied with Jean Baptiste le Prince. Later he became a pupil of Jean Georges Wille, a well-known line engraver. Bervic is known for the wonderful brilliancy and softness he achieved. He strove for exactness and regularity. A full-length portrait of Louis XVI in coronation robes, after the painting by Callet, established his reputation.

Bervic's best-known work, a plate of the marble group "Death of Laocoön and His Two Sons," is said to be the best representation of marble ever done. The order of the *Reunion* was given him in 1813, and the *Legion of Honour* in 1819. So slowly did he work that in his lifetime he produced only some 15 plates, and failing eyesight caused him to leave two works unfinished. He died March 23, 1822.

BERWICK, JAMES FITZJAMES, DUKE OF (1670–1734), marshal of France, was the natural son of James, duke of York, afterwards James II. of England, by Arabella Churchill (1648–1730), sister of the duke of Marlborough. He was born at Moulins (Bourbonnais) on Aug. 21 1670, and educated in France. He served his first campaign in Hungary under Charles of Lorraine, and was present at the siege of Buda. He then returned to England, was made a colonel of the 8th Foot, and in 1687 was created duke of Berwick, earl of Teignmouth and Baron Bosworth. The revolution forced him to flee to France. He served under James II. in the campaign in Ireland, and was present at the battle of the Boyne. For a short time he was left in Ireland as commander-in-chief, but his youth and inexperience unfitted him for the post. He then took service in the French army, fought under Marshal Luxembourg in Flanders, and took part in the battles of Steinkirk and Neerwinden, at the latter of which he was taken prisoner. He was, however, immediately exchanged for the duke of Ormond, and afterwards served under Villeroi. In 1695 he married the widow of Patrick Sarsfield, who died in 1698. His second marriage, with Anne Bulkeley, took place in 1700. He served in the campaign of 1702, after which he became naturalized as a French subject. In 1704, he first took command of the French army in Spain, but after one campaign he was replaced by the Marshal de Tessé. In 1705 he commanded against the Camisards (*q.v.*) in Languedoc, and when on this expedition he is said to have carried out his orders with remorseless rigour. After his successful expedition against Nice in 1706 he became a marshal of France, and returned to Spain as commander-in-chief of the Franco-Spanish armies. On April 25, 1707, the duke won the great and decisive victory of Almanza, where an Englishman at the head of a French army defeated Ruvigny, earl of Galway, a Frenchman at the head of an English army. The victory established Philip V. on the throne of Spain. Berwick was made a peer of France by Louis XIV., and duke of Liria and of Xereca and lieutenant of Aragon by Philip. Thenceforward Berwick was recognized as one of the greatest generals of his time, and successively commanded in nearly all the theatres of war. From 1709 to 1712 he defended the south-east frontier of France in a series of campaigns which, unmarked by any decisive battle, were yet models of the art of war as practised at the time. The last great event of the war of the Spanish Succession was the storming of Barcelona by Berwick, after a long siege, on Sept. 11 1714. Three years later he was appointed military governor of the province of Guienne, in which post he became intimate with Montesquieu. In 1718 he again entered Spain with an army; and this time he had to fight against Philip V., the king who owed chiefly to Berwick's courage and skill the safety of his throne. Marshal Berwick advised and conducted the siege of Philippsburg, and was killed by a cannon-shot on June 12 1734. Cool, self-possessed and cautious as a general, Marshal Berwick was at the same time not wanting in audacity and swiftness of action. He was a true general of the 18th century, not less in his care for the lives of his men than in his punctiliousness and rigidity in matters of discipline.

The *Mémoires* of Marshal Berwick, revised, annotated and continued by the Abbé Hooke, were published by the marshal's grandson in 1778. Montesquieu made many contributions to this.

BERWICK, a manufacturing borough of Columbia county, Pa., U.S.A., on the Susquehanna river, 25 mi. S.W. of Wilkes-Barre. It is served by the Pennsylvania and the Lackawanna railways. Pop. (1930) 12,660; (1940) 13,181, federal census. It manufactures armour plate, combat tanks, steel freight and passenger railway cars, rail buses, silk, shirts, knitted goods, food products and iron rolling mill products. The largest plant of the American Car and Foundry company is there.

BERWICKSHIRE, county, Scotland, forming its south-east extremity, bounded N. by East Lothian and the North sea; E. by the North sea; S.E. by the county of the borough and town of Berwick; S. by the Tweed and Roxburghshire, and W. by Midlothian. Its land area is 292,535 ac. or 457.1 sq.mi., and it has a coastline of 21 mi. The county is naturally divided into three districts; Lammermuir, the upland district occupied by the hills of that name in the north; Lauderdale, or the valley of the Leader, in the west; and the Merse (the March of Borderland, giving a title to the earls of Wemyss), the largest district, occupying the south-east. The Lammermuirs are a range of round-backed hills, whose average height is about 1,000ft., while the highest summit, Says Law, reaches 1,749ft. They belong to the Silurian uplands of southern Scotland. The Silurian strata terminate eastward at St. Abb's head; in this direction, and on the southern flanks of the hills, and in Lauderdale they are overlaid unconformably by old red sandstones. From the Lammermuirs the Merse stretches to the south and east, and is comparatively level country, mainly occupied by the cementstone group of the carboniferous system, which attains a great thickness. The coast is rocky and precipitous, broken by ravines and not accessible, except at Eyemouth Harbour, for small vessels, and at Coldingham and Burnmouth for fishing boats. St. Abb's head, a promontory with a lighthouse upon it, rises to 310ft. The Eye is the only river of any size which falls directly into the sea. The others—the Leader, the Eden, the Leet and the Whiteadder with its tributaries, the Blackadder and the Dye—all flow into the Tweed. Of these the largest and most important is the Whiteadder, which has its source in the parish of Whittingehame on the East Lothian side of the Lammermuirs, and, following a sinuous course of 35m., joins the Tweed within the bounds or liberties of Berwick.

History.—Traces of Roman occupation and early British settlement exist in various parts of the Merse. Edin's or Etin's Hall, on Cockburn Law, 4m. north of Duns, is still called the Pech's or Pict's House, and is one of the very few brochs found in the Lowlands. After the Romans withdrew (409) the country formed part of the Saxon kingdom of Northumbria, and the inhabitants were converted to Christianity through Modan in the 6th, and Oswald, Aidan and Cuthbert (traditionally believed to have been born in the vale of the Leader) in the 7th centuries. The Danes landed in 886, and destroyed the nunnery at Coldingham, founded about 650 by Ebba, daughter of Æthelfrith, king of Northumbria, after whom the adjoining promontory of St. Abb's head was named. After the battle of Carham (1018) the district, then part of Lothian, was annexed to Scotland. Birgham (pron. Birjam), 3½m. west of Coldstream, was the scene of the conference in 1188 between William the Lion and the bishop of Durham, which discussed the attempt of the English church to assert supremacy over the Scottish. Here also met in 1289 a convention of the Scots estates to consider the projected marriage of Prince Edward of England to the Maid of Norway; and here was signed in 1290 the treaty of

Birgham, assuring the independence of Scotland. The ford at the confluence of the Leet and Tweed near Coldstream gave access to south-eastern Scotland. Edward I. crossed it with his army in 1296, encamping at Hutton the day before the siege of Berwick, and it was similarly employed as late as 1640, when the marquess of Montrose led the Covenanters on their march to Newcastle, although James VI. had already caused a bridge to be constructed from Berwick to Tweedmouth. During the long period of international strife the shire was repeatedly overrun by armies of the English and Scots kings, fighting for the ancient frontier town of Berwick. It was finally ceded to England in 1482. Upon the site of the nunnery at Coldingham King Edgar in 1098 founded a Benedictine priory, which was one of the oldest monastic institutions in Scotland and grew so wealthy that James III. annexed its revenues to defray his extravagance, a step that precipitated the revolt of the nobles (1488). The priory was seriously damaged in the earl of Hertford's inroad in 1545, and Cromwell blew up part of the church in 1650. The chancel (without aisles) was repaired and used as the parish church. The remains contain some fine architectural features, such as, on the outside, the Romanesque arcades surmounted by lancet windows at the east end, and, in the interior, the Early Pointed triforium. On the coast, about 4m. north-west of Coldingham, are the ruins of Fast Castle—the "Wolf's Crag" of Scott's *Bride of Lammermoor*—situated on a precipitous headland. Four miles west is the Pease or Peaths bridge, built by Thomas Telford in 1786 across the deep pass which was of old one of the strongest natural defences of Scotland. The bridge is 123ft. high, 300ft. long and 16ft. wide. Near it are the ruins of Cockburnspath Tower, once a strong fortress and supposed to be the "Ravenswood" of the *Bride of Lammermoor*. In the south-west of the shire, besides Dryburgh Abbey there are, at Earlston, remains of the castle traditionally the residence of Thomas the Rhymer. Hume Castle, the ancient seat of the Home family, is a picturesque ruin about 3 mi. south of Greenlaw. Coldstream and Lamberton, being close to the Border, were both resorted to (like Gretna Green in the west) for clandestine marriages. In Lamberton church was signed in 1502 the contract for the marriage of James IV. and Margaret Tudor, which led, a century later, to the union of the crowns of Scotland and England.

Population and Government.—The population of Berwickshire was estimated at 26,295 in 1938. In 1931 the number of persons speaking Gaelic and English was 66. The only considerable towns are Eyemouth (pop. est. 1938, 2,196) and Duns (1,874), two of the four small burghs. The county, with Haddington, returns one member to parliament. Lauder, a small burgh, is the only royal burgh, and Duns the county town, a status, however, which was held by Greenlaw from 1696 to 1853, after which date it was shared by both towns until conferred on Duns alone. Berwickshire forms a sheriffdom with Roxburgh and Selkirk shires, and there is a resident sheriff-substitute at Duns.

Agriculture.—The soils vary, sometimes on the same farm. Along the rivers is a deep rich loam, resting on gravel or clay, chiefly the former. The less valuable soil of the Merse has been much improved by drainage. The more sandy and gravelly soils grow quantities of turnips. Oats (19,442 ac. in 1938) is the principal grain crop, but wheat and barley (together 17,222 ac.) are also grown. The flocks of sheep are heavy (407,951 in 1938) and cattle are pastured in great numbers. Large holdings predominate, 48% being over 100 ac. in 1938 and the average size at 199.6 ac., the highest of any Scottish county. A migratory tendency noted among the agricultural labourers, which they may have by inheritance as Borderers, has fitted them for colonial life, to which the scarcity of industrial occupation has largely driven the surplus population. The trade of the county is mainly in corn, sheep and eggs. The sales of cattle and sheep mostly take place at the auction marts at Reston, Duns and Earlston. There are also grain markets at Duns and Earlston. Berwick, with which the county has no legal or fiscal connection, is its chief market.

Other Industries.—The Tweed salmon fisheries are famous, and the lesser rivers of the Merse are esteemed by anglers. Eyemouth, Burnmouth and Cove are engaged in sea fisheries, Eyemouth being the centre of a fishing board district. Haddock, herring, lobsters and crabs are chiefly taken. There is quarrying of the intrusive igneous rocks found in limited areas. Earlston produces woollen cloths. At Cumledge on the Whiteadder, blankets and tartan are manufactured, and paper is made at Chirnside and near Ayton. The L.N.E.R. serves coast districts from Berwick to Cockburnspath, and there is a branch from Reston to St. Boswells.

BERWICK-UPON-TWEED, municipal borough and county of itself, in the Berwick-upon-Tweed parliamentary division of Northumberland, England, at the mouth of the Tweed on the north bank, 339 mi. N.W. of London; pop. (1938) 12,060. Area 11.1 sq.mi. The east coast route from London (L.N.E.R.) to Scotland crosses the border here.

Very little is known of the history of Berwick before the Conquest. It was not until the Tweed became the boundary between England and Scotland in the 12th century that Berwick as the chief town on that boundary became really important. Until the beginning of the 14th century Berwick was one of the four royal boroughs of Scotland. After Edward I had conquered Berwick in 1302 he gave the burgesses a charter, by which the town was made a free borough with a gild merchant, having two markets every week, and a fair. It has been noted for salmon fishery in the Tweed from very early times. James I granted the incorporation charter in 1604; but on his accession to the English throne, Berwick rapidly lost its importance as a frontier town. The town has the rare feature of a complete series of ramparts surrounding it. The bell tower, from which alarms were given when border raiders were observed, is in fair preservation. Adjoining the walls, between the windmill and the brass bastions, are the oldest (1719) barracks in England. There are slight remains of the castle, which fell into disrepair after the union of England and Scotland. There are no traces of the churches, monasteries or other principal buildings of the ancient town. Educational institutions include an Elizabethan grammar school. Three bridges connect the town with the south side of the Tweed. The oldest, of 15 arches, was finished in 1634. It has been supplemented by a much larger and wider bridge, erected in 1926. The Royal Border bridge, a quarter of a mile up the river, is a railway viaduct, 126 ft. high, with 28 arches.

The reach of the river from the old bridge to the mouth forms the harbour. The entrance to the harbour is protected by a stone pier. Principal exports are grain, coal and fish; imports are bones and bone-ash, guano, phosphate and timber. Herring and other sea fisheries are of some value. Fairs are held annually at the beginning of March and the end of May. Many inhabitants are employed in the coal mines and ironworks of the neighbourhood.

The custom of mentioning Berwick-upon-Tweed specially after Wales, though abandoned in acts of parliament, is retained in certain proclamations. It was made a free town in 1551 and became a county of itself in 1836. The liberties of the borough, commonly called Berwick Bounds, include the towns of Spittal, at the mouth, and Tweedmouth immediately above it, on the south bank of the river. Berwick was at first represented in the court of the four boroughs and in 1326 in Robert Bruce's parliament. After being taken by the English it remained unrepresented until it was retaken by the Scots, when it sent two members to the parliament at Edinburgh from 1476 to 1479. In 1482 the burgesses were allowed to send two members to the English parliament, and were represented there until 1885, when the town was disfranchised.

BERWYN, a residential suburb of Chicago (Ill.), U.S.A., in Cook county, 8 mi. from the loop, between Oak Park, Cicero, Forest Park, and Riverside, and served by the Burlington Route and the Illinois Central railways. Within walking distance are several forest preserves. In 1937 there were 21 manufacturing establishments which paid $68,121 in wages; the total value of products was $450,018. The assessed valuation of property in Berwyn was $20,731,000 in 1940. The village was laid out in 1890 and incorporated as a city in 1908. The population was 5,841 in 1910; 14,150 in 1920; 47,027 in 1930; and 48,451 in 1940 by federal census.

BERYL, the name applied to the species of precious stone including the emerald (*q.v.*), the aquamarine (*q.v.*) and other

transparent varieties known as "precious beryl," with certain coarse opaque varieties unfit for use as gem-stones. The name comes from the Gr. *βήρυλλος*, a word of uncertain etymology applied to the beryl and probably several other gems (*see* GEM). Beryl is a silicate of beryllium and aluminium, $Be_3 Al_2 Si_6 O_{18}$; alkalis (Na, K, Li, Cs) sometimes replace Be up to a maximum of 7%. It crystallizes in the hexagonal system, usually taking the form of long six-sided prisms, striated vertically and terminated by the basal plane, sometimes associated with various pyramidal faces. It cleaves rather imperfectly parallel to the base. The colour may be blue, green, yellow, brown, colourless or rarely pink. The specific gravity is about 2·7, and the hardness 7·5 to 8. The transparent crystals are pleochroic—a character well marked in emerald.

Beryl occurs as an accessory constituent of many granitic rocks, especially in veins of pegmatite, while it is found also in gneiss and in mica-schist. Rolled pebbles of beryl occur, with topaz, in Brazil, especially in the province of Minas Geraes. Crystals are found in drusy cavities in granite in the Urals, notably near Mursinka; in the Altai mountains, which have yielded very long prismatic crystals; in the mining district of Nerchinsk in Siberia, principally in the Adun-Chalon range, where beryl occurs in veins of topaz-rock piercing granite; in Cornwall, Ireland, Scotland and other parts of Europe; and in many parts of the United States.

BERYLLIUM or **GLUCINUM,** a metallic element with relationships to magnesium, zinc and aluminium. (Symbol Be, atomic number 4, atomic weight 9·02; no isotopes.) Beryllia was first isolated from beryl in 1797 by Vauquelin, whereas Wöhler, Bussy and Debray were the first to isolate the element itself in impure powder form by the decomposition of its chloride with sodium and potassium. Later, Lebeau obtained this element by electrolysis of a fused mixture of sodium and beryllium fluorides carried out at a comparatively low temperature (incipient red heat) in nickel crucibles, the product being in the form of tiny leafy or fern-like particles. By this process the yield is low, and subsequent refinements neither increased the yield nor improved the purity of the fused metal obtained by melting down the fine particles into a compact mass.

Electro-metallurgy.—Although probably the first preparation of metallic beryllium by electrolysis at a temperature high enough to melt the product is that of Liebmann, yet much more recently Stock and Goldschmidt have produced by more effective methods fairly pure fused metal by high-temperature electrolysis. They electrolyse beryllium fluoride dissolved in a fused mixture of sodium and barium fluorides in a graphite pot with an iron rod dipping into the middle of the melt. The electric current is passed between the pot and the iron rod through the melt so that beryllium is precipitated on the iron, the temperature of the pot being kept sufficiently high to melt the deposit into a compact mass. For pure beryllium a temperature of 1,280° C. must be reached and, as there is normally at this temperature a rapid loss by evaporation and not a little commotion in the melt, much experience is required for the satisfactory and continuous working of such a method.

At the National Physical Laboratory, Teddington, England, a process similar in principle to that outlined above has been closely studied for a number of years and the inherent defects have been overcome. This research shows that the production of beryllium by the improved method would cost little more than the analogous process in regular use for the manufacture of aluminium, provided pure beryllia could itself be procured as cheaply as alumina. Useful though beryllium metal would be, it is unfortunate that no very considerable deposit of beryllium minerals has ever been located. The largest deposits as yet known are of beryl containing no more than 4 or 5% of the metal. Absence of demand and difficulty of identification have been responsible for a serious lack of information concerning the occurrence of beryllium minerals. This deficiency should be less felt in the future now that knowledge of the properties both of the element itself and of its various alloys and minerals is increasing.

Properties and Uses.—The application of beryllium as an industrial metal is still in its infancy. The metal is unique in being lighter than aluminium and practically as light as magnesium (sp. gr. 1·84), and having a much higher melting point (1,280° C.), higher corrosion resistance, and greater hardness than either of these elements.

Beryllium is of a dark steel-grey colour; it takes a high polish which, however, appears to have no exceptional reflectivity for white light. Its hardness is evidently dependent to an unusual extent upon its purity, and as prepared at the National Physical Laboratory (99·9% purity), it is as hard as 0·20 carbon-steel, probably owing this hardness and also its brittleness to some specific impurity. Like aluminium, the metal combines vigorously with many other elements but becomes inert to corrosive and other influences through the formation of a fine protective film of oxide of a very tenacious and inactive nature. Beryllium may be sublimed or distilled rapidly at a temperature not far removed from its melting point.

Alloys with copper, silver, iron, aluminium, etc., have been investigated with interesting results, although much work remains to be done before commercial demands will arise for any of these materials. Its lightness, high melting point, hardness, and heat conductivity point to possible application in the construction of pistons in motor-car and aeroplane engines where cost is a minor consideration. The ductile metal, or a beryllium-rich alloy with some other metal or metals, might supplant aluminium for many purposes where lightness, strength, and corrosion resistance are essential as in all aero-construction. Alloys with iron are being investigated and an untarnishable silver-beryllium alloy has been recorded.

Chemistry of Beryllium.—The Copaux method of extracting beryllium salts from beryl and other silicates is worthy of note in that these refractory minerals are thereby treated cheaply, with remarkable ease, and with a high yield. The method consists in heating at 850° C. a mixture of finely crushed beryl or other mineral and crude sodium silicofluoride (which is a cheap by-product of artificial phosphate manufacture from fluorapatites). Hot water washings dissolve beryllium salts from the mass, leaving in the residue both alumina and silica.

The unique behaviour of beryllium salts in dissolving large quantities of beryllium hydroxide has been put to good account in a novel method for the purification of beryllium solutions and separation of compounds. So remarkable is this property that there are but few salts of beryllium which can be crystallized out of solution, as are the salts of other elements. The usual product of attempted crystallization is a gummy mass of highly "basic" and very variable composition. This peculiarity of beryllium salts has undoubtedly hindered the progress of beryllium chemistry.

Inorganic Compounds of Beryllium.—*Beryllium oxide* (*beryllia*). The compound of beryllium and oxygen is usually obtained as a very refractory white powder which can be volatilized *in vacuo* at a high temperature. A small percentage is contained in the mixture of oxides used in incandescent gas mantles. At the National Physical Laboratory it has been found possible to use beryllia in the form of crucibles for melting and subliming pure beryllium metal without contamination. These crucibles are made by compressing a mixture of beryllia and gum in moulds of the desired shape. After removal from the mould and drying, they are fired in a ceramic kiln to 1,500° C.

Beryllium chloride is formed by passing dry hydrogen chloride over the heated metal. It is prepared by the action of the phosphorus chlorides, sulphur chloride, or preferably carbon tetrachloride on beryllia at 700–800° C. (C. Matignon and M. Piettre). It is a white, crystalline, hygroscopic solid melting at about 400° C., and is very soluble in water with formation of hydrochloric acid.

Beryllium iodide, prepared by the action of iodine on the metal in a vacuum at about 300° C., is a colourless crystalline solid which volatilizes below its melting point (510° C.). It is soluble in water with formation of hydriodic acid. By introducing the vapour of the iodide into an evacuated vessel in which is sus-

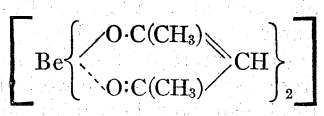
pended a thin tungsten wire electrically heated to about 700° C., dissociation takes place into iodine and beryllium, the metal being deposited on the tungsten in a very pure form. The diameter of the wire can be increased by deposition from 0·1mm. to 4 or 5mm.

Beryllium fluoride remains as a glassy transparent mass on heating the double fluoride of beryllium and ammonium, and is extremely hygroscopic. The beryllium halides cannot be crystallized from aqueous solutions.

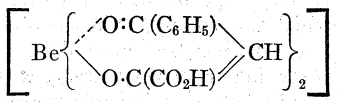
Beryllium sulphate is prepared by the action of sulphuric acid on beryllia. The excess of acid is removed by evaporation, the residue being dissolved in water and poured into alcohol, whereupon the sulphate slowly separates. To ensure freedom from acid, two or more crystallizations from alcohol are necessary, the salt being finally crystallized from water. It consists of colourless crystals containing water of crystallization. Its aqueous solution dissolves large quantities of beryllia when treated with the hydroxide or basic carbonate.

Organic Compounds of Beryllium.—*Basic beryllium acetate* $(CH_3{\cdot}CO_2)_6Be_4O$, produced by dissolving beryllium hydroxide or basic carbonate in acetic acid, is insoluble as such in water but soluble in such organic solvents as glacial acetic acid, chloroform, ether and alcohol. From these solutions the compound separates in well-defined crystals belonging to the cubic system. These crystals have a definite melting point and can be distilled unchanged under normal or reduced pressure. When subjected to X-ray examination, the component parts of the basic acetate molecule are found to be arranged as follows. The lone oxygen atom is placed centrally, the four beryllium atoms occupy the four vertices of a regular tetrahedron, and the six acetate groups span symmetrically the six sides of this regular solid. Homologues $(R{\cdot}CO_2)_6Be_4O$, have also been prepared and examined (Morgan and Astbury, 1926), namely the propionate, *n*- and *iso*-butyrates, and pivalate (trimethylacetate). These derivatives are also readily soluble in organic media.

Beryllium acetylacetone, another co-ordination compound, is also insoluble in water but soluble in organic solvents; it melts and distils without decomposition. In this substance beryllium is in fourfold association with two ring-forming radicals (chelate groups).



Beryllium benzoylpyruvate, a similar co-ordination compound, has been shown by Mills and Gotts (1926) to exist in two optically active forms, thus establishing the fact that these arrangements of four associating units round beryllium are not uniplanar but tetrahedral. (*See* STEREOCHEMISTRY.)



In the foregoing co-ordination compounds, beryllium is not combined directly with carbon but only indirectly through oxygen. True organo-metallic derivatives have, however, been obtained in which the metal is attached directly to one or two organic radicals. Earlier workers (Cahours, 1860, and Lavroff, 1884) have indicated the probable existence of such beryllium compounds, and Gilman and Schulze (1927), by using anhydrous beryllium chloride with the appropriate Grignard reagent (*q.v.*), have definitely identified beryllium dimethyl as a snow-white solid subliming at 200°, and beryllium diethyl as a colourless liquid m.p. 12°, b.p. 110°/15mm., both being spontaneously inflammable in air. These observers also obtained beryllium di-*n*-butyl and the corresponding diphenyl together with compounds of the type R·Be·X, where R is an alkyl or aryl group and X is bromine or iodine. (*See* ORGANO-METALLIC COMPOUNDS.)

See "Beryllium," *Trans. Faraday Soc.*, xxii. (1926); C. L. Parsons, *The Chemistry and Literature of Beryllium* (1909).

(H. A. S.; A. C. V.)

BERYLLONITE, a mineral phosphate of beryllium and sodium ($NaBePO_4$), found as highly complex orthorhombic crystals and as broken fragments in the disintegrated material of a granitic vein at Stoneham, Maine, where it is associated with felspar, smoky quartz, beryl and columbite. The crystals vary from colourless to white or pale yellowish, and are transparent with a vitreous lustre; there is a perfect cleavage in one direction. Hardness 5½–6; specific gravity 2·845.

BERZELIUS, JÖNS JAKOB (1779–1848), Swedish chemist, was born at Väfversunda Sorgard, near Linköping, Sweden, on Aug. 20 or 29, 1779. He studied chemistry and medicine, and graduated as M.D. in 1802 at Uppsala. Appointed assistant professor of botany and pharmacy at Stockholm in the same year, he became full professor in 1807, and from 1815 to 1832 was professor of chemistry in the Caroline medico-chirurgical institution of that city. The Stockholm Academy of Sciences elected him a member in 1808, and in 1818 he became its perpetual secretary. The same year he was ennobled by Charles XIV., who in 1835 further made him a baron. He died at Stockholm on Aug. 7, 1848. During the first few years of his scientific career Berzelius was mainly engaged on questions of physiological chemistry, but about 1807 he began to devote himself to the elucidation of the composition of chemical compounds through study of the law of multiple proportions and the atomic theory. Perceiving the exact determination of atomic and molecular weights to be of fundamental importance, he spent ten years in ascertaining that constant for some two thousand simple and compound bodies, and the results he published in 1818 attained a remarkable standard of accuracy, which was still further improved in a second table that appeared in 1826. He used oxygen—in his view the pivot round which the whole of chemistry revolves—as the basis of reference for the atomic weights of other substances, and the data on which he chiefly relied were the proportions of oxygen in oxygen compounds, the doctrines of isomorphism, and Gay Lussac's law of volumes. When Volta's discovery of the electric cell became known, Berzelius, with W. Hisinger (1766–1852), began experiments on the electrolysis of salt solutions, ammonia, sulphuric acid, etc., and later this work led him to his electrochemical theory, a full exposition of which he gave in his memoir on the *Theory of Chemical Proportions and the Chemical Action of Electricity* (1814). This theory was founded on the supposition that the atoms of the elements are electrically polarized, the positive charge predominating in some and the negative in others, and from it followed his dualistic hypothesis, according to which compounds are made up of two electrically different components. At first this hypothesis was confined to inorganic chemistry, but later on he extended it to organic compounds, which he saw might similarly be regarded as containing a group or groups of atoms—a compound radicle—in place of simple elements. Although his conception of the nature of compound radicles did not long retain general favour—indeed, he himself changed it more than once—he is entitled to rank as one of the chief founders of the radicle theory. He continued and extended the efforts of Lavoisier and his associates to establish a convenient system of chemical nomenclature. By using the initial letters of the Latin (occasionally Greek) names of the elements as symbols for them, and adding a small numeral subscript, to show the number of atoms of each present in a compound, he introduced the present system of chemical formulation (*see* CHEMISTRY). He effected improvements in analytical methods and the technique of the blowpipe (*Über die Anwendung des Löthrohrs,* 1820), of his classification of minerals on a chemical basis, and of many individual researches such as those on tellurium, selenium, silicon, thorium, titanium, zirconium and molybdenum, most of which he isolated for the first time. Apart from his original memoirs, of which he published over 250, mostly in Swedish in the *Transactions* of the Stockholm academy, he published a *Lehrbuch der Chemie,* which went through five editions (first 1803–18, fifth 1843–48), and *Jahresbericht* (1821–48), or annual report on the progress of physics and chemistry, prepared at the instance of the Stockholm academy.

BERZEVICZY, ALBERT DE (1853–1936), Hungarian politician and writer. After studying law and politics at Budapest university, he travelled extensively in Europe. He was professor of law at the Academy of Eperjes and in 1881 was returned to the Hungarian parliament by the same town. He became minister

of education in 1903; from 1910–12 he was president of the House of Deputies. Berzeviczy published numerous historical and other works, among which may be mentioned *Absolutism in Hungary*, vol. I., (1925); *Landscape Painting in the 17th Century* (1910). In 1905 he was president of the Hungarian Academy of Sciences, over whose centenary celebrations he presided in 1925.

BES, the Egyptian god of recreation, represented as a dwarf with large head, goggle eyes, protruding tongue, shaggy beard, a bushy tail seen between his bow legs hanging down behind (sometimes clearly as part of a skin girdle) and usually a large crown of feathers on his head. A Bes-like mask was found by Petrie amongst remains of the twelfth dynasty. In the temple of the queen Hatshepsut at Deir el Bahri (*c.* 1500 B.C.), he is figured along with the hippopotamus goddess as present at the queen's birth. His figure is that of a grotesque mountebank, intended to inspire joy or drive away pain and sorrow, his hideousness being perhaps supposed actually to scare away the evil spirits. In his joyous aspect Bes plays the harp or flute, dances, etc. He is figured on mirrors, ointment vases and other articles of the toilet. Amulets and ornaments in the form of the figure or mask of Bes are common after the New Kingdom; he is often associated with children and with child-birth and is figured in the "birth-houses" devoted to the cult of the child-god. Perhaps the earliest known instance of his prominent appearance of large size in the sculptures of the temples is under Tahraka, at Jebel Barkal, Nubia, at the beginning of the 7th century B.C. As the protector of children and others he is the enemy of noxious beasts, such as lions, crocodiles, serpents and scorpions. Large wooden figures of Bes are generally found to contain the remains of a human foetus. In the first centuries of our era an oracle of Besas was consulted at Abydos, and prescriptions exist for consulting Besas in dreams. Bes may be of non-Egyptian origin, African, as Wiedemann, or Arabian or even Babylonian, as W. Max Müller contends; the god is often named "coming from the Divine Land" (*i.e.*, the East or Arabia), or "Lord of Puoni" (Punt), *i.e.*, the African coast of the Red Sea; his effigy occurs also on Greek coins of Arabia. Contrary to the usual rule, he is commonly represented in Egyptian sculptures and paintings full faced instead of in profile.

BESANÇON, city of eastern France, capital of the department of Doubs, 76m. E. of Dijon by the P.L.M. railway. Pop. (1936) 58,303. It lies enclosed by hills on the river Doubs, under the western Jura. The Doubs almost surrounds the city proper, forming a peninsula, the high neck of which is crowned by the citadel; on the right bank lie populous industrial suburbs, including the frequented thermal and saline spa of Besançon-la-Mouillère. The limestone plateau of the Jura, with its open stretches and salt springs, was a centre of population in the Hallstatt Period (Early Iron Age), and the strategic site was soon recognized. As *Vesontio* it was the chief town of the Sequani, and in 58 B.C. was occupied by Julius Caesar. Marcus Aurelius promoted it to the rank of a *colonia*. During succeeding centuries it was several times destroyed and rebuilt. The archbishopric dates from the close of the 2nd century, and the archbishops gradually acquired considerable temporal power. In 1184 Frederick Barbarossa made it a free imperial city. It afterwards became detached from the German kingdom, and during the 14th century fell to the dukes of Burgundy, from whom it passed to the emperor Maximilian I. Under the Austro-Spanish domination (1477–1647) it became very prosperous, and superseded Dôle as the real capital of Franche-Comté. During the 17th century it was attacked several times by the French, to whom it was definitely ceded by the peace of Nijmwegen in 1678. It was then fortified by Vauban. Until 1789 it was the seat of a *parlement*. In 1814 it was invested and bombarded by the Austrians, and was important during the Franco-German War of 1870–71.

The river is bordered by fine quays and by the shady promenades which are a feature of Besançon. The cathedral of St. Jean, founded in the 4th century, has often undergone reconstruction; it resembles the churches of the Rhine basin and also the cathedral of Nevers in having apses at both ends. The main portions date from the 11th, 12th and 13th centuries; the eastern apses and the tower are 18th century work. In the interior there are a "Madonna and Child" of Fra Bartolommeo and a number of other mediaeval and modern works of art. The Archbishop's palace adjoining the cathedral is 18th century. The Palais Granvelle, in the heart of the town, was built from 1534 to 1540 by Nicolas Perrenot de Granvella, chancellor of Charles V. Built round an arcaded courtyard, it is occupied by the learned societies of the town. The hôtel de ville, like much of the town, dates from the 16th century. The law court preserves a Renaissance façade and a fine 18th century audience hall. A 15th century round tower and the 16th century Porte Rivotte are relics of fortifications. The Roman remains include a triumphal arch (the Porte Noire, partly rebuilt in 1820) decorated with bas-reliefs, considered to have been built in commemoration of the victories of Marcus Aurelius in 167; remains of a theatre, or an amphitheatre, of an aqueduct, and of a former Roman bridge, forming part of the modern bridge. Besançon has statues of Victor Hugo (1802–1885), and of the Marquis de Jouffroy d'Abbans (1751–1832), inventor of steam navigation.

It is the seat of an archbishopric, a court of appeal and a court of assize, centre of an *académie* (educational division), seat of a prefect and headquarters of the VII. army corps. It has tribunals of first instance and of commerce, a chamber of commerce, a board of trade-arbitrators and an exchange. The university (founded in 1287) has faculties of science and letters, a preparatory school of medicine and pharmacy and a free faculty of law. The library contains over 130,000 volumes, and the city has good collections of pictures, antiquities and natural history. The chief industry of Besançon is watch- and clock-making, introduced from the district of Neuchâtel in the 18th century. The artificial silk industry is also important, the wood pulp from the Jura forests being a factor in the early location of the industry here.

BESANT, ANNIE (1847–1933), British theosophist, was born in London, Oct. 1, 1847, the daughter of William Page Wood. She married, in 1867, the Rev. Frank Besant (d. 1917), afterwards vicar of Sibsey, Lincs., but obtained a separation from her husband in 1873. She had become an ardent Freethinker, and from 1874 to 1888 she worked in close association with Charles Bradlaugh, both in politics and in freethought propaganda, as a lecturer and a writer of pamphlets over the signature of "Ajax." Her increasing tendency towards Socialism of the more revolutionary type occasioned a divergence between them after 1885, which was completed in 1889 by her adhesion to the Theosophical Society. She became a devoted pupil of Mme. Blavatsky, and threw in her lot very largely with India. She founded the Central Hindu college at Benares, and was elected president of the Theosophical Society in 1907; she established the Indian Home Rule League and became its president in 1916, and in 1917 she was president of the Indian National Congress, but later dissociated herself from the extreme wing of the Nationalist Party. For a short time in 1917 she was interned at a hill station by Lord Pentland. While the Montague reforms were in preparation Mrs. Besant at first supported the Government, but, after a brief spell of constitutionalism, she again advocated with astounding energy the extreme nationalist position. Meanwhile the strange episode of her protégé, J. Krishnamurti, who was to be the new world teacher, had begun in 1910, and the new Order of the Star was founded. In 1926–27 Mrs. Besant travelled widely in England and America with Krishnamurti, as the new Messiah, urging his claims much more vehemently than he wished. Returning to India she was involved in a lawsuit with the father of the boy, and she withdrew much of what she had said. Her gifts of oratory and organization had carried her to the position, unique for an Englishwoman, of leader in a Hindu political movement. In addition to her numerous freethought pamphlets and works on theosophy, she published an *Autobiography* (1893), and *The Religious Problem in India* (1902). She died Sept. 20, 1933.

BESANT, SIR WALTER (1836–1901), English author, was born at Portsmouth on Aug. 14 1836. He was educated at King's college, London, and Christ's college, Cambridge, graduated in 1859 as 18th wrangler, and from 1861 to 1867 was senior professor of the Royal college, Mauritius. From 1868 to 1885 he

acted as secretary to the Palestine Exploration Fund. In 1884 he was mainly instrumental in establishing the Society of Authors, a trade-union of writers designed for the protection of literary property, which has rendered great assistance to inexperienced authors by explaining the principles of literary profit. Of this society he was chairman from its foundation in 1884 till 1892. He married Mary, daughter of Mr. Eustace Foster-Barham, of Bridgwater, and was knighted in 1895. He died at Hampstead on June 9, 1901. Besant's first stories were written in collaboration with James Rice. Two at least of these, *The Golden Butterfly* (1871), and *Ready-Money Mortiboy* (1872), are among the most vigorous and most characteristic of his works. After Rice's death Sir Walter wrote *All Sorts and Conditions of Men* (1882), a stirring story of East End life in London, which set on foot the movement for the establishment of the People's Palace in the Mile End road. His sympathy with the poor was also shown in another attempt to stir public opinion, this time against the evils of the sweating system, in *The Children of Gibeon* (1886).

Other popular novels by him were *Dorothy Forster* (1884), *Armorel of Lyonesse* (1890), and *Beyond the Dreams of Avarice* (1895). He also wrote critical and biographical works, including *The French Humorists* (1873), *Rabelais* (1879); and lives of Coligny, Whittington, Captain Cook and Richard Jefferies. Besant undertook a series of important historical and archaeological volumes, dealing with the associations and development of the various districts of London, of which the most important was *A Survey of London,* unfortunately left unfinished, which was intended to do for modern London what Stow did for the Elizabethan city. Other books on *London* (1892), *Westminster* (1895) and *South London* (1899) showed that his mind was full of his subject. The improved conditions of the literary career in England are largely due to his efforts.

BIBLIOGRAPHY.—*See* also *Autobiography of Sir Walter Besant* (1902), with a prefatory note by S. S. Sprigge; the preface to the library edition (1887) of *Ready-Money Mortiboy* contains a history of the literary partnership of Besant and Rice.

BESELER, HANS VON (1850–1921), Prussian general and governor of Poland during the German occupation, was born on April 27, 1850, at Greifswald, and entered the army. He was on the retired list at the outbreak of World War I, but was recalled. He conducted the siege of Antwerp, which he occupied on Oct. 9, 1914. In 1915, he was employed on the eastern front, where he took Novogeorgievsk on Aug. 19. From Aug. 27, 1915, to Nov. 1918 he was German governor-general of Poland at Warsaw. He endeavoured, with diminishing success, to organize a form of Polish national government and representation under German auspices and to form a Polish army under German control, until the Armistice put an end to his schemes. He died near Potsdam on Dec. 22, 1921.

BESENVAL DE BRONSTATT, PIERRE VICTOR, BARON DE (1722–1791), French soldier, was born at Soleure. He became commander of the Swiss Guards in succession to his father. When the Revolution began Besenval was given command of the troops which the king had concentrated on Paris in July 1789—a movement which led to the taking of the Bastille on July 14. Besenval was inactive in the crisis, was arrested, tried by the tribunal of the Châtelet, but acquitted. He died in Paris on June 3, 1791. The authenticity of the rather scandalous *Mémoires* (ed. T. A. de Ségur, 4 vols. 1805–07) attributed to him is disputed.

BESKOW, BERNHARD VON, BARON (1796–1868), Swedish dramatist and historian, son of a Stockholm merchant, was born on April 19, 1796. He held high appointments at court and was, from 1834 onwards, perpetual secretary of the Swedish academy, using his great influence with tact and generosity. His poetry is over-decorated, and his plays are grandiose historical poems in dramatic form. Among them are "Erik XIV.," 2 parts (1826); and four pieces collected (1836–38) as *Dramatiska Studier,* the most famous of which is the tragedy of "Thorkel Knutsson." His works include many academical memoirs, volumes of poems, philosophy, and a valuable historical study, *Om Gustav den Tredje såsom konung och menniska* (5 vols. 1860–69, "Gustavus III. as king and man"), printed in the transactions of the Swedish academy (vols. 32, 34, 37, 42, 44). He died on Oct. 17, 1868.

See also a notice by C. D. af Wirsen in his *Lefnadsteckningar* (Stockholm, 1901).

BESNARD, PAUL ALBERT (1849–1934), French painter, born in Paris on June 2, 1849, studied at the Ecole des Beaux-Arts, winning the Prix de Rome in 1874. He was a pupil of J. Brémond and of Cabanel. He lived in England from 1879 to 1883, and was a friend of Legros, from whom he learned the art of etching. He devoted himself to the study of colour and light as conceived by the impressionists, and he applied their new vision of light and atmosphere to ideological and decorative works on a large scale, such as his frescoes at the Sorbonne, the École de Pharmacie, the Salle des Sciences at the Hôtel de Ville, the mairie of the first arrondissement, the Musée des Arts Decoratifs, the Comédie Française, and the chapel of Berck hospital, for which he painted 12 "Stations of the Cross." He travelled to Algiers, Morocco and India, bringing back sketches sparkling with light and colour. From 1913 to 1919 he was director of the Académie de France in Rome, and on his return became director of the École Nationale des Beaux-Arts, and president of the Salon des Tuileries, which he helped to found in 1923. A great virtuoso, he achieved brilliant successes alike in water-colour, pastel, oil and etching; also in portraiture, in landscape and in decoration. A good example of his work is his portrait of Mme. Réjane; and his analysis of light can be studied in his picture "Femme qui se chauffe" at the Luxembourg in Paris.

BIBLIOGRAPHY.—E. Bricon, *Psychologie d'Art: les Maitres de la fin du XIX. Siècle, M. Besnard, etc.* (1900); G. Lecomte, "Albert Besnard," *Gazette des Beaux-Arts* (vol. xxxiii., Jan. and Feb. 1905); Camille Mauclair, *Albert Besnard, l'homme et l'oeuvre* (1914); Delteil Loys, *Le peintre Graveur Illustré,* "Albert Besnard" (vol. xxx., 1926).

BESOM, a bundle of rods or twigs (Old Eng. *besema,* a rod) used for sweeping; a stiff broom.

BESSARABIA, a province of Rumania extending from Poland on the north, about lat. 48·3° N., to the Black sea, and lying between the Pruth and Dniester rivers. The latter divided it from the Ukrainian and Moldavian autonomous republics of the Russian federation, while the former separated it from the Rumanian province of Moldavia. After the Russian revolution of Oct. 1917, the National Council of Bessarabia declared a Moldavian Democratic republic, forming part of the R.S.F.S.R., but later Bessarabia first declared herself entirely independent and in Nov. 1918 agreed to unconditional incorporation with Rumania. The Treaty of Paris Oct. 28, 1920, signed by the British empire, France, Italy and Japan recognized this incorporation, but the United States of America stood aside from the treaty on the ground that there was no representative of the Russian government to state the Russian side of the case. Russia continued to regard Bessarabia as "occupied territory," and no settlement was reached between the Russian and Rumanian delegates when they met in Genoa in 1922 and in Vienna in 1924. The situation was disastrous to the commerce of both countries, but was particularly so for the province of Bessarabia, since the Dniester was formerly the main artery for Bessarabian grain and wool. Three Bessarabian railways were arranged to converge on Odessa, while the fourth linked with Akkerman (Cetatea Alba) and thence by sea with Odessa. The latter town formed the natural outlet for Bessarabian cereals, fruit and wine, which found a ready market in Russia, but which were less easily disposed of to agricultural Rumania. On June 28, 1940, Bessarabia was ceded to the soviet union and constituted on Aug. 2, 1940 the Moldavian S.S. Republic, but Rumanian armies reoccupied the province in the summer of 1941, after the German attack on the U.S.S.R.

Bessarabia consists of (1) the black-earth agricultural region of the Volhynian-Podolian plateau (850 to 1,150 ft.) in the north, (2) the central area, deeply dissected by north-west to south-east tributaries of the Dniester, and shorter north-east to south-west tributaries of the Pruth. The soil is mainly *podzol,* with marshy soils in the valleys, especially that of the Reut: this region is thickly forested with beech, oak and mountain ash, and with birch in places. (3) the Budjak steppe area, south of the line of old Roman earthworks which extend from Leovo, the limit of

navigation on the Pruth river, almost to the junction of the Botna river with the Dniester river. The steppe merges into the sandy soils, saltmarshes and lagoons of the coastal area. The climate is extreme, with a rainfall of about 25 in. per annum. The average January temperature at Kishinev is 27° F.; July, 72° F.

Agriculture is the main occupation, with maize and wheat as the chief grain crops. Fruit growing is widespread, the Bessarabian plum being particularly fine. Except in the north, vineyards are widespread, though the local wine is sour and liable to go bad during transport. Tobacco, barley, flax, watermelons, saffron and madder are grown. In the steppe pasture-lands sheep, cattle, horses, goats, pigs and buffaloes are reared, though their numbers greatly diminished after 1915, when there were nearly 3,000,000 head in the country. Wool and woollen cloth are exported, and there are small manufactures of leather, soap and iron goods. Fishing is productive near the Shabalat and Dniester limans. Marble is quarried; and salt and saltpetre, worked.

The economic life of Bessarabia was much disturbed by the 1914–21 war conditions, and by the continued severance of trade relations with Russia. Administrative changes meant radical alterations in the life of the people; new currency had to be adopted; the old *zemstvos* and *volosts* (district and sub-district councils) were replaced by prefects and sub-prefects appointed from Bucharest; there was expropriation of all private estates over 247 ac. in extent. Communications, formerly poor, were still worse, partly because the railways were of a different gauge from those in the rest of Rumania and partly because they did not link with Rumanian ports. This situation was further aggravated by the devastations of World War II.

The area of Bessarabia is 44,420 sq.km. and its population in 1930 was 2,865,506. Of these Moldavians form about 50%, and Ukrainians about 20%, and there are also Jews, Russians, Bulgarians and Germans; colonies of the latter settled in the Budjak steppe to the west of Akkerman in 1814. Nomad gypsies (*tsigane*) also inhabit the steppe. The chief towns are Kishinev (Chisinau), the capital, on the Byk river, Hotin, Bender and Akerman (Cetatea Alba) three river ports on the Dniester; Ismail (Tuchkof), Reni and Kagul, river ports on the Pruth. Balti (Byeltsi) on the Reut, is also of some importance.

The original inhabitants were Cimmerians, and after them came Scythians. In early Christian times Bessarabia, a key to the Byzantine empire, was often invaded. In the 2nd century it was occupied by the Getae, a Thracian tribe, whom the Roman emperor Trajan conquered in 106; he then incorporated the region in the province of Dacia. In the following century the Goths poured into this quarter of the empire, and in the 5th century it was overrun by Huns, Avars and Bulgarians. Then followed in the 7th century the Bessi, a Thracian tribe, who gave their name to the region, and in the 9th the Ugrians, the ancestors of the present Magyars, the country being then known as Atel-kuzu. The Ugrians were forced farther west by the Turkish tribe of the Petchenegs in the 10th century, and these were succeeded in the 11th century by the Kumans (Comani) or Polovtsians, a kindred Turkish stock or federation. In the 13th century Bessarabia was overrun by Mongols under the leadership of Batu, grandson of Jenghiz Khan. In this century also the Genoese founded trading factories on the banks of the Dniester. In 1367 Bessarabia was subdued and annexed by the ruling prince of Moldavia. During the 16th century it was in possession alternately of Turks and Nogais or Crimean Tatars. From the 18th century it was disputed by Turks and Russians, the latter capturing it five times between 1711 and 1812. In the latter year it was annexed to Russia, and in 1829 its frontier was pushed southward so as to include the delta of the Danube. After the Crimean War, however, Russia ceded to Moldavia not only this later addition, but also certain districts in the south of the existing government, amounting altogether to an area of 4,250 sq.mi., and a pop. of 180,000. By the treaty of Berlin (1878) Russia recovered 3,580 sq.mi. with pop. 127,000.

See *The Rumanian Occupation in Bessarabia. Documents* (Paris, 1919); A. Babel, *La Bessarabie* (1927); O. G. Lecca, *Formation et Développement du Pays et des Etats Roumains* (1922); Henry Baerlein, *Bessarabia and Beyond* (London, 1935). (R. M. F.; X.)

HISTORY

The history of Bessarabia goes back to the early Christian era, when it was already a bulwark of Christian Europe against the barbarians. Traces of the walls erected by the Emperor Trajan to protect the old Roman colony of Dacia still exist in the southern extremity of the province. Later, fortified towns such as Hotin (Khotin), Soroca, Tighina (Bender) and Cetatea Albă (the Turkish Akerman) were built and maintained under alternating Rumanian princes and Turkish suzerains until, in 1812, Russia, in pursuance of the policy initiated by Catherine II. of extending Russian territory eastward at the expense of the Turkish empire, and to obtain command of the mouth of the Danube, annexed the province now known as Bessarabia and, under the Treaty of Bucharest, left the Turks in possession of that portion of the Principality of Moldavia to the west of the Pruth.

Annexation by Russia.—Although the annexation was styled by the Russians "the delivery of the Moldavians from the pagan yoke of Turkey" (*see* Casso's *Russia to the Danube,* Moscow, 1913) it is significant that, fearing the introduction of serfdom, an exodus of the peasantry commenced forthwith, only to be checked by drastic measures on the part of the Turks who, declaring the Russian portion of the province to be contaminated by the plague, put to the sword all who crossed the Pruth.

Thus, for over a century the province continued under Russian domination (except three southern districts restored to Rumania in 1856 after the Crimean War, which, however, were taken back by Russia in 1877 in exchange for the Dobruja), becoming slowly Russianized and more or less satisfied with its lot. It must, however, be remembered that the Russian population in the province was small, consisting solely of landed proprietors and the officials and military required to administer and garrison the province. For the rest, the population consisted—as to-day—of compact masses of Moldavians and scattered colonies of Bulgars, Tartars, Ruthenians and Germans. The towns were populated with Jews, who by Russian edict were forced to live in the provinces and forbidden residence in the capital and larger towns of Russia.

Union with Rumania.—With the fall of the Imperial régime in 1917 and the establishment of the Soviet republics, the leading Bessarabians declared for autonomy, and a National Council (Sfatul Tărei) was formed. Fearing, however, that the wave of terrorism following the collapse of the Russian army in the field would swamp the province, appeal was made to Rumania for military assistance in guarding the railways and keeping order. This was forthcoming conditionally on eventual union with Rumania, and on Jan. 24, 1918, as an initial step to this end, the National Bessarabian Council declared the province to be the "Independent Moldavian Republic" and renounced all connection with the Soviet Union. On Nov. 27, 1918, "Sfatul Tărei" held its last session and decided that Bessarabia should, voluntarily and unconditionally, be united to Rumania. Elections took place in 1919 and Bessarabian representatives were sent for the first time to the central National Assembly at Bucharest.

The union of the province was not recognized by the Allied Powers until March 1920. On Oct. 28 of that year a treaty was executed and signed by England, France, Italy, Rumania and Japan, giving concrete form to this recognition. The treaty was soon ratified by France and England, and on March 14, 1927, by Italy.

The U.S.S.R. never acknowledged the union of Bessarabia with Rumania, maintaining the province to be an integral part of the old imperial territory under soviet rule, and holding invalid the act of "Sfatul Tărei" in voting for union with Rumania.

Rumania, however, asserted that the action of the Bessarabians who, simultaneously with the Estonians, Lettonians and Ukrainians, adopted the principle of self-determination, could in no way be described as a Bolshevik movement but as a Moldavian national one, and that their choice of union with Rumania should consequently be respected.

Administration.—With the passing of the Russian régime in 1917, the system of administration in the province underwent change. The *zemstvos* (district councils) were abolished and prefects set up in their places. There were nine administrative districts

in the province, each in the charge of a prefect, whose powers were limited and who was responsible to the central authority at Bucharest.

A state of siege existed in the province after the union and a strong garrison was maintained, especially along the Dniester; military rule also prevailed during the Russian occupation of 1940–41 and after the Rumanian reconquest.

Economics.—By agrarian reform (a measure which, dictated by the circumstances of the moment, Rumania claimed to have saved the province from Bolshevism) land was given to the peasants, who required increased facilities, however, for its fuller development.

Money was limited and credit practically non-existent, so that the merchants, whose existence at least would be assured if the peasants' purchasing potentialities were greater, were often in difficult circumstances.

The government, however, strove to alleviate the situation by the institution of popular banks, granting loans at low interest, and by other means. By the fall of the imperial regime and the institution of Bolshevism in Russia, Bessarabia lost her markets for her wines, cereals, oil seed, etc.

Rumania, itself an agricultural country, has little need of Bessarabian products, which would, in any case, prove difficult and costly to transport owing to the lack of railway communications between the province and the old kingdom.

Railways.—A big program of railway construction provided for increased links with Bessarabia and a re-orientation of lines toward Bucharest and the Danube ports, as well as connecting links with Transylvania through the Bukovina.

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(N. L. F.; X.)

BESSARION, JOHANNES or **BASILIUS** (*c.* 1395–1472), titular patriarch of Constantinople, and an illustrious Greek scholar who contributed to the revival of letters in the 15th century, was born at Trebizond, the year of his birth being variously given as 1389, 1395, or 1403. He was educated at Constantinople, and under Gemistus Pletho the Neo-Platonist (1423). On entering the order of St. Basil, he took the name of Bessarion. In 1437 he was made archbishop of Nicaea by John VII. Palaeologus, whom he accompanied to Italy in order to bring about a union between the Greek and Latin churches, with the object of obtaining help against the Turks. At the councils held in Ferrara and Florence Bessarion supported the Roman Church, and gained the favour of Pope Eugenius IV., who invested him with the rank of cardinal. From that time he resided in Italy, doing much, by his patronage of scholars, by his collection of books and manuscripts, and by his writing to spread abroad the new learning. In 1463 he received the title of Latin patriarch of Constantinople. For five years (1450–55) he was legate at Bologna, and he was engaged on embassies to foreign princes, among others to Louis XI. of France in 1471. He died on Nov. 19, 1472, at Ravenna. Bessarion was one of the most learned scholars of his time. Besides his translations of Aristotle's *Metaphysics* and Xenophon's *Memorabilia,* his most important work is a treatise against George of Trebizond, a violent Aristotelian, entitled *In Calumniatorem Platonis.* Bessarion rather strives after a reconciliation of the two philosophies. His work, by opening up the relations of Platonism to religion, contributed to the extension of speculative thought in theology. His library, which contained a large collection of Greek mss. was presented by him to the senate of Venice, and formed the nucleus of the library of St. Mark.

See A. M. Bandini, *De Vita et Rebus Gestis Bessarionis* (1777); H. Vast, *Le Cardinal Bessarion* (1878); E. Legrand, *Bibliographie Hellénique* (1885); G. Voigt, *Die Wiederbelebung des klassischen Altertums,* ii. (1893); R. Rocholl, *Bessarion, Studie zur Gesch. der Renaissance* (Leipzig, 1904); L. Mohler, *Kardinal Bessarion* (Paderborn, 1923); Von Bessarion at the councils of Ferrara and Florence, A. Sadov, *Bessarion de Nicée* (1883); on his philosophy, monograph by A. Kandelos (in Greek: Athens, 1888). Most of his works are in Migne, *Patrologia Graeca,* clxi.

BESSEL, FRIEDRICH WILHELM (1784–1846), German astronomer, was born at Minden July 22, 1784. In 1804 he calculated the orbit of Halley's comet from observations made in 1607 by Thomas Harriot, and communicated his results to H. W. M. Olbers, who procured their publication (*Monatliche Correspondenz,* x. 425), and recommended him in 1805 for the post of assistant in J. H. Schröter's observatory at Lilienthal. A masterly investigation of the comet of 1807 (Königsberg, 1810) led the king of Prussia to summon him, in 1810, to superintend the erection of a new observatory at Königsberg, of which he acted as director from its completion in 1813 until his death. In this capacity he inaugurated the modern era of practical astronomy. For the purpose of improving knowledge of star-places he reduced James Bradley's Greenwich observations, and derived from them an invaluable catalogue of 3,222 stars, published in the volume named *Fundamenta Astronomiae* (1818). In *Tabulae Regiomontanae* (1830) he definitely established the uniform system of reduction still in use. During the years 1821–33 he observed all stars to the ninth magnitude in zones extending from −15° to +45° dec., and thus raised the number of those accurately determined to about 50,000. He corrected the length of the seconds' pendulum in 1826, in a discussion re-published by H. Bruns in 1889; measured an arc of the meridian in East Prussia in 1831–32; and deduced for the earth in 1841 an ellipticity of $\frac{1}{299}$. His ascertainment in 1838 (*Astronomische Nachrichten,* Nos. 365–366) of a parallax of 0″·31 for 61 Cygni was the first authentic result of the kind published. He announced in 1844 the binary character of Sirius and Procyon from their disturbed proper motions; and was preparing to attack the problem solved later by the discovery of Neptune, when he died at Königsberg March 17, 1846. Modern astronomy of precision is essentially Bessel's creation. Apart from the large scope of his activity, he introduced the effective use of the heliometer, the correction for personal equation (in 1823), and the systematic investigation of instrumental errors. He issued 21 volumes of *Astronomische Beobachtungen auf der Sternwarte zu Königsberg* (1815–44), and a list of his writings drawn up by A. L. Busch appeared in vol. 24 of the same series. Especial attention should be directed to his *Astronomische Untersuchungen* (1841–42), *Populäre Vorlesungen* (1848), edited by H. C. Schumacher, and to the important collection entitled *Abhandlungen* (1875–82), issued by R. Engelmann at Leipzig. His minor treatises numbered over 350. In pure mathematics he enlarged the resources of analysis by the invention of Bessel's Functions. He made some preliminary use of these expressions in 1817, in a paper on Kepler's Problem (*Transactions Berlin Academy,* 1816–1817, p. 49), and fully developed them seven years later, for the purposes of a research into planetary perturbations (*ibid.* 1824, pp. 1–52).

See also H. Durège, *Bessels Leben und Wirken* (Zürich, 1861); J. F. Encke, *Gedächtnissrede auf Bessel* (1846); C. T. Anger, *Erinnerung an Bessels Leben und Wirken* (Danzig, 1845); *Astronomische Nachrichten,* xxiv. 49, 331 (1846); *Monthly Notices Roy. Astr. Society,* vii. 199 (1847); *Allgemeine deutsche Biographie,* ii. 558–567.

BESSEL FUNCTION, in mathematics, a solution of Bessel's differential equation

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-n^2)y=0.$$

The designation *cylinder function,* also used by many writers, has its source in the use of these functions to express solutions of such physical problems as the flow of heat or of electricity in a solid circular cylinder. They first appear in this connection in the work of J. B. J. Fourier (*La Théorie analytique de la Chaleur,* 1822, and a memoir of 1811, published in 1824). They had, however, been previously employed in other physical and astronomical problems. In 1732 Daniel Bernoulli investigated the transverse oscillations of a heavy chain suspended at one end, and expressed the horizontal displacement in terms of a Bessel function. Leonhard Euler found, in 1764, that these functions could be used to evaluate the displacement of a point on a vibrating stretched membrane. Their first use in celestial mechanics is in Lagrange's memoir of 1770 on Kepler's Problem concerning the motion of a planet about the sun. They were also employed by other writers

of the earlier classical period of mathematics (Poisson, 1823, Laplace, *Mécanique Céleste,* 1827). F. W. Bessel, after whom these functions are named, made a systematic investigation of their properties in his memoir of 1824 on Kepler's Problem, following his earlier paper of 1817 on the same subject.

The importance of Bessel functions in mathematical physics and astronomy is indicated by the foregoing examples of their applications, to which we may add more modern solutions of problems in wave-theory, elasticity, hydrodynamics, and optics. The bibliography of G. N. Watson (*A Treatise on the Theory of Bessel Functions,* Cambridge University Press, 1944) contains a list of over seven hundred papers on these functions and their applications.

In modern treatises Bessel functions are considered as depending both upon x and n, which may have complex as well as real values. The value of n is called the *order* of the function. Three *kinds* are distinguished. The *Bessel function of the first kind,* designated by $J_n(x)$, is given by the infinite series

$$\frac{x^n}{2^n\Gamma(n+1)}\left[1-\frac{x^2}{2\cdot(2n+2)}+\frac{x^4}{2\cdot4\cdot(2n+2)(2n+4)}-\cdots\right],$$

where $\Gamma(n+1)$ is the gamma function, which is equal to the product of all integers from 1 to n when n is a positive integer. Functions of the *second kind,* designated by $Y_n(x)$ and $K_n(x)$, are variously defined, but are expressible as linear combination of functions $J_n(x)$ and $J_{-n}(x)$, or limits of such combinations while functions of the third kind, $H_n(x)$, are of the form $J_n(x) \pm\sqrt{-1}.Y_n(x)$.

These functions are expressible as limiting cases of spherical harmonics. They also appear as coefficients in series expansions of certain elementary functions. Extensive studies have been made of the problem of expressing an arbitrary function in terms of infinite series or of definite integrals in terms of Bessel functions. In this connection it has been necessary to determine the zeros of Bessel functions. Asymptotic expansions have also furnished an extensive field of investigation.

Many tables of these functions have been published. Among the best and most extensive are those of Watson in the work already quoted.

See, in addition to the Treatise of Watson, *Encyclopädie der math. Wissenschaften* (II.,A,10,VIII.), and the corresponding section of the French *Encyclopédie;* A. Gray and G. B. Mathews, *A Treatise on Bessel's Functions* (1895); N. Nielsen, *Handbuch der Theorie der Cylinderfunktionen* (Leipzig, 1904). (D. R. C.)

BESSEMER, SIR HENRY (1813–1898), English engineer, was born on Jan. 19, 1813, at Charlton, in Hertfordshire. Throughout his life he was a prolific inventor, but his name is chiefly known in connection with the Bessemer process for the manufacture of steel. It has been of enormous industrial importance, since it effected a great cheapening in the price of steel. Bessemer's attention was drawn to the problem of steel manufacture in the course of an attempt to improve the construction of guns. His process was the decarbonization of cast iron by forcing a blast of air through the mass of metal when in the molten condition. Thus he was able to convert melted cast iron into malleable iron in a perfectly fluid state. The first public announcement of the process was made at the Cheltenham meeting of the British Association in 1856. He erected steelworks in Sheffield to develop the process. At the outset he had found great difficulty in making steel by his process—in his first licenses to the trade iron alone was mentioned. Experiments he made with South Wales iron were failures because the product was devoid of malleability. Robert Mushet showed that the addition of a certain quantity of spiegeleisen (*see* IRON AND STEEL) had the effect of removing the difficulties. The value of Mushet's procedure was shown by its general adoption in conjunction with the Bessemer method of conversion but Bessemer proved it not essential by showing, in 1865, samples of steel made by his own process. Bessemer became F.R.S., and received a knighthood in 1879. He died at Denmark hill, London, on March 15, 1898.

See an *Autobiography* with concluding chapter by Sir Henry's son, H. Bessemer (1924); R. F. Mushet, The *Bessemer-Mushet process* (1883).

BESSEMER, a city of Jefferson county, Ala., U.S.A., 11 mi. S.W. of Birmingham, in the centre of the iron, coal and limestone region of the state. It is served by the Atlanta, Birmingham and Atlantic, the Alabama Great Southern, the Frisco, the Illinois Central, the Louisville and Nashville, the Seaboard Air Line and the Southern railways. The population in 1920 was 18,674, of whom considerably more than half (10,561) were Negroes; in 1930 it was 20,721 and in 1940, 22,826 by the federal census. It is a part of the Birmingham workshop and has large iron and steel industries and coal-mining operations, and also manufactures fertilizers, brick, coal-tar derivatives and high explosives. The annual industrial pay roll approximates $15,000,000. Bessemer was laid out in 1887, incorporated in 1888, and had a population of 4,544 at the 1890 census. It was named after Sir Henry Bessemer, inventor of a steel-making process.

BESSEMER, a city near the northwest corner of the upper peninsula of Michigan, U.S.A., about 15 mi. from Lake Superior; the county seat of Gogebic county, and the centre of important mining and lumbering operations. There are several iron mines in the immediate vicinity. It is near federal highway 2, and is served by the Chicago and North Western, and the Soo railroads. The population in 1930 was 4,035 and in 1940 was 4,080 by the federal census.

BESSEMER STEEL. In 1856, in a paper before the British Association, Bessemer outlined the method associated with his name which, with modifications in detail, gave to the world the power to make steel cheaply. After several revisions in the design of the blowing vessel, the present shape was determined as the most satisfactory and a works was established in Sheffield in 1860 to operate the process. Almost concurrent with Bessemer's experiments trials on similar lines were being made by William Kelly in the United States. Kelly's efforts were never carried to a commercial stage, although he was adjudged to have certain rights under the American patent laws. A settlement was made, however, between Bessemer and Kelly under which the latter retired and the claims of the English inventor were in future unchallenged. The application of the process spread rapidly both in Great Britain and abroad, but the later development of the Open Hearth method of steel manufacture checked the growth of the Bessemer process. Whilst the output of Bessemer steel especially on the Continent, for reasons which will be indicated later, is still very large, the quantity tends to decline in relation to the amount made in Open Hearth furnaces.

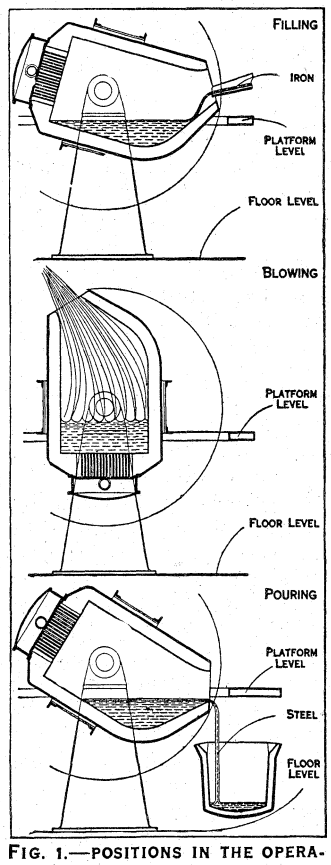

FIG. 1.—POSITIONS IN THE OPERATION OF A BESSEMER CONVERTER

Theory of Process.—Pig-iron contains a number of constituents in addition to iron. These include carbon, silicon, sulphur, phosphorus and manganese. Steel contains similar constituents, but in different proportions. Steel making therefore consists in eliminating, or adding, the necessary constituents to pig-iron under conditions which enable the ultimate result to be controlled with certainty. This is an important point since the character of steel alters quickly with a relatively small difference in its constituents.

All the elements named, including iron, have a strong affinity for oxygen with the exception of sulphur and phosphorus, which are not affected by it. Further, the reactions of iron, carbon,

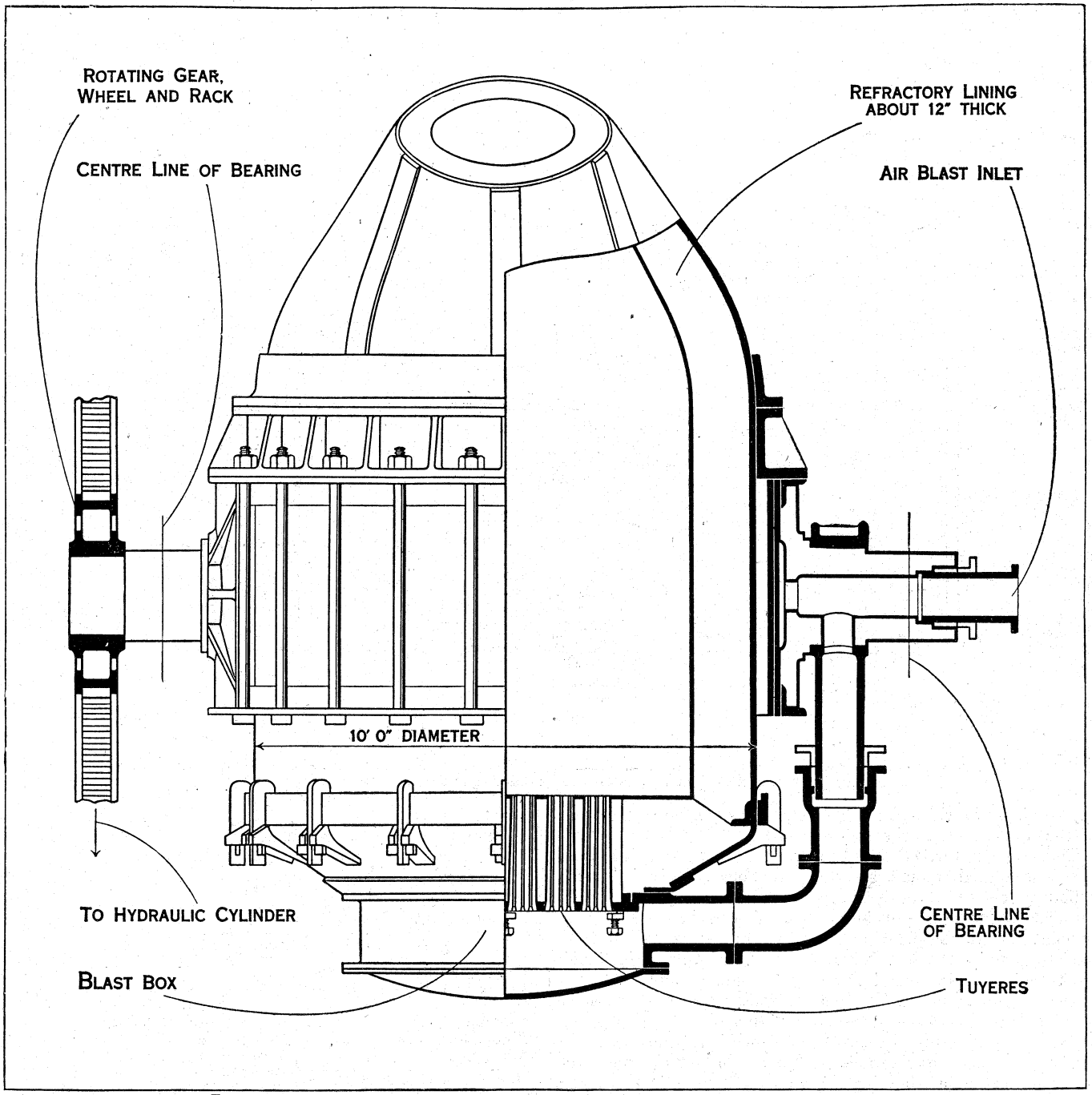

FIG. 2.—OPERATING POSITION FOR BESSEMER CONVERTER, FILLING, BLOWING AND POURING

silicon and manganese with oxygen are each heat producing. The essential principle of the Bessemer process consists of blowing air under pressure through a body of molten pig-iron thus oxidizing rapidly by atmospheric oxygen a portion of the iron, practically all the silicon and manganese and, finally, the carbon. The heat generated is sufficient to maintain the metal in a liquid state.

At the end of the blow the vessel contains liquid metal consisting of iron, sulphur and phosphorus covered with a layer of slag. In order to convert the metal into steel the requisite amounts of manganese, silicon and carbon have to be added. This is done by using ferro-manganese, ferro-silicon or anthracite coal. These additions also act as deoxidizers and serve to remove any excess oxygen present in the metal after blowing.

As already indicated, sulphur and phosphorus are not affected by the process as described, and Bessemer was compelled to use pig-iron as free of these elements as possible. A large proportion of the pig-iron made, however, contains more phosphorus than is permissible in steel, and this iron was useless until Thomas and Gilchrist conceived the idea of lining the vessel with basic material, such as magnesian limestone, and adding lime to the metal while blowing. A reaction takes place between the phosphorus and the lime, forming calcium phosphate, which again makes a slag on the metal. The discovery of this Basic Bessemer process in 1878 was of the utmost importance, as it made possible the utilization of the vast resources of phosphoric iron ore in Lorraine and in America.

Description of Plant.—The principal component of a Bessemer plant is naturally the vessel or converter. This is illustrated in fig. 2 which shows a pear-shaped vessel of steel lined with a suitable refractory material, siliceous in the case of the Acid Bessemer and dolomite in the Basic Bessemer. The capacity of the vessel varies with the conditions of the plant, many of those in Great Britain being capable of holding 10 tons, whilst in the U.S.A. vessels of 25 tons capacity are frequently used. The bottom of the vessel is made easily removable, a development introduced by Holley in America. In the bottom are carried the

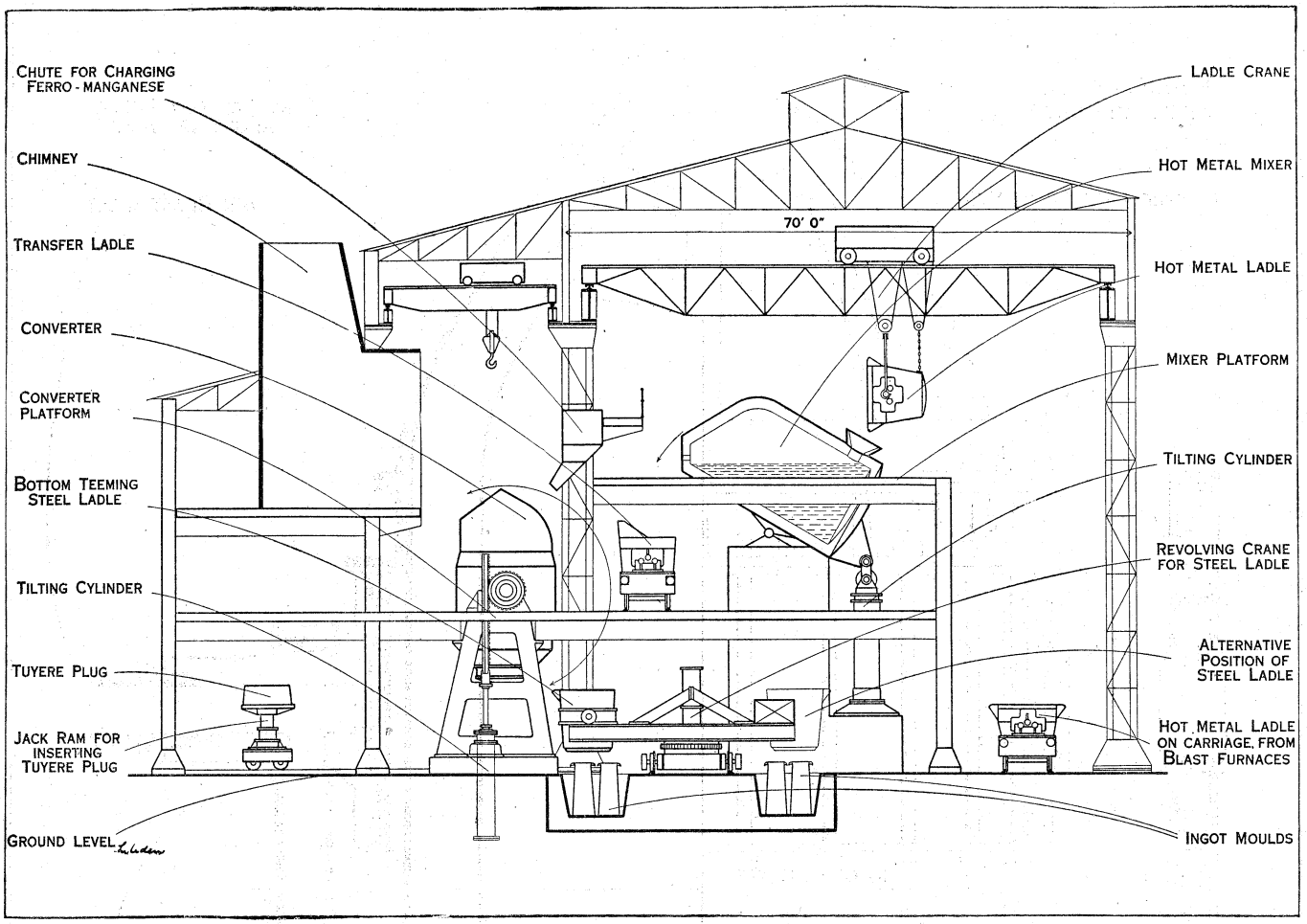

FIG. 3.—DIAGRAMMATICAL PLAN SHOWING ARRANGEMENT OF A BESSEMER STEEL PLANT

tuyere blocks in which are formed the holes for the introduction of the pressure air to the liquid metal.

The vessel is carried on substantial trunnions, and is capable of being rotated through an angle of about 200° by hydraulic cylinders operated through controlling valves arranged on a platform located at a safe distance. The pig-iron in some cases is brought cold to the plant and melted in a cupola, but in more modern practice the iron is carried in ladles, whilst still liquid, from the blast furnace and poured into a large cylindrical vessel known as a metal mixer. The mixer in some works has a capacity of 1,000 tons of metal, and therefore with such a large store any variation in the quality of the pig-iron is rectified by mixing.

The three positions shown in fig. 1 indicate how the converter is held whilst filling, blowing and pouring respectively. As the converter is rotated from the filling to the blowing position the liquid metal flows over the tuyeres, but as air at a pressure of 25 lb. per sq. in. is being blown through them this prevents any choking. The action during blowing is vigorous. A shower of sparks is ejected continuously, and after a few moments a yellowish red flame appears which persists for four or five minutes. The temperature of the metal rises and boiling commences. The flame increases in size and becomes bright, intense, and of characteristic colour. After about eight minutes the flame changes to a bluish colour, becomes almost transparent and "drops," showing that the reactions are over. The blow occupies about 20mins. in all. The converter is now turned horizontal and the ferro-manganese added. The steel is then ready and is poured into a ladle from which it is tapped into ingot moulds.

Thus a charge of pig-iron of a weight in some cases up to 25 tons can be converted into steel in about 25mins. The vessel is turned with spout downwards and completely emptied; any repairs are then done to the lining and a new charge is at once introduced. A diagrammatic arrangement of a Bessemer plant is shown in figure 3, above.

A typical example of the changes which take place during the blowing of an acid Bessemer charge is as follows:—

Constituents.	Pig-iron.	End of first stage 4 mins.	After 9 mins. blow.	End of blow.	Steel ingot.
Graphite carbon .	2·030	..	..	..	..
Combined carbon .	1·240	2·270	1·580	0·097	0·466
Silicon . . .	1·952	0·790	0·635	0·020	0·030
Sulphur . .	0·014	trace	trace	trace	trace
Phosphorus . .	0·048	0·051	0·064	0·067	0·055
Manganese . .	0·086	trace	trace	trace	0·810

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BESSEY, CHARLES EDWIN (1845–1915), American botanist, was born at Milton, O., on May 21, 1845. He graduated at Michigan Agricultural college (1869), and studied with Dr. Asa Gray at Harvard (1872–73 and 1875–76). At Iowa Agricultural college he was professor of botany (1870–84), and was acting president in 1882; at the University of Nebraska, professor of botany after 1884, acting chancellor (1888–89, 1899–1900 and 1907), and head dean after 1909. He was one of the ablest investigators and teachers of botany of his time and a pioneer in introducing present laboratory methods of teaching biology. With the publication of *Botany for High Schools and Colleges* (1880), he introduced morphology to America. This book was the first in the series of "Bessey's text-books," which set a standard for modern work. The development of various interests of the State of Nebraska was the result of his generous public interest. He was a member of many national organizations, and was elected to

almost every office to which an American botanist could aspire, culminating in the presidency of the American Association for the Advancement of Science.

He was the author of *Geography of Iowa* (1876); *Botany for High Schools and Colleges* (1880); *Essentials of Botany* (1884); *Elementary Botanical Exercises* (1892); *Phylogeny and Taxonomy of Angiosperms* (1897); *Elementary Botany* (1904); *Plant Migration Studies* (1905); *Synopsis of Plant Phyla* (1907); *Phyletic Idea in Taxonomy* (1908); and *Outlines of Plant Phyla* (1909–11–12–13). He was botanical editor of *The American Naturalist* (1880–97), of *Science* from 1897, and of *Johnson's Cyclopaedia* from 1893 until his death on Feb. 25, 1915.

For further biography see *Science,* new series, vol. xli (1915) and L. H. Pammel, *Prominent Men I Have Met,* no. 6 (1928).

BESSIÈRES, JEAN BAPTISTE, duke of Istria (1768–1813), French marshal, served for a short time in the "Constitutional Guard" of Louis XVI. and as a non-commissioned officer took part in the war against Spain. In the Army of the Eastern Pyrenees and in the Army of the Moselle he repeatedly distinguished himself for valour, and in 1796, as captain, he served in Bonaparte's Italian campaign. He accompanied Napoleon in the invasion of Styria in command of the "Guides," who formed the nucleus of the later Consular and Imperial Guard. As *chef de brigade* he next served in the Egyptian expedition. Returning to Europe with Napoleon, he was present at Marengo (1800) as second-in-command of the Consular Guard. Promoted general of division in 1802 and marshal of France in 1804, he made the most famous campaigns of the *Grande Armée* as colonel-general of the Guard Cavalry (1805, 1806, 1807). In 1805 he had received the Grand Eagle of the Legion of Honour, and in 1809 was created duke of Istria. With the outbreak of the Peninsular War, Marshal Bessières had his first opportunity of an independent command and his crushing victory over the Spaniards at Medina del Rio Seco (1808) justified Napoleon's choice. When disaster in other parts of the theatre of war called Napoleon himself to the Peninsula, Bessières continued to give the emperor the very greatest assistance in his campaign. In 1809 he was again with the *Grande Armée* in the Danube valley. At Essling his repeated and desperate charges checked the Austrians in the full tide of their success. At Wagram he had a horse killed under him. Replacing Bernadotte in the command of the Army of the North, he successfully opposed the British Walcheren expedition, and in 1811 he was back again in Spain. As Masséna's second-in-command he was present at the battle of Fuentes d'Onoro, but Napoleon who looked on him as an able commander and a true friend never detached him for very long, and in 1812 he commanded the Guard Cavalry at Borodino and in the retreat from Moscow. At the beginning of the 1813 campaign he was appointed to the command of the whole of Napoleon's cavalry. Three days after the opening of the campaign, while reconnoitring the defile of Poserna-Rippach, Bessières was killed by a musket-ball. As a commander, especially of cavalry, Bessières left a reputation excelled by very few of Napoleon's marshals, and his dauntless courage and cool judgment made him a safe leader in independent command. He was personally beloved to an extraordinary extent amongst his soldiers, and (unlike most of the French generals of the time) amongst his opponents. It is said that masses were performed for his soul by the priests of insurgent Spain, and the king of Saxony raised a monument to his memory.

His younger brother, BERTRAND, BARON BESSIÈRES (1773–1855), was a distinguished divisional leader under Napoleon. His last public act was his defense of the unfortunate Ney.

See A. Rabel, *Le Maréchal Bessières* (1903).

BESSUS, satrap of Bactria and Sogdiana under Darius III. In the battle of Gaugamela (Oct. 1, 331 B.C.) he commanded the troops of his satrapy. When Alexander pursued the Persian king on his flight to the East (summer 330 B.C.), Bessus, with some other conspirators, deposed Darius and shortly afterwards killed him. He then tried to organize a national resistance against Alexander in the eastern provinces, proclaimed himself king and took the name Artaxerxes. But he was taken prisoner in the summer of 329. Alexander sent him to Ecbatana, where he was condemned to death.

See Arrian, iii., 30, 5; iv., 7, 3. Curt. vii., 10, 10.

BEST, WILLIAM THOMAS (1826–1897), English organist, the son of a solicitor, was born at Carlisle on Aug. 13, 1826. After holding various smaller appointments he became, in 1855, organist of St. George's Hall, Liverpool, where his performances rapidly became famous throughout England. Ill-health compelled him at last to retire in 1894. He was engaged as solo organist at all the Handel festivals at the Crystal Palace, and also as organist at the Albert Hall, where he inaugurated the great organ in 1871. He died at Liverpool on May 10, 1897.

One of the greatest of modern organists who was also a fine all-round musician, his performances of Bach's organ works were particularly fine. His own compositions for the organ, chiefly comprised in the publication entitled *Organ Pieces for Church Use,* have a strong and marked individuality, typical alike of the composer, and of the style of his own organ playing.

BESTIA, the name of a family in ancient Rome, of which the following were the most distinguished:

(1.) LUCIUS CALPURNIUS BESTIA, Roman tribune of the people in 121 B.C., consul in 111. He was given the command against Jugurtha, but, having been heavily bribed, concluded a disgraceful peace. On his return to Rome he was tried and condemned. He is probably identical with the Bestia who went into exile (90) to avoid punishment under the law of Q. Varius, whereby those who had aided the Italian allies in their revolt were to be brought to trial (Appian, *Bell. Civ.* i. 37; Val. Max. viii. 6. 4). He is mentioned in a Carthaginian inscription as one of a board of three, perhaps an agricultural commission.

See Sallust, *Jugurtha;* Cicero, *Brutus,* xxxiv. 128; for the general history, A. H. J. Greenidge, *Hist. of Rome* (1904), vol. i. pp. 346 foll.

(2.) LUCIUS CALPURNIUS BESTIA, one of the Catilinarian conspirators, possibly a grandson of the above. He was tribune elect in 63, and it had been arranged that, after entering upon his office, he should accuse Cicero of responsibility for the impending war. This was to be the signal for revolution. The conspiracy, however, was put down and Bestia had to content himself with a violent attack upon Cicero at the close of his year of office. This Bestia is probably not the Lucius Calpurnius Bestia who was accused of bribery during his candidature for the praetorship in 57, and, in spite of Cicero's defence, was condemned. In 43 he joined Antony's party, apparently in hope of the consulship.

Sallust, *Catiline,* xvii. 43; Appian, *Bell. Civ.* ii. 3; Cicero *Ad. Q. Fr.* ii. 3, 6.

BESTIARY. The mediaeval bestiary combined the characteristics of a natural history text-book and Aesop's fables. It professed to describe the nature and habits of living creatures and drew from them far-fetched moral and religious lessons. Its descriptive portions were drawn largely from the *Hexameron* of Ambrose, the *Etymology* of Isidore, and the works of Rabanus Maurus, which themselves were based on the writings of Aristotle, Pliny and Solinus. In its earliest form it was known as *Physiologus,* that is, "the Naturalist," by which title it was denounced in a papal decree of *c.* 500 as written by heretics and falsely ascribed to St. Ambrose. It was also commonly attributed to St. Epiphanius (4th century). A *physiologus* seems to have been in existence as early as the 2nd century B.C., and the addition of Christian moralizations was natural in view of the many zoological metaphors found in the Bible:—"the lion of the house of Judah," "the deaf adder that stoppeth her ears," and so forth. About the beginning of the 12th century the *physiologus,* with its description of some 40 creatures, developed into the bestiary, which often described as many as 200, divided into sections under beasts, birds, reptiles and fishes, with the addition, in a few mss., of trees and stones.

The bestiary was enormously popular in the middle ages, and mss. exist in most European languages, as well as in Armenian, Ethiopic and Syriac, most belonging to the period from the 12th to the 14th century, and particularly to the first half of the 13th. A large proportion of these, beginning with a fine 10th century ms. in the Royal Library at Brussels, are illustrated, and these illustra-

tions greatly influenced contemporary art. A more or less complete bestiary is painted on two piers of the nave of the church of St. Savin-le-Mont, and another is carved round the south doorway of Alne church in Yorkshire, while isolated illustrations, painted or carved, are innumerable. Heraldry derived from this source its unicorns, yales, leopards and fire-breathing panthers; travellers, such as Jacques de Vitry, drew on the bestiaries for the wonders of the East, and preachers for their similes; while Richard de Fournival (*c.* 1250) wrote a *Bestiaire d' Amour,* in which he gave the symbolism a profane and amatory significance.

Regarded as natural history the bestiaries are puerile; the descriptions of even the common domestic animals show very little power of observation; those of the rarer creatures show infinite credulity on the part of the writers and an inventive ingenuity on the part of the artists, whose renderings of such beasts as the crocodile are splendidly free from the fetters of realism. Sirens, dragons, the mantichora or man-headed lion, and the caladrius, a bird which, being brought to the bedside of a sick man, would indicate his recovery or death by turning its head towards or away from him, were all accepted as being as real as rabbits. But they influenced art, literature and thought down to the days of Shakespeare, and we still condemn the hypocrisy of the "crocodile's tears" when it devours a man, and approve the "licking into shape" by which the bear fashions her cubs, born without form.

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BESTUZHEV-RYUMIN, ALEXIUS PETROVICH, COUNT (1693–1768), grand chancellor of Russia, the second son of Count Peter Bestuzhev, the early favourite of the empress Anne, was born at Moscow and educated abroad, with his elder brother Mikhail, at Copenhagen and Berlin. He served his apprenticeship to diplomacy by Peter the Great's orders, at the Congress of Utrecht (1712) under Prince Kurakin, and in the service of the elector of Hanover, whom he followed to London when he became George I. of England. After a short service at the court of Anne, duchess of Courland, he was sent to Copenhagen in 1721 as Russian minister. The death of Peter the Great in 1725 prevented his advancement, and it was only in 1739, at 46 years of age, that he was recalled to Russia by the favour of Biren. After Biren's fall, he was for a short time imprisoned at Schlüsselburg.

His chance came when the empress Elizabeth, immediately after her accession, appointed him vice-chancellor. For the next 20 years, during a period of exceptional difficulty, he practically controlled the foreign policy of Russia. Bestuzhev rightly recognized that the interests of France and Russia in Turkey, Poland and Sweden were diametrically opposed, and Russia could never hope to be safe from the intrigues of France in these three borderlands. It was, therefore, the basic policy of Bestuzhev to bring about a quadruple alliance between Russia, Austria, Great Britain and Saxony, to counterpoise the Franco-Prussian league. But he was on dangerous ground. The empress herself was averse from an alliance with Great Britain and Austria, whose representatives had striven to prevent her accession; and many of her personal friends, in the pay of France and Prussia, took part in innumerable conspiracies to overthrow Bestuzhev. Nevertheless, step by step, Bestuzhev, aided by his elder brother Mikhail, carried out his policy. On Dec. 11, 1742, a defensive alliance was concluded between Great Britain and Russia. Bestuzhev had previously rejected with scorn the proposals of the French government to mediate between Russia and Sweden on the basis of a territorial surrender on the part of the former, and he conducted the war so vigorously that by the end of 1742 Sweden lay at the mercy of the empress. At the peace congress of Åbo (Jan.–Aug. 1743) he insisted that the whole of Finland should be ceded to Russia, by way of completing the testament of Peter the Great. But the French party contrived to get better terms for Sweden, by appealing to the empress's fondness for the house of Holstein. The Swedes, at the desire of Elizabeth, accepted Adolphus Frederick, duke of Holstein, as their future king, and, in return, received back part of the duchy of Finland. Nor could Bestuzhev prevent the signing of a Russo-Prussian defensive alliance (March 1743); but he deprived it of all political significance by excluding from it the proposed guarantee of Frederick's Silesian conquests. Moreover, through Bestuzhev's efforts, the credit of the Prussian king (whom he rightly regarded as more dangerous than France) at the Russian court fell steadily, and the vice-chancellor prepared the way for an alliance with Austria by acceding to the treaty of Breslau (Nov. 1, 1743). A bogus conspiracy, however, got up by the Holstein faction, aided by France and Prussia, who persuaded Elizabeth that the Austrian ambassador was intriguing to replace Ivan VI. on the throne, alienated the empress from Austria for a time; and Bestuzhev's ruin was regarded as certain when, in 1743, the French agent, the marquis de La Chétardie, arrived to reinforce his other enemies. But he found a friend in need in M. L. Vorontsov, the empress's confidant, who shared his political views. Still his position was most delicate, especially when the betrothal between the grand-duke Peter and Sophia of Anhalt-Zerbst (afterwards Catherine II.) was carried through against his will, and Elizabeth of Holstein, the mother of the bride, arrived in the Prussian interest to spy upon him. Frederick II., conscious of the instability of his French ally, was now eager to contract an offensive overthrow of Bestuzhev. But Bestuzhev at last convinced the empress that Chétardie was an impudent intriguer, and on June 6, 1744, Chétardie was ordered to quit Russia within 24 hours. Five weeks later Bestuzhev was made grand chancellor (July 15). Before the end of the year Elizabeth of Holstein was also expelled from Russia, and Bestuzhev was supreme.

The attention of European diplomacy at this time was concentrated upon the king of Prussia, whose insatiable acquisitiveness disturbed all his neighbours. Bestuzhev's offer to attack Prussia if Great Britain would guarantee subsidies was rejected in 1745. Then he turned as a last resort to Austria, and on May 22, 1746, an offensive and defensive alliance was concluded between the two powers manifestly directed against Prussia. In 1747 alliances were also concluded with Denmark and the Porte, and a closer agreement was reached with England by the Treaty of St. Petersburg (Dec. 9, 1747).

Bestuzhev's triumph coincided with the peace congress of Aix-la-Chapelle, which altered the whole situation of European politics and introduced fresh combinations, the breaking away of Prussia from France and a rapprochement between England and Prussia, with the inevitable corollary of an alliance between France and the enemies of Prussia. Bestuzhev's violent political prejudices at first prevented him from properly recognizing this change. His Anglomania also misled him. His enemies, headed by his elder brother Mikhail and the vice-chancellor Vorontsov, powerless while his diplomacy was faultless, quickly took advantage of his mistakes. When, on Jan. 16, 1756, the Anglo-Prussian, and on May 2 the Franco-Austrian alliances were concluded, Vorontsov advocated the accession of Russia to the latter league, whereas Bestuzhev insisted on a subsidy treaty with Great Britain, which was ratified, against the empress's real wishes, on Feb. 1, 1756. But his influence was now on the wane. The totally unexpected Anglo-Prussian alliance had justified the arguments of his enemies that England was impossible, while his hatred of France prevented him from adopting the only alternative of an alliance with her. To prevent underground intrigues, Bestuzhev now proposed the erection of a council of ministers, to settle all important affairs, and at its first session (March 14–30) an alliance with Austria, France and Poland against Frederick II. was proposed though Bestuzhev opposed any composition with France. Elizabeth maintained that the conclusion of the Anglo-Prussian treaty nullified Russian engagements with England. He endeavoured to support his failing credit by a secret alliance with the grand-duchess Catherine, whom he hoped after the Empress's death to make regent for her son, passing over Peter, from whom

Bestuzhev expected nothing good either for himself or for Russia. The negotiations were conducted through the Pole Stanislaus Poniatowski. The accession of Russia (Dec. 31, 1756) to the anti-Prussian coalition was made over his head and the cowardice and incapacity of Bestuzhev's friend, the Russian commander-in-chief, Stephen Apraksin, after the battle of Gross-Jagersdorf (1757), was made the pretext for overthrowing the chancellor. His unwillingness to agree to the coalition was magnified into a determination to defeat it. He was deprived of the chancellorship and condemned to death, which was commuted to banishment to his estate at Gorstovo (April 1759), where he remained till the accession of Catherine II., who recalled him to court and created him a field-marshal. But he took no leading part in affairs and died on April 21, 1768, the last of his race.

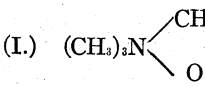
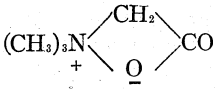
See *The Sbornik of the Russian Historical Society*, vols., 1, 3, 5, 7, 12, 22, 26, 66, 79, 80, 81, 85–86, 91–92, 96, 99, 100, 103 (1870, etc.); *Politische Correspondenz Friedrichs des Grossen*, vols. 1–21 (1879–1904); R. Nisbet Bain, *The Daughter of Peter the Great* (1899).

BESTUZHEV-RYUMIN, MIKHAIL PETROVICH, Count (1688–1760), Russian diplomatist, was educated at Berlin, and was sent by Peter the Great to represent Russia at Copenhagen in 1705. In 1720 he was appointed resident at London at a time when the English court was greatly inflamed against Peter, who was regarded as a dangerous rival in the Baltic; and Bestuzhev was summarily dismissed for protesting against the lately formed Anglo-Swedish alliance. On the conclusion of the peace of Nystad in 1721 he was sent as ambassador to the court of Stockholm. His first official act was the signing of a defensive alliance between Russia and Sweden for 12 years in 1724. He was successively transferred to Warsaw (1726) and to Berlin (1730), but returned to Stockholm in 1732. How far Bestuzhev was concerned in the murder (June 28, 1739) of the Swedish diplomatic agent Sinclair in Silesia on his journey home from Constantinople, it is difficult to say. It is certain that Bestuzhev sent information to his court of Sinclair's mission, which was supposed to be hostile to Russia, and even supplied the portrait of the envoy for recognition. The Swedish authorities are unanimous in describing Bestuzhev as the arch-plotter in this miserable affair; yet, while the active agents were banished to Siberia, Bestuzhev was not even censured. The Sinclair murder led ultimately to the Swedish-Russian War of 1741, when Bestuzhev was transferred first to Hamburg and subsequently to Hanover, where he endeavoured to conclude an alliance between Great Britain and Russia. On his return to Russia in 1743, he was made grand marshal, and married Anna, the widow of Paul Yaguzhinsky, Peter the Great's famous pupil. A few months later his wife was implicated in a false conspiracy got up by the French ambassador, the marquis de La Chétardie, to ruin the Bestuzhevs (*see* Bestuzhev-Ryumin, Alexius Petrovich), and after a public whipping, had her tongue cut out and was banished to Siberia. Thither Bestuzhev had not the manhood to follow her, but went abroad, and subsequently resumed his diplomatic career. His last and most brilliant mission was to Versailles, shortly after the conclusion of the coalition against Frederick the Great. He died in Paris on Feb. 26, 1760.

See Robert Nisbet Bain, *The Daughter of Peter the Great* (1899); Mikhail Sergyievich, *History of Russia* (Rus.), vols. xv.–xxii. (2nd ed., 1897). (R. N. B.)

BETAÏNE, a crystalline substance, called also acetobetaïne, lycine and oxyneurine, discovered in the sugar-beet by C. Scheibler in 1869. It occurs in cotton seed, in barley and wheat shoots, in vetch and in many other plants often associated with choline. It is also found in cuttlefish and crayfish and in mussels, etc.

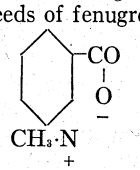
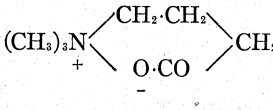
Betaïne is obtained synthetically by oxidizing choline (O. Liebreich, 1869), or by heating glycine (aminoacetic acid) with methyl iodide and alkali (P. Griess, 1875), and its hydrochloride is synthesised by heating together trimethylamine and chloroacetic acid (Liebreich). The free hydrated base, which is the methyl hydroxide of dimethylglycine, $HO{\cdot}N(CH_3)_3{\cdot}CH_2{\cdot}CO_2H$, crystallizes from alcohol in deliquescent crystals readily soluble in water. On heating it readily loses water, passing into an internal anhydride (I.), which has the characteristic betaïne structure and is the prototype of many more complex betaïnes.

(I.)  (II.) 

Formula I. represents the chemical structure hitherto ascribed to betaïne in which quinquevalent nitrogen and bivalent oxygen are united by a non-polar or co-valent linking, but it has also been suggested by Paul Pfeiffer (1922) that this anhydride formation is due to a polar or electrovalent association of the two atoms as indicated by formula II. According to this hypothesis betaïne contains two ions of opposite sign (positive quaternary ammonium ion and negative carboxylate ion) bound together by a methylene group.

The term betaïne is also employed generically to designate a large group of substances having the foregoing chemical structure. Several of these betaïnes are obtainable from natural sources, two examples of which are given.

Nicotinic acid (pyridine-3-carboxylic acid), derivable from the tobacco alkaloid, crystallizes in needles and melts at 232° C. It is soluble in hot water and in alcohol, but not in ether. It may be converted by the successive action on its alkali salt of methyl iodide and moist silver oxide into a betaïne which is identical with the alkaloid *trigonelline* (III.) discovered by E. Jahns (1885) in the seeds of fenugreek (*Trigonella foenum graecum*).

(III.)  (IV.) 

γ-Butyrobetaïne (IV.), obtained by Taheda (1910) from dog's urine after phosphorus poisoning, is probably identical with one of Brieger's ptomaines or putrefaction bases; it was first synthesised by Willstätter (1902).

Closely related to betaïne are the bases, choline, neurine and muscarine. Choline (bilineurine), $HO{\cdot}CH_2{\cdot}CH_2{\cdot}N(CH_3)_3{\cdot}OH$, which was first isolated by A. Strecker in 1862, is found in the bile, in brain substance, and in yolk of egg in the form of lecithin, a complex ester of glycerin with phosphoric acid and the fatty acids. It is also found in combination with sinapic acid in sinapin, the glucoside obtained from white mustard, and can be obtained from this glucoside by hydrolysis with baryta water. Synthetically prepared by the action of trimethylamine on an aqueous solution of ethylene oxide (A. Wurtz, 1868), it forms deliquescent non-poisonous crystals of strongly alkaline reaction, and absorbs carbon dioxide from the air.

Neurine, trimethylvinylammonium hydroxide, $CH_2{:}CH{\cdot}N(CH_3)_3{\cdot}OH$, a very poisonous, crystalline ptomaine base produced by the putrefaction of albumin, may be prepared by the action of moist silver oxide on ethylene dibromide and trimethylamine.

Muscarine, an exceedingly poisonous substance found in many fungi, may be obtained synthetically by oxidizing choline with dilute nitric acid (O. Schmiedeberg, 1876). Its constitution is generally represented as $CH(OH)_2{\cdot}CH_2{\cdot}N(CH_3)_3{\cdot}OH$. The name muscarine is also given to an oxazine colouring matter.

See G. Barger, *The Simpler Natural Bases* (1914); P. Pfeiffer, "On the theory of Betaïnes," *Berichte der deutschen chemischen Gesellschaft* (1922).

BETA RAYS, the stream of electrons (*see* Electron, The) ejected from certain radioactive substances. *See* Radioactivity; and Electricity, Conduction of: *in Gases*.

BETE, a people living in independent villages on the French Ivory Coast, in the valley of the Sassandra and its eastern affluents, with the same social and family characteristics as the Gouro. They practise husbandry and arboriculture and are animists.

See G. Joseph, *La Côte d'Ivoire* (1917).

BETELGEUSE, the brightest star in the constellation Orion (α Orionis). It is yellowish-red, and is thus easily distinguished from the other important stars in the constellation, which are white. Betelgeuse is a multiple star, being an irregular variable, sometimes above and sometimes below the first magnitude. It was the first star whose apparent diameter was measured, in 1920, by Michelson's interferometer method. (*See* Interferometer.) The

approximate distance of Betelgeuse from the sun is 325 light years. It is of spectral type M, its spectrum showing the flutings due to titanium oxide. (*See* ORION; SPECTROSCOPY and STAR.)

BETEL NUT. The name betel is applied to two different plants, which in the East are very closely associated in the purposes to which they are applied. The betel nut is the fruit of the Areca or betel palm, *Areca catechu*, and the betel leaf is the produce of the betel vine or pan (*Piper betle*), a plant allied to that which yields black pepper. The areca palm is a native of Malaya and is extensively cultivated in the south of India, Ceylon, Siam, the Malay Archipelago and the Philippine islands. It is a graceful tree with a straight, slender, unbranched stem reaching 40 or 50ft. in height and about 1½ft. in circumference, and bearing a crown of six to nine very large spreading pinnate fronds. The fruit is about the size of a small hen's egg, and within its fibrous rind is the seed or so-called nut, the albumen of which is hard, and has a mottled grey and brown appearance. The chief purpose for which betel nuts are cultivated and collected is for use as a masticatory—their use in this form being so widespread among oriental nations that it is estimated that one-tenth of the whole human family indulge in betel chewing. For this use the fruits are annually gathered between the months of August and November, before they are quite ripe, and deprived of their husks. They are prepared by boiling in water, cutting up into slices, and drying in the sun, by which treatment the slices assume a dark brown or black colour. When chewed a small piece is wrapped up in a leaf of the betel vine or pan, with a pellet of shell lime or chunam; and in some cases a little cardamom, turmeric or other aromatic is added. Mastication of the material causes a copious flow of brick-red saliva, which dyes the mouth, lips and gums. The habit blackens the teeth. Betel nuts are used as a source of catechu, which is procured by boiling the nuts in water; the catechu is then extracted. Its chief alkaloid is arecoline, to which vermifuge properties are attributed. The drug is employed by veterinarians as a vermifuge for dogs and sheep.

BETHANY (mod. *El-'Azarīyeh*, a corruption of Lazarion), a small village set among fruit trees and cornfields on the eastern slope of the Mount of Olives, Palestine; pop. 500, almost entirely Mohammedan. It was the residence of Lazarus and his sisters and much favoured by Jesus. An ancient tower marks the site of a convent of Benedictine nuns founded by Queen Millicent in A.D. 1147 and abandoned when Saladin took Jerusalem in 1187. A church was shown at this spot in the 4th century. Underneath is a vault opening on to a tomb-chamber claimed to be that of Lazarus. The original entrance was through the church, but when the church was converted into a mosque in the 16th century a separate entrance was excavated. The so-called house of Martha and Mary is some 30 yd. east of the tower. A Bethany (or Bethabara) beyond Jordan, which cannot, however, be identified, is mentioned in John i 28.

On the origin of the name *see* W. F. Albright, *Annual of American School of Oriental Research*, 158 *seq.* (1924).

BETHEL, a village on the watershed of the Judaean hill-country, in Palestine, 11 mi. N. of Jerusalem and 2,900 ft. above sea-level; pop. 446, Muslim. Bethel ("House of God"), now called Beitīn, but originally called Luz (Gen. xxviii 19), was accounted a holy place, due, perhaps, to the existence near by of a natural stone circle. Here Abraham pitched his tent and built an altar (Gen. xii 8); here Jacob had his vision (Gen. xxviii 10 *sqq.*); and here, at one time, was found the ark of the covenant (Judg. xx 27). It was visited yearly by Samuel when he went on circuit to judge Israel (I Sam. vii 16). Jeroboam welcomed the opportunity to exploit its sacred associations for political ends, and Bethel became a royal and national shrine for the northern kingdom (I Ki. xii; Amos vii). Situated on the frontier between the two kingdoms it passed eventually to Judah. Josiah destroyed its altar and desecrated its site (II Ki. xxiii 15). It was one of the strong places of Judah fortified by Bacchides (I Macc. ix 50). Remains of churches (12th and 6th centuries) are found here and at Burj Beitīn, a hill a short distance off to the southeast.

See G. Sternberg, "Bethel," *Zeitschr. Deutsch. Paläst. Vereins*, 1 *sqq.* (1915); J. E. McFadyen, "Bethel," *Expositor* 241 *sqq.* (1924).

BÉTHENCOURT, JEAN DE (*c.* 1360–1422), French explorer, sailed from La Rochelle on May 1, 1402, with two ships commanded by himself and Gadifer de la Salle to conquer the Canary Islands. Failing in a first attempt he secured help from Henry III., king of Castile, and the title of "king." There was some disagreement with Gadifer de la Salle, who had seized Lanzarote, but Béthencourt had Henry III.'s support against his rival. He visited France in 1405 to secure new colonists, and in 1406 returned once more, to spend the rest of his life in Normandy. His *Le Canarien, livre de la conquête et conversion des Canaries*, an untrustworthy narrative of his "conquest," was published with introduction and notes by G. Gravier (Rouen, 1874), and an English translation was edited by R. H. Major for the Hakluyt Society (1872).

BETHESDA, an urban district, Caernarvonshire, Wales, 5 mi. from Bangor, by a branch of the L.M.S.R. Pop. (est. 1938) 4,489. Area, 1.4 sq.mi. It lies near the lower end of the fine Nant Ffrancon (valley of the Ogwen stream). The scriptural name is due, as often in Wales, to the village or hamlet taking its title from the Nonconformist church. Here are extensive slate quarries belonging to Lord Penrhyn. Red, blue, gray and green slate is produced. Port Penrhyn, at the mouth of the stream Cegid (hemlock, *cicuta*), admits vessels of 300 tons to the quay at low water.

BETHESDA, the "House of Mercy," John v. 2, better perhaps Bethzatha or Bethsaida, a pool or public bath in Jerusalem, where miraculous cures were believed to be performed. The following identifications have been suggested: *Birket Isra'il*, near St. Stephen's gate; a large cistern, near St. Anne's church; the "Twin Pools," north of the Haram (the ancient Temple area); the *Hammām esh-Shifā'*—or pool of healing, west of the Haram; the Virgin's fountain, south of the Haram; and the "Pool of Siloam." Which, if any, of these identifications is correct, it is impossible to say.

See E. W. G. Masterman, "The Pool of Bethesda," in *Palestine Exploration Fund Quarterly Stat.*, 91 *seq.* (1921); R. A. S. Macalister, *A Century of Excavation in Palestine*, 137 *seq.* (1925).

BETH-HORON ("the place of the hollow way"), the name of two neighbouring villages, upper and lower Beth-horon, on the ascent from the coast plain of Palestine to the high tableland of Benjamin, which was until the 16th century the high road from Jerusalem to the sea. The two towns thus played a conspicuous part in Israelitish military history (see Josh. x. 10; I. Sam. xiii. 18; I. Ki. ix. 17; I. Macc. iii. 13–24, vii. 39 *sqq.*, ix. 50). Josephus (*Bell. Jud.* ii. 19) tells of the rout of a Roman army under Cestius Gallus in A.D. 66. The Talmud states that many rabbis were born in the place. It is now represented by *Beit 'Ūr-el-fōkā* and *Beit 'Ūr-et-tahtā*, around which much fighting took place in the attacks on Jerusalem, November to December 1917.

See T. Oelgarte, "Die Bethhoronstrasse," *Palästina Jahrbuch*, 73 *sqq.* (1918).

BETHLEHEM, Palestine, a town 5 mi. S. of Jerusalem on eastern spur of watershed; altitude 2,500 ft. (Heb. "house of bread" or "of Lahamu" [deity]; also called *Ephrathah* [Mic. v., Ruth iv.], but this is perhaps a district name.)

History.—Garrisoned by the Philistines in the time of Saul (II. Sam. xxiii. 14), Bethlehem was the early home of David and of his nephews Joab, Abishai and Asahel. Rehoboam fortified the town (II. Chron. xi. 6), and in its great khan (Chimham) the murderers of Gedaliah rested (586 B.C.) on their flight to Egypt (Jer. xli. 7). It was reoccupied after the captivity by Bethlehemites (Ezra ii. 21). The Bethlehem district is the scene of the story of Ruth. As the birthplace of Jesus it emerged gloriously from the obscurity into which it had fallen. Justin Martyr (*c.* A.D. 150) describes the scene of the birth as a "cave" near the village. In A.D. 315 Bethlehem was little more than a wilderness. Justinian enclosed the town with a wall (531). The Persians spared it in 614 and the Arabs in 636. The crusaders in their advance on Jerusalem occupied it at the invitation of the inhabitants (1099). It was erected into a Latin bishopric in 1110, passed to the Muslims in 1187 and was restored to the Christians through treaty (1229–44). In the 14th century the Greek Church made it an

episcopal see and in the 17th the Armenian did likewise. In 1489 the wall and towers were demolished and the moat filled in by order of the sultan, while in 1834 Ibrahim Pasha laid waste the Moslem quarter as punishment for a Moslem insurrection. It fell into the hands of the British at the time of the capture of Jerusalem (1917).

Church of the Nativity.—Bethlehem was evidently early recognized as a sacred site by Christians since Hadrian felt impelled to desecrate it (*c.* 132). Constantine in 330 erected a basilica (S. Maria a Praesepio) to which Justinian added. Convents of the Greek, Latin and Armenian churches closely surround it. Disputes for the possession of the sanctuary and precedence in worship occupied the churches for centuries, leading at times to disorderly scenes. The Grotto of the Nativity is a crypt occupying the centre of the transept and approached by steps leading down from either side of the choir. Fitted into the marble paving is a star with around it the words *Hic de Virgine Maria, Jesus Christus natus est.* Round the star burn night and day 15 lamps—six Greek, five Armenian, four Latin. Mass is celebrated here every day by the Greeks and Armenians. The Oratory of the Manger and the Altar of the Magi bear their witness to other sacred spots. From the Grotto access is obtained to the tombs of Eusebius of Cremona (d. 422), Paula (d. 404) and Jerome (d. 420), and to the cell, now a chapel, where Jerome made his famous translation of the scriptures. The Vulgate mosaics of the 12th century still adorn the church, and King Edward IV supplied the oak used in restoration of the roof (1482). A wall erected by the Greeks to separate the nave from the transept in 1842 was removed in 1918 by order of the governor of Jerusalem with the concurrence of the churches concerned.

Modern Town.—Bethlehem had a population (1931) of 6,815 (5,589 Christians). It is a prosperous town with many good houses. The centre of a fertile district its wine is among the best in Palestine. The chief occupation, apart from husbandry, is the manufacture and sale of religious mementoes made from mother-of-pearl, olive wood or "Dead Sea stone." The women of Bethlehem wear a special garb. A large number of schools and charitable institutions represents the activities of a wide variety of religious sects. (There was a small village in Zebulon, 7 mi. N. of Nazareth with the same name.)

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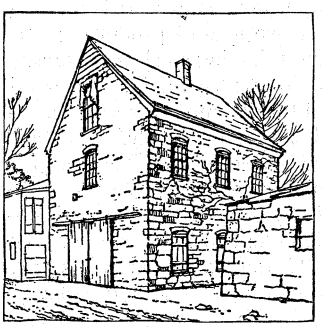
BETHLEHEM, a city of Pennsylvania, U.S.A., in Northampton and Lehigh counties, on the Lehigh river, 50m. north-west of Philadelphia. It is on the William Penn highway and the Bethlehem pike (one of the oldest highways in the country); is served by the Central Railroad of New Jersey, the Lehigh Valley, the Lehigh and New England, the Philadelphia, Bethlehem and New England, and the Reading railways; and is traversed by the Lehigh Coal and Navigation Company canal, running from the anthracite fields to tide-water. The area of the city is 17·8sq.m. Its population was 54,149 in 1920 of which about a fifth were foreign born; and was 58,490 in 1940.

The city is built on hills on both sides of the river, and commands delightful views as far as the Blue mountains, 20m. to the north. Three bridges connect the north and south sides. The Hill-to-Hill bridge, built in 1921 to 1924 at a cost of $3,500,000, has eight approaches at either end, crosses four railroads, the river, and the canal. The beautiful stone community buildings of the Moravians were erected between 1742 and 1774, and their present church dates from 1803. A conspicuous modern structure is the Liberty high school, standing in 16 acres of playgrounds. Lehigh university (chartered 1866) occupies a campus of 180ac. on the slope of South mountain. It has an annual enrolment of more than 1,500 students and an endowment of about $7,000,000.

Steel and silk are the outstanding industries. The Bethlehem Steel Corporation has its main office and parent plant in Bethlehem. Along the south bank of the river for a distance of over 3m. extend the comprehensive plants, which produce pig-iron, steel of all types, coke and its by-products, engines, machinery, ordnance, and many other steel products. Other corporations are engaged in the fabrication and erection of structural steel, notably anthracite breakers and washeries. The silk industry, with an annual output valued at $50,000,000, includes the manufacture of broad silk, silk throwing and hosiery mills. The assessed valuation of property in 1933 was $70,360,879, and taxes per capita amounted to $14.84.



BY COURTESY OF THE BETHLEHEM CHAMBER OF COMMERCE

THE FIRST WATER WORKS IN THE UNITED STATES, AT BETHLEHEM
Built of rough stone, this building still stands and is used as a dwelling. The original water pipes were made of hemlock logs

Bethlehem was founded in Dec. 1741, by religious exiles from Bohemia and Moravia, who came to America under the leadership of Bishop David Nitschmann, influenced by their Saxon patron, Count Zinzendorf, in search of freedom and to do missionary work among the Indians and Negroes. They developed their industries under a communistic system of labour, but in 1763 distributed most of them among the members of the congregation. During the revolution, Bethlehem was a thoroughfare for troops; and in 1776 and again in 1777 one of the community buildings was commandeered for a military hospital, where over 700 soldiers died. For a short time the Sun Inn, built in 1758 and still in service, was the refuge of a part of the Continental congress. The Moravians established a day-school (later developed into a college), a theological seminary, and in 1746 the first boarding school for girls in America (now a college); all are still functioning. Their love of music gave Bethlehem an unique distinction. An orchestra of strings, wind and brass was used in the church services before 1750. Since 1754 a choir of trombones has played at funerals, and from the belfry of the church has announced festival days and national holidays and the death of members of the church. An orchestra and a chorus (first the Collegium Musicum, which gave the first performance in America of Haydn's *Creation,* and later the Philharmonic Society) were in existence almost continuously until 1885. After a lapse of a few years choral music was revived by the organist, J. F. Wolle, and under his direction a national reputation was gained for the rendering of the works of Bach. Since 1895, except during the years of Dr. Wolle's absence (1906–12), an annual Bach festival of two days or more has been held in May, drawing music lovers from all parts of the world.

The borough of Bethlehem was incorporated in 1845. West Bethlehem was annexed in 1904. The city was formed in 1917 by the consolidation of Bethlehem and South Bethlehem, and in 1920 Northampton Heights was annexed.

BETHLEHEMITES, a name borne at different times by three orders in the Roman Catholic Church. (1) A community of friars at Cambridge, in 1257, whose habit was distinguished from that of the ordinary Dominicans by a five-rayed red star (in reference to Matt. ii. 9 f.). (2) An order of knighthood similar to the Knights of St. John, established by Pius II. in 1459 to resist the inroads of the Turks. (3) The Bethlehemite Order of Guatemala, a nursing community founded in 1650 by Pedro Betancourt (d. 1667), and raised to an order by Innocent XI. in 1687. They spread throughout Central America and Mexico and as far south as Lima, and with the corresponding order of sisters were conspicuous for their devotion during times of plague and other contagious diseases. This order became extinct about 1850.

BETHLEHEM STEEL CORPORATION, incorporated in Delaware July 1, 1919, is the successor to the New Jersey corporation of the same name which was organized on Dec. 10, 1904, to acquire the stock of Bethlehem Steel Company (Pa.) and of several other companies owning shipbuilding plants. Its only steel plant (at Bethlehem, Pa.) then had an annual ingot capacity

of 190,000 tons and manufactured principally armour plate and other ordnance. By large cash expenditures for construction and by purchases of properties of other companies, including the Pennsylvania Steel Company, Maryland Steel Company, American Iron and Steel Manufacturing Company, Lackawanna Steel Company, Midvale Steel and Ordnance Company, Cambria Steel Company and Pacific Coast Steel Company, the steel making capacity has been increased to 11,468,800 net tons, representing 14·1% of the present capacity of the United States. It is now the second largest steel company in the world and produces all of the principal commercial steel products, having steel, manufacturing and fabricating plants located in Pennsylvania, Maryland, New York, Delaware, Illinois, California and Washington. It also has extensive shipbuilding and ship repair facilities on both the Atlantic and Pacific coasts of the United States. The corporation is virtually self-contained, owning large reserves of all of its important raw materials. Its capital upon its organization was $30,000,000 of stock and $11,750,000 of bonds. Its capital, Dec. 31, 1939, consisted of $112,066,440 of preferred stock, $283,574,430 of common stock, $181,317,000 of funded debt and $78,229,111 of surplus. (E. G. Gr.)

BETHLEN, GABRIEL (Gábor) (1580–1629), prince of Transylvania, the most famous representative of the Iktári branch of a very ancient Hungarian family, was born at Illyé, and educated at Szarhegy, at the castle of his uncle András Lázár. Thence he was sent to the court of Prince Zsigmond Báthory, whom he accompanied on his famous Wallachian campaign in 1600. Subsequently he assisted Stephen Bocskay to mount the throne of Transylvania (1605), and remained his chief counsellor. Bethlen also supported Bocskay's successor, Gabriel Báthory (1608–1613), but the prince became jealous of Bethlen's superior abilities, and he was obliged to take refuge with the Turks. He was at Adrianople when the sultan proclaimed him prince of Transylvania, a choice confirmed by the Estates of Transylvania in September shortly before the murder of Báthory. On Oct. 13, 1613, the diet of Klausenburg confirmed the choice of the sultan. In 1615 Bethlen was also officially recognized by the emperor Matthias. Bethlen no sooner felt firmly seated on his throne than he seized the opportunity presented to him by the outbreak of the Thirty Years' War to take up arms in defence of the liberties and the constitution of the extra-Transylvanian Hungarian provinces. While Ferdinand was occupied with the Bohemian rebels, Bethlen led his armies into Hungary (1619), and soon won over the whole of the northern counties, even securing Pressburg and the Holy Crown. Negotiations for peace were opened at Pressburg, Kaschau and Bratislava successively, but came to nothing because Bethlen insisted on including the Bohemians in the peace, whereupon (Aug. 20, 1620) the estates of north Hungary elected him king. Bethlen accepted the title but refused to be crowned, and war was resumed, till the defeat of the Czechs at the battle of the White Mountain gave a new turn to affairs. Bethlen then concluded the peace of Nikolsburg (Dec. 31, 1621), renouncing the royal title on condition that Ferdinand confirmed the peace of Vienna, 1606 (which had granted full liberty of worship to the Protestants) and engaged to summon a general diet within six months. For himself Bethlen secured the title of prince of the Empire, the seven counties of the Upper Theiss, and the fortresses of Tokaj, Munkács and Ecsed. Subsequently Bethlen twice (1623 and 1626) took up arms against Ferdinand as the ally of the anti-Hapsburg Protestant powers. The first war was concluded by the peace of Vienna, the second by the peace of Pressburg, both confirmatory of the peace of Nikolsburg. After the second of these insurrections, Bethlen attempted a rapprochement with the court of Vienna on the basis of an alliance against the Turks and his own marriage with one of the Austrian archduchesses; but Ferdinand rejected his overtures. Accordingly, on his return from Vienna he married Catherine, the daughter of the elector of Brandenburg, and sister-in-law of Gustavus Adolphus of Sweden, who, he hoped, would help him to obtain the Polish crown. He died before he could accomplish any of his great designs (Nov. 15, 1629), having previously secured the election of his wife Catherine as princess. His first wife, Susannah Károlyi, died in 1622.

Gabriel Bethlen was certainly one of the most striking and original personages of his century. A zealous Calvinist, whose boast it was that he had read the Bible 25 times, he was nevertheless no persecutor, and even helped the Jesuit Kaldy to translate and print his version of the Scriptures. He was in communication all his life with the leading contemporary statesmen, so that his correspondence is one of the most interesting and important of historical documents.

His correspondence was published, ed. by Sándor (Budapest, 1866) and Szilágyi (1879). For his life *see* Anton Gindely *Acta et documenta historiam Gabrielis Bethleni illustrantia* (1890); Ignáe-Acsády *Gabriel Bethlen and his Court* (1890).

BETHLEN, STEPHEN BETHLEN DE, Count (1874-), Hungarian statesman, was born Oct. 8, 1874, at Cornesti (Gernyeszag), Transylvania. His father, Count Stephen Bethlen, was a member of the famous family that gave Gabriel Bethlen, Prince of Transylvania, to Hungarian history. His mother was Countess Helen Teleki. The son went to school at the Theresianium in Vienna, then studied law at the University of Budapest and also obtained the diploma of the academy of agriculture at Magyaróvár. He then travelled in Europe and the United States and on his return home took charge of the management of his large estates—estates which were sequestrated after the Treaty of Peace by the Rumanian Government.

In 1901 he was elected to parliament as a member of the Liberal opposition. Prior to the World War, Count Tisza offered Count Bethlen a portfolio in the cabinet, which was declined. The Emperor Francis Joseph appointed him a privy councillor, but until he became prime minister in 1921 he never held office.

After the Hungarian revolution of Nov. 1918, and during the ensuing régime of Count Michael Károlyi, Count Bethlen took a leading part in creating the counter-revolutionary organization which, when the Bolshevists came into power, took shape as the emergency Government of Szeged, and of which he was the chief representative in Vienna. (*See* Hungary.)

When the Hungarian Peace Delegation went to Paris Count Bethlen was one of the principal delegates, and it was under his personal direction that the Hungarian memorandum in relation to Transylvania was drafted. Ten months after the Treaty of Trianon had been signed, and a few days after King Charles had made his first fruitless effort to regain the throne of Hungary, Count Bethlen accepted the invitation of the regent, Admiral Horthy, to form a cabinet in consequence of the resignation of Count Paul Teleki.

As Prime Minister.—On April 14, 1921, Count Bethlen became prime minister. Few men in the political history of Europe had so often and for so long refused high office: few had ever accepted it under such thankless and discouraging conditions. The Succession States, with overwhelming armies, threatened the occupation of Hungary on the ground that the recent attempt of King Charles to regain the throne endangered the Peace Settlement. The great Allied Powers were in much the same mood. On the other hand the Hungarian people were seething with indignation over what they considered to be the injustice and humiliation of the dictated Treaty of Peace. In this crisis, with no cabinet experience, bitterly opposed both by royalist and socialist extremists, Count Bethlen dared to lead his country. He succeeded at home because of his unquestioned patriotism, moderate views and political sagacity: abroad his powers of reasoning, fairness and flair for negotiation received quick recognition.

In Oct. 1921 he achieved a notable diplomatic success by concluding at the Conference of Venice an amicable agreement with the Austrian Chancellor regarding western Hungary (Burgenland). For months Austria and Hungary had been on the verge of hostilities over the ownership of this territory which under the Peace Treaty had been allotted to Austria. In consequence of the Venice conference the important town of Sopron and its environs, after a plébiscite, were ceded back to Hungary. In the same month—Oct. 1921—Count Bethlen had to face another national crisis when King Charles for the second time

endeavoured to regain his throne. The firmness shown by Count Bethlen in concert with the regent undoubtedly saved Hungary from national extinction.

The elections rendered necessary by the expiration of the mandates of the existing Parliament returned Count Bethlen to power in June 1922. This second Government of Count Bethlen completed the scheme of land reform, re-established and reconstituted the upper house, created a new basis of suffrage, approved radically new standing orders for Parliament, ratified agreements settling outstanding political and economic difficulties with neighbouring states, and last but most important of all achieved the financial and economic salvation of Hungary. The courage of Count Bethlen in accepting office in his country's darkest days had been rewarded.

The economic reconstruction of Hungary became possible almost solely owing to Count Bethlen's personality and to his individual efforts. In the spring of 1923 he appealed in Paris to the Reparation Commission so to suspend the Reparation sword of Damocles as to permit Hungary to remain alive. At that time the state was faced with bankruptcy and the people with ruin. Count Bethlen took his political fortune in his hand, and pledged his proud countrymen to accept the financial control of the League of Nations. The Reparation Commission, by the casting vote of France, refused Count Bethlen's request. He went on a desperate pilgrimage to London, Paris and Rome to get that decision reconsidered. He was a stranger to practically all the Allied Ministers, yet thanks to his transparent integrity and reasonableness he succeeded. Within 18 months the Reparation Commission had suspended the Reparation charges, the League of Nations had arranged a plan of reconstruction, the Hungarian Parliament had agreed to all the League's demands of control, and a loan of about £11,000,000 was floated successfully on the money markets of the world—principally in London and mainly through British support. That would never have been achieved if Count Bethlen had been less patient or determined.

By June 1926, thanks largely to the self-sacrifice of the Hungarian people and their willingness to follow the lead of their prime minister, the success of the reconstruction scheme was achieved and the League Commissioner-General withdrew from Budapest. In December 1927 the last part of the League loan was handed over to the Hungarian Government for investment purposes. The Budget was in perfect equilibrium and the currency established.

The discovery at the beginning of 1925 of a plot to forge French bank notes, organized by Prince Windisch-Grätz and M. Nádossy, Chief of the Budapest Police, with the alleged object of financing the recovery of some of Hungary's lost possessions, created widespread sensation as well as great embarrassment for Count Bethlen and his Government. Prolonged investigations and public trials resulted in the imprisonment of Windisch-Grätz, Nádossy and others, with the complete vindication of Count Bethlen.

In the general election of Dec. 1926 Hungary showed its deepened confidence in Count Bethlen by returning him once more to power by a greatly increased majority. The combined Opposition succeeded in obtaining only 37 seats in a house of 245.

In Jan. 1927 Count Bethlen successfully concluded Hungary's first post-war political treaty. He visited Rome and signed with Signor Mussolini a Pact of Friendship, one of the most important clauses of which accorded to Hungary the use of the port of Fiume. In order to take full advantage of the facilities at Fiume it was necessary also to enter into negotiations with Yugoslavia. These were also initiated by Count Bethlen under friendly and favourable circumstances. The signing of the Italo-Hungarian Treaty was generally admitted to be a considerable political success for Count Bethlen, particularly in conjunction with the conclusion of commercial treaties with Czechoslovakia and Yugoslavia.

Count Bethlen in Nov. 1927 introduced a law for the modification of the Numerus Clausus Law by which greater opportunities were to be given in Hungarian Universities to Jewish students.

Throughout 1927 the Council of the League of Nations was occupied with the question of the powers of the Mixed Arbitral Court in relation to the compensation claims against Rumania by Hungarian optants. This case attracted world-wide attention, but as Count Bethlen was himself an optant and therefore pecuniarily interested he abstained, with characteristic scrupulousness, from taking part in the discussions before the League.

Count Bethlen's term of office ended in 1931. He had been in power longer than any prime minister in Europe. He married Countess Margit Bethlen, a talented poetess, and has three sons. He belongs, like his ancestors, who raised armies for Calvinism, to the Reformed (Calvinist) Church. (W. Go.)

BETHMANN-HOLLWEG, THEOBALD VON (1856–1921), German statesman, was born on Nov. 29, 1856, at Hohenfinow, near Berlin. He was descended from the Frankfort banking family of Bethmann, which attained great prosperity in the 18th century, and a branch of which was founded by his great-grandfather Johann Jakob Hollweg, who had married a daughter of the house.

Having risen through the regular legal and official stages of promotion, in 1905 he was appointed Prussian Minister of the Interior and in 1907 secretary of state for the Imperial Home Office, and vice-president of the Prussian ministry. At the time of Bethmann-Hollweg's appointment to the chancellorship in 1909, internal affairs, under his predecessor, Prince Bülow, had reached a deadlock in the reichstag owing to the revolt of a section of the Liberal-Conservative *bloc* against the proposal to establish death duties as part of the reform of the finances of the empire. It was not until the general elections of 1912 had transformed the situation by bringing a great accession to the strength of the moderate National Liberals and the Left, especially the Social Democrats, that the Government was able to reckon upon a more amenable majority.

In the interval Bethmann-Hollweg endeavoured to conciliate the Catholic Centre by a policy of compromise in matters which had threatened to lead to a renewal of the *Kulturkampf*, such as the denunciation of the Reformation in the Papal Encyclical of 1910 and the Catholic demand for the modification of the Jesuit law. He secured the final abrogation of this law under stress of war conditions in April 1917. Bethmann-Hollweg was likewise the sponsor of the new constitution for Alsace-Lorraine which in 1911 established the government of that territory of the empire upon the basis of popular representation in a territorial assembly and of admission, though without full State rights, to the Federal Council. He was less successful with the vexed question of the Prussian franchise, which, in 1910, he attempted to solve by proposing a direct system of election while retaining in a modified form the local division of the electorate according to income-tax assessment into three classes. His bill was ultimately rejected by the reactionary Chamber of Deputies.

He was equally unsuccessful in dealing with an outbreak of militarism in Nov. 1913 at Zabern (Saverne) in Alsace, where the population, exasperated by the truculence of a young officer, was subjected to the arbitrary exercise of martial law by the colonel in command of the garrison. Bethmann-Hollweg's treatment of the incident satisfied neither the reactionaries nor the advanced parties, and, for the first time in the history of the reichstag, a vote of censure was passed upon the Chancellor.

In 1914 Bethmann-Hollweg became famous by his remark to Sir Edward Goschen, British ambassador in Berlin, that the Belgian guarantee was "a scrap of paper." Over unrestricted submarine warfare he divested himself of responsibility, having declared in Jan. 1917, "I can give Your Majesty neither my assent to the unrestricted submarine warfare nor my refusal."

By the middle of July 1917, Bethmann-Hollweg had lost all support in the reichstag. The Conservatives and National Liberals were alienated by his Prussian franchise policy and his conflicts with the higher command. The Left and the Catholic Centre, in which Erzberger with his so-called Peace Resolution (adopted by the reichstag on July 19) had acquired the upper hand, were convinced that the Allied and Associated Powers would place no confidence in the overtures of men with the past

of Bethmann-Hollweg and Zimmerman. Finally, on the morrow of the publication of the second Prussian Franchise Edict, on July 14, 1917, Hindenburg and Ludendorff came to Berlin in order to hold conferences with the chiefs of political parties regarding the terms of the "Peace Resolution." The Chancellor could not tolerate this military interference with his own department, and the emperor, confronted with an ultimatum from his two indispensable military leaders, accepted the Chancellor's resignation. Bethmann-Hollweg retired to Hohenfinow and took no further part in politics beyond writing his *Reflections on the World War* (1919). He died at Hohenfinow on Jan. 1, 1921, after a brief illness.

BIBLIOGRAPHY.—C. Oman, *The Outbreak of the War of 1914–18* (1919); A. von Tirpitz, *Erinnerungen* (1919); Viscount Haldane, *Before the War* (1920); P. Scheidemann, *Der Zusammenbruch* (1921); Otto Hammann, *Bilder aus der letzten Kaiserzeit* (1922).

BETHNAL GREEN, an east metropolitan borough, London, England, bounded north by Hackney, east by Poplar, south by Stepney and west by Shoreditch. Pop. (est. 1938) 92,910. Area, 1.2 sq.mi. It is a district of poor houses in the "East End." The people make matchboxes, boots, furniture, textiles, metal objects, etc., but were formerly largely devoted to silk-weaving, which spread from Spitalfields (*see* STEPNEY). The Bethnal Green museum was opened in 1872. It contains pictures, furniture, costumes, an interesting collection of dolls' houses, entomological collections, etc.; it stands in public gardens. There are about 100 ac. of open spaces, including 70 out of the 217 ac. of Victoria park, within the borough. Among institutions are the missionary settlement of the Oxford House, founded in 1884, with its women's branch, St. Margaret's House; the North-Eastern hospital for children and the Craft school. The Leather Trades technical school, now in Tower Bridge road, was formerly in the borough. Bethnal Green returns one member in two divisions to parliament.

BETHSAIDA: *see* CHORAZIN AND BETHSAIDA.

BÉTHUNE (FAMILY). The seigneurs of Béthune, *avoués* (*advocati*) of the great abbey of Saint-Vaast at Arras from the 11th century, were the ancestors of a great French house whence sprang the dukes of Sully, Charost, Orval, and Ancenis; the marquises of Rosny, Courville, and Chabris; the counts of Selles and the princes of Boisbelle and Henrichemont. Conon de Béthune (*q.v.*), the crusader and poet, was an early forebear. The most illustrious member of the Béthune family was Maximilien, baron of Rosny, and afterwards duke of Sully (*q.v.*), minister of Henry IV. His brother Philip, count of Selles and of Charost, was ambassador to Scotland, Rome, Savoy, and Germany, and died in 1649. Hippolyte de Béthune, count of Selles and marquis of Chabris, who died in 1665, bequeathed to the king a magnificent collection of historical documents and works of art. The Charost branch of the family gave France a number of generals during the 17th and 18th centuries.

The last duke of Charost, Armand Joseph de Béthune (1738–1800), French economist and philanthropist, served in the army during the Seven Years' War, after which he retired to his estates and sought to ameliorate the lot of his peasants by abolishing feudal dues and introducing reforms in agriculture. Louis XV. said of Charost, "Look at this man, his appearance is insignificant, but he has put new life into three of my provinces." His only son, Armand Louis de Béthune, marquis de Charost, was beheaded on April 28 1794.

BÉTHUNE, CONON or QUESNES, **DE** (*c.* 1150–1224), French troubadour or *trouvère* of Arras, was born in the 12th century. He came about 1180 to the court of France, where he met Marie de France, countess of Champagne. To this princess his love poems are dedicated, and much of his time was passed at her court where the *trouvères* were held in high honour. At the French court he met with some criticisms from Queen Alix, the widow of Louis VII., on the roughness of his verse and on his Picard dialect. To these criticisms, interesting as proof of the already preponderant influence of the dialect of the Île de France, the poet replied by some verses in the satirical vein that best suited his temperament. Some of his best songs were inspired by anger at the delays before the crusade of 1188–92. Conon took part with Baldwin of Flanders in the crusade of 1204, and he is said to have been the first to plant the crusaders' standard on the walls of Constantinople. He held high office in the new empire and died about 1224. His verses, of which the crusading song *Ah! amors com dure departie* is well known, are marked by a vigour and martial spirit which distinguish them from the work of other *trouvères.*

The completest ed. of his works is in the *Trouvères belges* of Aug. Scheler (1876).

BÉTHUNE, town of France, capital of an arrondissement, department of Pas-de-Calais, 24m. N.N.W. of Arras, on the railway between Arras and St. Omer. Pop. (1936) 20,073. Béthune is situated on a low hill at the confluence of the Lawe with the canal from Aire to Bauvin. The town dates from the 11th century and was governed by its own lords till 1248, after which it passed successively to the counts of Flanders, the dukes of Burgundy, and the sovereigns of Austria and Spain. Ceded to France by the peace of Nijmwegen (1678), it was taken by the allied forces in 1710, and restored to France by the treaty of Utrecht. The main front astride the La Bassée Canal was situated about 5 mi. from Béthune during World War I, and the town thus became an important base. During the German advance (April 1918) many of the houses and public buildings were destroyed by bombardment. Béthune lies in the midst of the richest coal mines in France. Its industries include the distillation of oil, tanning, salt-refining and the manufacture of earthenware and casks. Trade is carried on in flax, cloth, cereals, oil-seeds, etc.

The town is the seat of a sub-prefect, and has a tribunal of first instance and a chamber of commerce.

BETOYAN, an important linguistic stock of South American Indians, so called from the Betoyes, one of its important tribes. The Betoyan stock occupies an extensive area in the region drained by the north-western tributaries of the Amazon system, from the Napo river in the south, northwards to the upper Apure in south-western Venezuela, and from the eastern slopes of the Andes eastwards to approximately 70° W. long. At least 60 or 70 tribes are included in the group.

Among the Betoyan tribes in general, the men wear a small apron or breech-clout, and the women wear an apron or go naked. The labret in the lower lip is common as an ornament. In general they are a sedentary, agricultural folk, growing manioc and maize, and living in large communal houses, usually rectangular and built of thatch. Some tribes, however, use a conical circular type of dwelling. Many make considerable use of coca, and most employ one or other narcotics and narcotic snuffs, inhaled by means of V-shaped bone tubes. The bow, spear (often poisoned), sword-club and blow-gun are their most important weapons. Most tribes make use either of great wooden signal drums, hollowed out of tree trunks, or of huge trumpets or flutes. The pan-pipe is also used. Dugout canoes are used on the rivers. Pottery is made, but tree-bast takes the place of textiles. Boys are obliged to pass through a puberty ceremony, involving whipping. The dead are buried (often in a canoe for a coffin) under the floor of the house. Several tribes exhume the bones after several years, burn them, and drink the ashes mixed with corn beer. The funeral ceremonies are elaborate, and involve the use of characteristic conical, fringed bast masks which cover the wearer to the knees, and are supposed to represent supernatural beings.

See J. Rivero, *Historia de los Missiones de los Llanos de Casanaré*, etc., *1736* (Bogota, 1883); J. Gumilla, *Historia natural, civil y geográfica*, etc. (Madrid, 1745); T. Koch-Krüneberg, *Zwei Jahre unter den Indianern* (Berlin, 1909–10); H. Beuchat and P. Rivet, "La famille Betoya ou Tucano" (*Mem. Soc. Linguistique de Paris*, vols. xvii., xviii.).

BETROTHAL. Betrothal was anciently a formal ceremony which in most cases preceded the actual marriage service, usually by a period of some weeks, but the marriage might be delayed for years. The canon law distinguished two types of betrothal:—(1) *Sponsalia de praesenti,* (2) *Sponsalia de futuro.*

The first was a true though irregular marriage, and was abolished by the Council of Trent as inimical to morality. The second was a promise to marry at a future date. The church never determined the form of the ceremony, but demanded that it should be entered into freely and at a legal age. The church further declared that females between the ages of 7 and 12, and males between 7 and 14, could be betrothed, but not married. The ill-defined laws as to betrothals tended to encourage abuses, especially in the rural districts. Betrothal consisted of the "interchange of rings—the kiss—the joining of hands, to which is to be added the testimony of witnesses." In France the presence of a priest was essential, and it was customary elsewhere for the couple to get their parish priest to witness their promise. Among the peasantry the place of rings was taken by a coin which was broken between the pair, each taking a part. But almost any gift sufficed. Sometimes the bride-elect received a bent or crooked sixpence. At the conclusion of the ceremony it was usual for the couple to pledge each other in a cup of wine. Gifts given at bethrothal could be recovered by the parties if the marriage did not take place. The church jealously watched over the fulfilment of such contracts and punished their violation. Betrothal, validly contracted, could be dissolved either by mutual consent or by the omission to fulfil one of the conditions of the contract. But here the church stepped in to override such law as existed by decreeing that whoever, after betrothal, refused to marry *in facie ecclesiae* was liable to excommunication. In England the law was settled by an act of 1753, which enacted that an aggrieved party could obtain redress only by an action at common law for breach of promise of marriage. Among the ancient Jews betrothal was formal and as binding as marriage (*see* MARRIAGE). Formal betrothal still retains much of its former importance on the European continent.

BIBLIOGRAPHY.—For betrothal customs in China, the East and elsewhere, consult L. J. Miln, *Wooings and Weddings in Many Climes* (1900) and H. N. Hutchinson, *Marriage Customs in Many Lands* (1897). On early English law as to betrothals *see* Sir F. Pollock and Maitland, *History of English Law before the time of Edward I.* (2nd ed. 1898). *See* also J. O. Halliwell-Phillipps, *Outlines of the Life of Shakespeare* (1848, 1883).

BETTER BUSINESS BUREAUS are maintained in more than 60 principal cities of the U.S.A. and Canada to protect both business and the community from unfair, misleading, or fraudulent advertising and selling. The National Better Business Bureau in New York city concerns itself with national advertising; the local bureaus are independent and non-profit corporations but co-ordinate their functions through the National Association of Better Business Bureaus. In a typical year the bureaus collectively entertained 138,000 complaints of consumers and 430,000 inquiries; 12,000 cases were referred to governmental agencies.

BETTERMENT, a term used particularly in connection with the increased value given to real property by causes for which a tenant or the public, but not the owner, is responsible. A statute passed to facilitate the rebuilding of London after the Great Fire of 1666 provided that owners of property who derived direct pecuniary benefit from a public improvement should contribute a fair proportion of the total cost. The betterment sections of the Act of Charles II. were imported almost bodily into the first statute establishing this principle passed by the city of New York in 1691, whence it spread throughout most of the Union under the name of "special assessment." From the United States it passed to Canada, Australia, New Zealand, South Africa, and to some British possessions. In England the statute of 1667 was followed by legislation of a similar character, until in 1760, by 2 Geo. 3, c. 29, the principle of betterment was abandoned. After the passing of the Municipal Reform Act 1832, the principle was revived in the Westminster Sewers Act 1834. It was recognized in the Metropolitan Sewers Act 1848; the Wimbledon and Putney Common Act 1871; the Public Health Act 1875; the Artisans Dwelling Act 1882; the Housing of the Working Classes Act 1890; the Manchester Corporation Act 1894; the London County Council (Improvements) Act 1897; the Town Planning Act 1925; the Town Planning (Scotland) Act 1925; and the Roads Improvement Act 1925.

The betterment principle has been applied also in France, Belgium and Germany. (*See* COMPENSATION.)

See E. R. A. Seligman, *Essay in Taxation,* 8th ed. (1913); T. M. Cooley, *A Treatise on the Law of Taxation* (Chicago, 1903); V. Rosewater, *Special Assessments* (1893). (H. H. L. B.)

BETTERTON, THOMAS (*c.* 1635–1710), English actor, son of an under-cook to King Charles I., was born in London. He was apprenticed to John Holden, Sir William Davenant's publisher, and possibly later to a bookseller named Rhodes, who had been wardrobe-keeper to the theatre in Blackfriars. The latter obtained in 1659 a licence to set up a company of players at the Cockpit in Drury Lane, and here Betterton made his first appearance in 1660. His talents at once brought him into prominence, and he was given leading parts. On the opening of the new theatre in Lincoln's Inn Fields in 1661, Sir William Davenant, the patentee, engaged Betterton and all Rhodes's company to play in his *Siege of Rhodes.*

Betterton was held in high esteem by Charles II. who sent him to Paris to examine stage improvements there. According to Cibber it was after his return that shifting scenes instead of tapestry were first used in an English theatre. In 1692, in an unfortunate speculation, Betterton and his friend Sir Francis Watson were ruined; but Betterton's affection for Sir Francis was so strong that he adopted the latter's daughter and educated her for the stage. In 1693, with the aid of friends, he erected the New Playhouse in the tennis court in Lincoln's Inn Fields. It was opened in 1695 with Congreve's *Love for Love.* But in a few years the profits fell off, and Betterton determined to quit the stage. At his benefit performance, when the profits are said to have been over £500, he played Valentine in *Love for Love.* In 1710 he made his last appearance as Melantius in *The Maid's Tragedy;* he died on April 28, and was buried in Westminster Abbey.

In appearance he was athletic, slightly above middle height, with a tendency to stoutness; his voice was strong rather than melodious, but in recitation it was used with the greatest dexterity. Pepys, Pope, Steele and Cibber all bestow lavish praise on his acting. The blamelessness of his life was conspicuous in an age and a profession notorious for dissolute habits. Betterton was author of several adaptations which were popular in their day. In 1662 he had married Mary Saunderson (d. 1712), an admirable actress, whose Ophelia shared the honours with his Hamlet.

BIBLIOGRAPHY.—*The Life and Times of Thomas Betterton* (1886); *see* Howe, *Thomas Betterton* (1891); Odell, *Shakespeare from Betterton to Irving* (vol. 1), (1921).

BETTINELLI, SAVERIO (1718–1808), Italian Jesuit and man of letters, was born at Mantua on July 18, 1718. He entered the Society of Jesus in 1736, taught rhetoric at Venice, and was then head of the college of nobles at Parma. He travelled extensively in Europe, and finally settled in Italy in 1759, and had just been appointed to the chair of rhetoric at Modena in 1773 when the Jesuits were banished. His old age was spent in Mantua. He had become famous with his *Lettere dieci di Virgilio Agli Arcadi* (1756), in which he attacked the cult of Dante. This book which brought him personal compliments from Voltaire, made him many enemies. His important *Risorgimento negli studj, nelle Arti e ne' Costumi dopo il Mille* (1775–86) sketches Italian progress in literature, science, the fine arts, industry, etc.

See Federico *L'opera litteraria di Saverio Bettinelli* (1913).

BETTING: *see* GAMING AND WAGERING.

BETTING TAX. By the enactment of the Finance Act, 1926, the British Parliament imposed a duty on bets and betting, a means of raising revenue that was recommended by a majority of the House of Commons committee appointed in 1923 to report on the subject. The tax was withdrawn by the Finance Act of 1929, but the £10 bookmakers' licence duty was retained and a new duty of £40 a year imposed on them in respect of every telephone installed in their offices; a tax of ½% was also imposed on stakes laid with a totalizator.

The scheme of the legislation was to charge excise duties on betting, and on certificates required to be taken out by bookmakers in respect of their businesses. From Nov. 1, 1926 to April 15, 1929, betting duty had to be paid on every bet made with a book-

maker, at 3½% (later 2%) of the amount staked. In the case of a bet in respect of a horse race made on the racecourse, on the day of a race, with a bookmaker on the course, by a person on the course, the rate of duty was 2% of the amount staked. Bookmakers had to take out a "bookmaker's certificate" annually, on which an annual duty of £10 was paid, and a similar duty was payable annually in respect of an "entry certificate," which had to be taken out by a bookmaker for betting premises used by him.

The betting duty was payable by the bookmaker with whom the bet was made, who had to issue to the backer at the time of making the bet a "revenue ticket" denoting that the duty had been paid. These tickets did not need, however, to be issued by a bookmaker who had arranged with the commissioners of inland revenue to furnish returns of all bets made with him and had given security for the payment of the duty.

Penalties were provided for contravention of the act, for carrying on business as a bookmaker without having a proper certificate in force, and for keeping or using, or assisting or being concerned in the keeping or using, of any betting premises in respect of which a proper entry certificate was not in force. Any person found accepting a bet without issuing a revenue ticket, or failing to produce a bookmaker's certificate when lawfully required, could be arrested without a warrant. A court before which a bookmaker was convicted of any offence under these provisions could order him to be disqualified from holding a bookmaker's certificate for any period the court considered fit; but a bookmaker so disqualified could apply after three months for the removal of the disqualification.

Betting Not Legalized.—When these proposals were first put before Parliament they met with much opposition both from bookmakers and from persons and societies opposed to the practice of betting on religious, moral or social grounds. The bookmakers were apprehensive that the tax would diminish betting; other objections were based on the fear that betting, by being taxed, would thereby be recognized by the State as being lawful. To meet apprehensions of the latter kind, the section imposing the duty provided that nothing in the provisions was to render lawful any betting in any manner or place in which it was at the commencement of the act unlawful, or was to authorize the writing, printing, publication or sending of any notice, circular or advertisement which was at that time unlawful. Illegal betting, as in the case of street betting, therefore, remained illegal. Bets were not made recoverable at law by the payment of the duty.

In July 1927 the chancellor of the exchequer stated in the House of Commons that in the eight months to the end of June 1927 the tax had yielded about £1,750,000. The amount received by the Board of Customs and Excise for Betting certificates was £2,625,530 in the financial year 1927–28.

An alteration made by the Finance Act of 1927 was the extension of the duty reduction to 2%, which in 1926 applied only to bets on horse races, or to bets made on the ground on any sporting event; but on Oct. 1, 1928, the tax on racecourse bets was reduced to 1%, and from 3½% to 2% on those made with the bookmaker.

The decision to abolish the tax in 1929 was due to the admitted difficulties of administration, the number of evasions owing to the large volume of betting which still passed through the hands of the unrecognized street bookmaker, and dissatisfaction with the returns. The experience of other countries where the method of collection is either by means of the totalizator or the pari mutuel indicates that taxation in this form will yield a satisfactory return. The totalizator (*q.v.*) is a machine operated by electric power, which registers every bet made with it, and shows publicly the amount of money staked on each horse in the particular race, and the total amount staked on all horses in the race. (J. S. S.)

BETTWS-Y-COED (Bĕt'tŏŏs-ĭ-koid), urban district, Caernarvonshire, Wales, on the Llugwy, near its confluence with the Conway. Southward, above the confluence, the Vale of Conway is narrow, and in less than two miles the confluence of the Lledr from the west and the Conway from the east is reached, giving routes to Blaenau Festiniog and Corwen respectively. Pop. (est. 1938) 747. Area 7 sq.mi. The words *y coed* ("the wood") are added to distinguish the village from more than one other Bettws (=Bede-house) in Wales. Since the days of David Cox the neighbourhood, with its beautiful glen and river scenery, has been famous as a centre for artists and tourists. In summer it is much visited by motor traffic from England and from the seaside resorts of north and west Wales, being well served by roads, and by the railway (London, Midland and Scottish) from Conway. It is also on one of the main approaches to Snowdonia, Telford's "Holyhead Road" crossing the Conway by an iron bridge dating from 1815. The picturesque bridge over the Llugwy in the village dates from the 15th century. Most of the streams provide trout fishing; and the Conway, where the primitive coracle has long lingered, is famous for its salmon. Other objects of interest are the Swallow falls (Rhaidr-y-Wenol) 2¼ m. from Bettws to the west and Dolwyddelan Castle, about 6 m. S.W. of Bettws-y-coed, a keep of uncertain date near a slate-quarrying village of that name, the birth-place of Llewellyn the Great (1194–1240).

BETTY, WILLIAM HENRY WEST (1791–1874), English boy actor, known as "the young Roscius," was born on Sept. 13, 1791, at Shrewsbury. He first appeared on the stage at Belfast before he was twelve in an English version of Voltaire's *Zaire*. He afterwards played with success in Dublin, Glasgow and Edinburgh. In 1804 he first appeared at Covent Garden, when the troops had to be called out to preserve order, so great was the crush to obtain admittance. At Drury Lane he played for the unprecedented salary of over 75 guineas a night. George III. presented him to the queen, and Pitt on one occasion adjourned the House of Commons that members might be in time for his performance. In 1808 he made his final appearance as a boy actor, and entered Christ's college, Cambridge. He reappeared four years later, but the public would have none of him. He died in 1874. His son Henry Betty (1819–97) was also an actor.

BETUL, a town and district of British India, in the Nerbudda division of the Central Provinces. Pop. (1941) 11,841. The administrative headquarters of the district were moved many years ago to the town of Badnur (*q.v.*) 3 miles to the north.

The District of Betul has an area of 3,885 square miles. Pop. (1941) 438,342. The mean elevation of the district is about 2,000 ft. It is the westernmost of the Satpura districts situated upon the elevated tract which divides the Nerbudda valley on the north from the Berar plain on the south. The northern part of the district forms an irregular plain of sandstone formation. It is well wooded and resembles an English park, but the population is sparse and the cultivation poor. The central tract possesses the best soil in the valleys of the Machna and Sampna rivers. It is well cultivated and studded with villages. In the south lies a rolling plateau of basaltic formation (with the sacred town of Multai and the springs of the river Tapti at its highest point) extending over the southern face of the district. There are basins of fertile soil enclosed between stony ridges of trap rock, and water is to be found near the surface even among the ridge lands. The richer soils produce wheat, pulse and some sugar cane, irrigated from wells; the poorer, oil seeds and small millets. The district suffered severely in the great famines of 1897 and 1900. The poorer tracts in the north are mainly inhabited by aboriginal tribes, Gonds and Korkus, but the fertile areas in the centre and south of the district are occupied by Hindu immigrants in the north from Malwa and in the south from the Deccan. Mohammedans are less than 2% of the population.

There are 1,200 square miles of Government forests exporting teak and other timber. Agriculture and forests provide the chief occupations of the people and there is no large industry. In spite of its rugged character the district has progressed. A number of roads were made in the famines, and a few years ago the northern section of the railway Itarsi to Nagpur opened up the north of the district with a branch to the Chhindwara coalfields. The southern section into Nagpur was completed in 1926, and the districts have developed very greatly in consequence.

In olden days the district had many changes of rulers, both local and from the north and south, but it passed into the hands of the Mahrattas from the Gonds in 1743 and came under British rule in 1818. Since the British census of 1872 the population has increased from 276,000 to 438,342. In 1911 it was

390,000, but a decline of 26,000 due to the influenza epidemic (1918–19) was soon made up. It is one of the most peaceful districts of the Central Provinces. Its urban population is only 13,000.

The climate is comparatively temperate, but the denser jungles are very malarious.

BETULACEAE, a family of the dicotyledons, tribe Amentiferae, with the flowers borne in characteristic aments or catkins. Six genera and about 100 species are recognized, characteristic of the north temperate zone of both hemispheres. *Betula,* the birch (*q.v.*), with about 40 species, *Alnus,* the alder (*q.v.*), 17 species, and *Carpinus,* ironwood or hornbeam (*q.v.*), with about 25 species, are characteristic. *Corylus,* with 8 species, produces the hazel nut; *see* HAZEL.

For a monographic treatment *see* H. Winkler, "Betulaceae," *Pflanzenreich* 19 (iv. 61): 1–149. f. 1–26 (1904).

BETWA, a river of India, which rises in the native state of Bhopal in Malwa, and after a course of 360 mi., for the most part in a north-easterly direction, falls into the Jumna at Hamirpur. A weir is thrown across the Betwa about 15 mi. from Jhansi town, whence a canal 168 mi. long takes off irrigating some 81,000 acres; similar works have been carried out elsewhere on the river.

BETZDORF, town in Rhenish Prussia, Germany, on river Sieg, tributary of the Rhine, 35 mi. E. of Bonn. Pop. (1933), 8,781. Iron is mined and there are machinery and wagon works.

BEUEL, a town on the Rhine opposite Bonn, Rhenish Prussia, Germany. Pop. (1939) 20,810. Metal-work, asphalt, basalt, cardboard, paper, vaseline and chemicals are produced.

BEULE, CHARLES ERNEST (1826–74), French archaeologist and politician, was born at Saumur on June 29, 1826. As one of the professors in the École Française at Athens he had the good fortune to discover the propylaea of the Acropolis, and his work, *L'Acropole d'Athènes* (2nd ed., 1863), was published by order of the minister of public instruction. In May–Nov. 1873 he was minister of the interior in the Broglie ministry. He died by his own hand on April 4, 1874. He was the author of numerous works on archaeological and historical subjects.

See Ideville, *Monsieur Beulé, Souvenirs personnels* (1874).

BEURNONVILLE, PIERRE DE RUEL, MARQUIS DE (1752–1821), French general. Minister of war in Feb. 1793, he denounced his old commander, C. F. Dumouriez, to the Convention, and was one of the four deputies sent to watch him. Given over by him to the Austrians on April 3, 1793, Beurnonville was not exchanged until Nov. 1795. He entered the service again, and was appointed inspector of infantry of the army of England in 1798. In 1800 he was sent as ambassador to Berlin, in 1802 to Madrid. Napoleon made him a senator and count of the empire. A member of the provisional government in 1814, he followed Louis XVIII. to Ghent during the Hundred Days and after the restoration was made marquis and marshal of France.

See A. Chaquet, *Les Guerres de la Révolution* (1886).

BEUST, FRIEDRICH FERDINAND VON, COUNT (1809–1886), Austrian statesman, was born January 13, 1809, in Dresden, of an ancient Brandenburg family long settled in Saxony. He was educated at Leipzig and Göttingen, and entered the Saxon diplomatic service in which he served at Berlin, Paris, Munich and London. In Feb. 1849 he became minister for foreign affairs and also minister for education and public worship, an office he exchanged in 1853 for the ministry for internal affairs, in which year he also became minister-president. His was the hand that guided Saxony through the revolutionary days of 1849 and which subsequently restored order by repressive measures that won him the hatred of the German Liberals. But his chief interest was in foreign policy, and he became the champion of the lesser German states against the hegemony, and unifying policy, of Prussia. This policy naturally brought him into conflict with Bismarck who attacked him in the press as a "particularist," or supporter of the smaller states as against Prussia. In 1851 he supported Austria and again in 1866 when Bismarck forced the Seven Weeks' War upon Austria. After Königgrätz, Bismarck refused to negotiate with him; and Beust in consequence resigned all his offices.

At the moment when his public career seemed to have ended in disaster, he received a wholly unexpected offer from the Emperor Francis Joseph of the Austro-Hungarian Ministry for Foreign Affairs. A Protestant and a Saxon might well have hesitated to accept such a post at such a moment; but Beust did not hesitate, and threw himself into his new task with all his untiring energy. He brought the negotiations for the *Ausgleich* between Austria and Hungary to a successful conclusion and, in his capacity of Austro-Hungarian minister-president, restored parliamentary government and by a liberal policy did much to rid the country of repressive and mediaeval institutions and restrictions. For his services in these and other matters, he was raised to the dignity of a count in 1868 and made chancellor of the empire. At the same time he surrendered the office of minister-president to Hohenwart whose federalist plans were subsequently a probable cause of his downfall. In foreign policy Beust did much to improve the reputation of the empire abroad, and he ever worked steadfastly to promote a Franco-Austrian *entente.* When the Franco-Prussian war broke out, Beust openly displayed his sympathy for France; but he completely accepted the resulting unification of Germany and, at the moment of his dismissal from office in 1871, was engaged in promoting a good understanding between the Central empires.

The exact reason for his dismissal has never been divulged (it is said Beust himself never learnt of it), but his downfall was softened by his appointment as Austrian ambassador at London from whence he was transferred to Paris in 1878. He retired from the diplomatic service in 1882, and died at Altenberg, near Vienna, on Oct. 24, 1886.

A diplomatist *à la carrière,* a wit and man of the world, Beust has hitherto been dismissed too lightly as a statesman of the makeshift school. The recent opening to public inspection of the Austrian archives has enabled the full details of his diplomacy to be studied; and from such a study Beust emerges with an enhanced reputation. His sangfroid in moments of crisis was wholly admirable, because it was not the sangfroid of one who did not appreciate the dangers by which he was beset. If he was more German than Hungarian in his outlook on affairs that mutually concerned the two races, he can scarcely be blamed; and certainly at all times he sought to tread along a middle course of safety in foreign policy and firm and equitable government at home.

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BEUTHEN, a town of Germany, in the extreme south-east of the Prussian province of Upper Silesia, 120 mi. S.E. of Breslau, on the railway to Cracow. Pop. (1939), 100,644. It is the centre of the mining district (lead and zinc) of Upper Silesia. Arising out of this are its chemical and machine industries. Beuthen is an old town, and was formerly the capital of the Bohemian duchy of Beuthen, which in 1620 was ultimately granted, as a free lordship of the empire, to Lazarus, Baron Henckel von Donnersmarck, by the emperor Ferdinand II. In the partition of Upper Silesia between Germany and Poland in 1921 (*see* SILESIA) Beuthen was retained by Germany.

BEVEL, the inclination of one surface of a solid body to another, also any angle other than a right angle, and in carpentry or joinery the angle to which a piece of timber must be cut. The tool known as a bevel is a rule with two arms that can be set at any angle. In heraldry, a bevel is an angular break in a line. Bevelment or bevelling is a term in crystallography expressing the replacement of the edge of a crystal by two planes equally inclined to the planes adjacent to them. In architecture, a bevel is any sloped edge, or the surface resulting when the corner of a

beam or other member is cut off at an angle. The term bevel is used especially when the resultant surfaces are relatively small; the term splay is used when they are large. Bevel is used also to describe the sloped surfaces between the projecting faces and the recessed joints of rusticated masonry.

BEVERLEY, WILLIAM ROXBY (1814?–1889), English artist and scene-painter, was appointed scenic director for the Covent Garden operas in 1853. In 1854 he entered the service of the Drury Lane theatre and for 30 years continued to produce wonderful scenes for the pantomimes, besides working for Covent Garden and a number of other theatres. He executed many dioramic views, and was a frequent exhibitor of sea pictures at the Royal Academy from 1865 to 1880. He died at Hampstead on May 17, 1889.

BEVERLEY, municipal borough in the East Riding of Yorkshire, England, eight mi. N.N.W. of Hull by the L.N.E.R. Pop. (1938 est.) 14,140. Area 3.77 sq.mi. It lies in level country east of the Yorkshire Wolds, near the river Hull, and has communication by canal with Hull. There are evidences of a pre-Conquest settlement. A traditional charter of 925 is said to have granted sanctuary in the town. Thurstan, archbishop of York, gave the burgesses their first charter in the reign of Henry I. The church of St. John the Evangelist, Beverley minster, is on the site of a Saxon church founded by John of Beverley (640–721), which became a college of secular canons in the 10th century. It shows some of the finest examples of Early English architecture in the country, while the west front and most of the exterior is in the Decorated style. The church of St. Mary also shows beautiful Decorated and Perpendicular work. Of the old walls of the town only a 15th century gateway remains. Cloth weaving, one of the chief mediaeval industries of Beverley, was important as early as 1315. Beverley was a large market centre, especially from Tudor times, and in 1534–55 was granted three fairs together with weekly markets on Wednesdays and Saturdays. Incorporation charters were granted in 1573, 1629, 1663 and 1685. In the 18th and 19th centuries a large agricultural trade grew up and the town became the social centre of the neighbourhood. Subsidiary industries include tanning, brewing and the manufacture of gelatin, whiting and oil cake, but Beverley has been superseded by Hull. It is in the Holderness parliamentary division. Here are the offices of the East Riding county council.

BEVERLY, birthplace of the American navy, a city of Essex county, Massachusetts, U.S.A., on the picturesque "North Shore," and 18 mi. N.E. of Boston. It has a land area of 15 sq.mi., includes nine miles of seacoast, and is the starting point of the famous North Shore drive. It is served by the Boston and Maine railway, motorbuses, steamers and also by aeroplanes from Beverly airport, the largest port in Essex county. The population was 13,884 in 1900; 25,086 in 1930; and 25,537 in 1940 by the federal census.

Manufacturing and commerce have displaced the fishing and seafaring occupations of earlier days; and among the manufactures shoe machinery has taken the place formerly held by boots and shoes, which are still, however, an important product. The plant of the United Shoe Machinery corporation has 26 ac. of floor space and 8 mi. of aisles. In all some 35 products are manufactured in the city, including oiled clothing, shoe findings, soles, heels, lasts and counters. The output of the 46 establishments in 1940 was valued at over $10,000,000. Beverly is an important receiving and distributing point for oil from the Texas fields and for coal. The commerce of the harbour in 1940 amounted to 400,000 tons, chiefly of these two commodities, and was valued at $6,500,000. Market gardening and horticulture are carried on quite extensively within the city. The assessed valuation of property is about $41,095,900, giving a per capita valuation second highest among the cities of the state.

Beverly was settled in 1626 by Roger Conant; was incorporated as a separate township in 1668, and as a city in 1894. The first cotton mill in the U.S.A. was established here in 1788, and the first Sunday school in New England in 1810; and the manufacture of britannia ware was begun in 1812. It was the home of George Cabot (1751–1823), first secretary of the navy, Nathan Dane (1752–1835), and Wilson Flagg (1805–1884); and the birthplace of Lucy Larcom (1826–1893), who made it the scene of much of her *Story of a New England Girlhood.* During the administration of President Taft it was the summer capital.

BEVERLY HILLS, a luxurious residential city of Los Angeles county, Calif., U.S.A., surrounded by Los Angeles, and 9 mi. from the ocean. It was incorporated in 1914 as a city of the sixth class, and is governed by a city council serving without pay. The area is 5 sq.mi. The city was well planned and laid out in advance with wide parkways and curving boulevards lined with uniform plantings of trees. Now over 28,000 trees are under care of the park department. Business development has been rapid of recent years, with many famous shops. Population in 1920 was 674; in 1940 it was 26,823. The assessed valuation of property in 1940 was over $60,000,000. It is world-famed as the home of celebrities of the screen, radio and stage.

BEVIS OF HAMPTON, the name of an English metrical romance. The wife of Guy, count of Hampton (Southampton) asks a former suitor, Doon or Devoun, emperor of Almaine (Germany), to send an army to murder Guy in the forest. The plot is successful, and she marries Doon. When threatened with future vengeance by her ten-year-old son, Bevis, she determines to make away with him also, but he is saved from death by a faithful tutor, is sold to heathen pirates, and reaches the court of King Hermin, whose realm is variously placed in Egypt and Armenia. The exploits of Bevis, his love for the king's daughter Josiane, his mission to King Bradmond of Damascus with a sealed letter demanding his own death, his imprisonment, his final vengeance on his stepfather are related in detail. After succeeding to his inheritance he is, however, driven into exile and separated from Josiane, to whom he is reunited only after each of them has contracted, in form only, a second union. The story also relates the hero's death and the fortunes of his two sons.



AFTER A WOOD CUT OF 1667
BEVIS OF HAMPTON, THE HERO OF MANY EARLY ENGLISH ROMANCES

The oldest extant version appears to be *Boeve de Haumtone,* an Anglo-Norman text which dates from the first half of the 13th century. The oldest ms. of the English metrical romance, *Sir Beues of Hamtoun,* dates from the beginning of the 14th century. The French *chanson de geste, Beuve d'Hanstone,* was followed by numerous prose versions, and in Italy, where *Bovo d'Antona* was the subject of more than one poem, the tale was interpolated in the *Reali di Francia,* the Italian compilation of Carolingian legend. Although the English version that we possess is based on a French original, it seems probable that the legend took shape on English soil in the 10th century, and that it originated with the Danish invaders. R. Zenker (*Boeve-Amlethus,* Berlin and Leipzig, 1904) establishes a close parallel between Bevis and the Hamlet legend as related by Saxo Grammaticus in the *Historia Danica.*

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BEWDLEY, municipal borough, Worcestershire, England, lies near the Shropshire border on the sloping right bank of the Severn. The ancient Forest of Wyre, extending from south-east Shropshire, borders the town on the west. Population (1938 est.) 4,296. Bewdley (*i.e., Beaulieu*) was held by the king at the time of the Domesday survey. The manor, then called *Bellus Locus* or *Beaulieu* on account of its beautiful situation, was after-

wards granted to the Mortimers, in whose family it continued until merged in the Crown on the accession of Edward IV.

In 1250 a bridge, the only one between it and Worcester, was built across the river and helped the commerce of the town. Trade flowed along two routes; the Severn giving connections, through a flourishing barge-traffic with Shrewsbury, Bridgnorth, Worcester, Gloucester and Bristol; while the bridge was the crossing place of a famous west-to-east route from Ludlow, along which wool from the Welsh hills was taken to the east of England. Bewdley received its first charter from Edward IV. in 1472, and later ones in 1605, 1685 and 1708. A fair and weekly markets were granted in 1373 and confirmed at various times. At Bewdley the Worcester-Shrewsbury line of the G.W.R. is joined by lines east from Birmingham and west from Tenbury. A bridge by Telford (1797) crosses the river, while above the town an aqueduct carries the pipe from the Elan valley reservoirs in Radnorshire, to Birmingham. Bewdley serves as a market town and as a riverside pleasure resort for the Black Country. The borough was extended in 1933. Area 5.8 sq.mi. It is in the Bewdley parliamentary division of Worcestershire, though in earlier times was itself represented.

BEWICK, THOMAS (1753–1828), English wood-engraver, born at Cherryburn, near Newcastle-on-Tyne, on Aug. 12, 1753, showed, at a very early age, a remarkable talent for drawing. He had no tuition, and no models save natural objects. At 14 he was apprenticed to Mr. Beilby, an engraver in Newcastle. He seems after this to have devoted himself entirely to engraving on wood. In 1784 appeared his *Select Fables*. The *Quadrupeds* appeared in 1790. While working on the *Quadrupeds* Bewick engraved the large block known as the "Chillingham Bull." His great achievement, that with which his name is inseparably associated, the *British Birds*, was published from 1797–1804. Of his other productions the engravings for Goldsmith's *Traveller* and *Deserted Village*, for Parnell's *Hermit*, for Somerville's *Chase*, and for the collection of *Fables of Aesop and Others*, may be specially mentioned. Bewick was for many years in partnership with his former master. He died at Gateshead on Nov. 8, 1828.

See his autobiography, *Memoirs of Thomas Bewick, by Himself* (1862); D. C. Thomson, *Life and Works of Bewick* (1882); Austin Dobson, *Thomas Bewick and his Pupils* (1884), and the same author's article in the *Dictionary of National Biography*.

BEXHILL or **BEXHILL-ON-SEA,** a municipal borough and watering place in the Rye parliamentary division of Sussex, England, 62 mi. S.S.E. of London, on the Southern railway. Pop. (est. 1938) 23,430. Area, 12.52 sq.mi. The ancient village, with the Norman and Early English church of St. Peter, lies inland on the slope of the low hills fringing the coast. Bexhill developed very rapidly after about 1884 and in 1902 was incorporated. It has a marine parade, pier and *Kursaal*, and a new entertainment centre was opened in 1935. The climate is bracing and the neighbouring country pleasant. During World War II, 2,600 houses were damaged in the German air raids of 1940–41.

BEXLEY, NICHOLAS VANSITTART, 1ST BARON (1766–1851), English politician, was the fifth son of Henry Vansittart (d. 1770), governor of Bengal, and was born in London on April 29, 1766. Educated at Christ Church, Oxford, he took his degree in 1787, and was called to the bar at Lincoln's Inn in 1791. He began his public career by writing pamphlets in defence of the administration of William Pitt, especially on its financial side, and in May 1796 entered parliament. In 1801 he was appointed joint secretary to the treasury, a position which he retained until the resignation of Addington's ministry in April 1804. He became secretary for Ireland under Pitt (Jan.–Sept. 1805); and secretary to the treasury (1806–07) under the Grenville administration. During these and the next few years Vansittart's reputation as a financier was gradually rising. In 1809 he proposed and carried without opposition in the House of Commons 38 resolutions on financial questions, and only his loyalty to Sidmouth prevented him from joining the cabinet of Spencer Perceval as chancellor of the exchequer in Oct. 1809. He opposed an early resumption of cash payments in 1811, and became chancellor of the exchequer when the earl of Liverpool succeeded Perceval in May 1812.

When Vansittart became chancellor of the exchequer the country was burdened with heavy taxation and an enormous debt. Nevertheless, the continuance of the war compelled him to increase the custom duties and other taxes, and in 1813 he introduced a complicated scheme for dealing with the sinking fund. In 1816, after the conclusion of peace, a large decrease in taxation was generally desired, and there was a loud outcry when the chancellor proposed only to reduce, not to abolish, the property or income tax. The abolition of this tax, however, was carried in parliament, and Vansittart was also obliged to remit the extra tax on malt, meeting a large deficiency principally by borrowing. He devoted considerable attention to effecting real or supposed economies with regard to the national debt. He carried an elaborate scheme for handing over the payment of naval and military pensions to contractors, who would be paid a fixed annual sum for 45 years; but no one was found willing to undertake this contract, although a modified plan on the same lines was afterwards adopted. Vansittart became very unpopular in the country, and he resigned his office in Dec. 1822. His system of finance was severely criticized by Huskisson, Tierney, Brougham, Hume and Ricardo. On his resignation Liverpool offered Vansittart the post of chancellor of the duchy of Lancaster. Accepting this offer in Feb. 1823 he was created Baron Bexley in March, and granted a pension of £3,000 a year. He resigned in Jan. 1828. In the House of Lords Bexley took very little part in public business, although he introduced the Spitalfields weavers bill in 1823, and voted for the removal of Roman Catholic disabilities in 1824. He took a good deal of interest in the British and Foreign Bible Mission, the Church Missionary Society and kindred bodies, and assisted to found King's college, London. He died at Foots Cray, Kent, on Feb. 8, 1851. There are nine volumes of Vansittart's papers in the British Museum.

See S. C. Buxton, *Finance and Politics* (1888); Spencer Walpole, *History of England* (1890).

BEXLEY, a municipal borough (1937) in the Dartford parliamentary division of Kent, England, 12 mi. E.S.E. of London by the Southern railway. Pop. (est. 1938) 77,020. Area, 7.61 sq.mi. Bexley is mentioned in Domesday and has had a church since the 9th century. The present church of St. Mary is Early English and later. With the rental of the manor of Bexley, William Camden, the antiquary, founded the ancient history professorship at Oxford. Watling street may be traced over Bexley heath. Agriculture is still important, but industrialization of the region greatly increased the population, which was only 12,918 in 1901. Metal workers, including fitters, engineers and tool makers, are the most important elements. Chemical industries are also carried on.

BEY, a modern Turkish word, the older form being *beg* (*cf.* Pers. *baig*), the administrator of a district, later an honorific title throughout the Turkish empire. In Tunis "bey" has become the hereditary title of the reigning sovereigns (*see* TUNISIA).

BEYBAZAR, the chief town of a *kaza* of the Angora vilayet of Turkey, situated on an affluent of the Sakaria (anc. *Sangarius*), about 52 mi. west of Angora. It corresponds to the anc. Lagania, renamed Anastasiopolis under the emperor Anastasius (491–518), a bishopric by the 5th century. Its well built wooden houses cover the slopes of three hills at the mouth of a gorge filled with fruit gardens and vineyards. The chief products are rice, cotton and fruits.

From Beybazar come the fine pears sold in Constantinople as "Angora pears"; its musk-melons are equally esteemed; its grapes are used only for a sweetmeat called *jevizli-sujuk* ("nutty fruit sausage"). There are few remains of antiquity apart from numerous rock-cut chambers lining the banks of the stream. Pop. 21,340.

BEYERS, CHRISTIAN FREDERICK (1869–1914), South African soldier, was born in the Cape Colony, but went in early life to the Transvaal. He took a prominent part in the South African War, reaching the rank of general. On the grant of responsible government to the Transvaal in 1906, Beyers was elected Speaker of the House of Assembly, and commended himself to the Opposition by his tolerance and impartial conduct in the chair. On the establishment of Union, in 1910, he was ap-

pointed commandant-general of the South African Defence Force and in that capacity visited England in 1912. On the outbreak of the World War, he showed determined opposition to the policy of Botha and Smuts, especially in regard to the campaign in German South-West Africa. His ultra-patriotic views and strong religious feelings gave him much influence with the backveld Boers, and helped to foment the rebellion. After conducting an acrimonious correspondence with Smuts, he resigned his post and shortly afterwards went openly into revolt. After various vicissitudes his forces were harried and broken, and Beyers himself, in trying to escape across the Vaal river, was drowned Dec. 8 1914. At first some doubts were entertained as to the manner of his death, but on Dec. 10 these were dispelled by the finding of his body.

BEYLE, MARIE HENRI: *see* STENDHAL.

BEYRICH, HEINRICH ERNST VON (1815–1896), German geologist, was born at Berlin on Aug. 31, 1815, and educated at Berlin and Bonn. In 1865 he became professor of geology and palaeontology in the Berlin university; and when the Prussian Geological Survey was instituted in 1873 he was appointed co-director with Wilhelm Hauchecorne (1828–1900). He published *Beiträge zur Kenntniss der Versteinerungen des rheinischen Übergangsgebirges* (1837); *Über einige böhmische Trilobiten* (1845); *Die Conchylien des norddeutschen Tertiärgebirges* (1853–57). He died on July 9, 1896.

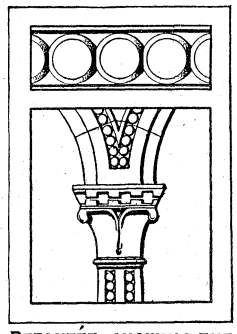
BEYSCHLAG, WILLIBALD (1823–1900), German Protestant divine, was born at Frankfort-on-Main on Sept. 5, 1823, and died at Halle on Nov. 25, 1900. He became professor ordinarius of practical theology at Halle in 1860. A theologian of the mediating school, he became leader of the *Mittelpartei,* and with Albrecht Wolters founded as its organ the *Deutschevangelische Blätter.* Among his works are *Die Christologie des Neuen Testaments* (1866), *Der Altkatholicismus* (three editions, 1882–83), *Leben Jesu* (1885; 3rd ed. 1893), *Neutestamentliche Theologie* (1891–92; 2nd ed., 1896), *Christenlehre auf Grund des kleinen luth. Katechismus* (1900), and an autobiography *Aus meinem Leben* (1896–98).

See P. Schaff, *Living Divines* (1887); Lichtenberger, *Hist. Germ. Theol.* (1889); Calwer-Zeller, *Kirchenlexikon.*

BEZA (DE BÈSZE), **THEODORE** (1519–1605), French theologian, son of *bailli* Pierre de Bèsze, was born at Vezelai, Burgundy, on June 24, 1519, of good parents, known for generous piety. An uncle, Nicolas de Bèsze, counsellor of the Paris parlement, placed him (1529) under Melchior Wolmar at Orleans, and later at Bourges. Wolmar, who had taught Calvin Greek, grounded Beza in Scripture. Beza studied law at Orleans (May 1535 to Aug. 1539), beginning to practise it in Paris (1539). To this period belong his exercises in Latin verse, in the loose style of the day, published by him as *Juvenilia* in 1548. Though not in orders, he held two benefices. A severe illness wrought a change in him; he married his mistress, Claude Desnoz, and joined Calvin at Geneva (Oct. 1548). In Nov. 1549 he became Greek professor at Lausanne, where he acted as Calvin's adjutant and defended the burning of Servetus in his *De Haereticis a civili magistratu puniendis* (1554). In 1558 he became professor at Geneva. His ability was shown in the Colloquy of Poissy (1561). On Calvin's death (1564), he became his biographer and successor. As a historian, Beza has been the source of serious mistakes; as an administrator, he softened the rigour of Calvin. His editions and Latin versions of the New Testament had an influence on the English versions of Geneva (1557 and 1560) and London (1611). The famous codex D. was presented by him (1581) to Cambridge university with a dubious account of the history of the ms. His numerous works are of little moment, except those mentioned. He resigned his offices in 1600, and died on Oct. 13, 1605. He was not the author of the *Histoire ecclésiastique* (1580), sometimes ascribed to him; nor, probably, of the vulgar skit published under the name of Benedict Panavantius (1551) and there is no authority for attributing it to him.

See Laingaeus, *De Vita et Moribus* (1585, calumnious); Antoine la Faye, *De Vita et Obitu* (1606, eulogistic); Schlosser, *Leben* (1806); Baum, *Th. Beza,* portrait (1843–1851); Heppe, *Leben* (1861).

BEZANT or **BYZANT,** a Byzantine gold coin which had a wide circulation throughout Europe up to about 1250. (*See* MONEY, MEDIAEVAL.) Bezants were also issued in Flanders and Spain. Silver bezants, in value from one to two shillings, were in circulation in England in the 13th and 14th centuries. In Wycliffe's translation of the Bible he uses the word for a "talent" (*e.g.,* in Luke xv. 8). In heraldry, bezants are represented by gold circles on the shield, and were introduced by the crusaders.



BEZANTÉE, SHOWING THE USE OF THE DISC LIKE FORMS AS A DECORATION FOR A ROMANESQUE PIER AND ARCADE

BEZANTÉE, in architecture, a name given to a band or moulding decorated with a series of flat, circular projections supposedly resembling the coins (bezants) struck in Byzantium.

BEZBORODKO, ALEKSANDER ANDREYEVICH, PRINCE (1747–1799), grand chancellor of Russia, was born at Gluchova on March 14, 1747, and educated at home and in the clerical academy at Kiev. He accompanied Count Rumyantsev, then the governor-general of Little Russia, to the Turkish War in 1768, and was present at the engagements of Larga and Kaluga, and at the storming of Silistria. The field marshal recommended him to Catherine II., and she appointed him in 1775 her petition-secretary. In 1780 he accompanied her on her journey through White Russia. On his return from a delicate mission to Copenhagen, he presented to the empress "a memorial on political affairs" which comprised the first plan of a partition of Turkey between Russia and Austria. This document was transmitted almost word for word to Vienna as the Russian proposals. He followed this up by *Epitomised Historical Information concerning Moldavia.* For these two state papers he was rewarded with the posts of "plenipotentiary for all negotiations" in the foreign office and postmaster-general. From this time he was inseparably associated with Catherine in all important diplomatic affairs, though officially he was the subordinate of the vice-chancellor, Count Alexander Osterman. He wrote all the most important despatches to the Russian ministers abroad, concluded and subscribed all treaties, and performed all the functions of a secretary of state. He identified himself entirely with Catherine's political ideas, even with that of re-establishing the Greek empire under her grandson Constantine. For the foreign policy which he carried out *see* CATHERINE II. The empress, as usual, richly rewarded her *comes* with pensions and principalities. In 1786 he was promoted to the senate, and it was through him that the empress communicated her will to that august state-decoration. In 1787 he accompanied Catherine on her triumphal progress through South Russia in the capacity of minister of foreign affairs. On his return from concluding the peace of Jassy (1792) he found his confidential post of secretary of petitions occupied by the empress's last favourite, P. A. Zubov. He complained of this "diminution of his dignity" to the empress in a private memorial in the course of 1793. Subsequently Catherine reconciled him with Zubov, and he resumed the conduct of foreign affairs.

On the death of Catherine, the emperor Paul entrusted Bezborodko with the examination of the late empress's private papers, and shortly afterwards made him a prince of the Russian empire, with a correspondingly splendid apanage. On the retirement of Osterman he received the highest dignity in the Russian empire —that of imperial chancellor. Bezborodko was the only Russian minister who retained the favour of Paul to the last. During the last two years of his life the control of Russia's diplomacy was entirely in his hands. His programme at this period was peace with all the European powers, revolutionary France included. But the emperor's growing aversion from this pacific policy induced the astute old minister to attempt to "seek safety in moral and physical repose." Paul, however, refused to accept his resignation. He died at St. Petersburg on April 6, 1799. Bezborodko was a typical Catherinian, corrupt, licentious and self-seeking. But he was generous and affectionate.

See *Sbornik* (Collections) of the *Imperial Russian Historical Society* (Fr. and Russ.), vols. 60–100 (St. Petersburg, 1870–1904); Nikolai Ivanovich Grigorovich, *The Chancellor A. A. Bezborodko in Connexion with the Events of His Time* (Russ., St. Petersburg, 1879–81).

BEZEL, a sloping edge, as of a cutting tool, also known as basil. In jewellery, the term is used for the oblique sides or faces of a gem; the rim which secures the crystal of a watch in position or a jewel in its setting, and particularly the enlarged part of a ring on which the device is engraved (*see* RING).

BEZIERS, town of France, capital of an arrondissement, department of Hérault, 47m. S.W. of Montpellier by rail. Pop. (1936) 69,880. Béziers lies in a wine-growing district, on a hill on the left bank of the Orb, joined at this point by the Canal du Midi. The Romans established a colony here. The name Besara occurs as early as Festus Avienus (later 4th century). The town was destroyed with a great massacre in 1209 by de Montfort in the crusade against the Albigenses. The walls were rebuilt in 1289; but the town suffered severely in the wars of the 16th century, and all its fortifications were destroyed in 1632. The Allée Paul Riquet divides the old town on the west from the new town on the east. Above the old ramparts towers St. Nazaire, the former cathedral (12th to 14th centuries), a good specimen of the ecclesiastical fortification common in southern France. It has a rose window in the western façade, and stained glass and iron grilles in the choir-windows (14th century). Adjoining the south transept there are Gothic cloisters of the 14th century. There are also remains of a Roman arena. Road, canal and railway cross the Orb at Béziers. It is a market for wine, brandy, manure, chemical products, grain and flour. Béziers is the seat of a sub-prefect and has tribunals of first instance and of commerce, and several learned societies.

BÉZIQUE, a game at cards played with two similar packs from which the twos, threes, fours, fives, and sixes have been rejected, shuffled together and used as one (probably from Span. *besico,* little kiss, in allusion to the meeting of the queen and knave, an important feature in the game). It is modelled on a group of card games which possess many features in common; the oldest of these is *mariage,* then follow *brusquembille, l'homme de brou, briscan* or *brisque,* and *cinq-cents.* Bézique (also *besi* and *besigue*) is, in fact, *brisque* played with a double pack, and with certain modifications rendered necessary by the introduction of additional cards. The cards rank as follows:—Ace, ten, king, queen, knave, nine, eight, seven.

The usual game is for two players. The players cut for deal, and the higher bézique card deals. The objects of the play are: (1) to promote in the hand various combinations of cards, which, when declared, entitle the holder to certain scores; (2) to win aces and tens, known as "brisques"; (3) to win the so-called last trick. The dealer deals eight cards to each, first three, then two, and again three. The top card of those remaining (called the "stock") is turned up for trumps. As sometimes played, the first marriage, or the first sequence, decides the trump suit; there is then no score for the seven of trumps (*see* below). The stock is placed face downwards between the players and slightly spread. The non-dealer leads any card, and the dealer plays to it, but need not follow suit or win the trick. If he wins the trick by playing a higher card of the same suit led, or a trump, the lead falls to him. In case of ties the leader wins. Whoever wins the trick leads to the next; but before playing again each player takes a card from the stock and adds it to his hand, the winner of the trick taking the top card. This alternate playing and drawing a card continues until the stock (including the trump card or card exchanged for it, which is taken up last) is exhausted. The tricks remain face upward on the table, but must not be searched during the play of the hand.

The scores are shown as follows:—

Table of Bézique Scores.

Seven of trumps, turned up, dealer marks	10
Seven of trumps, declared (see below) or exchanged, player marks	10
Marriage (king and queen of any suit) declared	20
Royal marriage (king and queen of trumps) declared	40
Bézique (queen of spades and knave of diamonds) declared	40
Double bézique (all the four bézique cards) declared	500
Four aces (any four, whether duplicates or not) declared	100
Four kings (any four) declared	80
Four queens (any four) declared	60
Four knaves (any four) declared	40
Sequence (ace, ten, king, queen, knave of trumps) declared	250
Aces and tens, in tricks, the winner for each one marks	10
Last trick of all (as sometimes *played,* the last trick before the stock is exhausted) the winner marks	10

A "declaration" can only be made by the winner of a trick immediately after he has won it, and before he draws from the stock. It is effected by placing the declared cards (one of which at least must not have been declared before) face upwards on the table, where they are left, unless they are played, as they may be. A player is not bound to declare. A card led or played cannot be declared. More than one declaration may be made at a time, provided no card of one combination forms part of another that is declared with it. Thus four knaves and a marriage may be declared at the same time; but a player cannot declare king and queen of spades and knave of diamonds together to score marriage and bézique. He must first declare one combination, say bézique; and when he wins another trick he can score marriage by declaring the king. A declaration cannot be made of cards that have already been declared. Thus, if four knaves (one being a bézique knave) and four queens (one being a bézique queen) have been declared, the knave and queen already declared cannot be declared again as bézique. To score all the combinations with these cards, after the knaves are declared and another trick won, bézique must next be made, after which, on winning another trick, the three queens can be added and four queens scored. Lastly, a card once declared can only be used again in declaring in combinations of a different class. For example: the bézique queen can be declared in bézique, marriage, and four queens; but having once been declared in single bézique, she cannot form part of another single bézique. Two declarations may, in a sense, be made to a trick, but only one can be scored at the time. Thus with four kings declared, including the king of spades, bézique can be declared and scored, but the spade marriage cannot be scored till the holder wins another trick. The correct formula is "Forty, and 20 to score." The seven of trumps may be either declared or exchanged for the turn-up after winning a trick, and before drawing. When exchanged, the turn-up is taken into the player's hand, and the seven put in its place. The second seven can, of course, be declared. A seven when declared is not left on the table, but is simply shown.

The winner of the last trick can declare anything hitherto undeclared in his hand. After this all declarations cease. The winner of the last trick takes the last card of the stock, and the loser the turn-up card (or seven exchanged for it). All cards on the table, that have been declared and not played, are taken up by their owners. The last eight tricks are then played, but the second player must follow suit if able, and must win the trick if able. Finally, each player counts his tricks for the aces and tens they may contain, unless (as is often done) they are scored at the time. If a player revokes in the last eight tricks, or does not win the card led, if able, the last eight tricks belong to his adversary. The deal then passes on alternately until the game (1,000) is won. If the loser does not make 500, his opponent counts a double game, or double points, according as they have agreed. The score is best kept by means of a special bézique-marker.

Rubicon Bézique.—Four packs are used. Nine cards are dealt by threes to each player. The rules of ordinary bézique hold good in regard to dealing, leading, playing to lead, drawing, and declaring; but a player who receives a hand containing no picture-card (king, queen, or knave) scores 50 for *carte blanche,* which he shows. If he does not draw a picture-card, he can again score for *carte blanche.* The trump suit is decided by the first sequence or marriage declared. As four packs are used, triple and quadruple bézique may be made. Triple bézique counts 1,500, quadruple 4,500. Tricks are left face upwards, till a *brisque* (ace or ten) is played, when the winner takes all the played cards and puts them in a heap; their only value is the value of the *brisques,*

which are only counted when the scores are very close; then they are used to decide the game. They may be counted during the play, provided there are not more than 12 cards in the stock. Declarations can only be made after winning a trick and before drawing. In addition to the ordinary bézique declarations, sequence, counting 150, can be made in plain suits. Declared cards, except *carte blanche,* remain on the table. If the holder of *carte blanche* holds four aces and wins the first trick, he can declare his aces. With the exceptions already made, the scores for declarations are the same as at ordinary bézique. Declaration is not compulsory. Cards led or played cannot be declared. There are three classes of declarations, their order being (1) marriage and sequence, (2) bézique, (3) fours. A card once declared can be used for a second declaration, but only in an equal or superior class. If a card of a declared combination be played to a trick, another card of the same rank may be used to form a second similar combination; *e.g.,* if aces be declared and one of them be played by the playing of a fifth ace, then aces can be declared a second time.

If a player has a chance of a double declaration he can declare both, but can only score one at the time. As in other variations of bézique he announces, say, "40, and 20 to score." He should repeat, "20 to score," after every trick, until he can legally score it, but if he plays a card of the combination he cannot score the points. To the last nine tricks, after the stock is exhausted, the second player must follow suit and win the trick by trumping or over-playing, if it is possible for him to do so. The winner of the odd trick scores 50.

The game consists of one deal. In reckoning the score all fractions of 100 are neglected; the winner scores 500 for game in addition to the difference between his own points and his opponent's. The loser is "rubiconed" if he does not score 1,000 points, in which case the winner adds the loser's points to his own, takes 300 for *brisques* and 1,000 for game; but the loser may claim his *brisques* to save a rubicon, though they are not reckoned among his points. If a rubiconed player has scored less than 100 the opponent counts the score as 100.

Six Pack Bézique is the most common form of rubicon bézique. It is played a great deal at London clubs, and is the most popular of modern two-handed games.

Six packs of 32 cards, each, from ace to seven, are used. The cards rank as follows:—ace, ten, king, queen, knave, nine, eight, seven.

Twelve cards are dealt to each player, one at a time. If a player has a hand dealt to him without a king, queen, or knave, he declares *carte blanche* before playing a card. *Carte blanche* must be shown by exposing all the cards one at a time, and picking them up again. A player holding *carte blanche* scores 250 points, and he can go on scoring 250 points every time that he draws another plain card on showing the card drawn to his adversary.

A player is not obliged to follow suit or to trump, until the final play.

The suit of the first marriage which is declared becomes the trump suit. If a sequence is declared before any marriage the suit of the sequence is the trump suit.

The declarations and their values are as follows:—

	Points
Carte blanche	250
Royal marriage (in trumps)	40
Common marriage (in other suits)	20
Sequence (ace, ten, king, queen, knave of trumps)	250
Backdoor sequence (not in trumps)	150
Bézique (queen of spades and knave of diamonds)	40
Double bézique (two of each)	500
Treble bézique (three of each)	1500
Quadruple bézique (known as the *grand coup*)	4500
Four aces of trumps	1000
Four tens of trumps	900
Four kings of trumps	800
Four queens of trumps	600
Four knaves of trumps	400
Four aces	100
Four kings	80
Four queens	60
Four knaves	40
The last trick	250

The game is won by the player who scores the most points. The winner deducts the score of the loser from his own score, and adds 1,000 points for the game. If the loser fails to score 3,000 points he is rubiconed; *i.e.,* the winner adds the two scores together with the addition of the 1,000 points for winning the game. If neither player scores 3,000 points, the one who scores the greater number of points wins a rubicon.

After both players have played to a trick they each draw another card from the stock. The winner of the trick draws first.

After a player has won a trick he may make any declaration that he has. Declared cards must be exposed, face upwards, on the table and must remain so until they are played.

If a declared card be played, and a card which restores any declared combination be substituted, the combination may be declared again and scored again at its full value:—thus, if a player has declared four aces he may play one of them and score 100 points again on putting down another ace. If he has declared a sequence he may part with any card of the sequence in play and score another 250 points on putting down a card similar to the one played.

After the stock is exhausted the players take their declared cards into their hands and play them out. Each player must follow suit when able and must head the trick if he can. If he has none of the suit led he must trump. The winner of the last trick scores 250 points.

See Charles Goodall & Co., *The Royal Game of Bézique* (1868); Scribner, *Complete Guide to the game of Bézique* (1874); The International Card Co., *Rubicon Bézique* (1905); F. Jessel, *The Laws of Six Pack Bézique* (1921). (W. DA.)

BÉZOUT, ÉTIENNE (1730–1783), French mathematician, was born at Nemours on March 31, 1730. He studied mathematics in opposition to the wishes of his parents. In 1763 he became examiner of naval entrants in mathematics, and a few years later he undertook similar work for the artillery. Bézout wrote two text books, *Cours de mathématiques à l'usage des gardes du pavillon et de la marine, avec un traité de navigation* (1764–69) and *Cours de mathématiques à l'usage du corps royal de l'artillerie* (1770–72). These were adopted in a number of schools; they ran into many editions and were translated into other European languages. He was very conscientious in his work as an examiner, and in the limited time at his disposal for mathematical research he studied the theory of equations. Bézout's work on this subject was of great value to the geometers of the time, who were being hindered by the lack of knowledge in algebra. He published papers in the *Histoire de l'Académie Royale des Sciences* in 1764 and 1768. In the first of these papers he used determinants, but did not deal with their general theory. His most important work was the *Théorie générale des équations algébriques* (1779), which contained much valuable material on the theory of elimination. Bézout was a member of the Paris Academy; he died of fever on Sept. 27, 1783.

BEZWADA, a town of British India, in the Kistna district of Madras, on the left bank of the river Kistna, at the head of its delta. Pop. (1941) 86,184. Here are the headquarters of the Kistna canal system, which irrigates about 700,000 acres, and also provides navigation throughout the delta. There are rice-mills, and cotton-ginning and -pressing factories. The town is an important trade centre and the junction of 5 railways, and has increased largely in population in recent years. The anicut or dam at Bezwada, consists of a mass of rubble, fronted with masonry, 1,240 yards long. Ancient cuttings on the hills west of Bezwada have been held by some to mark the site of a Buddhist monastery; by others they are considered to have been quarries. At Undavalle to the south are some noted cave-shrines.

BHAGALPUR, town of British India, in the province of Bihar, which gives its name to a district and to a division; situated on the right bank of the Ganges, with a station on the East Indian railway. Pop. (1941) 93,254. The chief educational institution is the Tejnarayan Jubilee college. There are two monuments, one erected by the government, the other by the landholders, to the memory of Augustus Cleveland, who, as collector of Bhagalpur at the end of the 18th century,

"by conciliation, confidence and benevolence, attempted and accomplished the entire subjection of the lawless and savage inhabitants of the Jungleterry of Rajamahall." A silk institute has been established by government, which has introduced new kinds of silk to the weavers, who formerly only used tussur, and has produced artistic designs in coloured silk. Sabaur near the town is the headquarters of the agricultural department of the government of Bihar.

The District of Bhagalpur stretches across both banks of the Ganges. It has an area of 4,248 sq.mi. and a population (1941) of 2,408,879. It is a long and narrow district, divided into two unequal parts by the river Ganges. The north is a flat alluvial plain, mainly under rice cultivation and watered by a number of streams. Three fine rivers flow through the district—the Ganges, Kosi and Ghagri. The Ganges runs a course of 60m. through Bhagalpur. The Kosi falls into the Ganges near Colgong and receives the Ghagri 8m. above its debouchure. The tract south of the Ganges is traversed by the loop-line of the East Indian railway, and that to the north by the Bengal and North-Western railway. Rock sculptures of the 6th or 7th century exist at Patharghatta 8m. N.E. of Colgong; at the latter place a small rock-cut temple of A.D. 800 or 900 stands on a small hill close to the Ganges.

The Division of Bhagalpur stretches across the Ganges from the Nepal frontier to the hills of Chota Nagpur. It comprises the five districts of Monghyr, Bhagalpur, Purnea, Darjeeling, and the Santal Parganas. The total area is 18,701 sq.mi.; and in 1941 the population was 9,598,025.

BHAMO, a town and district of Burma. The town was in ancient times the capital of the Shan state of Manmaw, later the seat of a Burmese governor. It is now the headquarters of a district in the North-East Frontier division of Burma on the Chinese frontier. It is about 300 mi. up the river Irrawaddy from Mandalay, and so nearly 1,000 mi. by river from the sea. It is normally the highest point reached by the regular services of steamers of the Irrawaddy Flotilla company. It is also the nearest point on the river to the Chinese frontier, 53 mi. distant. Pop. (1931) 7,827, of whom a large number were Chinese, natives of India and Chinese-Shans. It stretches for nearly 4 mi. along the Irrawaddy bank in a series of small villages, transformed into quarters of the town, but the town proper is confined mainly to the one high ridge of land running at right angles to the river. The surface of the ground is much cut up by ravines. When the Irrawaddy is at its height the lower portion of the town is flooded, but usually for no very long time. Here had long been the terminus of the land commerce from China until the opening of the Burma road in 1938.

The district of Bhamo lies wholly in the basin of the Irrawaddy, which, as well as its tributaries, runs through the heart of it. On the east of the river is the Shan plateau, running almost due north and south. West of the Irrawaddy there is a regular series of ranges, enclosing the basins of the Kaukkwe, Mosit, Indaw and other streams down which much timber is floated. The hills are inhabited chiefly by Kachins. Area of district 4,146 sq.mi.; pop. (1941) 129,302. (L. D. S.; X.)

BHANDARA, a town and district of British India in the Chhattisgarh division of the Central Provinces. The town (pop. 1941, 19,708) is situated on the left bank of the River Wainganga, 7 miles from a station on the Bengal-Nagpur Railway. It has considerable manufactures of cotton cloth and brass-ware, and, besides all the ordinary institutions at the headquarters of a district, it has a Government High School and subsidiary schools attached to it.

The District of Bhandara has an area of 3,580 square miles, having lost some 300 square miles by transfer to the Balaghat district. Its population declined by 11% in the famine decade, but has now recovered, and in 1941 was 963,225. It is a beautiful, well-wooded district containing over 3,000 small lakes and tanks, and in the last 20 years several Government Storage Works for irrigation have been constructed. The eastern portion, on the borders of the Chhattisgarh, is very hilly, and there are small wooded hills dotted over the whole country. The strip of country on the north-west produces Juar (big millet). In the south-west there is a fertile plain near Powni, where wheat is the chief crop. Apart from these tracts, Bhandara is a rice-growing country, a considerable area being irrigated from its lakes and tanks.

The Great Eastern road and the Bengal-Nagpur railway traverse the district from west to east, on the way between Nagpur and Calcutta. At Gondia, a trading centre, two narrow gauge branch lines join the main line, one leading to Jubbulpore on the north, and the other to Chanda in the south.

The wilder areas of the district are to be found in the Zamindaris, or the estates of ancient feudal proprietors, who hold them on a favoured tenure continued from Mahratta days. Ponwars are the best cultivators, and Kohlis are tank constructors and sugar cane growers of much repute. The beautiful Nawegaon Bandh lake was constructed by an ancestor of the present Kohli proprietor. There are colonies of weavers in some of the small towns, though this industry is declining. Otherwise the industries are all small. Cigarettes are extensively manufactured at Tirora from the tobacco of the country.

The chief towns in the interior of the district are—Gondia (14,957); Powni, an old walled town and fort (12,525); Tumsar (10,061).

There are extensive deposits of high-grade manganese in the north-west of the district, exporting some 300,000 tons of ore. A branch line from Tumsar to serve these mines is under construction.

The district has developed greatly, and its population has increased.

BHANG, an East Indian name for the hemp plant, *Cannabis sativa* (*see* HEMP), but applied specially to the leaves dried and prepared for use as a narcotic drug. In India it is recognized under the three names and forms of Bhang, Gunja or Ganja, and Churrus or Charas. Bhang consists of the dark-green, aromatic, larger leaves and capsules of the plant on which resinous matter has exuded. Bhang is prepared in the form of a cake or manjan, and is smoked, with or without tobacco, or is made into an intoxicating beverage by infusing in cold water and straining. Gunja is the flowering or fruit-bearing tops of the female plants. It is gathered in stalks of several inches in length, the tops of which form a matted mass, from the agglutination of flowers, seeds and leaflets by the abundant resinous exudation which coats them. Churrus is the crude resinous substance separated from the plant. The use of preparations of hemp among the Muslim and Hindu population of India is very general; and the habit also obtains among the population of central Asia, the Arabs and Egyptians, extending even to the negroes of the valley of the Zambezi and the Hottentots of South Africa.

BHARAHAT or **BARHUT,** a village in the small state of Nagod in India lying about 120m. S.W. of Allahabad. It is famed for the remains of an imposing *stūpa* which was excavated in 1874. The *stūpa* was circular, 70ft. in diameter and 42ft. high. It was surrounded by a stone railing 100ft. in diameter so that between railing and *stūpa* there was an open circle round which visitors could walk; and the whole stood towards the east side of a paved quadrangle about 300ft. by 320ft., surrounded by a stone wall. The railing consisted of 80 square pillars, 7ft. 1in. in height, connected by cross-bars about 1ft. broad. Both pillars and cross-bars were elaborately carved in bas-relief, and most of them bore inscriptions giving either the name of the donor, or the subject of the bas-relief, or both. The forms of letters of the inscriptions, and the architectural details fix the date of the monument in the 3rd century B.C. The bas-reliefs tell of the literature, clothing, buildings and other details of the social conditions of the peoples of Buddhist India at that period; and they emphasize how much more prominent the Tibetan type of Indian was in the north than it is to-day. Unfortunately only about half the pillars, and about one-third of the cross-bars have been recovered. When the *stūpa* was discovered the villagers had already carried off the greater part of the monument to build their cottages with the stones and bricks of it. The process has gone on till now nothing is left except what Gen. Cunningham found and rescued and carried off to Calcutta.

BHARAL (bŭr'ăl), the Tatar's name for the "blue sheep" *Pseudois nahura,* of Ladakh and Tibet. The general colour is blue-gray with black "points" and white markings and belly; and the horns of the rams are olive-brown and nearly smooth, with a sigmoid backward curvature. The bharal serves to connect sheep (*q.v.*) with goats.

BHARATPUR or **BHURTPORE,** an Indian state in the Rajputana agency. Its area covers 1,978 sq.mi., and its population in 1941 was 575,625. The country is generally level, but detached hills, rising to 200 ft. in height, occur, especially in the north. These hills contain good building stone and some of them iron ore. The Banganga is the only river which flows through the state, on its way to the Jamna below Agra.

Bharatpur rose into importance under Suraj Mall, a Jat chieftain, who founded the present ruling family and bore a conspicuous part in the destruction of the Delhi empire. Having built the forts of Dig and Kumbher in 1730, he received in 1756 the title of rajah, and subsequently joined the great Mahratta army with 30,000 troops. In 1803 the East India company concluded a treaty, offensive and defensive, with Bharatpur. In 1804, however, the rajah assisted the Mahrattas against the British. Lord Lake captured the fort of Dig and besieged Bharatpur, but was compelled to raise the siege after four attempts at storming. A treaty, concluded on April 17, 1805, guaranteed the rajah's territory; but a dispute as to the right of the succession again led to a war in 1825, and Lord Combermere captured Bharatpur with a besieging force of 20,000 men, after a desperate resistance, on Jan. 18, 1826. The fortifications were dismantled, the hostile chief being deported to Benares, and an infant son of the former rajah installed under a treaty favourable to the company. In 1853 the state came under British management during a minority, and the administration was improved, the revenue increased, a system of irrigation developed, tanks and wells were constructed and an excellent system of roads and public buildings was organized. The present maharajah succeeded in 1929, maintains a fine force of imperial service troops, and enjoys a salute of 17 guns.

The city of Bharatpur is 34 mi. W. of Agra by rail. The population in 1941 was 35,541. The immense mud ramparts still stand. It has a handsome palace, a new hospital and a high school. There are special manufactures of *chauris,* or flappers, with handles of sandalwood, ivory and silver, and tails also made of strips of ivory or sandalwood as fine as horsehair. The splendid palace of Suraj Mall is at Dig, 21 mi. from Bharatpur.

BHÁSCARA (b. 1114), known as Acârya (the learned), Indian astronomer and mathematician, was the head of an observatory at Oudjein. He wrote in verse on astronomy and mathematics, the *Siddhantashiromani.* The chapters on mathematics were translated by Colebrooke with the work of Brahmagupta (*q.v.*) and those on astronomy by L. Wilkinson (Calcutta, 1842). It is practically certain that Bháscara was acquainted with Arabic writings on mathematics; and it seems that the results of his own work were known in Europe in the 12th century. In Bháscara's work the Arabic numerals are used, and he was the first writer to give a systematic exposition of the decimal system. He enunciates the ordinary rules of arithmetic, arithmetical and geometrical progressions, simultaneous and quadratic equations, and some trigonometrical formulae. The book incidentally throws much light on economic conditions of the time, on the price of slaves, the rate of interest and so on.

See the *Dissertation* by Colebrooke, prefixed to his edition (1817); W. W. Rouse Ball, *Short Account of the History of Mathematics;* Cantor, *Geschichte der Mathematik* (vol. i, 3rd ed., 1906).

BHATGAON, a town of Nepal, Asia, 8 mi. from Kathmandu. It is a celebrated Hindu religious centre, favourite residence of the Brahmans of Nepal, and contains more families of that order than either Kathmandu or Patan. It has a population of 93,176 and its palace and buildings generally are of a more striking appearance than in other Nepalese towns. The town is said to possess many Sanskrit libraries.

BHATIA: *see* CASTE (INDIAN).

BHATTIANA, a tract in the Punjab, India, covering the Ghaggar valley from Fatehabad in Hissar to Bhatnair in Bikanir. In 1795 it was nominally under George Thomas, the Hariana adventurer, and after Lord Lake's victories (1803) it passed with the Delhi territory under British rule, but was not settled until 1810.

A district of Bhattiana was formed in 1837; in 1858 it was merged in the Sirsa district, which was divided up in 1884.

The district derived its name from the Bhattis, a Rajput clan, who held the country between Hariana, Bikanir and Bahawalpur. The Bhattis are a fine tall race, making capital soldiers, agriculturalists and horse-breeders.



FROM RUSSELL, "TRIBES AND CASTES OF CENTRAL PROVINCES OF INDIA" (MACMILLAN & CO.)
A NATIVE OF BHATTIANA WITH HIS PUTLA, OR DOLL

See H. A. Rose, *Glossary of the Tribes and Castes of the Punjab and North-West Frontier Provinces,* 3 vols. (1911–14).

BHAU DAJI (RAMKRISHNA VITHAL) (1822–74), Hindu physician, scholar and antiquary, was educated at the Elphinstone college in Bombay, where he eventually joined the teaching staff. Both he and his brother, NARAYEN DAJI, were physicians of note. Bhau Daji took an active interest in Bombay university, of which he was one of the original fellows, and was a champion of female education. In spite of his busy life as a physician in Bombay, he found time to study Indian antiquities, the medical methods of the ancient Hindus, and the history of leprosy. He left a valuable collection of Sanskrit mss. Dr. Daji's unbounded charity to the poor of Bombay caused his memory to be cherished in the city where his life was spent.

BHAVNAGAR or **BHAUNAGAR,** a native state of India in Western India States agency: area, 2,961 sq.mi.; pop. (1941), 618,429. The tribute is £8,500. The chief, whose title is *thakor sahib,* is head of the famous clan of the Gohel Rajputs of Kathiawar. The enlightened system of administration formed during the rule of the thakor sahib maharaja Sir Takhtsinghji Jaswatsinghji, G.C.S.I., was continued with admirable results under the personal supervision of his son. His grandson, Krishra Kumak Singhji, succeeded in 1919. The Gohel Rajputs are said to have settled in the district about 1260. The Bhavnagar-Gondal railway (282 mi.) has its terminus at the town of Bhavnagar (pop., 1941, 102,851), situated on the west coast of the gulf of Cambay. This is the chief port in Kathiawar and is well equipped, though only admitting vessels of small burden. It was founded in 1723 by the thakor sahib Bhausinghji, after whom it is named, in place of his former capital, Sihor, which was considered too exposed to the Mahratta power; it has an extensive cotton trade and its industries include a cotton mill and iron and tile works.

BHEESTY, the Hindustani name for a water carrier (Persian *bihisti,* paradise).

BHERA, a town in British India, Shahpur district, Punjab, on the river Jhelum. Pop. (1941) 20,219. It is an important centre of trade, with manufactures of cotton goods, metal-work and carving.

BHĪL, an aboriginal, probably Munda, tribe of central India (fr. Dravidian *bil,* "bow"). Its language only survives in about 6% of its vocabulary and it now speaks a mixture of Guzerāti and Mālwi. Possibly the pygmies of Ktesias and the Phyllitae and Pulindae of Ptolemy, its name is hardly traceable in Sanskrit literature but may appear as Pulinda in Asoka's edicts and later.

The present home of the Bhīls is the wild, hilly country between Mt. Abu and Asirgarh, whence they have spread west into Guzerāt, and of late even into Sindh, and south into the Deccan. The typical Bhīl is small, dark, broadnosed, but well-knit and active, a good woodman and hunter but a poor plowman. He still wears his hair long, and his womenfolk plait theirs into three tails. The men still carry a bow or axe. Divided into 40 totem-clans,

they owe military service to village headmen and chiefs of cantons. In religion the Bhīl is not yet fully Hinduized, since in famines he will eat beef, but not snakes, rats, monkeys or the horse. His chief god is Vāghdeo, the "tiger," and he propitiates ghosts, but he makes oath on the moon, or a dog, and reveres Devi and Hanumān of the Hindu pantheon, while the chief Hindu festivals are riotously celebrated. Superstition is rife.

The Bhīls claim to have once been much more numerous and to have held principalities in Rājpūtāna and its adjacent lands. A respectable tradition in *The Ocean of Story* avers that a ruler of Ujjain once espoused a Bhīl princess whose father promised him an aid of 20,000 archers. In Rajputana the tribe must have given its name to Bhīlwāra, the "Bhīl county," a district and town 80 mi. northeast of Udaipur; they are now in the hilly tracts of Kherwāra and Kotra, the people of which are almost wholly Bhīl. Near the latter lies Dungarpur, the Bhīl ruler of which, Dungaria, was killed about A.D. 1200 by a scion of Udaipur who expelled the Bhīls, named his new capital after his victim and promised his widows that on accession its chieftain's forehead should be marked with blood from the toe or finger of a descendant of Dungaria—a usage also observed till recently in Banswāra and Udaipur itself. Similarly, Kotah was wrested from its Bhīl rajah by a cadet of Bundi. In the Central India agency another Bhīlwāra, a sparsely peopled tract, lies in the Narbada valley between the Vindhyas and the Satpura range. The local aristocracy in the Vindhyas is formed of Bhilālas, a mixed tribe of Rājpūt and Bhīl origin, headed by the rajah of Onkar Mandhāta in the Central Provinces, where Rājpūts did not in earlier days disdain to eat with Bhīls whom they regarded as lords of the soil. Hence the Bhīl claim is undoubtedly well founded, but his early history is lost and how far his ancient domains extended cannot be ascertained. His hostility to the Rājpūts made him submissive to the Moghuls, but the Marathas renewed his persecution, and British rule found him at a low ebb.

In 1825 a policy of reclamation replaced one of force. The Bhīl agency was formed in Khandesh, and in 1840–44 the Mewār Bhīl corps was raised with headquarters at Kherwāra. One of the few Indian regiments which remained loyal in the Mutiny, service in it has been popular and has done much to elevate the tribe. Given its colours in 1863, it was placed under the commander in chief in 1897.

BHĪMA, in the epic Hindu mythology, one of the Pāndava princes in the *Mahābhārata,* distinguished by his size, strength and voracity (Skt. "Terrible").

BHIWANI, town, British India, Hissar district, Punjab, 38 mi. S.E. of Hissar town by rail. Pop. (1941) 43,921. It is an important centre of trade with Rajputana, and has factories for ginning and pressing cotton, and metal manufactures.

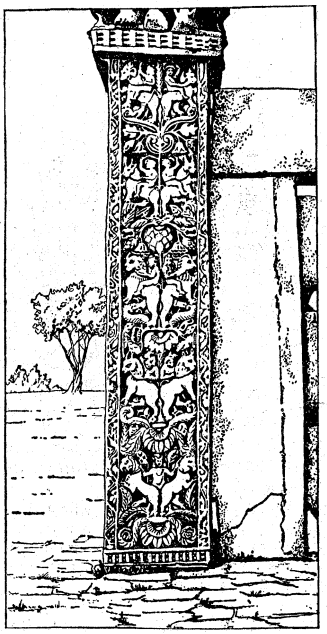
BHOIS: *see* CASTE (INDIAN).

BHOPAL, BEGUM OF, Nawab Sultan Jahan (1858–1930), was the third woman in succession to rule Bhopal, a state of about 7,000 sq.mi. in central India. Sprung from an ancient stock of Afghan invaders, she was married in 1874, and succeeded in 1901. She was keenly interested in the education and medical care of women, and encouraged agricultural and industrial development.

She visited Europe in 1911 and 1925, and secured the nomination of her son as her successor. She maintained a regiment of Imperial Service cavalry, and was entitled to a salute of 21 guns within and 19 outside her own territory. On May 18, 1926, the viceroy approved her decision to abdicate in favour of her son. She died on May 12, 1930.

BHOPAL, an Indian state in the Central India agency. Its area is 6,921 sq.mi., and its population in 1941 was 785,322. Bhopal is the principal Moslem state in Central India, and second only to Hyderabad for the whole of India. The surface of the country is uneven, being traversed by the Vindhya ranges, a peak of which near Raysen is upwards of 2,500 ft. above sea level. The general inclination of the country is towards the north, in which direction most of the streams of the state flow, while others, passing through the Vindhya ranges, flow to the Nerbudda.

Bhopal state was founded in 1723 by Dost Mohammed Khan, an Afghan adventurer. In 1778, when Gen. Thomas Goddard made his bold march across India, the state of Bhopal was the only Indian power that showed itself friendly; and in 1809 when another British expedition under General Close appeared in the same parts, the nawab of Bhopal petitioned earnestly but in vain to be received under British protection. But in 1817, at the outbreak of the Pindari War, a treaty was concluded between the chief and the British government. Since then Bhopal has been steadily loyal to the British government, and during the Mutiny it rendered good services. The throne descended in the female line from 1844, when Sikandar Begum became ruler, until 1926, when Sultan Jahan Begum abdicated in favour of her third and only surviving son. Succeeding begums have taken a great interest in the work of governing the state, which they carried on with marked success. Sultan Jahan Begum, who succeeded on the death of her mother, Shah Jahan Begum, in June 1901, was the only female ruler in India, and attained a unique position by her strength of character, sagacity and enlightenment. She reorganized the whole administration, advanced education and medical aid, and devoted herself especially to the amelioration of the condition of women in her state. The ruler has the title of Nawab and a salute of 19 guns.



BY COURTESY OF THE INDIAN STATE RYS.

ANCIENT COLUMN AT SANCHI BHOPAL

Called the Assyrian Tree of Life, this column belongs to one of the topes, or burial mounds, that are believed to be the oldest extant buildings in India. They are thought to date from the 3rd century B.C.

The state maintains a military force. The city of Bhopal had a population in 1941 of 75,228. The palace, with its rock fortress, is called Fatehgarh. An excellent water supply has been provided from two large artificial lakes. The headquarters of the political agent is in Bhopal.

BHOPAWAR, former agency in central India comprising the Dhar and Barwani, Ali Rajpur, Jhabua states, the minor state Jobat, and a number of districts and estates, some of them minute in area. The chief towns are Dhar (pop., 19,607); Barwani (8,949), and Kukshi (6,621).

BHOR, a native state of India, in the Deccan and Kolhapur agency, Bombay, situated among the higher peaks of the Western Ghats. Its area covers 910 sq.mi. Pop., 1941, 155,961; the tribute is £312. The chief, whose title is *pant sachiv,* is a Brahman by caste.

The town of Bhor is 25 mi. S. of Poona. Pop. 1941, 6,335. The Bhor Ghat, on the northern border of the state, has always been the main pass over the Western Ghats between the sea-coast and the Deccan, and is traversed by the main line of the Great Indian Peninsula railway.

BHUJ, a town of India, the capital of the native state of Cutch, in the Western India States agency situated at the base of a fortified hill, on the north side of the Ran of Cutch. Pop. (1941) 23,282. It is well known for its silver work. It contains some interesting examples of architecture of the middle of the 16th century and later.

BHUTAN, an independent state in the eastern Himalayas, lying between Tibet and British India, with the latter of which the boundary marches for about 200 miles. It is bounded on the east by a tract inhabited by savage tribes, such as Abors and Mishmis, called by the Tibetans Kha Lo and Ting Lo, *i.e.,* savages at the entrance and savages at the bottom; and on the west by the state of Sikkim and the district of Darjeeling. The whole of Bhutan presents a succession of lofty and rugged mountains running generally from north to south and separated by deep

valleys. The principal ranges, proceeding from west to east, are the Masong-chung-dong between the rivers Amo-chu and Wang-chu; the Dokyong-la between the Wang-chu and Ma-chu; the Black Mountain range between the Ma-chu and the Manas, which is traversed by the Pele-la pass; and on the extreme east the Tawang range.

The country, so far as it is known, is divided into three distinct tracts. Proceeding from south to north the first tract about 30m. broad consists of the outer hill ranges, which, rising from the plains of India, intercept the moisture-laden winds coming from the Bay of Bengal; they are consequently subject to a heavy rainfall, of 200 to 300in. annually, and are clothed in dense vegetation. The second or central tract, which is about 40m. in width, comprises a number of valleys, lying at an elevation of 3,500 to 10,000ft. above sea level and separated by high mountain ridges. The slopes of the mountains are gentler; the rainfall averages only 40 to 60in.; the valleys such as those of Paro, Ha and Punaka, are broad and under cultivation; and it is here that the bulk of the population is found. The east of Bhutan, however, where the outer range is lower than it is to the west, is a region of heavy precipitation, as the monsoon travels up the valley of the Kuru-chu as far as the snowy range. The third or northern tract consists of more rugged mountains and of snowy ranges rising to 24,000ft., with Alpine valleys lying at a height of 12,000 to 18,000ft., which are frequented only by graziers and their herds of cattle. Bhutan is drained by numerous rivers, which, forcing their passage through narrow defiles, eventually pour themselves into the Brahmaputra. The largest is the Manas, which has two main tributaries, the Kuru-chu or Lhobrak and the Dangme-chu; the Amo-chu, known as the Torsa in India, which flows down the Chumbi valley between Bhutan and Sikkim; the Wang-chu or Raidak draining the Ha, Paro and Trashi-chöd-zong valleys; and the Ma-chu, which flows through the Punaka valley and in its course through the plains is called the Sankosh. As is natural in a country rising from low valleys to perpetual snow, every kind of climate is to be met with. The lower valleys are saturated with moisture, hot and steamy; the central valleys, according to their elevation, may be bathed in hot sunshine or enjoy a temperate coolness; the extreme north has the rigours of frost and ice. Similarly there is every variety of vegetation. The lowest slopes are covered with dense semi-tropical vegetation and virgin forest. In the temperate tract the mountain heights and ridges are covered with coniferous forests (fir, pine, spruce and larch) and with rhododendrons; oaks, beech, ash, maple, cypress and yew are also common on the slopes below them. Higher up there are grassy slopes, but gradually all vegetation disappears.



LAMA PRIEST BEFORE A SHRINE IN BHUTAN

Equipped with a prayer wheel and beads, he is ready to perform his duties of worship. The decorations on the trees and poles, in the background, are religious symbols

Fauna.—The lower ranges abound in animal life: of the hills to the east of Bhutan J. C. White wrote "They are the haunt of almost every kind of wild animal—elephant, rhino, tiger, leopard, bison, mythun, sambur, cheetah, hog-deer, barking deer, etc." Bears are also found and musk deer in the snows. Pheasants, jungle fowl and other small game abound. The country has also been long famous for its sturdy and strong though small horses or ponies, about 13 hands high, which are admirably suited for rough mountain work. They are called *tangan,* probably from a Tibetan name for this kind of horse, and are mentioned in the *Ain-i-Akbari* of the 16th century. In the treaty of 1774 between the East India Company and Bhutan it was stipulated that the Deb raja should pay an annual tribute of five "Tangan horses."

Area and Population.—Nothing is known with certainty of either the area of Bhutan or of the number of its inhabitants. The former has been estimated at 16,800 square miles. The population is believed to number only a few hundred thousand and is chiefly concentrated in the central valleys. There are clear indications, such as the ruins of houses and the remains of old irrigation channels, that the country was formerly more thickly populated than it is at present; and it has been estimated that, with its fertile soil, it is capable of supporting 1½ million persons by agriculture. The dominant race consists of the Bhotias, who are of Tibetan origin: the name Bhutan itself is a contraction of the Indian name Bhotanta meaning the end of Bhot (*i.e.,* Tibet). They speak a dialect of Tibetan: their religion is the same form of Buddhism as is prevalent in Tibet. They differ from the Bhotias of Tibet and Sikkim in one respect: both men and women have close cropped hair and do not wear pig-tails. Along the foothills to the west of the Amo-chu river the Bhotias have been supplanted by the Nepalese, thrifty cultivators, who eagerly take up waste lands and convert them to tilth. They are not allowed to cultivate east of that river, where they would bring the Bhotias' grazing land under the plough. The people living to the east of the Black Mountain range appear to have affinities with the Assamese and eastern frontier tribes. Their stature is smaller, their complexion is darker, and their features are smaller than those of the Bhutanese west of the range, who are big, burly men with typical Mongolian features. The chief places and centres of population are Punaka, the old winter capital, Trashi-chöd-zong, the summer capital, Tongsa, Paro and Ha. The lamas or priests are the religious, and the Penlops or chiefs the temporal authorities under the maharaja. The lamas are regarded with superstitious dread and reverence by the people who ascribe to them supernatural powers. There are nine provinces under eight Penlops, who resemble feudal barons and have retainers armed with helmets, hide shields and swords. Their forts (*dzongs* or *jongs*) are like baronial castles dominating the valleys. These *jongs* are of vast size, some having accommodation for 2,000 and more persons. Of the Paro *jong* Lord Ronaldshay wrote: "One is overwhelmed by its immensity, and one's critical faculties are swamped by the one dominant impression which it leaves upon one's mind —that of size." They have a distinctive style of architecture—walls sloping slightly inwards (as in Tibet), shingle roofs, large courtyards and a square central tower or keep. The monasteries, also often of great size, are generally most picturesquely situated: that of Ta-tsang is built on the face of a perpendicular crag, over 2,000ft. in height, and appears literally to cling to the rock. A distinctive feature of the chief altars in the monastery chapels is that they are supported by a pair of elephant's tusks. The ordinary houses, with their wooden walls and roofs and projecting eaves, resemble Swiss chalets: no iron work is used, and even the doors turn on wooden hinges. The chief crops are maize, which grows up to a height of 7,000ft. above sea-level; rice, for which Bhutan is the chief source of supply for Tibet; *marua,* a millet which, when fermented, yields a stimulating and mildly intoxicating drink; barley, which when distilled produces a potent spirit called *chang;* wheat, buckwheat and mustard. The fields are laid out in a series of terraces cut out of the sides of the hills and supported by stone embankments. An ingenious system of irrigation is practised, the water being often brought a long distance by aqueducts. The chief industries are metal work, the weaving of strong and durable cloth, fine basket and mat work. The Bhutanese are expert joiners and also excel in metal work, silver, iron, copper and brass. A high degree of skill is shown in the temple vessels, swords and daggers which they produce: the designs are Chinese in character. The making of needlework pictures on temple banners is a special art of the lamas, and bell-casting of the artificers. Iron ore is obtained from mines at Borshang. The roads, as a rule, are rough mountain tracts. In the valleys the rivers are in some places spanned by bridges constructed on the cantilever principle, and in ravines by suspension bridges with chains of wrought iron and a narrow roadway of planks or bamboos. Rice is exported to Tibet, but trade is tending more and more in the direction of India, where it has been

stimulated by fairs in the Darjeeling and Jalpaiguri districts of Bengal and in the Darrang district of Assam. The bulk of the trade is insignificant and much of it is conducted by barter.

The Dharm Raja and the Deb Raja.—At the head of the Bhutan Government there were formerly two supreme authorities, the Shab-tung Rim-po-che, known in India as the Dharm raja, the spiritual head, and the Deb raja who was the temporal ruler, with a council of permanent ministers. The Dharm raja is regarded as an incarnation of Buddha. On the death of a Dharm raja a year or two elapses, and the new incarnation is then reborn in one of the ruling families. When able to speak, the child establishes his identity by recognizing the rosary, books, etc., of the Dharm raja. He is then trained in a monastery, and on attaining his majority assumes supreme pontifical power. The Deb raja was in theory elected by the council. In practice he was merely the nominee of whichever of the governors (Penlops) of Paro and Tongs (east and west Bhutan) happened for the time to be the more powerful. This system has fallen into desuetude. The Tongsa Penlop (Sir Ugyen Wang-chuk, K.C.I.E.), having overcome his rivals in a civil war, became predominant after 1885. The Dharm raja died and no reincarnation was found. Pending a reincarnation the supreme spiritual authority was vested in the Deb raja, who withdrew from mundane affairs and became a religious recluse. The administration of Bhutan passed into the hands of the Tongsa Penlop, who in 1907 was elected hereditary maharaja of Bhutan by the abbots, lamas, councillors and people.

History.—Of the early history of Bhutan little is known but according to the best Bhutanese record Tibetan troops invaded the country at the end of the 9th century A.D., and "drove out the Indian princes and their subjects" and then settled down in occupation of the land. When the British assumed dominion in Bengal, Bhutan was more extensive, for it included part of Darjeeling on the east and the Duars of Jalpaiguri on the south, *i.e.*, a strip of submontane country and the passes from the plains. The relations of the British with Bhutan commenced in 1772, when the Bhutanese invaded the principality of Cooch Behar and took the raja away as a captive. In response to an appeal for assistance, Warren Hastings sent a force which drove out the invaders and pursued them into their own territories. Upon the intercession of the Tashi Lama, then regent of Tibet, a treaty of peace was negotiated in 1774. Warren Hastings sent Bogle in 1774 and Turner in 1783 as emissaries to Bhutan, with a view of promoting commercial reciprocity; but little intercourse took place until the occupation of Assam by the British in 1826. It was then discovered that the Bhutanese had usurped the Duars in the Darrang district of Assam, and for these they agreed to pay a small tribute. They failed to pay, however, and committed depredations within the British territory. Capt. R. B. Pemberton was accordingly deputed to Bhutan, but his negotiations yielded no definite result. Every other means of obtaining redress and security proving unsuccessful, the Assam Duars were annexed in 1841, and the British Government consented to pay to Bhutan a sum of Rs.1,000 per annum so long as the peace was kept.

Scarcely a year passed, however, without the occurrence of raids in which the Bhutanese plundered, massacred or carried away British subjects as slaves. At last in 1863 Sir Ashley Eden was sent as an envoy to Bhutan to demand reparation for these outrages. He was kept in duress and subjected to the grossest insults; and under compulsion signed a treaty giving over the disputed territory to Bhutan. After Sir A. Eden had made his escape, the viceroy disavowed his treaty, stopped the allowance for the Assam Duars and demanded the immediate restoration of British captives. The Bhutanese not complying with this demand, Bhutan was invaded in 1865. The Bhutanese surprised an English garrison at Dewangiri, and the post was abandoned with the loss of two mountain guns. This disaster was soon retrieved and the Bhutanese were compelled to sue for peace, which was concluded in Nov. 1865. Bhutan ceded all the Duars of Bengal and Assam, with the rest of the territory taken from them, and agreed to liberate all kidnapped British subjects. The British Government, in return for these concessions, undertook to pay an annual allowance subject to the condition of continued good behaviour. Since that time the relations between the Indian Government and Bhutan have been satisfactory.

During the present century Bhutan has been brought into closer relations with India. The treaty of 1865 has provided that disputes between Bhutan and Sikkim or Cooch Behar should be referred to the British Government. These provisions were amplified by a treaty concluded in 1910, by which the Bhutanese Government agreed to be guided by the advice of the British Government in regard to its external affairs, while the British Government undertook to exercise no interference in the internal administration of Bhutan. The annual allowance was at the same time raised to Rs.100,000 a year. This treaty disposed of claims made by China and provided a safeguard against Chinese aggression. In the same year the Chinese Government formally claimed Bhutan as a feudatory and was informed by the British minister at Peking that Bhutan was independent of China and its external relations were under the British Government, which would not tolerate any attempt by China to exercise influence over Bhutan.

See J. Claude White, *Sikkim and Bhutan* (1909); Earl of Ronaldshay, *Lands of the Thunderbolt* (1923); Sir Charles Bell, *Tibet, Past and Present* (1924).

BIAFAR, a Portuguese Guinea people related to the Bagnun, Balante, Mandjak, Bola and Papel, and located on the right bank of the Geba estuary.

See Dr. Maclaud, "Distribution des races sur la côte occidentale d'Afrique," *Bulletin Géogr. hist. descript.* (1906).

BIALIK or **BYALIK, HAYYIM NACHMAN** (1873–1934), the greatest Hebrew poet of modern times, was born in 1873, at Radi, in the province of Volhynia, Southern Russia. His father was an innkeeper, but a scholar. When the boy was 6, the family removed to Zhitomir, and a year later the father died, leaving the widow and family in great poverty. Young Bialik subsequently lived with his grandfather, and although fond of frolic and indisposed to study, was a quick pupil at the Cheder (Hebrew school). The love of nature, which he gained in the woods in his early days, and the poverty and gloom of the Cheder life, are reflected in his poems. He wished to go to the University of Berlin, but this was impossible, and he became a student at the noted Yeshibah (Rabbinical seminary) of Volozhin. When he grew up he left for Odessa where he came under the notice of "Achad Ha-am," the nom de plume ("One of the People") of Asher Ginzberg, the Hebrew philosopher and literateur, to whose publication, "Hashiloach," he contributed Hebrew poems which quickly attracted attention. His "In the City of Slaughter," a poem prompted by the Kishineff pogrom of Easter 1903, not only gained him renown but stirred the emotion of the Jews, inspired them to self-defense, and gave impulse to the Zionist and nationalist movement. Bialik was now recognized as a force in the revival of Hebrew; with his friend Ravnitzki, he started a successful printing and publishing business in Odessa and produced Hebrew literature, new and old, which considerably influenced the Hebrew renascence. During World War I Bialik virtually ceased to write, for poets, he said, were not needed and the Jews should learn to face the stern realities of life; he wrote little thereafter. Escaping impoverished from Russia to Berlin in 1921 he revived the publishing firm, "Dvir," with which Dr Shmarya Levin, the Zionist orator, has also been since associated. A few years later it was transferred to Tel-Aviv, the Jewish suburb of Jaffa, where it produces original works in Hebrew, revisions of mediaeval rabbinical literature, and educational books. In 1926 Bialik visited England and America.

An English edition of some of his poems was edited by L. V. Snowman and published with an introduction by Vladimir Jabotinsky in 1924.

BIALYSTOK, a province of Poland, bounded north by Germany and Lithuania; east by the province of Nowogródek; south by the provinces of Lublin and Polesie, and west by the province of Warsaw. Area, 12,391 square miles. It is a uniform plain, drained by the Niemen, Bobr, Narew and Bug, all navigable rivers. Granites and gneisses crop out along the Bug, Cretaceous and especially Tertiary deposits elsewhere. The soil is mostly sandy. Forests, principally of conifers, are of great extent, *e.g.*,

those of Augustow and Grodno, and part of the vast forest of Bialowieza (376 sq.mi.), embracing wide areas of marshy ground. In the last-mentioned forest the wild ox survives, having been jealously preserved since 1803. Large peat bogs may be as much as 4 to 7 ft. thick. The climate is wet and cold. Agriculture is the predominant industry. The crops principally grown are potatoes, rye, oats, wheat, flax, hemp and some tobacco. There is a manufacturing industry, especially in woollens, distilling and tobacco. The woollen industry, centred at Bialystok, ranks third (after Lodz and Bielsk) in Poland. Other factories produce silk fabrics. The industrial area suffered great damage during the German occupation, 1915–18, and after reviving in 1921 declined during the financial crisis of 1924. The province is crossed by main lines of railway from Warsaw to Leningrad and from Brest to the Prussian frontier. The population in 1931 was 1,643,000. The province is divided into 14 districts, the chief towns being Bialystok (*q.v.*), Grodno (49,818), Lomza, Bielsk, Suwalki, Augustow and Wolkowysk. The province was divided at the partitions of Poland between Germany and Russia and was reunited to Poland in 1919. Soviet troops occupied Bialystok in 1939 and it was taken by Germany in 1941.

BIALYSTOK, a town of Poland, capital of the province of the same name, on the Warsaw-Leningrad railway. Pop. (1931) 91,335, about 75% Jews. Founded in 1320, it became part of Prussia after the third partition of Poland but was annexed to Russia in 1807. In 1845, woollen mills were built there. In World War II Bialystok was occupied by the U.S.S.R. in 1939 and by Germany in 1941.

BIANCHINI, FRANCESCO (1662–1729), Italian astronomer and antiquary, was born of a noble family at Verona. A paper by him on G. D. Cassini's new method of parallaxes was inserted in the *Acta Eruditorum* of Leipzig in 1685. He published separately: *Istoria Universale* (1697), only one volume of which appeared; *De Calendario et Cyclo Caesaris* (1703); *Hesperi et Phosphori nova Phaenomena* (1729), in which he asserted Venus to rotate in 24⅓ days; and (posthumously) *Astronomicae et Geographicae Observationes Selectae* (1737) and *Opuscula Varia* (1754).

See Fontenelle, "Eloge," *Mémoires de l'Acad. de l'Histoire,* p. 102 (1729); Mazzoleni, *Vita di Francesco Bianchini* (Verona, 1735).

BIARRITZ, watering-place, south-west France, in the department of Basses-Pyrénées, on the Bay of Biscay about 5 mi. W.S.W. of Bayonne. Pop. (1936) 19,061. A small fishing village in the early 10th century. It rose rapidly into importance under the patronage of the empress Eugénie, and is today the most frequented seaside resort of France. The climate is admirable at all seasons, and the situation of the town, at the foot of the Pyrenees, where the pine-grown Landes (*q.v.*) merge into the rocky Basque coast, is unsurpassed. A magnificent promenade runs from the sandy Grand Plage, facing north-west, to the Côte des Basques, south of the triple Promontoire du Halde. The adjoining Promontoire de l'Atalaye has a mediaeval fort. These small peninsulas are surrounded by rocky islets, some of them united by jetties which enclose the Port de Refuge, available only in fair weather. The Côte des Basques is never without its foaming breakers, whence the name "Côte d'Argent" applied to the whole of the French Basque coast.

BIAS, of Priene in Ionia, one of the so-called Seven Sages of Greece, son of Teutamus, flourished about 570 B.C. The aphorisms attributed to him may be found collected in F. W. A. Mullach, *Fragmenta Philosophorum Graecorum* (1860). He is said to have written a poem on the best means of making Ionia prosperous. His advice to its inhabitants, at the time of the Persian invasion, to migrate to Sardinia and there found a single pan-Ionic city (Herodotus i. 170), has generally been regarded as historical. He was honoured with a splendid funeral, and a sanctuary called Teutamium was dedicated to him.

See Bohren, *De Septem Sapientibus* (1860), and Crusius' exhaustive article in Pauly-Wissowa, with bibliography.

BIAS, something oblique or slanting (Fr. *biais,* of unknown origin). The term is used especially of a piece of cloth cut obliquely across the texture, or of a seam of two such pieces brought together. In the game of bowls (*q.v.*) it is applied alike to the one-sided construction of the bowl, and to the slanting line the bowl takes when thrown. The figurative sense of the word, prejudice or undue leaning to one side, is derived from this bowling term.

BIAXIAL CRYSTAL, a crystal having two optic axes, *i.e.,* two directions within the crystal in which the ordinary and extraordinary rays of light are propagated with the same velocity; *e.g.,* aragonite is a biaxial crystal and, in common with others, exhibits conical refraction. (*See* LIGHT.)

BIBACULUS, MARCUS FURIUS, Roman poet, flourished during the last century of the republic. According to Jerome, he was born at Cremona in 103 B.C. He wrote satirical poems after the manner of Catullus, whose bitterness he rivalled, according to Quintilian (*Instit.* x. I. 196), in his iambics. He even attacked Augustus (and perhaps Caesar), (Tac. Ann. IV. 34). He was also author of prose *Lucubrationes,* and perhaps of an epic poem on Caesar's Gallic Wars (*Pragmatia Belli Gallici*). Otto Ribbeck attributes to him one of the shorter poems usually assigned to Virgil. It is doubtful whether he is the person ridiculed by Horace (*Satires,* ii. 5, 40) and whether he is identical with the *turgidus Alpinus* (*Satires,* i. 10, 36), the author of an Aethiopis and of a poem on the Rhine.

See Weichert, "De M. Furio Bibaculo," in his *Poetarum Latinorum Reliquiae* (1830); fragments in L. Müller's edition of *Catullus* in the Teubner Series (1870).

BIBAUD, MICHEL (1782–1857), Canadian historian, was born at Côte des Neiges, Montreal, and educated at the Collège de Montreal. His *Histoire de Canada* (3 vols., 1837), dealing with Canadian history from its origins up to 1877, was pro-English and bureaucratic in tendency, thereby earning the condemnation of the French-Canadian public for whom it was written. Bibaud was the first French historian of Canada; he also wrote some satiric verse.

BIBER, HEINRICH JOHANN FRANZ VON (1644–1704), German violinist and composer, was for some time musical conductor at Salzburg, and was ennobled by the Emperor Leopold in 1681. He is regarded as the earliest important German composer for the violin.

BIBERACH, a town in the *Land* of Württemberg, Germany, on the Riss, a small affluent of the Danube, 22 mi. S.S.W. of Ulm. Pop. (1939), 11,573. It is still surrounded by mediaeval walls and towers, and has a 12th century church. Biberach became a free imperial city in 1312, but in 1803 it was deprived of its privileges and assigned to Baden, and in 1806 was transferred to Württemberg. The poet Wieland, born in 1733 at the neighbouring village of Oberholzheim, spent several years in the town. Its main industry is cloth, and its fruit markets are famous.

BIBIENA (BIBBIENA), GALLI DA, a family of Italian artists of the 17th and 18th centuries, who took their name from the birthplace of their progenitor, Giovanni Maria Galli (1625–65) born at Bibiena near Bologna. He was a painter, a pupil of Francesco Albani. He first laid the foundations of an artistry which was carried on by his descendants, who devoted themselves to scenic work for the theatre. Employing freely the highly ornate style of the Italian Late Baroque architecture and sculpture, the various members of the family produced a series of designs which are amazing for their splendour and spacious proportions. Bold perspective is called into the service of scenic staging. The work of the family was carried beyond the confines of Italy by members who were attached to the imperial court of Vienna and to other courts as architects and designers of theatrical festivities and court functions.

FERDINANDO GALLI BIBIENA (1657–1743), born at Bologna, was the son of Giovanni Maria. He studied painting under Carlo Cignani and architecture under Giulio Troili, called Paradosso. On Cignani's recommendation he entered the service of the duke of Parma. His chief work at this period was the villa and garden of Colorno. But he soon established a reputation for scenic designs and worked for the theatre. In 1708 he was called to Barcelona to arrange the decorations in connection with the wedding festivities of the future emperor, Charles VI., and when this prince ascended

the imperial throne he went to Vienna, and was there employed on designs of scenery and decorations for festivities at the court and at the opera. On his return to Bologna in 1717 he was elected a member of the Academia Clementina. In 1731 he built the royal theatre of Mantua, burned in 1781. The church of S. Antonio Abate at Parma is attributed to him. He wrote the following works: *L'Architettura Civile preparata sulla geometria e ridotta alla Prospettiva* (1711); *Direzioni a giovani studenti nel Disegno dell' Architettura Civile* (1731 and 1745); *Direzioni della prospettiva teorica, correspondenti a quelle dell' Architettura* (1753).

Franceso Galli Bibiena (1659–1739), born at Bologna, was the second son of Giovanni Maria. He studied under Parsinelli and Cignani, worked at Piacenza, Parma, Rome, and then became ducal architect at Mantua. After a stay in Genoa and Naples he was called to Vienna, where he built a large theatre. He was architect of the great theatre at Nancy, of the Teatro Filarmonico at Verona, which Milizia calls the finest theatre in Italy, of the Teatro Alibert in Rome. In 1726 he returned to Bologna and was made one of the directors of the Academia Clementina.

Alessandro Galli Bibiena (1687–1769), eldest son of Ferdinando, was born at Parma. In 1719 he became architect and painter at the court of the elector of the Palatinate. Among his works we may mention the right wing of the Schloss and the Jesuit church at Mannheim.

Giuseppe Galli Bibiena (1696–1756), second son of Ferdinando, was the most distinguished artist of the family. He was born at Parma on Jan. 5, 1696. As a youth he accompanied his father to Barcelona and afterwards to Vienna. Staying on, when his father left, he there became the chief organizer of splendid court festivities and functions. He designed catafalcoes for the deceased members of the imperial family, and scenery for their plays and dances. In 1722 he worked in Munich; in 1723 in Prague. In 1742 he designed the decorations for the Vienna opera; in 1747 he was employed at the Opera in Dresden; in 1748 he designed the interior of the theatre at Bayreuth; and in 1750 renovated the Dresden opera. The following year took him to Berlin, where he died in 1756. In 1740 he published a collection of engravings of architectural designs, *Architettura e Prospettive dedicate alla Maesta di Carlo VI.*

Antonio Galli Bibiena (1700–1744), third son of Ferdinando, was the architect of the Academia Virgiliana at Mantua and of the Teatro Communale at Bologna. He was also employed at the court of Vienna.

As the Bibienas' works in theatrical scenery were not executed in durable material, and as their decorations for court functions were necessarily of a temporary character, little has survived, and we are only able to judge of their richness and splendour from drawings, which have come down to us in great numbers and are preserved chiefly at Vienna, Munich and Dresden. A fine collection of them was published lately in Corrado Ricci's, *I. Bibiena* (1915).

Bibliography.—P. A. Orlandi, *Abecedario pittorico* (1704); G. Zanotti, *Storia dell' Academia Clementina* (1739); Crespi, *Felsina pittrice* (1769); Francesco Milizia, *Memorie degli Architetti Antichi e Moderni* (1781); C. Gurlitt, *Geschichte des Barockstils in Italien* (1887), and *Geschichte des Barockstils in Deutschland* (1889).

(I. A. R.)

BIBIRINE: *see* Bebeerine.

BIBLE. The English word "Bible" is derived through Mediaeval Latin from the Greek τὰ βιβλία, which simply means "the books." It is the name given to the collection of books which Christian people regard as sacred and in which they find the record of the revelation that lies at the basis of their faith.

INTRODUCTION

This article will deal with the collection as a whole. It will fall into two main sections, Old Testament and New Testament, and each section will treat of such topics as the Canon, Texts and Versions, Textual Criticism, Higher and Historical Criticism, and Chronology. But such an article may suitably be prefaced by some account of the conceptions which men in the past have formed of these books, and by some consideration of the characteristics which from age to age have impelled men to regard them as sacred or which have been attributed to them because they were sacred.

For the special problems presented by the individual books of the Bible and for a discussion of the historical origin and nature of each, the relevant separate articles should be consulted.

For the English versions of the Bible, *see* Bible, English.

To the first Christians, who were Jews, the law and the Prophets were already sacred. Their national sacred writings were to them the oracles of God, though they could no longer be regarded as containing the whole truth of God. The coming of the Messiah had revealed God with a completeness that could not be discovered in the Old Testament.

The word of the Lord was authoritative as even Moses and the prophets were not. Yet since all the hopes of the Old Testament seemed to these Jewish Christians to be fulfilled in Jesus Christ, they more than ever were convinced that their national sacred books were divinely inspired. From this source they drew, if not the articles of their creed, at least the proofs and supports of their doctrines. Christ died and rose again, according to the scriptures.

All the writings of the Old Testament spoke of Christ to them. Legal enactment, prophetic utterance, simple historical record, and more emotional psalm,—all alike could be covered by the phrase "the scripture says," all were treated as of one piece, and by diligent use of type and allegory single passages torn from any context could be used as proof-texts to commend or defend belief in Christ.

It is not strange that Jewish Christians claimed the Old Testament as their book and found in it the confirmation of their faith. It is more remarkable that the Old Testament in its Greek dress appealed to the Gentile world and became a valued weapon in the armoury of the Christian evangelist. It was not on account of any literary charm of the Greek version. Educated readers were offended by the poor style of the Septuagint. But a passage from Tatian, a second century Apologist, may serve to show how this very poverty of style sometimes proved arresting. "When I was giving my most earnest attention to discover the truth, I happened to meet with certain barbaric writings, too old to be compared with the opinions of the Greeks, and too divine to be compared with their errors and I was led to put faith in these by the unpretending cast of the language, the inartificial character of the writers, the foreknowledge displayed of future events, the excellent quality of the precepts and the declaration of the government of the Universe as centred in one Being." (Tatian, *Address to the Greeks*, 29.)

Evidently non-Jews were impressed by the supposed antiquity of the Hebrew scriptures and by the simplicity and directness of the teaching of the prophets. To philosophers weary of the discussions of the schools the Church offered in the Old Testament, with its note of assurance and absence of logical argument, that divine word which Plato desired as a surer and safer guide through life than human reason. The elaborate argument from prophecy to which the Church attached so much weight, convinced Gentiles as well as Jews; indeed it convinced Gentiles rather than Jews. Moreover men appreciated the moral insight of the prophets. Their oracles were not only less ambiguous but also more ethical than those of Delphi. And then there was the uncompromising monotheism of Israel and the doctrine of Creation. The opening chapter of Genesis won men to Christ, because it declared the government of the Universe to centre in one Being.

When, towards the close of the second century, the collection of apostolic writings was associated with the Old Testament, and the Bible was practically complete (*see* below, *New Testament*, 1. *Canon*), the Church could point enquirers to a number of books originally composed in Greek. But even so, the style of an evangelist like Mark offended the taste of educated readers, and the letters of St. Paul are not literature when judged by the standards of the age. When Celsus urges that truths taught in the gospels are expressed much better in the language of Plato, Origen does not deny the literary advantage of Plato, but claims that the simplicity of the scriptures appeals to the multitude.

In the characteristics which offended literary taste, Origen saw the proof that God had chosen the foolish things of this world to confound the wise. He makes much of the argument from prophecy, but stresses most the fact that "men of all nations have deserted the laws of their fathers and the established gods, for the observation of the laws of Moses and the discipleship of the words of Jesus Christ." He states very clearly the direct appeal of many parts of the scripture to men's conscience. "He who reads the words of the prophets with care and attention, feeling by the very perusal the traces of the divinity that is in them, will be led by his own emotions to believe that those words which have been deemed to be the words of God are not the compositions of men." (*De Princ.* iv. 1 and 6.)

Once the Bible was in being, Christians naturally attributed to the Bible as a whole the characteristics which the Jews had attributed to the Old Testament. According to Philo, all that the scriptures contain is true, and all truth is contained in them. It was easier for the Christians to assert this of the Bible than for Philo to assert it of the Law. But this assertion compelled Christian theologians to adopt Philo's method of dealing with difficult passages. Origen could see that there were passages, particularly in the Old Testament, but also in the gospels, that were not true in their literal sense. He could see that some passages were morally perplexing, and indeed indefensible on any Christian standard. The difficulty thus presented he surmounted by Philo's method of allegory. Where the literal sense of the scriptures is obscure, or untrue, or immoral, deeper meanings must await discovery. So he found a three-fold sense in scripture. For the most part, the literal sense is edifying and will appeal to all. But it is legitimate everywhere to look for secondary meanings, and in some passages it is imperative to do this, since only in this way can scripture be harmonized with itself. It was assumed that there could be no real contradictions in scripture. The sense of the fundamental harmony of the Old and New Testaments was expressed in Augustine's aphorism, "The New Testament lies hid in the Old, and the Old Testament is manifested in the New." Most Christians took over the view of inspiration accepted by Philo and Josephus, which regards the prophet or writer as a passive instrument in the hands of God. Some of the Fathers, such as Gregory of Nazianzus, perceived that divine inspiration did not override the personality of prophet or evangelist, but the Church in general tended to accept the ecstatic view of prophecy and the mechanical conception of inspiration. It is worth noting that the ancient Catholic Church encouraged Bible-reading, and that the Bible was early accessible in Syriac and Latin for those who did not read Greek. Harnack writes: "The Church was compelled to lay stress on Bible-reading because, according to her doctrine, souls could be lost through want of knowledge, and so she became the great elementary school mistress of the Greeks and Romans." (*Bible Reading in Early Ch.* p. 85.)

While the ancient Church up to the fall of the Roman Empire in the West encouraged Bible-reading, Christianity did not become simply the religion of a book. The baptismal confession of faith was attributed to the apostles as definitely as the New Testament itself, and when the claims of heretics to possess esoteric apostolic traditions had been refuted, the Church did not hesitate to assert apostolic sanction for traditions and usages that could not be directly traced in the apostolic writings. Consequently for the mediaeval Church the scriptures are still the final authority, but they are associated closely with ecclesiastical tradition, and this complex is assumed to represent the minds of the apostles. For St. Thomas Aquinas, the authority of the Church, both in its teaching and in its practice, cannot be distinguished from the authority of scripture. "In spite of the very explicit assignment of the sole ultimate authority to the scriptures, and the recognition of the duty of the theologian to bring all his teaching to the test of scripture and be content to rest upon no lower grade of assurance, we feel ourselves from the very first guided in our interpretation of scripture by an invisible hand, and referred to clauses of the creeds, to verses in the liturgy or to decrees of councils as though they were final authorities." Aquinas was able to harmonize scripture and Church tradition because he had at his disposal the methods of scripture interpretation that the scholastics took over from the Fathers, particularly from Origen and Augustine. Once again the allegorical method saved the situation. Positively the claim of the Christian scriptures to be a divine revelation rests for Aquinas on two elements: the element of miracle and the wide appeal of the truths contained therein. Miracle and prophecy and the power of inspiring a faith that triumphs over death are the main proofs of the divine origin of the scriptures.

The circumstances of the Dark Ages made a breach in the earlier habits of Bible-reading among the laity, and it was not till towards the close of the 12th century that the situation began to change. Perhaps the superstitious use of the scriptures to provide amulets and omens—a tendency that began early and grew more intense in the Dark Ages—may have inclined the Church to withhold the Bible from the laity. However that may be, when popular interest in the scriptures revived, the Church felt apprehensive because Bible-reading led to heresy. As men became acquainted once again with the text of the scriptures, they inevitably realized that the harmony which Aquinas assumed between the teaching of scripture and Church tradition was not obvious or complete. In the work of a commentator like Lyra, the traditional methods of interpretation were challenged by insistence on the literal meaning of the scriptures as fundamentally important. The Reformation detached the scriptures from the Church tradition, and permitted the plain sense of the scriptures to make a direct appeal to the common people.

The great Reformers held that all truths necessary for salvation were to be found in the scriptures and were to be found so plainly expressed that the ordinary devout reader could discover them for himself. They dwelt much on the sufficiency and perspicuity of the scriptures. Difficulties remained and perhaps would always remain, to exercise men's faith, but normally scripture was its own interpreter and light on its dark places could be derived from the texts whose meaning was clear. In exalting the scriptures over against Mediaeval Church tradition, the followers of the great Reformers assumed the perfection of the scriptures. The Bible was the source of guidance and enlightenment in every department of human life and thought. The Puritans tended to push the claim so far as to insist that no action in daily life could be regarded as righteous unless expressly warranted by Holy Writ. Whatsoever is not of faith is sin, and faith is not, save where there is an appeal to the word of God, and the word of God is the scripture.

Over against this extreme, Hooker advocated the claim of reason to be a God-given guide and defended the Anglican principle that Christians do not always need positive assurance from the scriptures for any given Church-rite or individual action, though they must never contravene scripture in the name of reason. George Fox and the Quakers urged that inspiration was not confined to the scriptures. The spirit of Christ still guided men, and though His guidance would not be contrary to the essential life of the scriptures, yet it might be given apart from the scriptures and would take men beyond the letter of the scriptures. But the main current of religious thought in England in the 17th century and later in the Evangelical revival endorsed the Puritan estimate of the Bible. The influence of the Bible was thus carried into the heart of English life and literature, but it was accompanied by the moral dangers of Bibliolatry. Scripture had still to be harmonised with itself, and this was the more difficult since symbolic interpretations were to be abandoned. Forced exegesis was constantly resorted to, both to defend the inerrancy and authority of the scriptures themselves and to secure Biblical authority for the tenets and practices of particular churches and individuals. Yet through it all, the case for the authority and inspiration of the scriptures is based broadly on the same grounds as in the days of the Apologists. Thus, Whitaker, the Elizabethan divine, summarizes the evidence for inspiration under eight heads: "(1) The majesty of the doctrine itself; (2) the simplicity, purity and divinity of the style; (3) the antiquity of the books themselves (the books of Moses are more ancient than the writings of any other men); (4) prophetic oracles; (5) miracles; (6) the failure of enemies to destroy them; (7) the testimony of martyrs, and (8) the character of the writers, mostly illiterate and inca-

pable of writing without inspiration." John Owen, Vice-Chancellor of Oxford in the time of the Commonwealth, who makes the strongest claims for the infallible authority of the scriptures is somewhat more discriminating in stating the grounds of his faith. He does not think that the evidence of miracles counts for much, and he holds that the authority of scripture must rest on its self-evidencing light and power.

Many difficulties of the Puritan view of the scriptures arose from the unsolved problem of harmonizing the contents of a literature whose production extends over a thousand years, when once the methods of interpretation adopted by the Fathers and the Schoolmen were surrendered. But more serious questions were precipitated by developments of natural science and by the progress of literary and historical criticism. Even before the advent of Copernicus, Colet saw that the story of creation could not be harmonized with natural science, and the work of Copernicus and Galileo brought men face to face with the actual limitations of the knowledge of Biblical writers. It was becoming apparent that not all truth is contained in the scriptures and not all that the scriptures contain is true. This problem of a conflict between the contents of the Bible and the findings of natural science has been intensified by every advance of science, and reached an acute stage in the work of Darwin. Men's reactions to this problem have varied. Those who suppose that the authority of the Bible depends on its inerrancy have tended to become either obscurantists or rationalistic agnostics. Those who reject this supposition have often restricted the sphere of the Bible to faith and morals, and have assumed with Spinoza that it has no ultimate authority in the realm of natural science, or of historical enquiry, or of philosophic speculation. The Bible is not intended to teach science or history: it is to guide men in faith and conduct. This attempted solution is expressly rejected in the Encyclical Letter *Providentissimus Deus* of Leo XIII. "For the system of those who, in order to rid themselves of these difficulties, do not hesitate to concede that divine inspiration regards the things of faith and morals and nothing beyond, because (as they wrongly think) in a question of the truth or falsehood of a passage, we should consider not so much what God has said as the reason and purpose which He had in mind in saying it—this system cannot be tolerated." "It is absolutely wrong and forbidden, either to narrow inspiration to certain parts only of Holy Scripture or to admit that the sacred writer has erred." The position thus defined by the Pope is still the position adopted by a large number of Protestants.

Side by side with the advance of natural science came the development of literary and historical scholarship, and the demand that the Bible should be read and studied like any other book. This meant not that the Bible was the same in character as any other book, but that the same canons of criticism must be applied to the national literature of the Hebrews and the writings of the first Christians as were applied to the literature and history of other people or to the classical documents of other faiths. "The study of Hebrew and Greek texts dissolved at last the cement by which the doctrine of Inspiration had held together the whole Bible as a homogeneous Divine product." The discrepancies and disharmonies in the scriptures could no longer be disguised. Moreover many traditional beliefs concerning the date and authorship of particular books were found to have no support in the text of the Bible itself. Thomas Hobbes had observed that the Pentateuch seems to be written *about* Moses rather than *by* Moses. Literary criticism showed that the Mosaic authorship of the Pentateuch was a Rabbinic tradition, which was unsupported by the Pentateuch.

The net effect of the progress of natural science and literary criticism was to undermine the claims made for the scriptures on the grounds of their alleged antiquity and absolute harmony. The traditional arguments from prophecy ceased to carry weight, and the appeal to miracles was discounted. The fundamental argument for regarding the scriptures as sacred and inspired remained untouched. Coleridge restated this essential argument in his *Confessions of an Enquiring Spirit,* where he urged that "whatever *finds* me, bears witness for itself that it has proceeded from a Holy Spirit." But the significance of his confession lies in his realization that this evidence for inspiration does not confirm the traditional ideas of verbal inspiration and complete inerrancy. Indeed he felt that to attribute equal value to all the contents of the Bible is to falsify the findings of the conscience of its readers. The propositions, "The Bible contains the religion revealed by God" and "Whatever is contained in the Bible is religion and was revealed by God," are not interchangeable.

The characteristics of the Bible emphasized in modern study are briefly these: First, its popular character and appeal, admitted by the early Fathers and asserted by the Reformers, have been confirmed by modern research. Thus, the Greek of the New Testament has been shown to be the language in every-day use in the Roman Empire in the first century A.D. Secondly, the literary charm of the Bible is in the main a modern discovery. Tindal perceived that the Hebrew of the Old Testament would go much better into English than into Latin or Greek, and certainly the Old Testament in the Septuagint or the Vulgate made little appeal to men of taste. In England, through the authorized version, Hebrew literary genius has exerted a healthy influence both on language and literature. Thirdly, the Bible is at length discovered to be, not a manual of theology, but the record of a varied and developing religious experience. In it religion is presented, not in an abstract and dogmatic form, but in concrete historical embodiments. It thus becomes the guide and inspiration of personal religion. Fourthly, the Bible is contrasted with a book like the Koran, inasmuch as the Koran represents a revelation to a single prophet, while the Bible contains writings ranging from the Hebrew monarchy to A.D. 100, contributes to the true understanding of a series of uniquely vital centuries in human history, and exhibits a variety of experience combined with the real unity of a genuine development. Thus, historical criticism suggests the idea of progressive revelation and outlines the steps of the actual progress. Fifthly and lastly, the permanent and unique value of the Bible is now seen to depend, not on any miracle attending its composition, not on any form of inspiration confined to Biblical writers, but simply on the unique phenomenon of Hebrew prophecy and its culmination in the life and teaching of Jesus. So long as men recognize the distinctive character of Hebrew prophecy or so long as they respond to the influence of Jesus, the volume which contains the history of His people and their preparation for His coming, together with the memories, impressions and reflections of His first disciples, must retain in their hearts and thoughts a place no other book can claim or fill.

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OLD TESTAMENT

1. CANON

There exists no historical account of the formation of the Old Testament canon. The popular idea that it was closed by Ezra rests on no ancient foundation. Certainly in 2 Esdras (near the end of the 1st century A.D.), we read (xiv. 20–26, xxxviii.–xlviii.), that the law being burnt, Ezra, at his own request, was inspired to rewrite it; in forty days he dictated 94 books to five scribes, *i.e.,* the 24 books of the Old Testament and 70 apocryphal books, filled with esoteric wisdom and superior to the Old Testament. This worthless legend contains nothing about a completion of the Canon or collection or redaction of sacred books; yet patristic writers infer from it that Ezra restored the lost Old Testament books. The reference to the library of Nehemiah in 2 Macc. ii. 13 is found in a late and untrustworthy section of the book and nothing definite can be built upon it.

The modern idea that the Old Testament canon was closed by Ezra is not found before the thirteenth century A.D. From this time the legend grew, until with Elias Levita (1538), and especially Johannes Buxtorf (1665), it assumed the form that the "men of the Great Synagogue"—a body of very dubious historicity—with

Ezra as president, collected the books, restored the text and made the threefold division. Through their reputation this view acquired general currency, but it rests on no authority in antiquity whatever.

In the Jewish canon the books are divided into three parts. "The Law, the Prophets and the Writings, *i.e.*, the Hagiographa," is the standing Jewish expression for the Old Testament, and the books are arranged in the following three divisions:

1. The Torah (or "Law"), *i.e.*, our "Pentateuch" (5 books). 2. The "Prophets" (8 books) in two groups: (*a*) The "Former Prophets"; Joshua, Judges, Samuel, Kings; (*b*) The "Latter Prophets," Isaiah, Jeremiah, Ezekiel, the "Minor Prophets" (called "The Twelve," and counted as *one* book). 3. The "Writings" (or the "Sacred Writings" *i.e.*, the "Hagiographa"), consisting of three groups (11 books): (*a*) the poetical books, Psalms, Proverbs, Job; (*b*) The five Megilloth (or "Rolls")—read in the synagogues at five sacred seasons—Song of Songs, Ruth, Lamentations, Ecclesiastes, Esther; (*c*) The remaining books, Daniel, Ezra and Nehemiah (forming *one* book), Chronicles. The 24 books of the Hebrew Canon have become 39, as in the English Bible, by treating each of the Minor Prophets as a separate book, by separating Ezra from Nehemiah and subdividing Samuel, Kings and Chronicles. When the Greek translation was made between the third and first centuries B.C., the books were regrouped, mostly by subjects, in the order history, poetry, prophecy, the Apocrypha being included and its books being placed in the appropriate classes. Substantially the same order was followed in the Vulgate. The reformers placed the Apocrypha at the end; the remaining books, as they stood in the Vulgate, were then in the order which they retain in the English Bible.

The tripartite division was far earlier than the Talmud. The Proverbs of Jesus, the son of Sirach (*c.* 200 B.C.), now known as Ben Sira or Ecclesiasticus, were translated into Greek by his grandson about 130 B.C. He speaks of "the law, and the prophets, and the other books of our fathers," and of the law, and the prophets, and the rest of the books (*cf.* the Law, the Prophets and the Psalms, Luke xxiv. 44). *See* also Dan. ix. 2 (R.V.), written *c.* 165 B.C. This threefold division represents three successive stages in the history of the collection. The Law was the first part to be definitely recognised as authoritative, or canonised; then the Prophets ("Former" and "Latter"); lastly the Hagiographa. In the absence of external evidence we must fix the dates by internal evidence. This points to the conclusion that the Law was not completed and accepted as canonical before 444 B.C. (*cf.* Neh. viii.–x.); that the prophets were completed and recognised about 250–200 B.C.; and the Hagiographa between about 150 and 100 B.C.

We must now sketch the process by which the Old Testament reached its completed form. It is characteristic of nearly all the longer books and some of the shorter that they were not completed by a single hand, but were gradually expanded and reached their present form by stages.

The earliest beginnings of Hebrew literature were probably poetical. Great national occurrences and the deeds of ancient heroes stimulated the national genius for poetry and evoked lyric songs, suffused with religious feeling, by which their memory was perpetuated. Illustrations may be found in the opening of the Song of Moses in Ex. xv.; Song of Deborah (Judges v.), the extracts from the "Book of Jashar" (or "of the Upright," *i.e.*, Israel), *see* Josh. x. 12, 13, II. Sam. i. and probably I. Kings viii. 13 (Sept. 53) in the Septuagint; and in the fragment from "the Book of the Wars of Yahweh" (Num. xxi. 14, 15); the war ballad in Num. xxi. 27–30. To these may be added the Blessings of Jacob (Gen. xlix.) and Moses (Deut. xxxiii.). These poems are in most cases considerably older than the narratives in which they are embedded.

The historical books form two series: one, consisting of the books from Genesis to II. Kings (exclusive of Ruth which belongs to the Hagiographa) embracing the period from the Creation to the destruction of Jerusalem in 586 B.C.; the other, comprising Chronicles, Ezra and Nehemiah, beginning with Adam and ending with Nehemiah's second visit to Jerusalem in 432 B.C. These, while differing in scope and point of view, are both constructed on a similar plan. Older writings have been combined by a compiler, or a succession of compilers, so that the points of juncture are often discernible and the sources can be disentangled. The authors of the historical books in their present form do not, as a rule, *rewrite* the matter in their own language; they *excerpt* from pre-existing documents such passages as are suitable to their purpose and incorporate them in their work, sometimes adding matter of their own. The sources thus combined can generally be distinguished by strongly marked individualities of style from each other and from additions of the compiler. The literary differences are often accompanied by differences of treatment, or representations of the history, which confirm independently the conclusions of the literary analysis. Sometimes the excerpts form long complete narratives; in other cases they consist of short passages taken alternatively from two older narratives and dovetailed together to make a continuous story. The compiler of Judges and Kings has arranged older narratives in a framework of his own; the literary structure of the Hexateuch, *i.e.*, the Pentateuch and the Book of Joshua, is more complex.

The Hexateuch.—The Hebrew traditions respecting Israel's origins and early history were probably first cast into a written form in the 10th or 9th century B.C. by a prophet living in Judah, who, from the almost exclusive use in his narrative of the sacred name Yahweh (*see* JEHOVAH), is referred to by the abbreviation J. This writer, who is characterised by a singularly bright and picturesque style, and also by deep religious feeling and insight, relates man's creation from the dust, his first sin and its consequences (Gen. ii. 4b–iii. 24); then he gives an account of the early growth of civilisation (Gen. iv.), of the Flood (parts of Gen. vi.–viii.), and the origin of different languages xi. 1–9; afterwards in a series of vivid pictures he gives the story, as tradition told it, of the Patriarchs, of Moses and the Exodus, of the journey through the wilderness and the conquest of Canaan. Examples of J's narrative (including here or there verses taken from another document), may be found in Gen. xii., xiii., xviii.–xix., xxiv., xxvii. 1–45, xxxii., xliii., xliv.; Ex. iv.–v. (mostly), viii. 20–ix. 7, x. 1–xi., xxxiii. 12–xxxiv. 26; Num. x. 29–36, and most of Num. xi.

Somewhat later than J, another writer, commonly referred to as E, from his preference for the name *Elohim* ("God") rather than "Yahweh," living apparently in the Northern Kingdom, wrote down the traditions as they were current in Northern Israel, in a style resembling that of "J," but not quite as bright and vivid, and marked by small differences of expression and representation. The first traces of "E" are found in the life of Abraham, in parts of Gen. xv. Examples of other passages belonging to E are Gen. xx. 1–17, xxi. 8–32, xxii. 1–14, xl.–xlii. and xlv. (except a few isolated passages); Ex. xviii. 20–23 (including the Decalogue—in its original terser form, without the explanatory additions—and the collection of laws, the "Book of the Covenant," in xxi.–xxiii.), xxxii. (mostly), xxxiii. 7–11; Num. xii., most of Num. xxii.–xxiv.; Josh. xxiv. E thus covers substantially the same ground as J, and often gives a parallel, though somewhat divergent, account of the same events. The laws in the Book of the Covenant were no doubt taken from a pre-existing source; with J's regulations in Ex. xxxiv. 17–26, they form the oldest legislation of the Hebrews that we possess; they consist principally of civil ordinances, suited to regulate the life of the community living under simple traditions of society, and chiefly occupied in agriculture, but partly also of elementary regulations respecting religious observances (altars, sacrifices, festivals, etc.).

Not long, probably, after the fall of the Northern Kingdom in 722 B.C., a prophet of Judah selected extracts from J and E and combined them with additions of his own in a single narrative (JE). As distinguished from the priestly narrative (*see* below), it has a distinctly prophetical character; it treats the history from the standpoint of the prophets and their religious ideas often find expression in it. To it belong most of the best-known narratives of the patriarchal and Mosaic ages. Its style, especially in the parts belonging to J, is graphic and picturesque, the descriptions are vivid and abound in detail and colloquy, and both emotion and religious feeling are warmly and sympathetically expressed in its relation.

Deuteronomy.—Probably in the 7th century during the reign of either Manasseh or Josiah the narrative of JE was enlarged by the addition of the discourses of Deuteronomy. These purport to be addresses delivered by Moses to the people shortly before his death. There was probably some tradition of such a farewell address. In strong and persuasive oratory he sets before Israel, in a form adapted to the needs of the age in which he lived, the fundamental principles of Moses. Yahweh was Israel's only God, who tolerated no other God beside Himself, and who claimed to be the sole object of the Israelites' reverence. This fundamental thought is insisted on and developed with great eloquence and power. The truths on which the writer loves to dwell are the sole Godhead of Yahweh, His spirituality, His choice of Israel, and the love and faithfulness which He had shown towards it by redeeming it from slavery and planting it in a free and fertile land; from which are deduced the great practical duties of loyal and loving devotion to Him, an uncompromising repudiation of all false gods, the rejection of all heathen practices, a cheerful and ready obedience to His will and a warm-hearted and generous attitude towards man. Love of God is the primary spring of human duty (vi. 5). In ch. xii.–xxvi. the author embodies most of the laws incorporated in JE, with many others which were current, often expanding them and enforcing them by moral and religious motives. His ideal is a community of which every member is full of love and reverence towards his God, and of sympathy and regard for his fellow men. The "Song" (xxxii.) and "Blessing" (xxxiii.) of Moses are not by the author of the discourses; and the "Blessing," though not Mosaic, is of considerably earlier date.

The influence of Deuteronomy on the later literature was great. It gave the religious ideals of the age, and moulded the phraseology in which these ideals were expressed. Its style lent itself readily to imitation; and a school of writers imbued with its spirit, and using its expressions, quickly arose. Thus the "JE" sections in Joshua were considerably expanded by a Deuteronomic editor, whose additions generalise Joshua's successes and describe his conquest of Canaan as far more complete than the earlier narratives assert. The compilers of Judges and Kings are also strongly influenced by Deuteronomy. (*See* DEUTERONOMY.)

The priestly sections of the Hexateuch (known as "P") are later than "JE," and even than Deuteronomy. This is apparent—to mention but one feature—from their more complex ritual and hierarchical organisation. They are apparently the work of a school of priests, who, after the destruction of the temple, began to write down and codify the pre-exilic ceremonial regulations, combining them with a narrative extending from the creation to the settlement in Canaan; and who completed their work during the century following the restoration in 537 B.C. Their chief object is to describe in detail the leading institutions of the theocracy (tabernacle, sacrifices, purification, etc.), which they refer to the Mosaic age. The history, except at important epochs, is briefly summarised. Statistical data (lists of names, genealogies, and precise chronological notes) are a conspicuous feature. But the legislation though written down in or after the Exile was not the creation of that period. Many elements were of great antiquity as is clear from the older literature; it is based on pre-exilic temple usage, though in some respects a development of it, and exhibits the form which the older institutions ultimately assumed. In "P's" picture of the Mosaic age there are many ideal elements; it represents the priestly ideal of the past rather than the past as it actually was. Its style is strongly marked, numerous expressions not found elsewhere in the Hexateuch occur in it repeatedly. The following examples of passages from P will illustrate what has been said: Gen. i. 1–ii. 4a, xvii., xxiii., xxv. 7–17, xlvi. 6–27; Ex. vi. 2–vii. 13, xxv.–xxxi., xxxv.–xl.; Lev. i.–xvi., xxvii.; Num. i. 1–x. 28, xv., xviii., xix., xxvi.–xxxi., xxxiii.–xxxvi.; Josh. v. 10–12, the greater part of xv.–xix., xxi. 1–42. The section Lev. xvii.–xxvi. has a character of its own; it consists of a substratum of older laws, partly moral (xviii.–xx. mostly), partly ceremonial. It exhibits very marked characteristics, from one of which it has received the name of the Law of Holiness. These laws have been combined with elements belonging to, or conceived in the spirit of, the main body of P. Not long after "P" was completed, probably in the 5th century B.C., the whole, consisting of "JE" and Deuteronomy, was combined with it; and the existing Hexateuch was thus produced.

For a detailed discussion of the remaining books of the Old Testament reference must be made to the relevant articles. Here some general observations must suffice. Judges consists substantially of older narratives arranged together not earlier than *c* 600 B.C. by a compiler in harmony with a theory of the religious history of the period derived from Deuteronomy, and provided by him, where he deemed it necessary, with introductory and concluding comments and chronological notes. The books of Samuel consist of a series of narratives dealing with the lives of Samuel, Saul and David, some apparently almost contemporary with the events they describe, while others are later. We have two different views of the monarchy in I. Sam., in ix. 1–x. 16, xi. 1–11, 15, it is viewed as God's gracious gift to His people; in viii., x. 17–27, xii. which reflect the feeling of a much later date, it is viewed unfavourably and represented as granted by God unwillingly. Kings resembles Judges in its structure. Prophetic narratives and notices derived from official annals have been placed in a framework by the compiler who was greatly influenced by Deuteronomy, especially with reference to worship at the high places or local sanctuaries.

The Latter Prophets.—Isaiah, Jeremiah, Ezekiel, the Twelve. The activity of the Prophets was largely called for by national crises. They were moral reformers, religious teachers, political advisers. They held up before a backsliding people the ideals of human duty, religious truth and national policy. They expanded and developed, and applied to new situations, the truths which in a germinal form they had inherited. The nature and attributes of God; His gracious purposes towards man; man's relation to God and the consequences it involves; the true nature of religious service; the call to repentance as a condition of God's favour; the ideal of character and action which each should strive to realize; the responsibilities of office and position; the claims of mercy and philanthropy, justice and integrity; indignation against the oppression of the weak and the unprotected; ideals of a blissful future, when the troubles of the present will be over, and men will bask in the enjoyment of righteousness and felicity—these, and such as these, are the themes which are ever in the prophets' mouths and on which they enlarge with unwearied eloquence and power.

Isaiah.—This book falls into two parts i.–xxxix. and xl.–lxvi. In the former it is generally admitted that xiii.1–xiv.23, xxi.1–10, xxiv.–xxvii., xxxiv.–xxxv. are later than Isaiah; and several critics would considerably enlarge the area of non-Isaianic material. The latter falls into two divisions (*a*) xl.–lv. and (*b*) lvi.–lxvi. The former is the work of a prophet (the Second Isaiah) who wrote about 540 B.C., assuring the exiles that Cyrus would overthrow Babylon and restore them to their own land. Opinion is divided as to whether the poems on "The Servant of Yahweh" are to be assigned to him or to another prophet. In lvi.–lxvi. we have a number of oracles, written probably about the time of Nehemiah, possibly the work of one man, but probably of more than one.

Jeremiah.—Jeremiah received his call in 626 B.C., and his latest prophecy (xliv.) was delivered in Egypt soon after the Fall of Jerusalem in 586. His was a sensitive and tender nature; he laments with great pathos and emotion his people's sins, the ruin to which his country was hastening and the persecutions provoked by his predictions of disaster. The biographical narratives were probably written by Baruch, who also wrote in 604 B.C. at the prophet's dictation the prophecies delivered from the time of his call. But the book was certainly not compiled in its present form by Baruch; and it contains a certain amount of later matter, though much less than some recent scholars (*e.g.*, N. Schmidt, Duhm and Hölscher) have asserted.

Ezekiel.—Ezekiel taken captive to Babylonia with Jehoiachim in 597 began his ministry in 592. He denounced the sin of Judah and steadily predicted the Fall of Jerusalem which took place in 586 (i–xxiv.). Prophecies on foreign nations follow in xxv.–xxxii.; and the book closes with prophecies of restoration (xxxiii.–xlviii.). In xl.–xlviii. he describes minutely the organisation of the restored community. His book has generally been thought to bear throughout the stamp of a single mind; but recently this has been denied, especially by Hölscher, who regards the book as

for the most part of a later date, but probably without justification.

The Twelve Prophets.—The two earliest, Amos and Hosea, prophesied in the Northern Kingdom about 760 and 740 B.C. respectively. The former the prophet of God's inexorable righteousness, the latter the prophet of His inexhaustible love, saw the approaching ruin of Northern Israel and vainly exhorted the nation to reform. Approximate dates may be assigned to the other Minor Prophets as follows: Micah 725–680, Zephaniah 625; Nahum shortly before the destruction of Nineveh in 612; Haggai 520; Zechariah i.–viii. 520 and 518; Malachi 460–450; Joel 5th century; Jonah 4th century. The date of Habakkuk is very uncertain; it has generally, but perhaps wrongly, been assigned to the reign of Jehoiakim. Obadiah was written in its present form after the destruction of Jerusalem, but its relation with Jer. xlix. 7–22 raises complex problems. Zech. ix.–xiv. perhaps belongs to the period beginning with the conquests of Alexander, between 332 and *c.* 300 B.C.

The Psalms.—In the Psalter devotion receives its fullest expression; in lyrics of exquisite tenderness and beauty the most varied emotions find utterance—despondency and distress, penitence and resignation, hope and confidence, jubilation and thankfulness, adoration and praise. The Psalter is composed of five books all compiled after the return from captivity. Independent collections have been incorporated in it. It is an exaggeration to say that there are no pre-exilic Psalms; yet the Psalter, as a whole, is the expression of the deeper spiritual feeling which marked the later stages of Israel's history. Most of the Psalms presuppose the historical conditions, or the religious experiences, of the ages that followed Jeremiah. Its compilation can hardly have been completed before the 3rd century B.C.; if, as is probable, it contains Psalms of the Maccabean period, it cannot have been completed till after 165 B.C.

The Book of Proverbs.—The Wisdom-books of the Old Testament are Proverbs, Job and Ecclesiastes. The wisdom of the Hebrews dealt with the philosophy of human nature, sometimes also of physical nature; its writers observed human character, studied action in its consequences, laid down maxims for education and conduct, and reflected on the moral problems which human society presents. The book which consists of eight distinct portions was formed gradually. A small nucleus of the Proverbs may be Solomon's, but the great majority no doubt represent the generalisations of a long succession of sages. The book will not have reached its present form before the 4th century B.C. But recent discovery of Egyptian parallels to one section of the book suggests that a considerably larger section of it may be pre-exilic than has often been supposed.

Job.—The outline of the story was probably borrowed from tradition; but the poet has used it as a vehicle for expressing his own new thoughts on the suffering of the righteous and the prosperity of the wicked, and especially to indicate the sufferer's own reaction to his trial as it affected his relation to God. The speeches of Elihu are a later insertion; but the prologue, epilogue and the speech of Yahweh are probably integral parts of the original work. Its date may most plausibly be assigned to about the close of the 5th century.

The Megilloth.—The five Megilloth or rolls are the Song of Songs, Ruth, Lamentations, Ecclesiastes and Esther. The Song of Songs (*see* CANTICLES) in exquisite poetry extols the power and sweetness of pure and faithful human love. In spite of features which suggest that it was written in North Israel at an early date, it is probably as late as the 4th or 3rd century B.C. The view that it contains the story of a country maiden who remains true to her rustic lover in spite of the blandishments of Solomon should probably be set aside. It seems to be a collection of wedding songs. The graceful and tender idyll of Ruth probably belongs to the 5th century. The Lamentations were written after the Fall of Jerusalem, the second and fourth soon after the catastrophe, the first and fifth presumably nearer the end of the exile, while the third is perhaps post-exilic. It is unlikely that any of them were composed by Jeremiah. Ecclesiastes must be one of the latest books in the Hebrew Canon, written probably towards the end of the 3rd century. Its tender-hearted author is in despair as he contemplates the futility of existence and the misery of his fellows. Progress is impossible, God has deliberately concealed from men the real scheme of things knowing which they could have ordered their lives aright; nor from the present can we take refuge in the future and hope for a blessed immortality. The Book of Esther will not be earlier than the 3rd century B.C., it is not improbable indeed that it belongs to the latter half of the 2nd century.

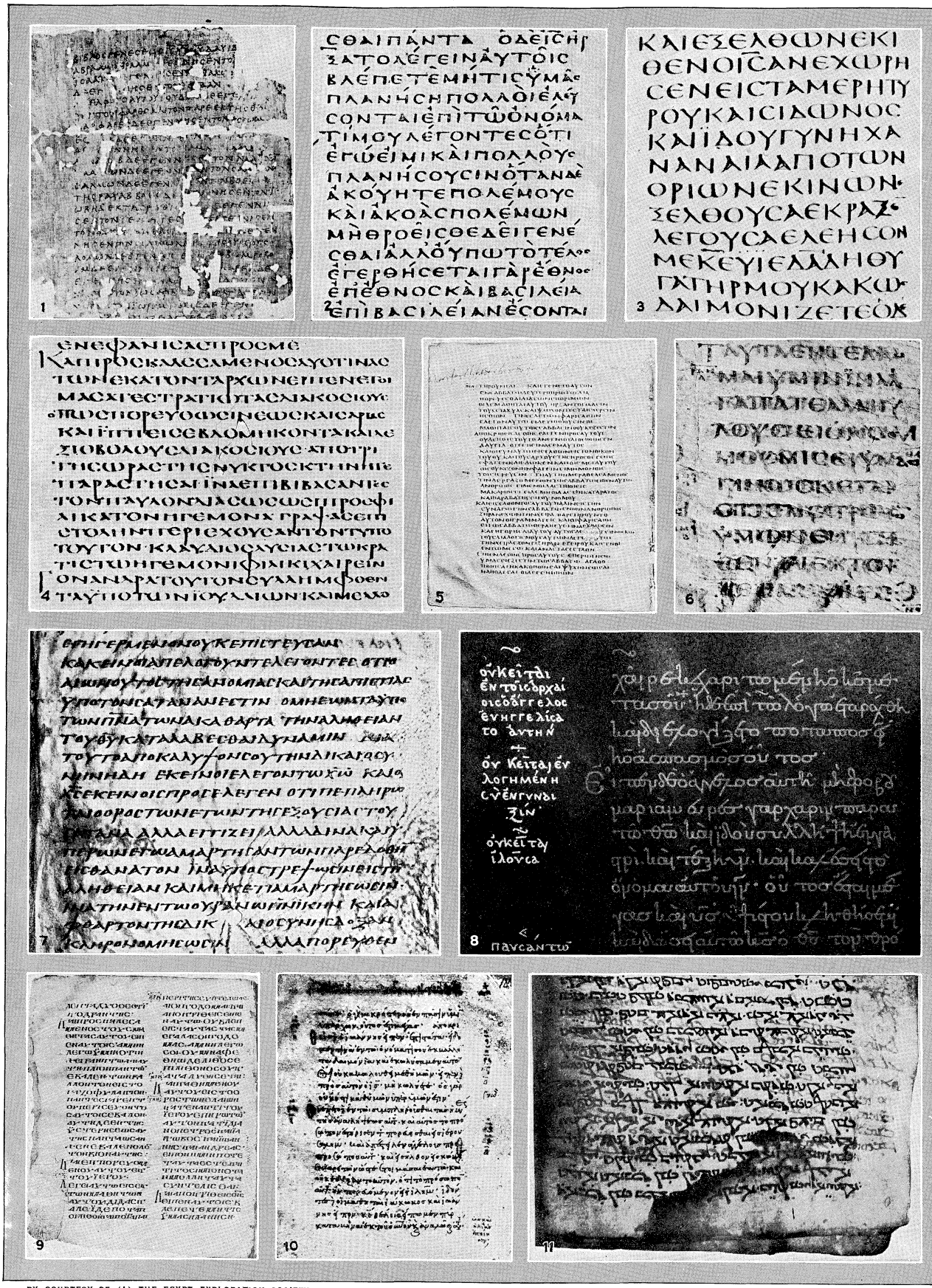
The Book of Daniel.—This book was written to encourage the pious Jews in the persecution of Antiochus Epiphanes 168–165 B.C. It is possible that the narrative section ch. i.–vi. may belong to the 3rd century. Ch. vii.–ix. describe events from Alexander through the lines of the Ptolemies and the Seleucidae, culminating in the persecution of Antiochus Epiphanes and predicting his speedy fall.

Chronicles, Ezra and Nehemiah.—These books are the work of a single compiler who has drawn on canonical and uncanonical sources, sometimes without substantial change, sometimes with material alteration. His additions, especially in Chronicles, placed the old history in a new light; he invests it with the associations of his own day, and pictures pre-exilic Judah (of the schismatic Northern Kingdom he says very little) as already possessing the fully developed ceremonial system, under which he lived himself, and as ruled by the ideas and principles current among his contemporaries. Much in his representation of the past cannot be historical. From historical allusions in the Book of Nehemiah it may be inferred that he wrote about 300 B.C. (S. R. D.; A. S. P.)

2. TEXTS AND VERSIONS

Text.—The form in which the Hebrew text of the Old Testament is presented to us in all mss. and printed editions is that of the Massoretic text, the date of which is usually placed somewhere between the 6th and 8th centuries. It is probable that the present text became fixed as early as the 2nd century A.D., but even this earlier date leaves a long interval between the original autographs of the O.T. writers and our present text. Since the fixing of the Massoretic text the task of preserving and transmitting the sacred books has been carried out with the greatest care and fidelity, with the result that the text has undergone practically no change of any real importance; but before that date, owing to various causes, it is beyond dispute that a large number of corruptions were introduced into the Hebrew text.

Massoretic Text.—An examination of the extant mss. of the Hebrew O.T. reveals two facts which at first sight are somewhat remarkable. The first is that the oldest dated ms., the *Codex Babylonicus Petropolitanus,* only goes back to the year A.D. 916, though it is probable that one or two mss. belong to the 9th century. The second fact is that all our Hebrew mss. represent one and the same text, viz., the Massoretic. This text was the work of a special guild of trained scholars whose aim was not only to preserve and transmit the consonantal text which had been handed down to them, but also to ensure its proper pronunciation. To this end they provided the text with a complete system of vowel points and accents. Their labours further included the compilation of a number of notes, to which the term Massorah is now usually applied. These notes for the most part constitute a sort of index of the peculiarities of the text, and possess but little general interest. More important are those passages in which the Massoretes have definitely adopted a variation from the consonantal text. But many even of these readings merely relate to variations of spelling, pronunciation or grammatical forms; others substitute a more decent expression for the coarser phrase of the text, though in some instances the suggested reading really affects the sense of the passage. These last are to be regarded either as old textual variants or, more probably, as emendations corresponding to the *errata* or *corrigenda* of a modern printed book. They do not point to any critical editing of the text; for the aim of the Massoretes was essentially conservative. Their object was not to create a new text, but rather to ensure the accurate transmission of the traditional text which they themselves had received. Their work may be said to culminate in the vocalized text which resulted from the labours of Rabbi Aaron ben



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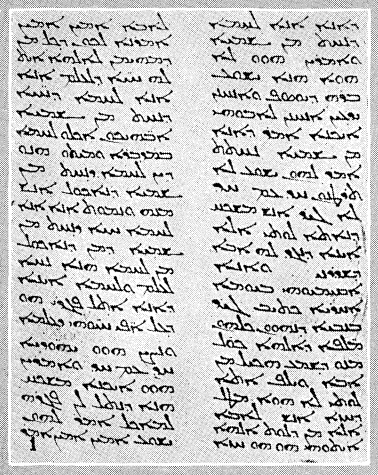
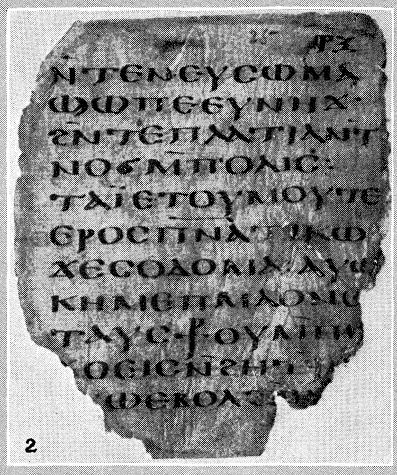
EXAMPLES OF GREEK AND SYRIAC BIBLICAL MSS. OF THE 4TH TO THE 12TH CENTURIES

1. *Oxyrhynchus Papyrus* 2, Greek, 3rd cent.: Matt. i 1–8. 2. *Cod. Vaticanus* (B), Greek, 4th cent.: Mark xiii 5–8. 3. *Cod. Sinaiticus* (ℵ), Greek, 4th cent.: Matt. xv 21–22. 4. *Cod. Alexandrinus* (A), Greek, 5th cent.: Acts xxiii 23–27. 5. *Cod. Bezae* (D), a Greek page, 4th–5th cent.: Luke vi 1–10. 6. *Cod. Purpureus Petropolitanus* (N), Greek, 6th cent.: John xv 17–18. 7. *Cod. Washingtonianus* (W), Greek, 5th cent.: interpolation after Mark xvi 14. 8. *Cod. Theodorae Imperatricis* (565), Greek, 9th cent.: Luke i 28–32. 9. *Cod. Koridethi* (Θ), Greek, 7th–9th cent.: Mark xii 43-xiii 5. 10. *Cod.* 700, Greek, 11th–12th cent.: Luke ix 48–54. 11. *Cod. Palimpsestus Sinaiticus* (Syr. S), Old Syriac Version, 4th cent., upper writing 8th cent.: Luke xix 39–45.





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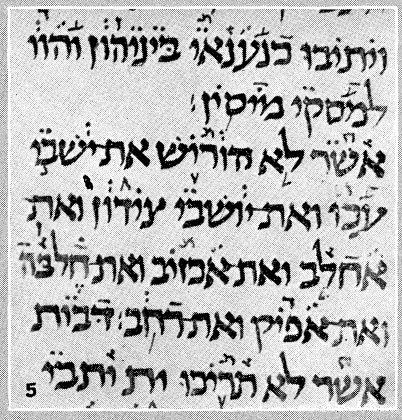

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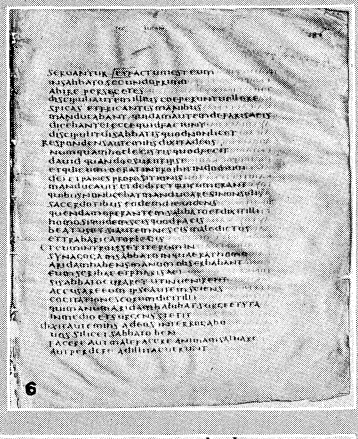

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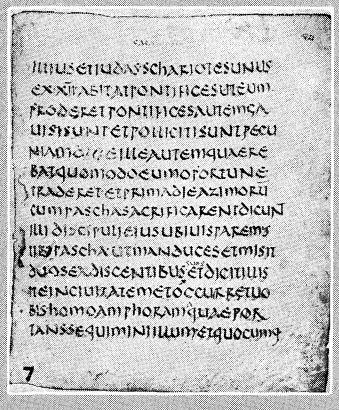

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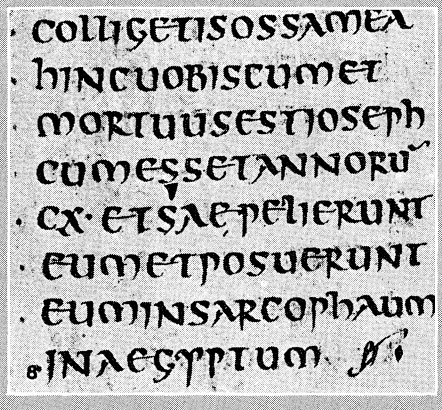

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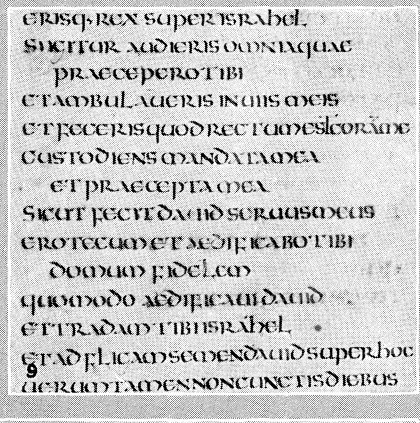

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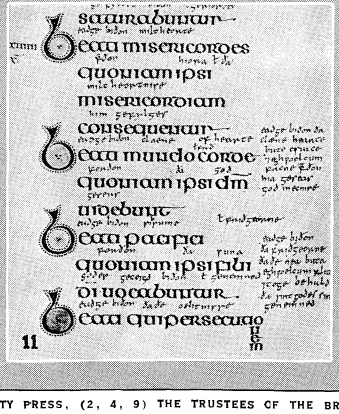

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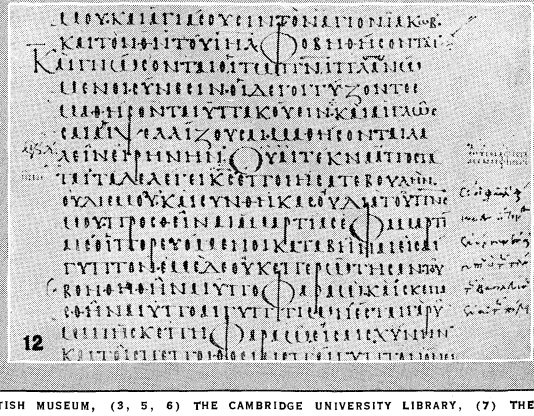

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EXAMPLES OF BIBLICAL MSS. OF THE 4TH TO THE 13TH CENTURIES

1. *Cod. Nitriensis Curitonianus* (Syr. *C*), Old Syriac Version, 5th cent.: John vi 41–53. 2. Sahidic Version, Ms. of 5th cent.: Rev. xi 7–9. 3. Armenian Version, Ms. of 1217: Matt. vi 20–22. 4. Hebrew Ms. of the Pentateuch, 9th cent.: Num. xxxii 22b–24. 5. Hebrew Ms. of the Pentateuch, 9th cent.: Judg. i 30–31. 6. *Cod. Bezae* (*d*), a Latin page, Old Latin Version, 4th–5th cent.: Luke vi 1–10. 7. *Cod. Bobiensis* (*k*), Old Latin Version, 4th–5th cent.: Mark xiv 10–13. 8. *Lyons Pentateuch*, Old Latin Version, 7th cent.: Gen. 1 24–25. 9. Latin Vulgate, fragment of Ms. early 8th cent.: III (I) Kings xi 37–39. 10. *Southampton Psalter*, late 10th cent.: Ps. lii (liii) 1–6. 11. *Lindisfarne Gospels*, about 700: Matt. v 6–10. 12. *Cod. Marchalianus*, Septuagint, 6th cent., with Hexapla marginalia: Is. xxix 23–xxx 3.

Asher in the 10th century. But the writings of Jerome in the 4th and of Origen in the 3rd century both testify to a Hebrew text practically identical with that of the Massoretes. Similar evidence is furnished by the Mishna and the Gemara, the Targums, and lastly by the Greek version of Aquila, which dates from the first half of the 2nd century A.D. Hence it is hardly doubtful that the form in which we now possess the Hebrew text was already fixed by the beginning of the 2nd century. On the other hand, evidence such as that of the Book of Jubilees shows that the form of the text still fluctuated considerably as late as the 1st century A.D., so that we are forced to place the fixing of the text some time between the fall of Jerusalem and the production of Aquila's version. Nor is the occasion far to seek. After the fall of Jerusalem the new system of biblical exegesis founded by Rabbi Hillel reached its climax at Jamnia under the famous Rabbi Aqiba (died *c.* 132). The latter's system of interpretation was based upon an extremely literal treatment of the text, according to which the smallest words or particles, and sometimes even the letters of scripture, were invested with Divine authority. The inevitable result of such a system must have been the fixing of an officially recognized text, which could scarcely have differed materially from that which was finally adopted by the Massoretes. That the standard edition was not the result of the critical investigation of existing materials may be assumed with some certainty. Indeed, it is probable, as has been suggested, that the ms. which was adopted as the standard text was an old and well-written copy, possibly one of those which were preserved in the Court of the Temple. (W. Robertson Smith, *Old Testament and the Jewish Church*, p. 69.)

It is, however, certain that before the 2nd century A.D. the various mss. of the O.T. differed very materially from one another. Sufficient proof of this statement is furnished by the Samaritan Pentateuch and the Versions, more especially the Septuagint. Indications also are not wanting in the Hebrew text itself to show that in earlier times the text was treated with considerable freedom. Thus, according to Jewish traditions, there are 18 passages ("corrections of the scribes"), in which the older scribes deliberately altered the text on the ground that the language employed was either irreverent or liable to misconception. Of a similar nature are the changes introduced into proper names; *e.g.*, Ishbosheth (II. Sam. ii. 8) and Mephibosheth (II. Sam. ix. 6), for the older forms Eshbaal and Merib-baal (I. Chron. viii. 33, 34); the use of the verb, "to bless," in the sense of cursing (I. Kings xxi. 10, 13; Job i. 5, 11, ii. 5, 9; Ps. x. 3); and the insertion of "the enemies of") in I. Sam. xxv. 22, II. Sam. xii. 14). These intentional alterations, however, only affect a very limited portion of the text, and though it is possible that other changes were introduced at different times, it is very unlikely that they were either more extensive in range or more important in character. At the same time it is clear both from internal and external evidence that the archetype from which our mss. are descended was far from being a perfect representative of the original text. For a comparison of the different parallel passages which occur in the O.T. (*e.g.*, I. and II. Sam., I. and II. Kings and I. and II. Chron.; II. Kings xviii. 13–xx. 19 and Isaiah xxxvi.–xxxix.; II. Sam. xxii. and Ps. xviii.; Ps. xiv. and liii., etc.) reveals many variations which are obviously due to textual corruption, while there are many passages which in their present form are either ungrammatical, or inconsistent with the context, or with other passages. Externally also the ancient versions, especially the Septuagint, frequently exhibit variations from the Hebrew which are not only intrinsically more probable, but often explain the difficulties presented by the Massoretic text. Our estimate of the value of these variant readings, moreover, is considerably heightened when we consider that the mss. on which the versions are based are older by several centuries than those from which the Massoretic text was derived; hence the text which they presuppose has no slight claim to be regarded as an important witness for the original Hebrew.

Versions.—In point of age the Samaritan Pentateuch furnishes the earliest external witness to the Hebrew text. It is not a version, but merely that text of the Pentateuch which has been preserved by the Samaritan community since the time of Nehemiah (Neh. xiii. 23–31), *i.e.*, about 432 B.C. It agrees with the Septuagint version in many passages, but its chief importance lies in the proof which it affords as to the substantial agreement of our present text of the Pentateuch, apart from certain intentional changes (*e.g.*, Ex. xx. 17, 19 ff; Num. xx. f.; Deut. xxvii. 4), with that which was promulgated by Ezra. Its value for critical purposes is considerably discounted by the late date of the mss., upon which the printed text is based.

The Targums, or Aramaic paraphrases of the books of the O.T. (*see* TARGUM), date from the time when Hebrew had become superseded by Aramaic as the language spoken by the Jews, *i.e.*, during the period immediately preceding the Christian era. In their written form, however, the earlier Targums, viz., those on the Pentateuch and the prophetical books, cannot be earlier than the 4th or 5th century A.D. Since they were designed to meet the needs of the people and had a directly edificatory aim, they are naturally characterized by expansion and paraphrase, and thus afford invaluable illustrations of the methods of Jewish interpretation and of the development of Jewish thought. The text which they exhibit is virtually identical with the Massoretic text.

The earliest among the versions as well as the most important for the textual criticism of the O.T. is the Septuagint (*q.v.*). This version probably arose out of the needs of the Greek-speaking Jews of Alexandria in the 3rd century B.C. The name Septuagint, strictly speaking, only applies to the translation of the Pentateuch, but it was afterwards extended to include the other books of the O.T. as they were translated. That the interval which elapsed before the Prophets and the Hagiographa were also translated was no great one is shown by the prologue to Ecclesiasticus, which speaks of "the Law, the Prophets and the rest of the books," as already current in a translation by 132 B.C. The date at which the various books were combined into a single work is not known, but the existence of the Septuagint as a whole may be assumed for the 1st century A.D., at which period the Greek version was universally accepted by the Jews of the Dispersion as Scripture, and from them passed on to the Christian Church.

In the 2nd century A.D. three new translations of the O.T. into Greek were made by Aquila, Symmachus and Theodotion. Aquila was a Jewish proselyte of Pontus whose version may be assigned to the first half of the 2nd century. It is characterized by extreme literalness, and clearly reflects the peculiar system of exegesis which was then in vogue among the Jewish rabbis. Its slavish adherence to the original caused the new translation to be received with favour by the Hellenistic Jews, among whom it quickly superseded the older Septuagint. For what remains of this version, which owing to its character is of the greatest value to the textual critic, we have until recently been indebted to Origen's *Hexapla* (*see* below). Fragments, however, of two codices were discovered (1897) in the *genizah* at Cairo, which illustrate more fully the peculiar features of this version.

The accounts given of Theodotion are somewhat conflicting. On the whole it is probable that Irenaeus has preserved the most trustworthy account, viz., that he was a Jewish proselyte whose translation preceded that of Aquila. Theodotion's version was not an independent translation, but rather a revision of the Septuagint on the basis of the current Hebrew text. He retained, however, those passages of which there was no Hebrew equivalent, and added translations of the Hebrew where the latter was not represented in the Septuagint. A peculiar feature of his translation is his excessive use of transliteration, but, apart from this, his work has many points of contact with the Septuagint, which it closely resembles in style; hence it is not surprising to find that later mss. of the Septuagint have been largely influenced by Theodotion's translation. In the case of the book of Daniel, the translation of Theodotion was definitely adopted by the Church, and is accordingly found in the place of the original Septuagint in all mss. and editions. It is interesting to note in this connection that renderings which agree in the most remarkable manner with Theodotion's version of Daniel are found not only in writers of

the 2nd century but also in the New Testament. The most probable explanation of this phenomenon is that these renderings are derived from an early Greek translation, differing from the Septuagint proper, but closely allied to that which Theodotion used as the basis of his revision.

Symmachus, according to Eusebius and Jerome, was an Ebionite. He is not mentioned by Irenaeus and his date is uncertain, but probably his work is to be assigned to the end of the 2nd century. His version was commended by Jerome as giving the sense of the original, and in that respect it forms a direct contrast with that of Aquila. Indeed Dr. Swete thinks it probable that "he wrote with Aquila's version before him (and that) in his efforts to recast it he made free use both of the Septuagint and of Theodotion."

As in the case of Aquila, our knowledge of the works of Theodotion and Symmachus is practically limited to the fragments that have been preserved through the labours of Origen. This writer (*see* ORIGEN) conceived the idea of collecting all the existing Greek versions of the O.T. with a view to recovering the original text of the Septuagint, partly by their aid and partly by means of the current Hebrew text. He accordingly arranged the texts to be compared in six parallel columns in the following order: (1) the Hebrew text; (2) the Hebrew transliterated into Greek letters; (3) Aquila; (4) Symmachus; (5) the Septuagint; and (6) Theodotion. In the Septuagint column he drew attention to those passages for which there was no Hebrew equivalent by prefixing an obelus; but where the Septuagint had nothing corresponding to the Hebrew text he supplied the omission, chiefly but not entirely from the translation of Theodotion, placing an asterisk at the beginning of the interpolation; the close of the passage to which the obelus or the asterisk was prefixed was denoted by the metobelus. That Origen did not succeed in his object of recovering the original Septuagint is due to the fact that he started with the false conception that the original text of the Septuagint must be that which coincided most nearly with the current Hebrew text. Indeed, the result of his monumental labours has been to impede rather than to promote the restoration of the genuine Septuagint. For the Hexaplar text which he thus produced not only effaced many of the most characteristic features of the old version, but also exercised a prejudicial influence on the mss. of that version.

The *Hexapla* as a whole was far too large to be copied, but the revised Septuagint text was published separately by Eusebius and Pamphilus, and was extensively used in Palestine during the 4th century. During the same period two other recensions made their appearance, that of Hesychius which was current in Egypt, and that of Lucian which became the accepted text of the Antiochene Church. Of Hesychius little is known. Traces of his revision are to be found in the Egyptian mss., especially the *Codex Marchalianus,* and in the quotations of Cyril of Alexandria. Lucian was a priest of Antioch who was martyred at Nicomedia in A.D. 311 or 312. His revision (to quote Dr. Swete) "was doubtless an attempt to revise the κοινή (or 'common text' of the Septuagint) in accordance with the principles of criticism which were accepted at Antioch." To Ceriani is due the discovery that the text preserved by codices 19, 82, 93, 108, really represents Lucian's recension; the same conclusion was reached independently by Lagarde, who combined codex 118 with the four mentioned above. As Field (*Hexapla,* p. 87) has shown, this discovery is confirmed by the marginal readings of the *Syro-Hexapla.* The recension is characterized by the substitution of synonyms for the words originally used by the Septuagint, and by the frequent occurrence of double renderings, but its chief claim to critical importance rests on the fact that "it embodies renderings not found in other mss. of the Septuagint which presuppose a Hebrew original self-evidently superior in the passages concerned to the existing Massoretic text." (Driver.)

Latin Versions.—Of even greater importance in this respect is the Old Latin version, which undoubtedly represents a Greek original prior to the *Hexapla.* "The earliest form of the version" (to quote Dr. Kennedy) "to which we can assign a definite date, viz., that used by Cyprian, plainly circulated in Africa." In the view of many authorities this version was first produced at Carthage, but recent writers are inclined to regard Antioch as its birthplace, a view which is supported by the remarkable agreement of its readings with the Lucianic recension and with the early Syriac mss. Unfortunately the version is only extant in a fragmentary form, being preserved partly in mss., partly in quotations of the Fathers. The non-canonical books of the Vulgate, however, which do not appear to have been revised by Jerome, still represent the older version. It was not until after the 6th century that the Old Latin was finally superseded by the Vulgate or Latin translation of the O.T. made by Jerome during the last quarter of the 4th century. This new version was translated from the Hebrew, but Jerome also made use of the Greek versions, more especially of Symmachus. His original intention was to revise the Old Latin, and his two revisions of the Psalter, the Roman and the Gallican, the latter modelled on the *Hexapla,* still survive. Of the other books, which he revised according to the Hexaplar text, that of Job has alone come down to us. For textual purposes the Vulgate possesses but little value, since it presupposes a Hebrew original practically identical with the text stereotyped by the Massoretes.

Syriac Versions.—The Peshito (P'shiṭta) or "simple" revision of the O.T. is a translation from the Hebrew, though certain books appear to have been influenced by the Septuagint. Its date is unknown, but it is usually assigned to the 2nd century A.D. Its value for textual purposes is not great, partly because the underlying text is the same as the Massoretic, partly because the Syriac text has at different times been harmonized with that of the Septuagint.

The Syro-Hexaplar version, on the other hand, is extremely valuable for critical purposes. This Syriac translation of the Septuagint column of the *Hexapla* was made by Paul, bishop of Tella, at Alexandria in A.D. 616–617. Its value consists in the extreme literalness of the translation, which renders it possible to recover the Greek original with considerable certainty. It has further preserved the critical signs employed by Origen as well as many readings from the other Greek versions; hence it forms our chief authority for reconstructing the *Hexapla.* The greater part of this work is still extant; the poetical and prophetical books have been preserved in the *Codex Ambrosianus* at Milan (published in photo-lithography by Ceriani, *Mon. Sacr. et Prof.*), and the remaining portions of the other books have been collected by Lagarde in his *Bibliothecae Syriacae,* etc.

Of the remaining versions of the O.T. the most important are the Egyptian, Ethiopic, Arabic, Gothic and Armenian, all of which, except a part of the Arabic, appear to have been made through the medium of the Septuagint. (J. F. S.)

3. TEXTUAL CRITICISM

The aim of scientific Old Testament scholarship is to obtain a full appreciation of the Old Testament literature, of the life out of which it grew, and the secret of the influence which these have exerted and still exert. For this many things are needed, among which criticism is prominent. Of criticism there are several branches. First, the errors which have crept into the text must be detected and the text be restored as far as possible to its original form; this is the task of Textual or Lower Criticism. Exegesis must interpret the text thus recovered so as to bring out the meaning intended by the authors. The attempt must then be made to determine the scope, purpose and character of the various books, the times in and conditions under which they were written, whether they are severally the work of one or of more authors, at what date they reached their present form, whether they embody earlier sources, and, if so, to reconstruct these and assign dates to them. This is the province of Higher Criticism, so called to distinguish it from Lower Criticism. A further task is to estimate the value of this literature as evidence for the history of Israel; to determine, as far as possible, whether such parts of the literature as are contemporary with the time described present correct, or whether in any respect one-sided or biased or otherwise incorrect descriptions; and again, how far the literature that relates the story of long past periods has drawn upon trustworthy

records, and how far it is possible to extract historical truth from traditions (such as those of the Pentateuch) that present, owing to the gradual accretions and modifications of intervening generations, a composite picture of the period described, or from a work such as Chronicles, which is written on the assumption that the institutions and ideas of the present must have been established and current in the past. This is sometimes assigned to the province of Higher Criticism, but it is desirable to limit this term to the problems of authorship, date and literary analysis and to use the term "Historical Criticism" to cover the questions as to the historical value of the sources themselves and the historicity or otherwise of the narratives they tell. It must use all available and well-sifted evidence, whether derived from the Old Testament or elsewhere, to reconstruct the history of Israel. The supreme aim of the Old Testament student is to trace the growth and determine the character of the religion of Israel. Since revelation is a process in history, the history must be known that the revelation may be understood. For this all types of criticism are necessary; the lower that the text may as far as possible be exactly determined; the higher that the documentary sources may be ascertained and placed in their chronological order; the historical that the trustworthiness of the documents and the historicity of the stories they relate may be ascertained. In this section we are concerned with the textual or lower criticism. This, like all other branches of criticism, is very largely of modern growth.

At the basis of all sound study of the literature is the construction of a text as accurate as criticism can make it; and for a long time this first essential was lacking. Jewish study was exclusively based on the official Hebrew text, fixed probably in the 2nd century A.D. and thereafter scrupulously preserved. But it is obvious that this text already contained certain corruptions. This is clear from various considerations. Certain passages cannot be translated without violence as they stand. Passages occur more than once with variations, sometimes perhaps deliberate, but in other cases only to be reasonably accounted for on the theory that one of the variations is due to corruption. The translations of the Old Testament, notably the Septuagint, frequently present a different and in many instances undeniably a superior text. The official Hebrew text had probably suffered more corruption than can now, or perhaps ever will be, detected with certainty. While Jewish scholars who worked on the Hebrew text were placed at a disadvantage by its corruptions, Jewish Alexandrian and Christian scholars were more seriously hampered because they were dependent upon translations, especially the Septuagint. Although this earliest of the Greek versions was rendered from an earlier and purer form of the Hebrew text than that now preserved, those who were restricted to it were in a much worse position than those who could read Hebrew, partly because it was a translation, and partly because the translation was so defective. In his *Hexapla,* Origen placed in parallel columns the Hebrew, the Septuagint and certain later Greek versions, and thus brought together the chief existing evidence to the text. This, unhappily, is preserved only in fragments. Latin-speaking scholars were dependent on a Latin translation of the Greek translation, and thus studied the Old Testament at a double remove from the original. Jerome made a fresh Latin translation direct from the received Hebrew text. Though greatly opposed at first, this version (the Vulgate) subsequently became the basis of western Biblical scholarship. Thus the uncritical text of the original and the common use, not of the original, but of a version, reacted unfavourably on critical study. And this was aggravated by unsound methods of interpretation, legal or dogmatic or allegorical.

Critical method was not invented by biblical scholars and it was not applied to the Bible in order to discredit it. Biblical scholars adopted it from the students of other ancient literatures; the textual criticism of the classical literatures prepared the way for the textual criticism of the Old Testament; Bentley's *Phalaris* (1699) preceded any thorough or systematic application of higher criticism to any part of the Old Testament; Niebuhr's *History of Rome* (1811) preceded Ewald's *History of Israel* (1853–1859).

The fundamental principles of the textual criticism of the Old Testament are the same as those which apply to any other ancient text, and need not be described here (*see* TEXTUAL CRITICISM). But there are conditions peculiar to the text of the Old Testament which must be briefly described. The earliest Hebrew mss. of the Old Testament are not earlier than the 9th century A.D., or nearly 1,000 years after the latest parts of the Old Testament were written. These mss. and the ordinary Hebrew Bibles contain the text of the Old Testament itself, consisting only of consonants accompanied by vowels and accents which constitute a later Jewish interpretation. The Hebrew alphabet, like that of the Moabites, Aramaeans and Phoenicians, contained no vowels. Vowel signs and accents were invented by Jewish scholars between the 5th and 9th centuries A.D. After a prolonged and bitter conflict it was recognized by the end of the 17th century, thanks especially to the French Protestant scholar, Louis Cappel, and the English Protestant scholar, Brian Walton, that the vowels were a later addition to the text. Yet the influence of tradition lingered long after it had been proved to be false. Thus the R.V. is intended to translate the vocalized text; and legitimate translations of the consonantal text are frequently, though unjustifiably, described as emendations if they depart from the Jewish interpretation as expressed in the vowels. Even before the vowel signs were invented certain consonants which had come to be employed for vowel sounds had been inserted into the original text. The biblical authors themselves had occasionally employed them, but in most cases they were inserted by transcribers and editors. There was probably in most cases no clear division of the consonants into words. The first requisite for a critical treatment is, accordingly, to consider the consonants by themselves, to treat every vowel-consonant as possibly not original, and the existing divisions of the text into words as original only in those cases where they yield a sense better than any other possible division (or, at least, as good). This involves much ambiguity and demands increased skill, but anything short of it falls short also of strict critical method. The perception of this is even now none too general.

The text, like all ancient texts, has suffered from accidents of transmission, from the mistakes of copyists. This was demonstrated, in spite of opposition, by Capellus. To cure corruptions and establish a critical text many things were needed: a complete collation of existing mss. of the Jewish text and of the Samaritan text of the Pentateuch, the establishment of a critical text of the Septuagint, a careful study of several versions directed to determining when real variants are implied and what they are. Not a little has been accomplished but much remains to be done. The Hebrew mss. were collated by Kennicott and De Rossi at the close of the 18th century with sufficient thoroughness to justify the important conclusion that all existing mss. reproduce a single recension. The Samaritan mss. are still imperfectly collated; the same is true of the Syriac and other versions except the Septuagint. For the Septuagint much has been done. Holmes and Parsons prepared an edition with a magnificent critical apparatus (1798–1827); a rather smaller but more careful collation by Cambridge scholars is in process of publication. Neither edition constructs a critical text. Lagarde's contributions to right critical method have been conspicuous. While the value of the Septuagint has been recognized, it has been uncritically used and the correctness of its Hebrew original, while perhaps generally underestimated, has also been exaggerated.

What, then, is the position when we have used all our available resources? So far as we can detect the Hebrew text which underlies the Septuagint, we can recover a Hebrew text of the Pentateuch current about 280 B.C. and for most of the rest of the Old Testament current about 100 B.C. The text we can recover, from comparison with the Hebrew mss., differed but slightly from that officially established before the end of the 2nd century A.D. Comparing these two lines of evidence, we can reach a text current about 300 B.C. or later, but not errors which had already affected the common source of both. Accordingly, errors lurk even where no variants now exist, which can be corrected, if at all, only by conjectural emendation. The dangers of this method are well known and many such emendations have been ill advised; but frequently the textual critic who is at once competent and honest must either offer such emendations or indicate that such passages

are corrupt and the means of restoring them lacking. Conjectural emendation was practised on a modest scale by earlier critics but far more extensively by critics from the closing decades of the 19th century onwards. Frequently this has been in the interests of restoring the metre where the critic has rightly or wrongly detected the presence of a particular rhythm. Wellhausen and Cornill, Bickell and Duhm, Cheyne and Driver may be specially mentioned for their contributions to textual criticism. A valuable conspectus of results may be seen in Kittel's *Biblia Hebraica.* The Hebrew edition of P. Haupt's *Sacred Books of the Old Testament* presents a critical text of the books included in it with critical notes. (G. B. Gr.; A. S. P.)

4. HIGHER AND HISTORICAL CRITICISM

Down to the time of the Reformation doubt was scarcely raised, either among Jews or Christians, as to the traditional beliefs about the date and authorship of Old Testament books. Porphyry, the Neoplatonist philosopher, discerned that Daniel was not written in the Babylonian captivity but in the time of Antiochus Epiphanes four centuries later. The great Jewish scholar Ibn Ezra in a cryptic note on Deut. i. 1 collects several indications which point, as he seems to perceive, to the post-Mosaic origin of the Pentateuch. He also appears to question the authorship of Isa. xl.–lxvi. The reformers were concerned with the authority of ecclesiastical tradition in the interpretation and use of scripture, but not specially so in literary and historical criticism. Yet Luther exercised considerable freedom, especially as to the extent of the Canon, but also as to several questions of higher criticism. Thus for Luther it is a matter of indifference whether or not Moses wrote the Pentateuch; Chronicles he definitely pronounces less credible than Kings, and he considers that Isaiah, Jeremiah and Hosea probably owe their present form to later hands. Carlstadt definitely denied the Mosaic authorship of the Pentateuch, for Moses could not have related his own death; yet Deut. xxxiv. cannot be separated from the rest of the Pentateuch. The later scholastic Protestant doctrine of verbal infallibility necessarily encouraged critical reaction and proved a widely extended retarding force down into the 19th century. Nevertheless, criticism advanced by slow degrees among individuals, now in the Roman Church, now in the number of those who sat loosely to the restrictions of either Roman or Protestant authority, and now among Protestant scholars and theologians.

Thomas Hobbes in his *Leviathan* (1651) expressed a number of views on the Old Testament suggested to him by a critical study of it. The Pentateuch was written later than the time of Moses, but incorporated all that Moses is said to have written—for example, the law contained in Deut. xi.–xxvii., which is to be identified with the lost law discovered by Hilkiah and sent to Josiah. The historical books are considerably later than the history which they relate. The Psalter and Proverbs are in their present form late, though Ecclesiastes and the Song of Solomon are the work of Solomon. The whole Scripture assumed its present form after the return from Exile and before the time of Ptolemy Philadelphus. He insisted that, in default of external evidence, the critical problems must be solved by evidence drawn from the books themselves. Spinoza in his *Tractatus Theologico-politicus* (1671) drew attention in particular to the confused mixture of law and narrative in the Pentateuch, the occurrence of duplicate narratives and chronological incongruities. Father Simon in his *Histoire critique du Vieux Testament* (1682) also argues that the Pentateuch is the work of more than one author, and makes an important advance towards a systematic analysis by observing that the style varies, being sometimes very curt and sometimes very copious, "although the variety of the matter does not require it."

The first attempt at a continuous analysis was made by a French Roman Catholic physician, Jean Astruc. In a work published anonymously in 1753 under the title *Conjectures sur les mémoires originaux dont il paroît que Moyse s'est servi pour composer le livre de la Genèse,* he argued that in Genesis and Exod. i. 2 Moses had used different documents, and that of these the two chief were distinguished by their use of different Divine names—Elohim and Yahweh; by the use of this clue he gave a detailed analysis of the passages belonging to several documents. His criteria were too slight to give to all the details of his analysis anything approaching finality; but his criteria, so far as they went, were valid, and his results, broadly speaking, sound though incomplete. In particular they have abundantly justified his really important fundamental theory that the documents used by the compiler have been incorporated so much as they lay before him that we can get behind them to the earlier sources and thus carry back the evidence beyond the date of compilation to the earlier date of the sources. In identifying the compiler with Moses he failed to profit from some of his predecessors; and his adhesion to the Mosaic origin of the Pentateuch presumably blinded him to the similar phenomena which justify an analysis of the remaining books.

The same year saw the publication of Lowth's *De Sacra poesi Hebraeorum;* he issued a translation of Isaiah with notes in 1778. Both were translated into German and exerted considerable influence in Germany. Lowth's contribution to a more critical appreciation of the Old Testament lies in his perception of the nature and significance of parallelism in Hebrew poetry, in his discernment of the extent to which the prophetical books are poetical form, and in his treatment of the Old Testament as the expression of the thought and emotions of a people—in a word as *literature.*

In spite of these earlier achievements it is J. G. Eichhorn who has, not without reason, been termed the founder of modern Old Testament criticism. The publication of his *Einleitung* (*Introduction to the Old Testament*) in 1780–83, is a landmark in the history of Old Testament criticism. A friend of Herder, and himself keenly interested in literature, he treats the Old Testament as literature—like Lowth, but more thoroughly; himself an Oriental scholar, he treats it as an Oriental literature. His work is the first comprehensive treatment of the entire Old Testament in this manner. While much of the voluminous detail is provisional, most of the broad conclusions of literary criticism which emerge have passed after more than a century of keen and sometimes hostile examination, into the number of historical certainties or high probabilities. On linguistic grounds he argues that Ecclesiastes is as late as the Persian period 538–332 B.C. and that the Song of Solomon does not belong to the Solomonic age. He argues that "in our Isaiah are many oracles not the work of this prophet." Parts of Daniel belong to the exile, other parts are later. Moses was the author of the Pentateuch, but Genesis is analysed on lines similar to Astruc's analysis. He distinguishes the priests' code of the middle books of the Pentateuch and Deuteronomy the people's law book; and admits that even the books which follow Genesis consist of different documents, many incomplete and fragmentary (hence the title "Fragment-hypothesis"), but all the work of Moses and some of his contemporaries.

In his incomplete critically annotated translation of the Old Testament A. Geddes (1792–1800), a Scottish Romanist priest, argued that the Pentateuch rests on a variety of sources, partly written, partly oral, but was compiled in Canaan probably in the reign of Solomon. He rejected the clue from the variation in the divine names used by Astruc and Eichhorn. K. D. Ilgen in 1798 anticipated later criticism by pointing out that in Genesis two documents employed the divine name Elohim and consequently criticism had to reckon with three main sources. The fragment-hypothesis was elaborated by J. S. Vater (1802–05). A new stage opens with De Wette's early and exceedingly influential work, *Die Beiträge zur Einleitung in das Alte Testament* (1806–07). He carried criticism beyond literary analysis and appreciation to the determination of the worth to be attached to the documents as records. He gave a detailed proof of the untrustworthiness of Chronicles and thus cleared the way for that truer view of the history and religion of Israel which the treatment of Chronicles as trustworthy hopelessly obscured. His most influential and enduring contributions to Pentateuchal criticism were his proof that Deuteronomy belongs to the 7th century B.C. and his insistence that the theory of the Mosaic origin of all the institutions

described in the Pentateuch is incompatible with the history recorded in Judges, Samuel and Kings.

Strong in historical criticism, De Wette was weak in historical construction. But what he failed to give, Ewald supplied; and if more of De Wette's than Ewald's work still stands to-day, this is but an illustration of the melancholy fact that in history negative criticism is surer than positive construction. Ewald's *History of the People of Israel* (1843–59) was the first attempt on the grand scale to synthesize the results of criticism and present Israel's history as a great reality of the past. By the force of his wide learning, and even more of his personality, he long exercised an all-pervading and almost irresistible influence; and Stanley's *Lectures on the History of the Jewish Church* (1863–76) is among the fruits. He closes one epoch of Old Testament criticism: by his influence he retards the development of the next.

The criticism of the Pentateuch is concerned first with the discovery of the documentary sources and their delimitation, secondly with their arrangement in chronological order and their dates. It must be remembered that it was not till 1853 that Hupfeld in his *Sources of Genesis* demonstrated, what Ilgen had half a century earlier affirmed, that two documents used Elohim as a proper name. The modern documentary analysis was thus established which recognized four documents: the Yahwist (J), the two Elohistic documents (P and E) and Deuteronomy (D). It was generally held that P was the earliest and D was the latest. But the Grafian theory put forward in 1865 by K. H. Graf, though at the outset with an indefensible partition of P into early narrative and late legal material, assumed under Kuenen's influence its true form and affirmed that P as a whole was later than Deuteronomy and Ezekiel. In this, however, Graf had been largely anticipated by his teacher E. Reuss in his lecture room (1833–34), and by two Hegelian scholars, Vatke and George. In its final form it asserted that the order of the documents was JE, D, P, the legislation in Ezek. xl.–xlviii. forming the transition from D to P. Vatke had the merit of first bringing out the essential character of the movement. Its fundamental peculiarity lies in the fact that it is a criticism of what is supreme in Israel —its religion—and that it has rendered possible a true appreciation of this by showing that, like all living and life-giving systems of thought, belief and practice, the religion of Israel was subject to development. It seized on the prophetic element, and not the ceremonial, as containing what is essential and unique in the religion of Israel.

It was in the field of religious institutions, however, that the demonstration of the Grafian arrangement of the documents was most decisively given. The older view that P, with its exact details and developed ceremonial and sacerdotal system, was at once the earliest portion of the Pentateuch and the Grundschrift or foundation of the whole was maintained by Ewald and his school. The delay in the triumph of the Grafian criticism was due partly to the hostility of Ewald and his school, but in large part to the development of his theory by Vatke on *a priori* grounds in accordance with the principles of Hegel's philosophy of history. It was only after a fresh and keener observation of facts that the new theory made rapid progress. Graf was a pupil of Reuss. The master's divination that the true order was not Law, Psalms, Prophets, but Prophets, Law, Psalms, was reasoned out by his pupil. The famous Dutch scholar Kuenen accepted Graf's demonstration in a revised form, made it the basis of his masterly *Religion of Israel* (1869–70) and supported it by a long series of brilliant essays in the *Theologisch Tijdschrift*. Colenso, though he never entirely accepted the theory, contributed by his searching analysis of the unreality of P's narrative to the formation, or ratification, of the judgment on that document which is fundamental to it. It was J. Wellhausen who decisively changed the current of critical opinion by his *Geschichte Israels*, vol. i. (1878), known in its subsequent editions as *Prolegomena zur Geschichte Israels*. It was translated into English in 1885, with a preface by W. Robertson Smith (*q.v.*), who, with S. R. Driver (*q.v.*), was among the leading exponents of the new standpoint in the English-speaking world.

The Grafian theory found adherents in Holland and Great Britain, but only hostility in Germany till, in 1875, B. Duhm in his *Theologie der Propheten* "broke the consensus of German critics" (Kuenen). Wellhausen's history of Israel was, once more to quote Kuenen, "the crowning fight in the long campaign." From that time the theory became so widely accepted, though some very eminent scholars held out against it, that it remained for many years the orthodox critical view. Recently, however, from various sides the position has been attacked. Those who stand for the traditional view have argued that the distinction in the use of the divine names cannot be relied upon in the documentary analysis because the Hebrew text is in this respect frequently shown to be an insecure basis, owing to the variations in the Septuagint. This has been urged not simply by defenders of tradition such as Dahse and Wiener, but also by Eerdmans, who has formulated a new critical theory. But this has not had the far-reaching results anticipated by its advocates. The distinction in the divine names was actually the starting point for the analysis. It is not the foundation on which it rests, and it is only one clue to analysis among a number. It is in fact easier for critics to separate P from E where the divine names are identical than to separate E from J in which they are distinct. Moreover the investigation of the textual transmission of the divine names, especially by J. Skinner, *The Divine Names in Genesis* (1914), has resulted in the vindication of the general correctness of the Hebrew where the Greek differs from it. But some of those who accept the documentary analysis have shown a tendency to move from the Grafian position, sometimes in a more conservative, sometimes in a more radical direction. This has in both instances been connected with an attack on the generally accepted date of Deuteronomy. This has been the pivot on which the criticism of the Pentateuch has largely turned. It was the unquestioned belief of Grafians and pre-Grafians alike that the Law Book of Josiah's Reformation was to be identified with some form of Deuteronomy. Deuteronomy was supposed by the pre-Grafians to represent the final stage of legislation, but by the Grafians to initiate with the centralization of the worship, a process which had its sequel in Ezekiel and culminated in the priestly code. It has recently been argued that Deuteronomy was really very much earlier than the 7th century. A. C. Welch has put forward the view that, apart from the opening section of the legislation in Deut. xii–xxvi., the detailed regulations contemplate a plurality of high places. The current view has been occasioned simply by the opening law which demands centralization. This he takes to be a late prefix against which Jeremiah protested in the words, "the false pen of the scribes hath wrought falsely" (Jer. viii. 8). On the other hand a late date of Deuteronomy has been urged by R. H. Kennett (since 1905–06), and more recently G. Hölscher has argued that Deuteronomy was really written about 500 B.C. He recognizes the correctness of the view that the Book of Ezekiel is post-Deuteronomic and, since the prophet himself flourished in the first quarter of the 6th century, he regards the larger part of the book as not written by him. It is accordingly not surprising that the priestly legislation is relegated by Hölscher to a later date than that commonly assigned to it and that the whole story of Ezra and his reformation is treated as suspicious. It is scarcely likely that a reconstruction which involves so drastic and negative a criticism will prove acceptable. But the significant thing is that Hölscher adheres to the *Grafian sequence* of documents—Deuteronomy, Ezekiel, P.

On the detailed criticism of the other books reference must be made to the special articles devoted to them. But some general observations are necessary here. At a quite early date in the history of modern criticism it was recognized that Isaiah xl.–lxvi., and several sections in the earlier part of the book, could not be the work of Isaiah himself. Similarly Zech. ix.–xiv., it was seen, could not have been written by Zechariah, the contemporary of Haggai. Doubt was felt as to the authorship of Micah vi., vii., but till the closing decades of the 19th century the criticism of the prophets was on the whole conservative. This is excellently illustrated by the commentary on *Jeremiah* (1862) issued by so advanced a critic as Graf. In 1892 Wellhausen's *Minor Prophets* and Duhm's *Isaiah* fully initiated the more advanced criticism

of the prophets. The range of non-authentic prophecies was enlarged and the text more freely handled, interpolations in authentic prophecies were recognized on a larger scale and the addition of happy endings. Duhm brought down not a little in Isa. i.–xxxv. into the Maccabaean period. Marti followed up his criticism in a more thorough-going fashion. Duhm's handling of Jeremiah and the minor prophets gave a further illustration of his general principles. In particular the belief that eschatology was a late development created, as Wellhausen argued, by the literary study of the earlier prophets, resulted in the belief that nearly all the predictions of a happy future should be relegated to a period later than Ezekiel, with whom the movement had begun. The more recent development has been characterized by a reaction with which the names of Sellin in one way, Gunkel and Gressmann in another, have been associated. This has not been limited to the criticism of the prophets, it has affected most of the Old Testament books. It has been specially due to the feeling that the history, literature and religion of Israel must be placed far more fully in their international context. Israel was a very young people; great civilizations and cultures had been developed, millenniums before its birth, especially in Babylonia and Egypt. To these Israel owed a great debt. The earliest legislation of the Hebrews drew on much more ancient law and custom. The stories of the Creation and the Deluge go back to myths and legends of a far older time. The eschatological scheme found in the prophets is asserted to be of foreign origin. The Hebrews themselves were in contact with various civilizations outside of Palestine, while in Palestine itself layer after layer of foreign culture had been deposited. The general result has been to reverse the radical direction of criticism. Not that there is any widespread tendency to rehabilitate the traditional view of the Pentateuch; the Grafian theory is probably that still generally accepted. But in the case of the Psalms not only would such extravagances as Duhm's view that the bulk of the Psalter belongs to the 2nd and 1st centuries B.C. be generally rejected; but there would be much greater willingness to admit a substantial pre-exilic element in the Psalter. It must, of course, be recognized that all pre-exilic prophecy has come down to us in the works of post-exilic editors, so that the problem is not what elements in the books are later than the prophets whose name they bear, but, from these post-exilic collections, how are the pre-exilic elements to be extracted?

(G. B. Gr.; A. S. P.)

Bibliography.—Only a few works on the Old Testament can be mentioned. S. R. Driver's *Introduction to the Literature of the Old Testament* (1891, 9th ed. 1913) is the standard work, and like all his writings (*see* especially his Genesis in the Westminster series), cautious, exact and judicial. Steuernagel, *Einleitung in das Alte Testament* (1912), is the most comprehensive recent German work; Cornill, *Introduction to the Canonical Books of the Old Testament* (1907), represents a more radical, Sellin, *Introduction to the Old Testament* (1922), a more conservative movement in the critical camp. The points at issue are discussed in Cornill, *Zur Einleitung in das Alte Testament* (1912), and Sellin's reply published under the same title and in the same year; *see* also J. E. McFadyen, "The Present Position of Old Testament Criticism" in *The People and the Book* (ed. Peake). For the most recent developments *see* Meinhold's useful *Einführung in das Alte Testament* (2nd ed. 1926), G. Hölscher, *Geschichte der Israelitischen und Jüdischen Religion* (1922), radical, and indeed revolutionary. W. Robertson Smith's *The Old Testament in the Jewish Church* (2nd ed. 1892) is perhaps still the best fitted to initiate the student into the subject; J. Orr, *The Problem of the Old Testament* (1905), the best conservative statement. On special parts of the field: Kuenen, *The Hexateuch* (1886) and Wellhausen, *Prolegomena to the History of Israel* (1885), are great classics. Valuable also are J. E. Carpenter, *The Composition of the Hexateuch* (1902); Cheyne, *Job and Solomon* (1887), *The Origin and Religious Contents of the Psalter* (1891), and *Introduction to the Book of Isaiah* (1894). On the history of Criticism, *see* Cheyne, *The Founders of Old Testament Criticism* (1893); J. E. Carpenter, *The Bible in the 19th Century* (1903). Recent bibliographies are provided in *A Commentary on the Bible* (1919), and *The People and The Book* (1925), both edited by A. S. Peake; Sellin's *Introduction to the Old Testament* (1923); *The Cambridge Ancient History*, vol. iii. (1925), pp. 729–740, vol. vi. (1927), pp. 578–579; N. Baynes, *Israel among the Nations* (1927); *A Scripture Bibliography* (with annotations); A. Dufourcq, *Les Religions Paiennes et la Rel. Juive* (Paris, 6th ed., 1923), and *see* Hebrew Religion; Jews; Palestine and other relevant special articles.

(A. S. P.)

5. CHRONOLOGY

The importance of a fixed standard of chronology was only gradually felt in the history of the world. When the feeling arose, events were probably at first dated by the regnal years of kings; the reigns of successive kings were then arranged in order and grouped, if necessary, in dynasties, whereby a standard by degrees was constructed. Particular states frequently introduced fixed eras, which obtained a certain currency, as that of the Seleucidae at Antioch (312 B.C.), which the Jewish author of I. Maccabees follows. Some of the oldest documents, like the early Babylonian contract-tablets, are dated by the year in which some noticeable event occurred; examples of this method are found even in the Old Testament (*e.g.*, in Isa. vi. 1; xx. 1; Amos i. 1). During and after the exile, however, dating by the regnal year of the king became general, after the later Babylonian custom (*e.g.*, Isa. xxxvi. 1). The Babylonians and Assyrians were probably the first to employ fixed chronological standards; and numerous contract-tablets and lists of kings and yearly officials attest their precision in noting chronological details. Biblical chronology is in many respects uncertain. Before the monarchy conditions for securing an exact and consecutive chronology did not exist; the dates in the earlier history, though apparently often precise, were in fact added long after the events described and often rested upon an artificial basis, so that the precision is in reality illusory. Even after its establishment, although the required conditions existed, errors by various means crept into the figures, so that the dates as recorded frequently err by two to three decades of years. The exact dates of biblical events can be determined only when the figures in the Old Testament can be checked or corrected by the contemporary monuments of Assyria and Babylonia, or by the independent chronology of the Persian and Seleucid kings.

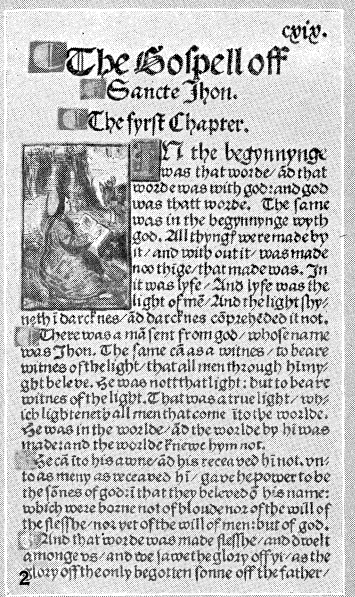
I. In the period from the creation of man to the Exodus the chronology, in so far as it consists of definite figures, depends upon the so-called "Priestly Narrative" of the Pentateuch. The figures are mostly, if not always, artificial, although the means now fail of determining upon what principles they were calculated. It is also noteworthy that in the Samaritan text as in the Greek version of the Pentateuch the figures, especially from the Creation to the birth of Abraham, differ considerably from those of the Hebrew text, yielding in the Samaritan a lower, but in the Greek a much higher, total (*cf.* Skinner, *Genesis*, pp. 234–235).

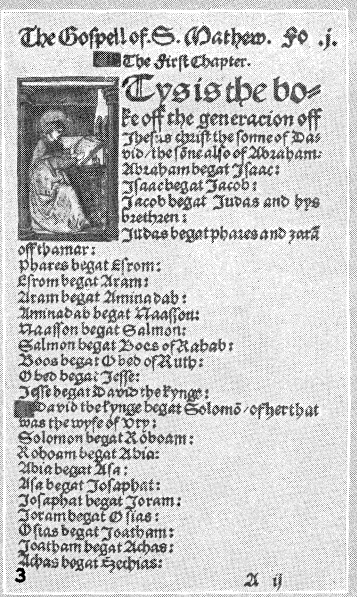
To the period from the Creation to the Flood the Hebrew text assigns 1656 (Samaritan, 1307; Greek, 2262) years. The names obviously belong to the prehistoric age and equally with the figures are as destitute of historical value as those of Babylonian mythology (S. R. Driver, *Genesis*, pp. 79–80 and 432).

To the period from the Flood to the call of Abraham, the Hebrew writer allows 365 (Samaritan, 1015; Greek, 1145) years. The ages of the patriarchs show that these figures are mythical; yet the age of each at the birth of the next might in itself be historical (S. R. Driver, *op. cit.*, pp. 137–138). The figures conceivably go back, through Berossus, to a Babylonian source; but they possess no historical value: accepting even Ussher's date of the Exodus, 1491 B.C., which is earlier than is probable, we should thereby obtain for the creation of man 4157 (Greek, 5328) B.C. and for the confusion of tongues 2501 (Greek, 3066) B.C. But Egyptian and Babylonian monuments prove that man appeared upon the earth long before either date for the Creation; and numerous Egyptian, Sumerian and Babylonian inscriptions of an age considerably earlier than either date of the confusion of tongues are preserved. The figures of Gen. v. and xi. merely indicate the manner in which the priestly writer—and probably to some extent tradition—pictured the course of these early ages. The lives of the patriarchs (except Enoch) in Gen. v. are much longer than those of the patriarchs in Gen. xi., and similarly the ages in Gen. xi. 10–18 are higher than those in Gen. xi. 19–26; it is thus a collateral aim of the author to exemplify a supposed gradual diminution in the length of life.

The patriarchs' sojourn in Canaan, from the call of Abraham to the Exodus, is reckoned at 215 years and the Israelites' sojourn in Egypt at 430 years. Thus from the Creation to the Exodus the total is 2,666 years. Now the 4th year of Solomon is equated with









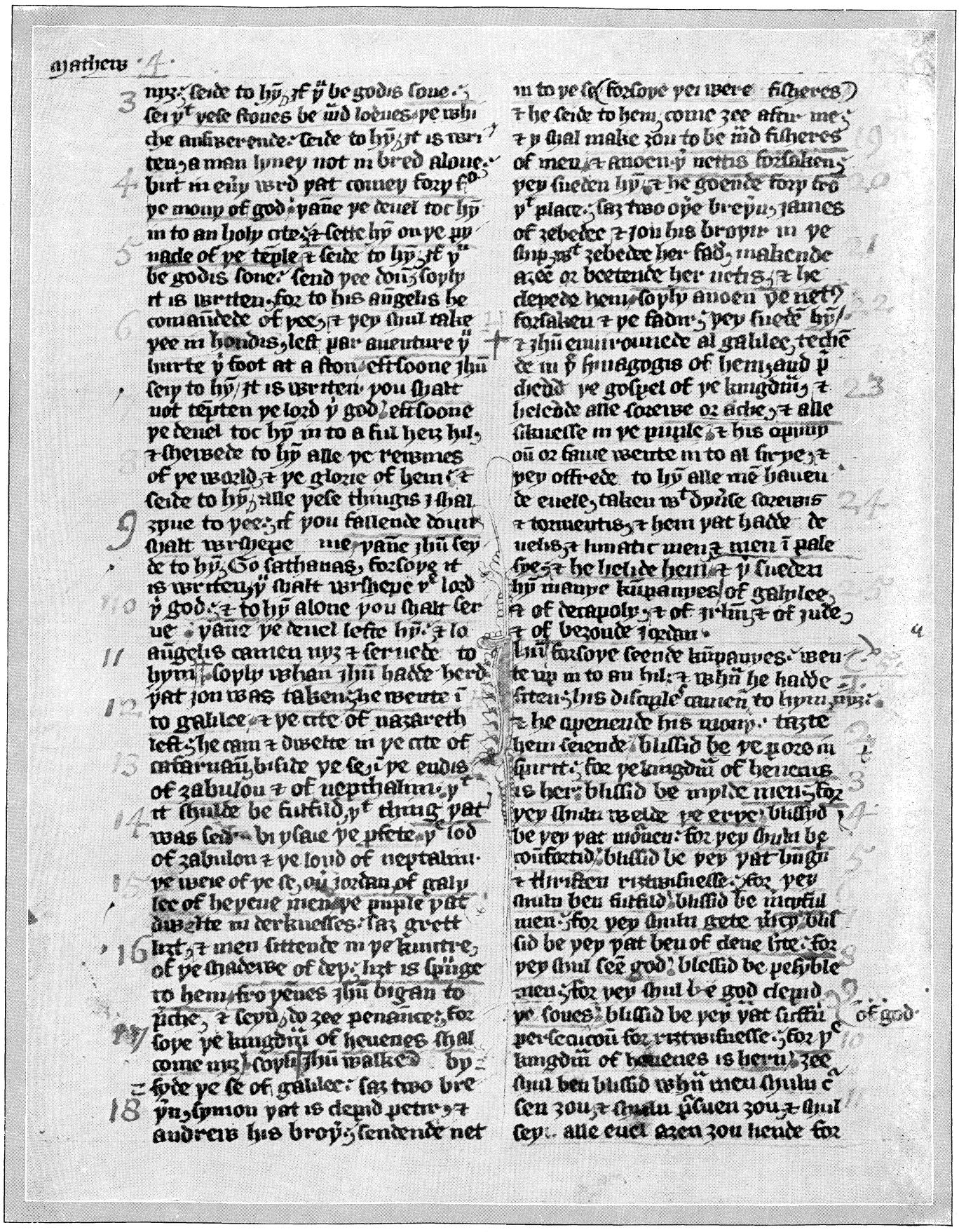


(2, 3) FROM FACSIMILE COPIES IN NEW YORK PUBLIC LIBRARY OF THE ORIGINALS IN THE BRITISH MUSEUM

LEAVES FROM 16TH CENTURY ENGLISH BIBLES

1. Woodcuts showing creation of the world and man; from Coverdale's version of the Bible, 1535
2. First chapter of St. John; Tyndale Bible, 1525
3. First chapter of St. Matthew; Tyndale Bible, 1525
4. Jacob's Ladder, to illustrate Gen. xxviii. 10–15; Bishops' Bible, 1568
5. Scenes illustrating the life of Samson; Bishops' Bible, 1568

BIBLE



A PAGE FROM THE WYCLIFFE TRANSLATION OF THE BIBLE

A page from Wycliffe's translation of the bible, completed in 1382-1384, taken from a copy made about the latter year. The page contains the gospel of St. Matthew, chapter IV. 3, to chapter V. 11, which is part of the temptation of Jesus, with the Beatitudes

the 480th year from the Exodus (I. Kings vi. 1); Ussher, therefore, dating Solomon's reign 1014–975 B.C.—at least 50 years too soon—placed the Exodus in 1491 B.C., the call of Abraham in 2501 B.C. and the Creation in 4004 (which should rather be 4157) B.C. (S. R. Driver, *op. cit.*, pp. xxvii.–xxviii.).

These figures raise suspicions; for the fact that 2,666 is just two-thirds of 4,000 has suggested the inference that it was reached by artificial computation. Further, the various documents composing the early narratives are mutually inconsistent. For example, the plain intention of Exod. xii. 40–41 is to describe the Israelites as having dwelt in Egypt for 430 years, which substantially agrees with Gen. xv. 13. It does not, however, accord with other passages, which assign only four generations from Jacob's children to Moses (Exod. vi. 16–20; Num. xxvi. 5–9; *cf.* Gen. xv. 16), or five to Joshua (Josh. vii. 1); and therefore, no doubt, the Samaritan and Greek read in Exod. xii. 40 that "the sojourning of the children of Israel in the land of Egypt, *and in the land of Canaan,* was 430 years," reducing the period in Egypt to half of that stated in the Hebrew text; viz., 215 years. This computation attained currency among the later Jews, *e.g.*, Josephus amongst others (*cf.* St. Paul's "400 years" in Gal. iii. 17); and the unnatural rendering of Exod. xii. 40 in the A.V. (as contrasted with R.V.), which Ussher followed, was intended to make it possible. The facts here briefly noted make it clear how precarious and in parts impossible the chronology of this period is.

Can any of these dates be fixed by external evidence? Several attempts, based on Gen. xiv. have been made to date Abraham. Thus Amraphel, "king of Shinar," has been identified with Khammurabi, 6th king (*c.* 2067–2025 B.C.) of the 1st Babylonian dynasty, although the equation of Shinar with Babylonia is doubtful (*ibid.*, p. 445), and Tidal, "king of Goiim," has been identified with several Hittite kings, preferably with Tudkhalia I. (*c.* 1550 B.C.?), who founded the Hittite empire (*ibid.*, pp. 448–450). All that can be said is that the second is perhaps more probable than the first suggestion, if one is held to exclude the other; for to accept both identifications requires the assumption that 400 years of history have been "telescoped" into one generation. It is best to admit the truth, that our knowledge is still too uncertain to settle the question. The date of the Exodus is almost equally doubtful; for example, it has been associated with the Hyksos dynasty (*c.* 1800–1600 B.C.) with Amenhotep III. and IV. (*c.* 1411–1360 B.C.) with Rameses II. and Merneptah (*c.* 1292–1198 B.C.) and even with the 20th dynasty (*c.* 1205–1100 B.C.). In spite of the shortening of the period between it and the founding of the kingdom, the age of Merneptah seems best to satisfy the conditions (S. R. Driver, *Exodus,* pp. viii. and xxx.–xlii.; *see* EXODUS, THE).

II. The period from the Exodus to the foundation of the Temple in the 4th year of Solomon is reckoned at 480 (Greek, 440) years (I. Kings vi. 1); but, if the number of years given for the various events by the Hebrew writers is added, the total is 534, or with the addition of the uncertain 20 years of Samuel's judgeship (I. Sam. vii. 2 and 15) 554 years; to this must be added the unknown number of years under Joshua and the elders (Judges ii. 7) and Saul (I. Sam. xiii. 1).

This period might be reduced to 480 years by the supposition, in itself not improbable, that some of the judges were local and contemporaneous; it has also been suggested that, after the Oriental fashion, the years of foreign domination were omitted, each judge's rule being reckoned not from the victory which brought him into power but from the death of his predecessor; we should thus obtain for this period $440+x+y$ years—viz., 40 in the wilderness; x for Joshua and the elders; 40 for Othniel; 80 for Ehud; 40 each for Barak and Gideon; 76 for Jephthah and the 5 minor judges; 40 for Eli; 20(?) for Samuel; y for Saul; 40 for David, and 4 of Solomon's reign—which, if 30 years be assigned conjecturally to Joshua and the elders and 10 years to Saul, would amount to 480 years. The terms used, however—viz., "the land *had rest* forty years" in Judges iii. 11; and similarly in iii. 30; v. 61, and viii. 28—hardly admit of the latter supposition; and, if they did, the correctness of the 480 years could scarcely be maintained. It is difficult to harmonize with the most probable date of the Exodus; it is, moreover, open to the suspicion of having been formed artificially, upon the assumption that the period in question consisted of 12 generations of 40 years each. In the years assigned to the judges, also, the frequency of the number 40 (which was seemingly regarded as a round number) is suspicious. On the whole no certain chronology of this period is yet attainable (*cf.* Burney, *Judges,* pp. 1–54).

III. From the foundation of the Temple to the captivity of Judah the dates are more abundant and more nearly correct than in any earlier period; nevertheless in details there is much uncertainty and difficulty. The Books of Kings were compiled about the beginning of the exile, and one object of the compiler was to give a consecutive and complete chronology of the period embraced by it. He therefore both noted carefully the length of each king's reign in both kingdoms, and (as long as the northern kingdom existed) correlated the history of the two by equating the commencement of each reign in the one with the year of the reign of the contemporary king in the other kingdom.

In these notices the lengths of the reigns were derived, it may be supposed, either from tradition or from official annals—the "book of the chronicles of Israel" or "Judah"; but the "synchronisms"—*i.e.*, the corresponding dates in the contemporary reigns in the other kingdom—were derived, it is practically certain, by computation from the lengths of the successive reigns. In some cases, perhaps, in the lengths of the reigns themselves, in other cases in the computations based upon them, errors which have vitiated more or less the entire chronology have crept in. The existence of these errors can be doubly demonstrated: (i.) the chronology of the two kingdoms is not consistent with itself; (ii.) the dates of various events as calculated by Ussher seriously disagree with the dates as fixed by contemporary Assyrian monuments which mention them.

(1) After the schism the first year of Jeroboam in Israel must coincide with the first year of Rehoboam in Judah; and after the death of Jehoram of Israel and Ahaziah of Judah in battle with Jehu the first year of Jehu in Israel must coincide with the first year of Athaliah in Judah: there are thus two fixed synchronisms. Now the regnal years of the kings of Israel from Jeroboam to Jehoram, when added together, amount to 98, while those of the kings of Judah from Rehoboam to Ahaziah, when added together, amount only to 95. This discrepancy alone would not be serious. But, when the regnal years in the two kingdoms from the division after Solomon's death to the fall of Samaria in the sixth year of Hezekiah are added, the total in the southern kingdom is 260 years, and in the northern kingdom only 241 years 7 months. This is a formidable discrepancy. Again, the length of the reigns of the various kings is not the same according to the traditional and the synchronistic figures. Since, however, it is clear on various grounds that these synchronisms are not original, any attempt to base a chronological scheme on them may be disregarded.

(2) The Assyrian method of chronological computation was particularly exact. A special officer was annually appointed who held office for and gave his name to the year; and lists of these eponymous officers have been discovered, running from 911 to 659 B.C. The accuracy of these "eponym canons" can frequently be checked by the royal annals. Thus throughout this period Assyrian chronology is certain; and the dates so established can be reduced to those of the modern calendar by calculations based on the record of an eclipse of the sun on June 15, 763 B.C. (G. Smith, *The Assyrian Eponym Canon,* pp. 29–41 and 82–83). By these means certain events in Hebrew history to which the Assyrian annals allude can be fixed. Such contacts are established in the reigns of Ahab (Rogers, *Cuneiform Parallels to the Old Testament,* pp. 294–297), Jehu (*ibid.*, pp. 303–304), Menahem (*ibid.*, pp. 313–316), Ahaz (*ibid.*, p. 322), Pekah and Hoshea (*ibid.*, pp. 320–321), Hezekiah (*ibid.*, pp. 341–345) and Manasseh (*ibid.*, pp. 355–357; *cf.* Schrader, *Keilinschriftliche Bibliothek,* vol. ii., pp. 160–161 and 238–241). There are similar references to the captures of Damascus (Rogers, *op. cit.*, pp. 317–320), Samaria (*ibid.*, pp. 326 and 331–332), and Ashdod (*ibid.*, pp. 328–331). The Babylonian chronology, though resting on a different principle, is equally accurate. Events in Babylonia were reckoned by the regnal years of each king; these can be dated with certainty from

Nabonassar (747–735 B.C.) onwards by comparing the lists of kings with the "Canon of Ptolemy," which also records certain astronomical observations (Pinches, in the *Proceedings of the Society of Biblical Archaeology,* vol. ii., pp. 193–204).

Approximate dates are also furnished by allusions to contemporary kings named in the Old Testament, viz., to Esarhaddon (680–669 B.C.) and possibly Ashurbanipal, under the guise of "Osnappar" (668–626 B.C.), of Assyria and to Evil-Merodach (561–560 B.C.) of Babylonia.

The Egyptians had no fixed chronology; yet certain dates can be calculated backwards from the conquest of Egypt by Cambyses in 525 B.C. as far as 664 or 663 B.C.; thereby rough synchronisms can be established for Josiah, Jehoahaz and Jehoiakim as contemporary with Necho II. (*c.* 609–593 B.C.) and for Jeremiah and the Jews in Egypt in the time of Hophra (*c.* 588–566 B.C.).

The following table gives the kings of Judah and Israel, the traditional length of each reign (followed by the synchronistic length in parentheses, when it differs), and those external events which can be accurately dated.

B.C.	Kingdom of Judah	B.C.	Kingdom of Israel
	Rehoboam, 17 years.		Jeroboam I., 20 (22) years.
	Abijah, 3 (2) years.		
	Asa, 41 (40) years.		
			Nadab, 2 (1) years.
			Baasha, 23 (24) years.
			Elah, 2 (1) years.
			Zimri, 7 days (4 years).
			Omri, 12 (7) years.
			Ahab, 22 (19) years.
	Jehoshaphat, 25 (21) years.		
		853	A. among allies defeated by Shalmaneser III. (858–824 B.C.) at Karkar.
			Ahaziah, 2 (1) years.
			Jehoram, 12 years.
	Jehoram, 7 (8) years		
	Ahaziah, 1 year.		
	Athaliah, 6 years.		
			Jehu, 28 years.
		842 or 841	Payment of tribute by J. to Shalmaneser III.
	Jehoash, 40 (37) years.		
			Jehoahaz, 17 (14) years.
			Jehoash, 16 (15) years.
	Amaziah, 29 (40) years.		
			Jeroboam II., 41 (63) years.
	Uzziah, 52 years.		
	Jotham, 16 (15) years.		
			Zechariah, 6 months (1 year).
			Shallum, 1 (0) month.
			Menahem, 10 (11) years.
		738	Payment of tribute by M. to Tiglath-Pileser III. (745–727 B.C.).
			Pekahiah, 2 years.
	Ahaz, 16 (13) years.		Pekah, 20 (27) years.
	Payment of tribute by A. to Tiglath-Pileser III.	*c.*733 or 732	Murder of P. apparently procured by Tiglath-Pileser III.
			Hoshea, 9 years.
		*c.*733 or 732	Accession of H. secured by Tiglath-Pileser III. / Capture of Damascus and devastation of Israel by Tiglath-Pileser III.
	Hezekiah, 29 years (7 years till capture of Samaria).		
		721	Capture of Samaria at beginning of reign of Sargon II. (721–705 B.C.).
711	Capture of Ashdod by Sargon II.		
701	Siege of Jerusalem by Sennacherib (705–681 B.C.).		
	Manasseh, 55 years.		
	M. tributary to Esarhaddon (680–669 B.C.).		
668	M. paraded by Ashurbanipal (668–626 B.C.) on 1st campaign in Egypt.		
	Amon, 2 years.		
	Josiah, 31 years.		
*c.*608	Death of J. in battle against Necho II. (*c.* 609–593) at Megiddo.		
	Jehoahaz, 3 months.		
	Jehoiakim, 11 years.		
	Jehoiachin, 3 months.		
597	1st deportation of captives, including J., to Babylon by Nebuchadrezzar II. (604–562 B.C.). / Zedekiah (11 years).		
586	Destruction of Jerusalem and 2nd deportation of captives, including Z., to Babylon by Nebuchadrezzar II.		

Several points require notice, beyond the inconsistencies, already noticed, in the Hebrew calculations. (1) Tradition gives in Judah 123 years from the accession of Athaliah to that of Ahaz, and in Israel 31 years from the death of Menahem to the fall of Samaria; yet the Assyrian annals allow to the first period only about 110 years and to the second period not more than 16 years at the most. (2) The same records permit at the outside 3, not 20, years to Pekah. (3) If Samaria fell in the 4th year of Hezekiah, Judah cannot have been invaded in his 14th year, since the Assyrian annals separate these events by more than 20 years. If, therefore, his first year is put in 728 B.C., the length of Ahaz's reign must be reduced; if it is placed in 715 B.C. the reigns of the following kings must be shortened. These are the most important, but not all, the discrepancies in the chronology of the kings, especially in the 8th century B.C., but they prove that, unless Assyrian or Babylonian records touch those of Israel and Judah, no certainty is possible; nor, in spite of the ingenuity expended on the problem, have scholars reached any agreement. The presence of errors in the Biblical figures is patent, but it is not equally clear where the errors lie nor how the available years ought to be redistributed. Working backwards, however, from the few fixed points available, we may safely put the rise of the monarchy under Saul about 1025 B.C., the division of the kingdom about 937 or 933 B.C., and the beginning of the reigns of Omri and Ahab about 887 and 876 B.C. respectively. So unsatisfactory, however, is the evidence and so diverse the results obtained by scholars, that the remaining dates are left to be approximately calculated from the information already given.

IV. In 538 B.C. Palestine became, and for two centuries remained, a Persian province under Cyrus, who had overthrown the Babylonian empire. The chronology of the Persian era offers no difficulty, and the principal events in Jewish history are given in the following list:

B.C.	*Events in Jewish History*
538	Edict of Cyrus II. (546–529 B.C.) permitting Jews to return to Palestine; return of many with Zerubbabel.
516–515	Completion of second Temple in sixth year of Darius I. (522–485 B.C.).

B.C.	*Events in Jewish History—continued*
458	Return of exiles with Ezra in seventh year of Artaxerxes I. (464–425 B.C.).
445	Nehemiah's first visit to Jerusalem.
432	Nehemiah's second visit to Jerusalem.
c. 350	Deportation of many Jews to Hyrcania and Babylonia, probably for revolt against Persians.

V. The Persian empire fell before Alexander the Great in 333 B.C.; thenceforth the chronology securely depends at first on the Persian and afterwards on the Seleucid era. Among the principal events from the submission of the Jews to Alexander until the capture of Jerusalem by Pompey mention may be made of the following:

332	Submission of Jews to Alexander the Great.
320	Palestine conquered by Ptolemy I. Lagus, king of Egypt (322–285 B.C.).
198	Palestine wrested from Ptolemy V. Epiphanes, king of Egypt (205–182 B.C.), by Antiochus the Great, king of Syria (223–187 B.C.).
168	Attempt of Antiochus Epiphanes, king of Syria (175–164 B.C.), to suppress Jewish religion; suspension of public worship in Temple for three years.
167	Rise of Maccabees.
166–165	Victories of Judas Maccabaeus over generals of Antiochus.
165	Re-dedication of Temple.
160	Death of Judas Maccabaeus.
160–142	Jonathan, younger brother of Judas.
142–135	Simon, elder brother of Judas.
135–105	John Hyrcanus, son of Simon.
105–104	Aristobulus I., son of Hyrcanus.
104–78	Alexander Jannaeus, brother of Aristobulus I.
78–69	Salome (Alexandra), widow of Alexander Jannaeus.
69	Aristobulus II., son of Alexandra.
63	Capture of Jerusalem by Pompey and incorporation of Palestine in Roman province of Syria.

In these last two periods, although there are events in Biblical history which are not fully or unambiguously dated, there is otherwise no difficulty through the help of the "Ptolemaic Canon" and the fullness of the records of the surrounding nations.

(S. R. D.; G. R. D.)

NEW TESTAMENT

1. CANON

The expansion of the Christian Church in Europe during the 1st century stands for us as the beginning of a new era in history. But the movement wore a different aspect to those who shared in it: to them it was an end rather than a beginning. "The ends of the ages" had come upon them, and the consummation, they believed, could not be long delayed. The literature of the apostolic age, written as it was for the most part under this conviction, was not intended by its writers to be the permanent authority of a Church which was to remain for ages "militant here upon earth." It was called forth by the needs of a generation which expected to survive to see the end of history and the inauguration of God's kingdom. Thus the New Testament, as a collection of Scriptures, was an undesigned and unforeseen product of the apostolic age. The fervour of the first age cooled, as the fulfilment of its early hope was deferred, but it left a large and widespread body of believers who still continued, though in a changed world and with a changed emphasis, to cherish the faith and the ideals which they had learned from their first evangelists. The formation of the New Testament shows us how the Christian Society protected itself from dissolution by appeal to a recognized collection of apostolic writings.

We are not here concerned to trace the original circumstances which called forth the various books included in the New Testament. Information on this subject will be found under the headings of the various books. Our present concern is to show—as far as can be shown—how these books came to be collected and finally to be compacted into a single corpus of Christian Scripture—a New Testament, which took its place beside the Scriptures of the Old Testament inherited from the Jewish Church. Our enquiries will show us that by the end of the 2nd century the New Testament was already complete in idea, though it was not till the 4th century that the exact limits of the Canon were finally and firmly drawn. But first we must turn to the Apostolic Church itself.

The Christians of the first age had, as we have seen, no idea of adding to Scripture. Many of them were Jews, and all of them, like the Jews, recognized the authority of the Old Testament: they differed from unconverted Jews—and sometimes also between themselves—only as to its interpretation and application. The Lord was the Messiah whom the prophets had foretold, and Christians found in the Old Testament the justification for their faith. But in addition to the Old Testament the Church had authorities of its own which from very early days existed in written form. These provided the materials for the New Testament of the 2nd century.

(1) *Sayings of Jesus Christ.*—A natural authority attached itself to the sayings and instructions of Jesus. Collections of sayings of Jesus, which in part or in whole have been embodied in the later "biographical" form of Gospel, must date back to very early times. Paul quotes a "word of the Lord" as indisputably authoritative (I. Thess. iv. 15; I. Cor. vii. 10; x. 14).

(2) *Apostolic Letters.*—Authority attached to the Twelve and also to other Apostles. God has set the Apostles first in the Church (1 Cor. xii. 28). By word when present, and by epistle when absent, Paul claimed—though not without opposition—to direct the Churches he had founded. His Epistles were intended to be read in public to the assembled congregation, and in some cases at any rate were preserved and treasured by the Churches to which they were addressed.

(3) *Prophecies.*—Perhaps the nearest approach to a Christian Scripture in the apostolic age was the prophecy, one example of which was finally embodied in the Canon. The author of the Apocalypse claims direct inspiration for his work, and he pronounces a curse on any who shall diminish or add to the words he has written (ch. xxii. 18).

(4) *Church Order.*—Lastly we may note a work which claims to give the teaching of the Lord through the 12 Apostles, the *Didache*. This work contains a summary guide to Christian morals and instructions with regard to the chief institutions of the Church. Its exact date and its exact place of origin are uncertain, but it appears to date from the later years of the 1st century when the leadership of the Church was passing from the enthusiastic missionaries of the first age to the local ministers, and was probably composed either in Syria or Palestine. The *Didache* is the forerunner of the later Church Orders—a class of writing which is not represented in the Canon of Scripture.

In the writings of the sub-apostolic age there is a marked decline in spiritual power, of which the authors themselves were not unconscious. Thus Ignatius of Antioch, though he can claim "to speak with God's own voice, give ye heed to the bishops and the presbyters and deacons" (Philadelph. vii. 1), yet clearly feels himself to hold a lower position than his apostolic predecessors: "I do not enjoin you, as Peter and Paul did. They were Apostles, I am a convict; they were free, but I am a slave to this very hour" (Rom. iv. 3). In these circumstances it was natural that the Church should cling jealously to the Gospels and to the apostolic writings which it had inherited, and this tendency was strengthened by the increasing pressure of heretical movements.

We have no certain knowledge as to how or where the fourfold Gospel Canon came to be formed. It is to be noted that Clement of Rome (*c.* A.D. 97) and Polycarp (*c.* 112) both quote sayings of the Lord in a form which is independent of any of the Gospels which afterwards became canonical. It is probable that each of the four canonical Gospels gained currency and prestige through being adopted by some one of the great Churches. Thus there is strong reason for associating Mark with Rome, whence it probably obtained currency in other Churches. Matthew—a revised and expanded Mark—appears to have been in use at Antioch at the beginning of the 2nd century. John is connected with Ephesus. Some think that the fourfold Gospel originated in Asia Minor, where we have evidence of comparative study of the merits of some of the Gospels early in the 2nd century. Others think it more likely that the fourfold Gospel came from Rome. In any case it probably represents concerted action to

standardize the Gospel which had been committed to the Church. Perhaps the apocryphal Gospel of Peter (not later than 140 and perhaps considerably earlier) provides our earliest testimony for the currency of the fourfold Gospel, for the writer appears to depend upon all of the four. Somewhat later (*c.* 170) Tatian at Rome undertakes in his Diatessaron to combine the four into a single harmony, while to Irenaeus (*c.* 185) it was as natural that there should be four Gospels as that there should be four winds and four quarters of the earth (*adv. Haeres.* iii. 11, 8). We may conclude that the fourfold Gospel had then been long established.

A collection of Pauline Epistles, including the Pastoral Epistles, dates from the beginning of the 2nd century at latest. Ignatius (*c.* 112) shows acquaintance with six Pauline Epistles, including I. Tim. and Tit., while the Epistle of Polycarp shortly afterwards refers to nine Epistles including I. and II. Timothy. The Pauline Epistles were also held in high estimation by the gnostic heresiarchs. Marcion (*c.* 140) acknowledged a collection of ten Pauline Epistles which did not include the Pastoral Epistles. It is perhaps more probable that this represented an earlier Pauline Corpus, than that Marcion deliberately rejected the Pastoral Epistles.

By the middle of the 2nd century the two chief component parts of the New Testament had taken shape, and the practice of reading apostolic writings in public worship together with the lections from the Old Testament Scriptures was preparing the way for the conception of a Canon of Scriptures of the New Testament. But the New Testament was not yet. Justin (*c.* 150) is familiar with the four Gospels—though some think that the infrequency of his citations from the Fourth Gospel is not accidental—and with the Pauline Epistles, but when he speaks of Scriptures he means the Old Testament. That Christ has fulfilled the prophecies of the Old Testament is Justin's chief apologetic argument. The full recognition of the Gospels and Epistles as Scripture was hastened by the pressure of heretical movements. Marcion appears to have been the first definitely to conceive the idea of a collection of Christian Scriptures. This was a corollary to his rejection of the Old Testament for which he substituted as a doctrinal authority a mutilated edition of St. Luke's Gospel and of ten Pauline Epistles (not including the Pastorals). The Church was determined to adhere to its inheritance of the Old Testament, but it could not allow itself to fall behind a heretic in the authority it ascribed to the apostolic writings. The reply to Marcion was the construction of a fuller and more authentic collection of apostolic writings, which could be set alongside the Old Testament Scriptures. Another force which by the reaction it occasioned fostered the idea of a fixed Canon of apostolic scripture was the Montanist revival of primitive Christian prophecy. This anti-ecclesiastical and anti-clerical movement with its unregulated and enthusiastic claim to present inspiration was countered by an appeal to apostolic tradition and thus a higher conception of the apostolic writings was encouraged.

It is not improbable that the compilation of the New Testament Canon is due to the deliberate action of the Roman Church. In any case it is certain that by the end of the 2nd century a collection of apostolic documents is generally recognized as authoritative Scripture, and from this time forward the idea of a body of Authoritative Christian Scripture is a presupposition of all theologians. Our most important document for this period is the fragment on the Canon published by Muratori in 1740 and generally known after him as the Muratorian fragment. It is written in Latin and probably emanates from the Church of Rome about the end of the 2nd century. The writer acknowledges a collection of Scripture consisting of the four Gospels, the Acts of the Apostles, 13 Epistles of Paul, two Epistles of John, the Epistle of Jude, the Apocalypse of John and the Apocalypse of Peter. The last is said however to be contested by some. Another prophetic work—the *Shepherd* of Hermas—is excluded from public reading on account of its late date. Writings connected with Marcion, Valentinus, Basilides and Montanus are condemned.

The Christian literature of the end of the 2nd century and the beginning of the 3rd shows widespread agreement as to the nucleus of the Canon: the four Gospels, Acts, 13 Pauline Epistles, and usually Jude, I. John or I. Peter are widely attested, though the last is not found in the Muratorian fragment and was perhaps not in the earliest Canon of the African Church. The Apocalypse of John was generally accepted in the West as being of apostolic authorship, but not accepted in the East. Hebrews and the Epistle of James were usually held to be apostolic and canonical in the East, but not in the West. Alexandria recognized a wider selection: Clement of Alexandria allowed apostolic status to the Epistle of Barnabas, the Apocalypse of Peter, the Epistle of Clement of Rome, and he quotes the *Didache* as Scripture. On the other hand he appears not to have received the Epistle of James, II. Peter and III. John. An important exception to the general practice of the Church is found in the Syriac-speaking Church of Edessa and Mesopotamia. This Church accepted as its Canon the Diatessaron of Tatian with the Acts and the Pauline Epistles. At an early date the Diatessaron was supplemented by a version of the four "separated" Gospels, but the Diatessaron, it seems, retained its place in public worship.

During the 3rd century the great influence of Origen encouraged a wider Canon. He shows acquaintance with all the Epistles which were later recognized, though he expresses hesitation in regard to James, II. Peter and II. and III. John.

The Canon assumed its final form in the course of the 4th century. At the beginning of that century there was still much uncertainty. Eusebius (H. E. iii. 25. 1) describes the situation and divides the books into three classes: (i.) Those which are generally acknowledged, (ii.) those which are disputed but widely recognized, and (iii.) those which are rejected. To the first class belong the four Gospels, Acts, the Epistles of Paul, I. Peter, I. John, and, if it is wished (εἴγε φανείη), the Apocalypse of John; to the second, James, Jude, II. Peter, II. and III. John; and to the last the Acts of Paul, the Shepherd of Hermas, the Apocalypse of Peter, Barnabas, the *Didache,* and, according to some, the Apocalypse of John. Others also reckon the Gospel according to the Hebrews in this class.

The Canon which finally won acceptance first appears in the 39th Festal Letter of Athanasius, A.D. 367. There was great laxity and uncertainty in Egypt as to the exact contents of the New Testament and Athanasius sets out to restore order. His great influence both in East and West secured the victory for his Canon along with the victory of Nicene Christianity. Other traditions held their own for a time. Thus the School of Antioch in general accepted only three Catholic Epistles—James, I. Peter, I. John, while one of its most illustrious representatives, Theodore of Mopsuestia, rejected the whole of this section of the Canon. The Eusebian Tradition represented by Cyril of Jerusalem and Gregory of Nazianzum, was already in virtual accord with Athanasius except that there was hesitation as to the recognition of the Apocalypse.

The West followed the lead of Athanasius. In 382 a synod was held at Rome under Pope Damasus at which the influence of Jerome secured the adoption of a list of books answering to that of Athanasius. This was ratified by Pope Gelasius at the end of the 5th century. The same list was confirmed independently for the province of Africa in a series of synods at Hippo Regius in 393 and at Carthage in 397 and 419 under the leadership of Augustine. It may be noted that though Augustine accepted the canonicity of Hebrews, his manner of quotation shows that he still felt doubts as to its Pauline authorship.

The second Canon of the second Trullan Council of 692, the Quinisextum, may be taken to have formally closed the process of the formation of the Canon for East and West.

The Syriac-speaking Churches had had, as we have seen, a different tradition from that of the rest of the Church. This was superseded by the creation of the Pĕshīṭtā version, which Prof. Burkitt has shown to have been almost certainly the work of Rabbula, Bishop of Edessa, 411–435. This set aside the Diatessaron and added the three Catholic Epistles, James, I. Peter and I. John. The Philoxenian version of 508 added the other four Catholic Epistles and the Apocalypse, and these were retained in the Harklean revision of 616. These latter versions, however, were confined to the Monophysite Churches, and the Nestorians continued to use the Pĕshīṭtā.

By the creation of the Canon of the New Testament the Church secured its connection with the creative movement in which it originated. The results have been mixed. The appeal to the classical authority of the apostolic age went along with a depreciation of the sense of present inspiration; and the transformation of the apostolic literature into apostolic scripture entailed an artificial exegesis similar to that which the Jews had already learned to apply to the Old Testament. This often obscured the original meaning of the text in its historical content and it was only after the idea of the Canon had received systematic criticism in the 18th century that a scientific historical exegesis could arise. For the ancient Church, Old and New Testament together came to form "one book" (Origen). But the Church was preserved from some of the most serious evils that wait upon a religion of a book; for the retention of the Old Testament as authoritative Scripture introduced "a wholesome element of complication" into the idea of the Canon. Once formed, the New Testament took precedence of the Old Testament, yet the Old Testament retained its place and its prestige. Lastly, it has been an inestimable gain that through the New Testament Canon the personality of Jesus Christ and the teaching of His greatest apostle have been placed in permanent authority over the Christian Church.

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(J. M. C.)

2. TEXTS, VERSIONS, EDITIONS

(*a*) **Greek MSS.**—The original autographs of the New Testament books have long since perished, and (except for a few fragments, all from Upper Egypt) the same fate has overtaken all the mss. used by Christians in the ante-Nicene period. When in the 4th century the empire became Christian and the Church established, copies of the Scriptures were multiplied in a substantial form—that of the *codex, i.e.,* book, on vellum. Two such, dating from the 4th century itself, and each originally containing what was regarded as a whole Bible, survive. Before the 4th century most Christian mss. were written on papyrus, and in the earliest times were in the form of a roll (*liber*), or a one-quire book (*uolumen*) like modern booksellers' catalogues. Such mss. would contain no more than a single Gospel; rolls were kept with others in a box (*capsa*).

Whole Bibles, even New Testaments (with or without the Apocalypse), were always rather uncommon. Generally the Four Gospels made one volume, the Pauline Epistles another: Acts (with the other Epistles) is sometimes found bound up with the Pauline Epistles, sometimes separate. Counting fragments, there must be some 4,000 Greek mss. whose existence has been reported, dating from the 4th century to the invention of printing, the greater number coming from the 11th to the 14th centuries.

The nomenclature of this vast series of books offers many problems. From the 9th century onward most Greek mss. were written in minuscules, *i.e.,* in a character more or less like the Greek of a printed book; before that "uncials" were used, *i.e.,* something like Greek capitals but more rounded (*e.g.,* C, not Σ, ω not Ω). Since 1751 it has been customary to denote the uncials by capital letters, and the minuscules (also called "cursives") by arabic figures. A much more scientific but very complicated notation has been invented by von Soden, and is used in his edition (*see* below), but it has not come into general use. Yet the old notation has grave defects: the arabic figures are arbitrary, giving no index of the character of the minuscules to which they belong, while the number of uncials has outrun the letters of the Latin and Greek alphabets, so that the Hebrew alphabet has had to be used. But there is a good case for retaining the old notation, at least for the more important mss. These are not very numerous, and so much has been written about some of them, such as "B" and "D," that it is inconvenient to rebaptize them.

The following are the most important mss. of the New Testament. There is no space here to give descriptions, except where really new information is to be given: for details the reader should consult the editions of Tischendorf or von Soden. von Soden's new numbers are given in brackets.

BIBLES:—

B—Vaticanus (δ1): 4th century.
[Phototype ed., Rome, 1889–90 and 1905.]

ℵ—Sinaiticus (δ2): 4th century.
[Phototype ed. by K. and H. Lake, 1911.]

A—Alexandrinus (δ4): 5th century.
[Phototype ed., London, 1879 and 1906.]

C—*Codex Ephraemi Rescriptus* (δ3): 5th century.
[Edit. by Tischendorf (1843).]

GOSPELS AND ACTS:—

D—*Codex Bezae Cantabrigiensis* (δ5): 5th century (*sic*).
[Edit. by F. H. Scrivener (1864); phototype ed. (Cambridge, 1899). The immense literature on this Graeco-Latin ms. and its history is admirably discussed by J. H. Ropes in *The Text of Acts* ("The Beginnings of Christianity," vol. iii., London, 1926), pp. lvi.–lxxxiv. D was at Lyons in the 9th century, but before that it was used as a *Greek* Gospel-book. Ropes (pp. lix. and lxvii.) gives reasons for thinking Sicily a likely place of origin.]

GOSPELS:—

W—*Washingtonianus* (ε014): 5th century.
[Facsimile, Michigan, 1912: full collation and introduction by H. A. Sanders, *The N.T. mss. in the Freer Collection,* part 1 (New York, 1912). W was bought in Egypt by Mr. C. L. Freer (from whom it is sometimes called the Freer Codex) in 1906: its great interest is its very curious "Western" text in Mark.]

Θ—*Codex Koridethi* (Gregory's 038, v. Soden's 050): 9th century.
[Now at Tiflis. Edit. by G. Beermann and C. R. Gregory, *Die Koridethi Evangelien* (Leipzig, 1913). Θ was written after 873 by a scribe, ignorant of Greek, somewhere in Pontus or Lesser Armenia (*see* on cod. 565), with a valuable text, especially in Mark.]

L—*Cod. Regius* at Paris (ε56): 8th century. Various fragments from Upper Egypt, all labelled T. [Noteworthy as showing that Alexandrian texts survived in Egypt long after the Byzantine text was elsewhere dominant.]

PAULINE EPISTLES:—

D^{paul}—*Claromontanus* (Hort's D_2, v. Soden's α1026): 6th century.
[Edit. by Tischendorf (1852). Graeco-Latin.]

G^{paul}—*Boernerianus* (Hort's G_3, v. Soden's α1028): 9th century.
[Edit. by C. F. Matthaei (1791). Graeco-Latin, Hebrews omitted.]

H^{paul}—Fragments at Athos, Paris, etc. (α1022): 6th century.
[Edit. by H. Omont (Paris, 1890); J. A. Robinson, *Euthaliana* (Cambridge, 1895). Oldest witness to the "Euthalian" edition of the Epistles and Acts.]

Minuscules.—Of Greek mss. in minuscules the following are the most important. Certain mss. agree so closely in rare readings that they must be direct or indirect copies of the same earlier codex; they are therefore best cited in groups, *e.g.,* 1 etc., or *fam*[1], stands for the whole group of which codex 1 is the chief representative. The age of the ms. is not given except for special reasons; v. Soden's notation where necessary is added in brackets. 1 etc., or *fam*[1] (I^{η} in v. Soden's apparatus, H^{r} in his Introduction) = 1–22–118–131–209–1582–2193. Of these the two most important are 1 (δ 254) and 1582 (ε183). Note that the would-

be decisive list of readings in v. Soden I., p. 1059, is full of serious errors.) Edit. by K. Lake, *Codex 1 of the Gospels* (Cambridge, 1902), but before 1582 was discovered. In any case Codex 1 remains the best member of the family.

28 (ϵ 168): readings in Tischendorf.

69 etc., or *fam*[13], or "the Ferrar Group" (*Iι* in v. Soden's apparatus, *J* in his Introduction) = 13–69–124–346–543–788–826–828–983–1689–1709. Edit. by T. K. Abbott from W. H. Ferrar's collations (Dublin, 1877); *see* also Streeter, *Four Gospels*, p. 80. This group must have descended from a very old ms. brought to Calabria before the 12th century. 124 (ϵ 1211), and after it 69 δ505), are specially valuable within the group.

565 (ϵ93), Tischendorf's 2[pe], Hort's 81: 9th century. This splendid ms., written in gold minuscules on purple vellum for (or by) the Empress Theodora, wife of Theophilus (842–56), is textually akin to Θ, with which it is practically contemporary. It also comes from the same region, viz., Kumish-Khane, south of Trebizond. Edit. by J. Belsheim, 1885, corrected by H. S. Cronin (ed. of Cod. N., Cambridge, 1899).

700 (ϵ133), Scrivener's 604: full collation and Introduction in H. C. Hoskier's *Full Account . . . of Codex* 604 (London, 1890).

Other minuscules, such as 33 (δ48), 157 (ϵ207), 579 (ϵ 376), are worthy of mention as having a text akin to ℵ and B, but the list here given has been selected to include the codices which have ancient elements of text not preserved elsewhere.

A few words must be said on the early Papyrus fragments of N.T. books discovered in the past 40 years. They all come from Upper Egypt, mostly from Oxyrhynchus, where the soil is dry enough to preserve perishable material. Most, of course, are so small in size that they present little textual material. The following stand out as of special interest:—

1. *Oxyrhynchus Pap.* 2: Matt. i. 1–9, 12, 14–20 (late 3rd century).

2. *Oxyrhynchus Pap.* 208 and 1228: fragg. of John i., xv., xvi., xx. (3rd century).

3. *Michigan Pap.* 1578: Matt. xxvi. 19–52 (3rd century).

4. *Michigan Pap.* 1571: Acts xviii. 27–xix. 6, 12–16 (3rd century).

5. *Oxyrhynchus Pap.* 405: Irenaeus, *c. Haer* iii. 9 (early 3rd century).

No. 2 is probably the oldest surviving Christian *uolumen, i.e.*, it contained the Gospel of John arranged in a single quire, like a bookseller's catalogue. Nos. 1 and 2 give general support to the ℵ B text, No. 3 seems to have a greater tendency towards "Western," *i.e.*, D, readings, but neither 1, 2 or 3 have Byzantine readings. No. 5 is specially noteworthy, in that it was published and dated before its connection with Irenaeus was perceived. Irenaeus wrote in A.D. 180, so this scrap comes from a ms. written only 30 or 40 years later (*see* the revised text in *Ox. Pap.*, vol. iv. p. 264). The fragment gives Irenaeus's quotation of Matt. iii. 16 f. in a text that agrees with D and *a* against other mss., and against the Latin translation of Irenaeus.

Quite distinct from these fragments is the Papyrus Book, containing Acts and some O.T. Books in Sahidic, dating from about A.D. 300 (edited by Sir E. W. Budge, London, 1923). The text is incorporated in Horner's ed. (*see* below).

BIBLIOGRAPHY.—*See* the editions given above under each item.

(*b*) **Versions.**—For about 80 years, from A.D. 70 to 150, almost all Christians were Greek-speaking subjects of the Roman empire. At the close of the period Christianity reached the Latin-speaking regions of Roman Africa and the little independent principality of Edessa (*q.v.*), beyond the Euphrates. Very soon afterwards Latin and Syriac versions of the newly collected New Testament Scriptures appear. These versions stand in a class by themselves for antiquity and critical importance, for in other countries (such as Egypt and Palestine) Christianity long remained a Greek-speaking cult and no written versions were made into what was regarded as the barbarous patois of provincials.

1. **Latin Versions.**—No tradition about the date, place or authorship of the first Latin versions survives. It is possible that the first rendering of any part of the New Testament into Latin was a Harmony of the Gospels, an early form of Tatian's Diatessaron (*see* TEXTUAL CRITICISM); what is certain is that the Scillitan Martyrs at Carthage (A.D. 180) had in their box of rolls "letters of Paul, the just man," which were not likely to be in anything else but Latin. By Tertullian's day, whose writings are dated from 20 to 40 years later, the whole Bible seems to have been extant in Latin, but Tertullian himself often translated directly from the Greek: he never shows that respect for the Latin text usually accorded to a vernacular rendering of some age. Cyprian, on the other hand, writing between 240 and 250, quotes the Latin Bible consistently and accurately. It may therefore be inferred that the New Testament was rendered into Latin, probably at Carthage, in the last third of the 2nd century.

Fragments of the Latin version used by Cyprian survive in Cod. Bobiensis (*k*), now at Turin, which contains the latter half of Mark followed by the first half of Matthew; and in the Fleury Palimpsest (*h*), now at Paris, which contains fragments of the Apocalypse and of Acts. Cod. Palatinus (*e*), formerly at Vienna, now restored to Trent, containing the latter half of Matthew, nearly all of John and Luke, and fragments of Mark, is of the same family but more assimilated to the European standard. (The class mark of *k* is G vii. 15: it was much damaged by damp in the great fire of 1904: phototype ed., Turin, 1913.)

In Cyprian's correspondence some letters come from Rome. The Biblical quotations in these differ perceptibly from those of Cyprian himself, and approach those of 4th-century writers such as Lucifer of Cagliari. By the middle of the 3rd century, therefore, the Church of Rome, now become a Latin-speaking community, had a version of its own. To this version, commonly called the "European Latin" to distinguish it from the "African," *i.e.*, Cyprianic, text, are assigned the remaining "Old-Latin" codices; of the Gospels there are some dozen, not counting small fragments (list below), including the Latin side of D. Only one fragmentary ms. of the Pauline Epistles survives besides the Latin sides of D[paul] and G[paul], but Acts and Apocalypse are represented, and there are some late non-Vulgate texts of most of the Catholic Epistles.

The mss. of the "European"-Latin differ much among themselves, but all seem to descend from the same stock, which is more like a revision of the "African"-Latin than a fresh independent translation. These differences were noted late in the 4th century and Pope Damasus commissioned the great scholar Jerome to draw up a standard revision. The Gospels were completed in A.D. 383 and the new revision rapidly found favour, even in Africa: at Hippo under Augustine in 404 the Gospels were publicly read from Jerome's revision, while for Acts the unrevised "African"-Latin was retained. In other countries, notably north Italy and parts of Gaul, the revised version made much slower progress. By the time of Gregory the Great (d. 604), however, Jerome's revision was everywhere used, except in so far as Old-Latin readings survived in imperfectly corrected codices. From its use ever since the 7th century Jerome's revision is known as the Vulgate, in contradistinction to the new renderings made from the Greek in the 16th century.

Short list of Old-Latin mss. of the Gospels, with dates, with the regions they may be held to represent, and the name of their editors.

a	Vercellensis, iv	N. Italy	Gasquet, 1914
b	Veronensis, v. or vi	,, ,,	Bianchini, 1749
c	Colbertinus, xii.	(mixed text)	Belsheim, 1888
d	Latin side of D, v.	? Sicily	Scrivener, 1864
e	Palatinus, v.	Africa, N. Italy	Tischendorf, 1847
ff	Corbiensis II., v.	Gaul	E. S. Buchanan, 1907
f	Brixianus, vi.	Gothic Lombardy	Bianchini, 1749
h	Claromontanus, vi. (Matt.)	Gaul	Belsheim, 1892
i	Vindobonensis, v. or vi (Luke, Mark)	? Lombardy	Belsheim, 1885
k	Bobiensis, iv. (Mark, Luke)	Africa	Sanday, 1886
l	Rehdigeranus, viii. (Luke) Matt.	Lombardy	Vogels, 1913
n	S. Gallensis, v. (fragg.)	N. Italy	H. J. White, 1886
q	Monacensis, vii	? Gothic Italy	H. J. White, 1888
r	Usserianus I., vi. or vii	Ireland	T. K. Abbott, 1884

There are several other smaller fragments. *f* is much influenced by the Gothic version, *q* occasionally so. *h* only contains Matthew. *l* contains all four Gospels but is only Old-Latin in Luke: the same is nearly true of *i*. The late ms. *c* is European in Matthew: there are many Vulgate readings throughout, especially in John, but in Mark and Luke *c* has a large African element.

The mss. from the rest of the N.T. are mentioned in the text. Add: D. de BRUYNE, *Les Fragments de Freising* (*r*) (Rome, 1921).

BIBLIOGRAPHY.—P. Sabatier, *Bibl. Sacror. Lat. Versiones Antiquae*, vol. iii. (Paris, 1751); a collection of Latin Patristic quotations, still indispensable. J. Wordsworth and H. J. White, *N.T. . . . Latine* (Oxford, 1889–); the only critical edition, with various readings, of the Vulgate N.T., still in preparation by Dean White. 1. For the early history of the Vulgate: S. Berger, *Histoire de la Vulgate* (Paris, 1893); J. Chapman, *Notes on the early History of the Vulgate Gospels* (Oxford, 1908). 2. For the Old-Latin: W. Sanday, *Old-Latin Biblical Texts, No. II.* pp. xlii.–clxvi., 1–53 (fundamental); F. C. Burkitt, *The Old Latin and the Itala* (Cambridge, 1896); *see* also *J. Theol. Studies*, xi., pp. 258–268, 447–458 (1910), also *Miscellanea Amelli*, pp. 25–41 (Montecassino, 1920); D. de Bruyne, *Quelques Documents* (*Sommaires africains*), Revue Bénédictine, pp. 221–227, April 1911. 3. For Codex Bezae: J. H. Ropes, *The Text of Acts* (London, 1926). 4. For the Latin Diatessaron: E. Ranke, *Codex Fuldensis* (1868); J. Bergsma, *Bibliotheek van middelnederlandsche Letterkunde* 54, 55, 61 (Leyden, 1895–98); D. Plooij, *A Primitive Text of the Diatessaron* (Leyden, 1923); F. C. Burkitt, *Tatian's Diatessaron and the Dutch Harmonies*, J. of Theol. Studies xxv., pp. 113–130 (Jan. 1924).

2. **The Diatessaron and Early Syriac Versions.**—The Gospel, according to Syriac tradition (*Doct. of Addai* 36), came to Edessa at the hands of Addai in the form of the Diatessaron, and the extant remains of early Syriac literature show that it was in a Harmony that the Gospel chiefly circulated among Syriac-speaking Christians prior to A.D. 411. The compiler of the Diatessaron, according to Eusebius, was Tatian, a disciple of Justin Martyr: after Justin's death Tatian returned to his native Mesopotamia and there evangelized (Epiphanius, *Haer.* xlvi. 1). It is in the opinion of the present writer probable that the *Addai* of Syriac tradition, who evangelized Edessa and introduced the Diatessaron, and the *Tatianos* of Eusebius and Ephiphanius, who compiled the Diatessaron and returned to his native Mesopotamia before A.D. 170 are one and the same, Addai being Tatian's native Semitic name as Shā'ūl was St. Paul's.

Besides the Diatessaron the four separate Gospels were translated into Syriac, probably about A.D. 200. Of this translation two mss. survive: the Sinai Palimpsest (4th century), discovered by Mrs. A. S. Lewis at the Convent of St. Catharine on Mount Sinai in 1892, quoted as Syr. *S;* and Cureton's ms. (early 5th century) from the Nitrian collection in the British Museum, quoted as Syr. *C*. These mss. differ considerably in reading, and each has certainly been influenced by the Diatessaron, so that in Syriac-speaking lands about A.D. 400 the Gospel was extant as a Harmony and as "separated Gospels" (in Syriac *Evangelion da-Mepharreshē*), the single copies having many discordant readings, just as had been the case in Latin before Jerome. To remedy this, Rabbūla, bishop of Edessa from 411 to 435, prepared a revised edition of the "Separated Gospels," freely correcting the text from Greek mss. such as were then current at Antioch: this edition he established by authority and suppressed the Diatessaron, with such success that no Syriac copy of the Diatessaron survives, and of the unrevised version only Syr. *S* and *C*. Rabbūla's revision is now used by both the great divisions of the Syriac-speaking Church (the Jacobites and Nestorians): to distinguish it from the elaborate later revision of the (Jacobite) Old and New Testament it is usually called Pĕshīṭṭā, *i.e.*, the simple version. For modern criticism Syr. *S* and Syr. *C* are among the half-dozen primary authorities; the Pĕshīṭṭā has only the value of a post-Nicene revision.

An Arabic translation of the Diatessaron survives, translated from a form of the Syriac in which the wording had been almost completely assimilated to the Pĕshīṭṭā, whereas the quotations of Ephraim (d. 373) show that the wording in ancient time had been more like that of Syr. *S* and *C*: in the processes of revision and of translation into Arabic many characteristics of the original must have disappeared. But the general arrangement of the Gospel mosaic has been well preserved, as we see from agreements in order with Ephraim's Commentary on the Diatessaron (extant in an Armenian translation only), which are enough to demonstrate that this Syriac Harmony is distinct from the Latin form of the same work, though akin to it (*see* further on TEXTUAL CRITICISM).

No ms. of the pre-Pĕshīṭṭā Syriac of the Acts or Epistles survives. For the Acts we have the Armenian translation of Ephraim's "Commentary," which is little more than an abridged paraphrase, almost worthless for textual purposes. For the Pauline Epistles we have many quotations in Aphraates (A.D. 345) and the Armenian translation of Ephraim's Commentary, which contains some valuable information, though the Armenian translator in too many cases has rendered Ephraim's quotations by the equivalent words of the Armenian vulgate. The only Catholic Epistles received in the Syriac-speaking Church before Rabbūla's revision were I. John and I. Peter, to which Rabbūla added James.

The Pĕshīṭṭā N.T. is extant in many mss., some actually of the 5th century. All present the same text with hardly any various readings.

BIBLIOGRAPHY.—F. C. Burkitt, *Evangelion da-Mepharreshē*, 2 vols. (Cambridge, 1904) [contains the texts of Syr. *C* and *S*, with full introduction]; A. S. Lewis, *The Old Syriac Gospels* (London, 1910) [contains the text of Syr. *S* with apparatus, etc.]. For the Pĕshīṭṭā, G. H. Gwilliam, *Tetraeuangelium Sanctum* (Oxford, 1901) [Gospels, with apparatus of mss.]; *The N.T. in Syriac*, Bible Society (London, 1905–20) [Syriac text only]; N.T. with Psalter, in Nestorian type (New York, 1886 and often reprinted) [almost as good]. For the Arabic Diatessaron, A. Ciasca, *Tatiani Evang. Harm. Arabice* (Rome, 1888); J. Hamlyn Hill, E. Trans. in *The earliest Life of Christ* (Edinburgh, 1894).

3. **Other Versions.**—*Egyptian* (or "Coptic") versions date from the last half of the 3rd century: before that Christianity appears to have been confined to Alexandria and a few Greek-speaking towns, such as Oxyrhynchus. There are two main versions, Sahidic, *i.e.*, that current in *eṣ-Ṣa'īd*, Upper Egypt, and Bohairic, *i.e.*, that current in the *Behēra*, S.E. of Alexandria. Mss. in other dialects (Fayyumic, Akhmimic) are found, but textually belong to the Sahidic. The Bohairic version dates from the Coptic revival of the 7th century, when the Greeks had been turned out by the Arabs: it seems to have been based on old Coptic materials, and is one of the purest representatives of the "Alexandrian" text. The Sahidic is of much the same character, but here and there a "Western" element comes into view, that may belong to the most ancient stratum of the Coptic versions.

BIBLIOGRAPHY.—G. Horner, *N.T., Bohairic*, 4 vols. (Oxford, 1898–1905), *Sahidic*, 7 vols. (Oxford, 1911–24). For the date of the Egyptian versions *see* I. Guidi, *Nachrichten von der K. Ges. der Wissenschaften*, pp. 49–52 (Göttingen, 1889); also *Ency. Biblica*, col. 5,008 f.

The *Armenian* nation, together with its king, Tiridates III., became Christian about the year 300: somewhere about that date the first Armenian version seems to have been made, apparently from the Old-Syriac. This original version was revised from the Greek by Mesrob about 400, but traces of the Syriac are still evident (*see* J. A. Robinson, *Euthaliana*, pp. 76–91). It was from this earlier Armenian version that the *Georgian* (or Iberian or Grusinian) version was made, the Adysh codex of which (dated 897) is said to present it in a very pure form.

The critical value of both the Georgian and Armenian versions is therefore the help they give towards better knowledge of the Old-Syriac version: when the Georgian N.T. has been critically edited it is likely to take a high rank for that purpose. Most Armenian mss. represent substantially the same text, viz., the mixed one resulting from Mesrob's revision. The most interesting ms. known is the Etchmiadzin codex of A.D. 989 discovered by F. C. Conybeare, which contains the Longer Conclusion to Mark (omitted by most old Armenian mss.) with the heading *Ariston Eritzu* ("of the Presbyter Arist[i]on"), and a peculiar recension of the *Pericope de Adultera* ([John] viii. 1–11).

BIBLIOGRAPHY.—J. Zohrab, *New Test.* (in Armenian) (Venice, 1789, reprinted with O.T., 1805). On the Armenian version, *see* J. A. Robinson, *Euthaliana*, pp. 72–98 (Cambridge, 1895). On Georgian Literature (including the N.T.) *see* R. P. Blake, *J. Theol. Studies* for Oct. 1924, vol. xxvi., pp. 50–64 (also Patr. Or. xx, pt. 3, Paris, 1928).

The *Gothic* version was made by Ulphilas (*Wulfila*), the apostle of the Goths, in the 4th century. It is the earliest surviving literature in any Teutonic language, and at the same time the earliest witness for the Byzantine text. Of the N.T. the Gospels and the Pauline Epistles (without Hebrews) survive, but with many gaps. Ulphilas worked among the Goths of the Danubian Provinces, but the surviving documents all belong to north Italy and the times of the Ostrogoths and Lombards. The chief critical importance of the Gothic version is the influence it had on certain codices usually reckoned as Old-Latin, notably *f*, and perhaps *q*.

A fragment of a bilingual Gothic-Latin codex containing a few verses of Luke xxiii. and xxiv. turned up at Antinoe in Egypt in 1908 and is now at Giessen (see *Streitberg*, vol. ii., p. 312).

Bibliography.—W. Streitberg, *Die Gotische Bibel*, 2 vols. (Heidelberg, 1908–10).

Ethiopic is the name given to Ge'ez, the classical language of the Abyssinians. Abyssinia became a Christian nation in the 4th century, and the Ethiopic version of the N.T. undoubtedly goes back to that period, but the existing mss. which are all late, have been much revised, chiefly from the Arabic version current in Egypt in the 13th century, when the Abyssinian Church was reorganized. It is this late revised text which has been printed, the only ancient piece of the older form being Matt. i.–x. as edited by Hackspill. Even in the revised text many relics of ancient readings are found, some possibly reflecting an early stage of Syriac-speaking Christian missionaries, but all readings agreeing with the (printed) Arabic version must be held to have little authority.

Bibliography.—T. Pell Platt, *N.T. Aethiopice* (London, 1830); C. A. Bode, *N.T. ex Aethiopica Lingua in Latinam trans.* (Brunswick, 1753). [A very good translation from the text in the London Polyglot of 1657.] I. Guidi, *Le Traduzione degli Evangelii in Arabo e in Etiopico* (Rome, 1888); L. Hackspill, *Z. für Assyriologie*, xi., pp. 117 ff. and 367 ff. (1896).

The *Harclean Syriac* was made in A.D. 616 by Thomas of Ḥarḳel (or Heraclea), bishop of Mabbog and one of the Monophysite exiles who lived in Egypt after the deposition of Severus of Antioch. Like other writings of the same school of translators Thomas follows the Greek with pedantic literalness, so that it is particularly easy to ascertain what Greek text he followed. For the most part this is the ordinary Byzantine vulgate, but in Acts he used in addition to his usual authority another exemplar which was full of very valuable "Western" readings, which he inserted sometimes in his text, sometimes in the margin (*see* Ropes's *Acts*, especially pp. clvi. n., clxxviii. f.). Thomas's work was based on a revision of the Syriac N.T. by Philoxenus of Mabbog, the greater part of which (if it really consisted in more than additional tables of contents, etc.) is no longer extant. What survives is the text of those parts of the N.T. not included in the Pĕshīṭṭā, viz., the four minor Catholic Epistles and the Apocalypse, all of which have been edited by J. Gwynn.

Bibliography.—J. White, *Versio Philoxeniana* (*sic, i.e.*, "Harclean"), Oxford, 1778–1803 (all the N.T. except Apocalypse; the missing end of Hebrews was supplied by R. L. Bensly, Cambridge, 1889). J. Gwynn, *The Apocalypse in Syriac, i.e.*, the true Philoxenian (Dublin, 1897); *Remnants of the Later Syriac Versions*, Minor Epistles, etc. (London, 1909). Ordinary modern editions of the Pĕshīṭṭā give these Minor Epistles (II. Peter, II. and III. John, Jude) from the Philoxenian as first published by E. Pococke in 1630, and the Apocalypse from the Harclean as first published by L. de Dieu in 1627.

Palestinian Syriac (or "Jerusalem" Syriac) is the name given to the Christian ecclesiastical literature in the vernacular Aramaic of Palestine. This literature is not old: it seems to owe its origin to the efforts of Justinian in the 6th century to root out paganism and Judaism from the country districts of the Orient. The surviving documents reflect the usages of the Greek-speaking Church of Jerusalem: they include a Lectionary of the Gospels, and another from other books; also fragments of the continuous text of most N.T. books. The text attested is a curious variety of the Byzantine, with some elements due to the Pĕshīṭṭā, and perhaps some relics of the ancient text of Caesarea.

Bibliography.—A. S. Lewis and M. D. Gibson, *The Palestinian Syriac Lectionary of the Gospels* (London, 1899); and *A Pal. Syriac Lect. cont. Lessons from the Pentateuch*, etc. (London, 1897); J. P. N. Land, *Anecdota Syriaca*, vol. iv. (Leyden, 1875); H. Duensing, *Texte und Fragmenta* (Göttingen, 1906). *See* also F. C. Burkitt, *Christian Palestinian Literature*, *J. Th. Stud.* ii., pp. 174–185 (Jan. 1901), and *The Old Lectionary of Jerusalem*, *J. Th. Stud.* xxiv., pp. 415–424 (July 1923).

Arabic versions must be noted at the end, though none of them are older than the 8th century: their only critical importance is the influence they have exercised since the 13th century upon the much older Ethiopic version.

Bibliography.—P. de Lagarde, *Die vier Evangelien arabisch* (Leipzig, 1864); I. Guidi, *Le Traduzione*, etc. (Rome, 1888). (*See* above on *Ethiopic Versions*.)

(*c*) **Editions.**—The editions of the Greek Testament here listed are those which for one reason or other were landmarks in the study of the text.

Erasmus (Basle, 1516): the actual first edition.

Complutensian Polyglot, printed 1514–17; published 1520.

Stephanus (*i.e.*, Robert Étienne), ed. 3 (Paris, 1550). This edition, which in all essentials follows Erasmus, gave what was till the time of Lachmann the received text (hence the symbol **ϛ**, *i.e.*, στ for Stephanus). The Elzevir editions of 1624 and 1633 are reprints of Stephanus with a few errors and corrections. Full details of the minute differences between these editions are given in H. C. Hoskier's *Full Account of Cod.* 604 (=700) (London, 1890).

J. Mill (Oxford, 1707): the first large collection of various readings.

J. J. Wetstein (Amsterdam, 1751): a still larger collection of readings, and a very valuable collection of illustrative parallels, especially from classical authors.

K. Lachmann (Berlin, 1842–50): the first thoroughgoing attempt to construct a text from ancient authorities alone, uninfluenced by printed editions. It took a scholar of Lachmann's calibre to make this, to us obvious, advance. Karl Lachmann is the famous editor of Lucretius: it was his study in *Studien und Kritiken* for 1835 (repeated in the Preface to vol. ii. of his N.T., 1850) that set the doctrine of the priority of Mark to Matthew and Luke on a firm philological foundation.

C. Tischendorf (8th ed., Leipzig, vol. i., 1869; vol. ii., 1872; vol. iii. [Prolegomena by C. R. Gregory], 1894). This edition was, until v. Soden's appeared, the largest collection of various readings. Tischendorf's text is rather capricious, but his notes are a model of clearness and compression combined, so that the work is still indispensable to the textual student.

Westcott and Hort (London, 1881–82). Vol. ii., containing the Introduction (reprinted 1896), was written by Dr. F. J. A. Hort, but the work is usually quoted by the symbol WH. Hort recognized three main families: the *Antiochian* or Constantinopolitan, to which belong most Greek mss. and the later versions (Gothic, Slavonic, etc.); the *Western*, to which belong D, the Old-Latin and the Old-Syriac versions; and the *Alexandrian*, to which belong many of the older Greek mss. (especially such as seem to have an Egyptian origin), and also the Egyptian versions, particularly the Memphitic (now called Bohairic). The Western family represents the careless, unrevised and often interpolated state of the text in ante-Nicene times; the Antiochian family is a smooth and plausible revision, made probably by the martyr Lucian of Antioch and adopted by the Church in the new royal city of Constantinople; the Alexandrian family is a comparatively pure form of text approved by the more careful Alexandrians, and is characterized mainly by minute scholastic emendations. Besides these a few very old documents exist, which attest a text not indeed perfect, but belonging to neither of the three main families: this text (or texts) Hort calls *Neutral*. Its most consistent representatives are B and ℵ, particularly B, so that Hort's text in the main is not unlike a corrected transcript of "Codex Vaticanus," which he refused to the end to regard as specially connected either with Alexandria or Caesarea.

The weak point in Hort's theory is the failure to incorporate B and ℵ into the Alexandrian phalanx, to which they obviously belong, whether or no we connect B and Alexandrians, as Bousset

(1894) and v. Soden do, with the recension of Hesychius (about which we know nothing but the name). In this connection it should be borne in mind that the actual attestation of the text approved by Hort is only rarely that of ℵ or B alone: it usually has support from the Old Syriac or Old Latin documents, *i.e.*, from some of the "Western" group, and so Hort called B "Neutral," meaning unlocalized.

For modern views, including B. H. Streeter's, *see* below on *Textual Criticism,* where note that what is there called "Byzantine" is Hort's Antiochian and what is called "Alexandrian" is Hort's Alexandrian *and* Neutral.

The edition of *Hermann v. Soden* (Berlin, vol. i. [Introduction], 1902–10; vol. ii. [Text and full Apparatus], 1913): this was an ambitious attempt to supersede Tischendorf in giving a complete conspectus of variants, including the newest discoveries, together with a new textual theory which necessitated a totally new notation for the documents. The new notation is almost incomprehensible in actual use, except to specialists, the textual theory has not commended itself to scholars, either in Germany or elsewhere, and there are grave inaccuracies in certain parts of the work, *e.g.*, vol. i., p. 1,059, which destroy confidence in statements about readings which otherwise cannot be controlled. It is therefore a work for specialists alone. Tribute must be paid to the immense industry of the large staff of workers, who have at least examined all the known Greek mss. whether in Europe or the Orient. Little of first-rate importance indeed has been brought to light in v. Soden's pages alone, for the full and most accurate presentation of new discoveries such as W and Θ must be sought elsewhere in separate publications. The outstanding merit of the work consists in this, that the investigator is never quite confident that he has mustered all the evidence for and against a given reading until he has verified his statements by consulting "von Soden."

3. TEXTUAL CRITICISM

The Textual Criticism of the New Testament has for its primary object the reconstruction of the original text from the Greek mss. versions and quotations in early writers described above. A secondary object is to trace the history of the text, to identify and characterize the various editions or recensions current in different times or localities. It is noteworthy that till the invention of printing neither in the original Greek nor in Latin was a complete uniformity of text arrived at, notwithstanding the authority ascribed to the words by ecclesiastical theory. Only in Syriac was uniformity reached.

A leading cause of this remarkable state of things must be sought in the very extensive variations which were current in early times, particularly in the Gospels. Apart from some half-dozen remarkable readings (such as the omission of "in Ephesus" in Eph. i. 1) the text of the Pauline Epistles resembles that of most ancient works: there are plenty of scribes' errors, etc., and the mss. fall into groups as is natural, but the variations are of small account and are mostly explicable from the context. In a word, the variations are *accidental.* In the Gospels, on the other hand, the characteristic variations are *intentional,* such as the addition or insertion of whole passages, some of which must certainly have been supplied from an external source. The longest is the whole story of the Woman taken in Adultery, inserted between John vii. 52 and viii. 12; others are a long insertion after Matt. xx. 28 (61 words), the saying about the Face of the Sky in Matt. xvi. 2–3 (31 words), the story of the Angel and the Bloody Sweat in Luke xxii. 43–44 (26 words), and many other shorter passages. No satisfactory palaeographical explanation has ever been found for these variants; they are evidently made on purpose, by persons who had new matter to insert into the text and felt themselves at liberty to do so. The fact of the occurrence of these longer Interpolations (as they are usually called) prepares us to find that very many of the shorter variants are of the same nature, *i.e.*, that they did not arise through scribal errors but by intentional efforts to improve or enrich the original. It is further evident, from the general course of ecclesiastical sentiment, that such violent modifications of what was regarded as Sacred Scripture must have taken place very early. Blunders may occur at any time, with whatever reverence a text is regarded; efforts to remove minor stumbling blocks, such as differences in parallel narratives, may have been made in later times, with the naïve idea that the less familiar wording was itself a scribal error. But the longer insertions, whether genuine additions to the Gospel History or not, must have come from sources literary or oral of which there is no trace in later times. In other words, both the longer and the shorter texts must go back into the 2nd century.

This is certainly true of the most important variations of all, viz., those connected with the end of the Gospel of Mark. The two oldest Greek mss. (ℵ and B), the better ms. of the Old-Syriac version (Syr. *S*), and some other authorities, end at xvi. 8 (ἐφοβοῦντο γάρ); the oldest and best Latin text (*k*), with some secondary support, adds a short sentence evidently intended to round off this abrupt conclusion; the great majority of our authorities, including W (5th century) and also Irenaeus (A.D. 180), possibly also Justin Martyr, *Apol.* i. 42 *fin.*, 45 (A.D. 153), attest the Longer Conclusion (Mk.) xvi. 9–20. The sentence (the so-called Shorter Conclusion) runs as follows: "But all the things which they had been commanded they also declared shortly to those with Peter. After these things Jesus himself also appeared, and from the East even to the West sent by them the holy and incorrupt tidings of eternal salvation. Amen." It is obvious that these variations imply a mutilated archetype, preserved in some branches of transmission with singular fidelity, and edited in others to supply an obvious defect.

The Gospels.—The *Gospels* thus form a textual problem by themselves. The few statements about the history of the text and various readings in early Christian writers being obscure and perhaps inaccurate, the best critical weapon is what is called the evidence of groups. In the last resort the appeal is to internal evidence: the groups or even single authorities which in repeated instances give the fresher, less conventional, readings are to be trusted in cases where the originality is less obvious.

A text formed by choosing intelligently between the readings attested by ℵB, by *k*, and by Syr. *S*—neglecting all other authorities—would differ little from the best that can be constructed. But if we are to get an idea of the history of the text, and the forms in which it was read in various regions in ancient times we must make a wider induction. If all the readings of all our authorities be tabulated it soon becomes evident that they fall into three main groups, for which the most convenient names are Byzantine, Alexandrian and "Western." The *Byzantine* group is that of the majority of the Greek mss.: if you construct a text of the Gospels by always accepting the reading of the majority, the result would be the Byzantine text. With it would generally agree the later versions, such as the Slavonic and the Gothic; the Latin Vulgate (A.D. 383) and the Syriac Peshitta (A.D. 411) would often, but not consistently, agree also. The *Alexandrian* group contains ℵ and B, sometimes with a few other Greek mss. and often with the Egyptian versions. The most consistent support of the *Western* group comes from the Old-Latin versions (*k e, a b, ff.*, etc.) together with D, a codex certainly written in the West; the two Old-Syriac mss. (Syr. *SC*) also very often support characteristic "Western" readings, and they are often attested by some later Greek mss.

The *Byzantine* text is found in the quotations of the Greek ecclesiastical writers from Chrysostom (400) onwards, the *Alexandrian* text in Egyptian writers as early as Origen (*c.* 215); it is of fundamental importance to observe that in all earlier Greek writers, including Clement of Alexandria, the Gospel quotations are (*a*) generally allusive and inaccurate, (*b*) "Western" in character.

It must further be remarked that while the Byzantine and Alexandrian texts are definite entities, easily constructible by the general agreement of their most consistent supporters, the "Western" texts differ widely among themselves. Moreover, the triple division above spoken of coalesces in most variations into two texts. That the three groups do exist as groups is proved by the occurrence of "ternary variations," *i.e.*, where there are three readings attested severally by the Byzantine, the Alexandrian and

the "Western" groups, *e.g.,* Matt. xxii. 13. To this class belong Hort's "conflate" readings, where an Alexandrian and a Western reading is combined in the Byzantine text (*Hort* § 134–149), *e.g.,* the last words in Luke. But very often Byzantines and Westerns stand together against the Alexandrians, also Byzantine and Alexandrians against Westerns; not infrequently also the Alexandrian group attesting a given reading is reinforced by important "Western" authorities.

The chief inferences to be drawn from these facts are:—(1) The Byzantine text is a recension properly so called, the form in which the Gospel was introduced into the new Christian metropolis of Constantinople; it was an eclectic fusion of texts previously current, and contains hardly any ancient element not better preserved elsewhere. (2) The Alexandrian text seems to have some connection with the great Christian scholar Origen, who (so far as we know) was the first to pay attention to the exact wording of the Gospels and to make any comparison of mss. (3) The "Western" text is not exclusively Western in the geographical sense, nor is it a single definite recension; it is more accurate to say that "Western" readings represent the variegated and uncorrected state of the text in the ante-Nicene period, especially from about A.D. 150 (when the Gospels were first collected together into a common corpus) until the time of Constantine.

Modern textual investigation is mostly connected with this mixed crop of "Western" readings, so as to sort them out into significant groups, whereby we may not only have better criteria for ascertaining the original in cases of doubt, but also get some idea of the kind of text current in various regions in early times. The most fruitful of these investigations in the last few years has been that of B. H. Streeter, whose book, *The Four Gospels* (London, 1924), treats of textual criticism at length. Dr. Streeter recognizes three divisions in the so-called "Western" group: there is the true Western text (=D W^{mk} lat-afr lat-eur), the Old-Antiochian text (=Syr. *S* and *C*), and what he has called the Caesarean text (Θ–565, 1 etc., 69 etc., 28, 700). It should be noted that Streeter recognizes that all the witnesses to his Caesarean text have often been assimilated to the Byzantine standard. Strictly speaking, therefore, the attestation consists of the readings of Θ etc. which differ from the Byzantine. The cornerstone of his construction is his demonstration that whereas Origen in the earlier parts of his Commentary on John, written in Alexandria, is a consistent witness to the text of ℵ B, nevertheless in the latter parts of the same work and in his Commentary on Matthew, written after he had removed to Caesarea in Palestine, his quotations attest a text more like that of Θ and its allies. Streeter concludes from this that B represents the local text of Alexandria about the year 200, while the non-Byzantine readings of Θ and its allies represent the text current at Caesarea early in the 3rd century.

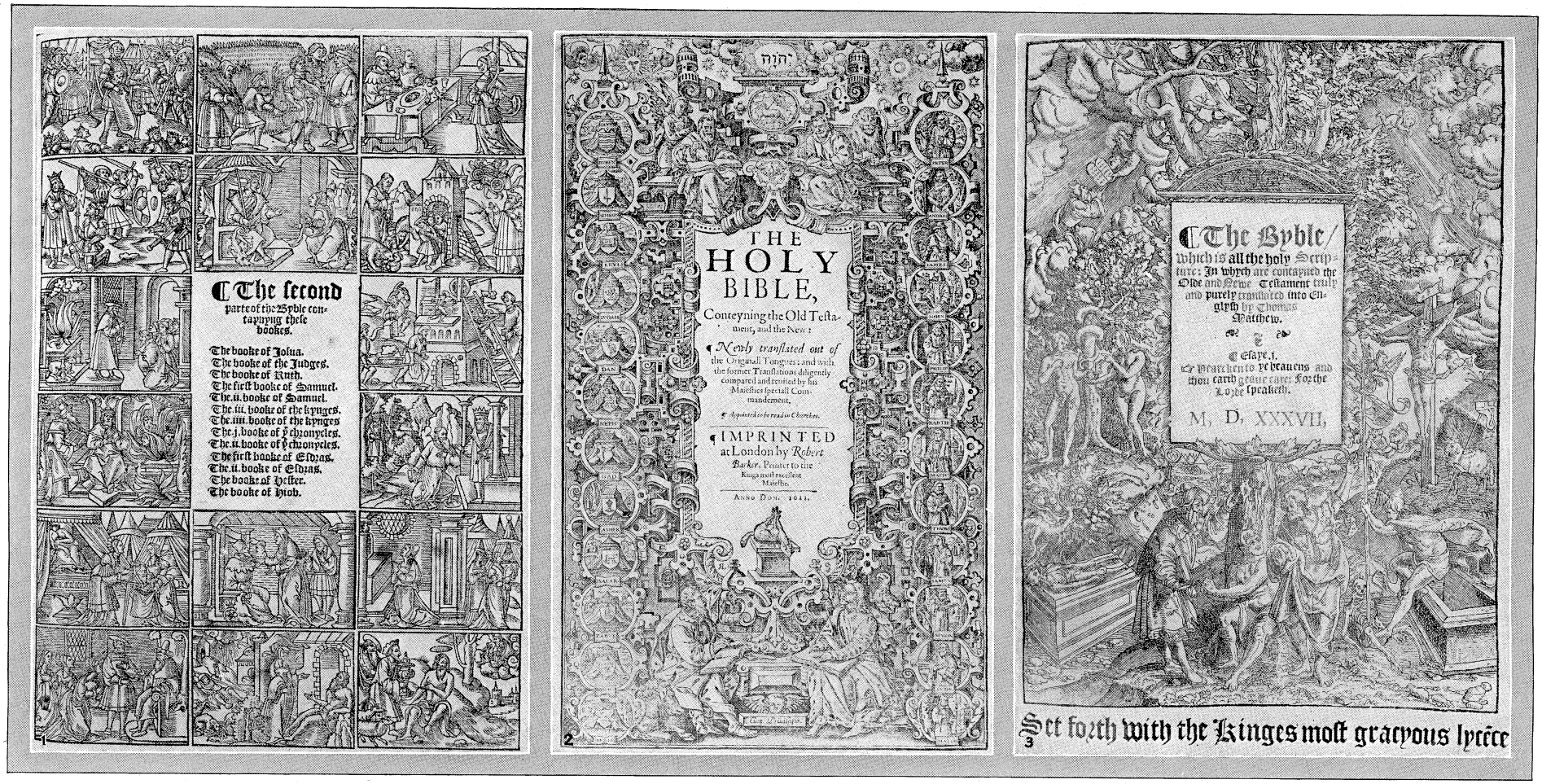
In the opinion of the present writer the weak point in Streeter's attractive theory is that the "interesting" readings of Θ–565, 1 etc., 69 etc., 28, 700, are regarded as fragments of *one* text, which nevertheless is separated from the Old-Syriac version with which they (particularly 1 etc., and 28) have much in common. (See *e.g.,* Mark ii. 27, iii. 17, vi. 22 f., x. 11 f.; viii. 10 [*τὸ ὄρος* W 28=Syr. *S*]). It *is* noteworthy that the whole "Western" phalanx does occasionally go wrong together, as when in Mark vi. 53 *καὶ προσωρμίσθησαν* is omitted by D W Θ–565, 1 etc., 28, 700, 983, *a b c ff i q r,* Syr.*S vg* arm: see *J. Theol. Studies,* xvii. p. 19 (Oct. 1915). It seems better to take the readings of Θ, etc., together with those of Syr. *S C,* as representing variants current in the East, just as the often discordant but yet very nearly connected readings of D and the various branches of the Old-Latin represent the state of the text in the West about A.D. 200 in its considerable but not unlimited variety. Some errors were very widely spread, others (though ancient) seem to have had always a limited circulation. It is a vain hope to imagine that we can arrive at the original text by constructing the Alexandrian, the Old-Western, and the Old-Eastern texts, and then accepting the agreement of either two against the other.

Two special points may be noticed here. For those who are convinced that Mark is the actual source of Matthew and Luke there is a difference of interest between the various readings in the text of Mark and those in the parallel passages of Matthew and Luke. A change of text in Mark may conceivably alter our view of the thing narrated: if "to the other side" in Mark vi. 45 be omitted (so W 1 etc., Syr. *S*), or "through Sidon" be read instead of "and Sidon" in Mark vii. 31, the whole course of the itinerary of Jesus is altered. On the other hand the omission or retention of Matt. xvi. 2–3 is a matter of merely literary interest: the authority for what happened on the occasion in question, both for ourselves and for "Matthew," is Mark viii. 10–13, and whether it was Matthew or a later editor who thought that the Saying about Weather could be introduced at that particular place is a secondary consideration. The other point is very well treated by Dr. Streeter in chap. xi. of *The Four Gospels:* it concerns the few and relatively insignificant agreements of Matthew and Luke against Mark, in which Streeter shows that almost all the cases not otherwise accounted for may be reasonably explained as harmonistic scribal alterations in the text, from which either the Old-Latin or the Old-Syriac, or both, have generally escaped.

Some Continental scholars, notably v. Soden, regard Tatian's Diatessaron (*see* above) as a prime cause of harmonistic readings: we know of this Gospel Harmony in two forms, (*a*) in Latin, (*b*) in Syriac. In *Syriac,* as explained above, it certainly played a great part; according to tradition the Gospel reached Edessa in the form of the Diatessaron, and the extant remains of Syriac literature before A.D. 411 show that the separate Gospels were much less used than this Harmony. It is not surprising, therefore, that the text of Syr. *S* and *C,* the two surviving mss. of the pre-Peshitta Syriac, should often exhibit harmonistic readings, many of which were no doubt due to the influence of the Diatessaron. In *Latin* there survives Codex Fuldensis (a ms. corrected in the year 546 by Victor, bishop of Capua), and also four Dutch Harmonies of the 13th and 14th centuries, their Latin original being closely connected with *Fuld* in text but not apparently derived directly from it. The wording in all these has been almost entirely assimilated to the Vulgate, but there are sufficient relics of Old-Latin renderings to show that the Harmony must have existed in pre-Vulgate times in Latin, with a text akin to lat-eur. There is little sign of its use by Latin Fathers, and its connection with Tatian is only inferred from a learned guess of Victor's, probable in itself but not traditional. The arrangement of the Gospel mosaic in the Latin and Syriac texts is so much alike as to demonstrate their kinship, but sufficiently different to make it improbable that the Old-Latin parent of *Fuld* was a translation from the Syriac. No tangible evidence of a Greek Diatessaron has appeared.

It is not likely, therefore, that this Harmony was ever widely used, or that it exerted any influence on the text of the Gospels, except in Syriac. To the present writer it seems probable that it never did exist in Greek, and that in both forms, Latin and Syriac, it was in origin a missionary substitute for a translation of the complete text of the Canonical Four. The Latin form, the arrangement of which though not the original wording is well preserved in *Fuld,* must have been the earlier: what "Tatian" took back with him to his native land (Epiphanius, *Haer.* xlvi. 1), where it became "The Gospel" to his converts, was a revised and improved edition.

Acts.—The text of *Acts* is connected with that of the Gospels, but the problem is in some ways different, as (except in the case of the great Bibles, which can hardly have existed in ante-Nicene conditions) the transmission of Acts has been separate from that of the Gospels. We have in Acts an Alexandrian and a Western text as in the Gospels. The Byzantine text is little more in Acts than a modification of the Alexandrian, with a few minor Western readings taken up here and there. But the Western text, as read in D and the Old-Latin texts (very little information in detail about the Old-Syriac of Acts survives), differs considerably from the Alexandrian, so much indeed as to have suggested to various scholars, notably Blass, that the Western was the original form and the Alexandrian a "second edition revised and corrected," perhaps by the author himself. The important "West-



TITLE PAGES FROM EARLY BIBLES OF THE ENGLISH REFORMATION

1. A title page from a part of the Great Bible, of 1539. The decorative border illustrates 16 scenes from Old Testament History
2. Title page of the authorized or King James version of the Holy Bible, of 1611. Illustrations of the twelve tribes of Israel are shown on the left side of the page, and on the right, the twelve Apostles are portrayed. Each illustration bears the name of an Israelite tribe or of an Apostle
3. A title page of New Testament illustrations from the Matthew Bible, of 1537. The illustrations shown trace the plan of God for the salvation of man from the creation of the world to the crucifixion, resurrection and ascension of Christ

BIBLE

1

Dsalm pacis qui eduxit de mortuis pastorem magnum ouium in sanguine testamenti eternj dñm nrm ihm xpm aptet vos in omni opere bono vt faciatis eius voluntatem: faciens in nobis quod placeat coram se p ihm xpm. cui est gla in secla seculoꝝ amen. Rogo autem vos frs vt sufferatis verbum solatij. Etenim p paucas 1 scripsi vobis. Cognoscite vim nrm et

Qeli narrant gloriã dei: et opera manuũ eius ãnũciat firmamẽtũ. Dies diei eructat verbũ: et nox nocti indicat sciam. Non sunt loquele neq; sermones: quoꝝ non audiãtur voces eoꝝ. In omnẽ terrã exiuit sonꝰ eorũ: et in fines orbis terre verba eorũ. In sole posuit tabernaculũ suũ: et ipe tanꝯ sponsus procedens de thalamo 10 suo exultauit ut gygas ad curren-

te. Therfore go we oute to hym wyth oute castels verynge his reproche or elles elyp. Or elis we haue not we re a dwellinge ataye: but we seeken a ataye to abyyde. Therfore by hym offre we all ooste of herynge euer more to god: that is to saye pe fru yt of lyppis knowlachynge to his name. Forsope, vpl ye forgete of we ele dynge or seruynge and of comon vynge forsope bi fuche ooffis: god is delemyd. Ouere ye to your pnoftis 10 ploftd or prelatis. and vndertepe ye to hem! 11 plitely wakeu: as to seeldynge

4

Dico enim vobis quia nullus ab illo tempore cognouit. Benedicat qui venit in nomine dñi. Et ingressus templum ibat XII dicere cuncta accesserunt ad illum principes sacerdotum et seniores populi in atrium principis sacerdotum et dicebant. In quacumque potestate hec facis: aut quis tibi dedit hanc potestatem ut hec facias? Respondens autem ihs dixit eis: interrogabo et ego vos unum sermonem: quem si dixeritis mihi et ego vobis dicam in qua potestate hec facio. Baptismum iohannis de celo erat an ex hominibus? Illi autem cogitabant apud semetipsos dicentes. Si dixerimus de celo dicet nobis quare ergo non credidistis ei? Si autem dixerimus ex hominibus timemus turbam omnes enim habebant iohannem sicut prophetam. Et respondentes dixerunt nescimus. Et ihs ait illis: nec ego dico vobis in qua potestate hec facio. Cepit autem ad plebem hanc parabolam dicere. Homo quidam fecit vineam et locauit eam agricolis et peregre profectus est multo tempore. Et in tempore misit ad agricolas seruum ut de fructu vineę darent ei. Qui cesserunt eum et dimiserunt inanem. Et addidit alium mittere seruum illi autem et hunc cesserunt et afficientes contumelia dimiserunt inanem. Et addidit tertium mittere illi autem et hunc vulnerantes eiecerunt. Dixit autem dominus vinee quid faciam? Mittam filium meum dilectum forsitan cum hunc viderint reuerebuntur. Videntes autem eum agricole cogitauerunt inter se dicentes. Hic est heres venite occidamus eum ut nostra fiat hereditas. Et eiecerunt eum extra vineam et occiderunt. Quid ergo faciet illis dominus vinee? Veniet et perdet agricolas et dabit vineam aliis. Quod audientes dixerunt illi absit. Ille autem respiciens eos ait. Quid est ergo hoc quod scriptum est. Lapidem quem reprobauerunt edificantes hic factus est in caput anguli? Omnis qui cecidit super lapidem illum conquassabitur super quem autem ceciderit conteret eum. Et querentes principes sacerdotum et scribe mittere in illum manus in ipsa hora timuerunt populum. Cognouerunt enim quoniam ad ipsos dixerit parabolam hanc. Et obseruantes misit insidiatores qui se iustos simularent ut caperent eum in sermone et traderent illum principatui et potestati presidis. Et interrogauerunt eum dicentes. Magister scimus quia recte dicis et doces et non accipis personam sed in veritate viam dei docens. Licet nobis tributum dare cesari an non? Considerans autem dolum illorum dixit ad illos. Quid me tentatis? Ostendite mihi denarium cuius habet imaginem et inscriptionem? Respondentes dixerunt cesaris. Et ait illis: reddite ergo que sunt cesaris cesari et que sunt dei deo. Et non potuerunt verbum eius reprehendere coram plebe et mirati in responso eius tacuerunt. Accedentes autem quidam de sadducęis qui negant esse resurrectionem interrogauerunt eum dicentes. Magister moyses scripsit nobis si cuius frater mortuus fuerit habens uxorem et hic sine liberis fuerit ut accipiat frater eius uxorem illius et suscitet semen fratri suo. Septem ergo fratres erant et primus accepit uxorem et mortuus est sine liberis. Et secundus accepit uxorem illam et hic mortuus est non relicto semine. Et tertius similiter. Et omnes septem non reliquerunt semen. Nouissima autem omnium defuncta est et mulier. In resurrectione ergo cuius de illis erit uxor? Omnes enim habuerunt eam uxorem. Et ihs dixit illis: nonne hoc ideo errastis quia nescitis scripturas neque virtutem dei? Cum enim a mortuis resurrexerint neque nubent neque uxores ducent sed erunt sicut angeli in celis. Quod autem mortui resurgant et moyses ostendit super rubum sicut dixit dominum deum abraham et deum isaac et deum iacob. Deus autem non est mortuorum sed viuorum omnes enim vivunt ad illum. Tunc respondentes quidam scribarum dixerunt. Magister bene dixisti. Et amplius non audebant quicquam interrogare eum. Ipse autem dixit quomodo dicunt christum filium esse dauid? Et ipse dauid dicit in libro psalmorum. Dixit dominus domino meo sede a dextris meis donec ponam inimicos tuos scabellum pedum tuorum. Dauid ergo dominum eum vocat et unde filius eius est? Audiente autem omni populo dixit discipulis suis. Attendite a scribis qui volunt ambulare in stolis et amant salutationes in foro et primas cathedras in synagogis et primos discubitus in cenis qui deuorant domos viduarum orationes prolixa prolixa orantes. Hi accipient maius iudicium. Videns autem pauperculam viduam mittentem minuta duo mi-

5

6

Ye thnainam φein· uinai φinai
nassns φeins· yaikφaiuiaça
φeins· sye ïnihininaçhana
aikφai· hhaiennsaranaφanasin
teinanriennshinhasara· çah
aeaetins φateiskranasnsiçm
na· svasyeçahyeisaeaetaμφai
skranainnsaraiu· çainibkir
raisnnsinekaistibnçai· akam
seinnsaeφaμnanbiain· nnte
φeinaistφinaanraκai· çahnahs
çahyiuκφsïnaiyins· amen·

Mat scabaiaeaetiφmannam
nissaseainsïze· aeaetiφçah
ïzyisattaïzyaksaiiaekhinina·
ïφçabainiaeaetiφnannamnis
saseainsïze· niφaiattaïz
yaκaeaetiφnissaseainsïzya
κκs·

φaiφsyasyeφaiainïtansraiκai·

*My soule magnyfieth ỹ Lorde. And my spirite hath reioyced in God my sauiour For he hath loked on the lowe degre of hys hande mayden: for lo: now from hence forth shall all generacions call me blessed. Because he ỹ is myghty, hath done to me greate thinges, & holye is his name. And his mercy is on thẽ that feare him, from generacion to generation. He hath shewed strength with his arme, he hath scattered thẽ that are proude in the ymaginacyon of their herte. * He hath putte downe the myghty from their seates, and exalted them of lowe degre. He hath fylled the hongri wt good thynges: and sent awaye the riche emptie. He hath holped his seruaunt Israel, in remembraunce of his mercye.

And it came to passe, that as the people preassed vpon him to heare the word of God, hee stood by the lake of Genesareth,

2 And saw two ships standing by the lake: but the fishermen were gone out of them, and were washing their nets.

3 And he entred into one of the ships, which was Simons, and prayed him, that hee would thrust out a little from the land: and he sate downe, and taught the people out of the ship.

4 Now when he had left speaking, he sayd vnto Simon, Launch out into the deepe, and let downe your nets for a draught.

ΒΙΑΓΓΕΛΙΟΝ ΚΑΤΑ
ΙΩΑΝΝΗΝ.

Ν ἀρχῇ ἦν ὁ λόγος, καὶ ὁ λόγος ἦν πρὸς τὸν θεόν, καὶ θεὸς ἦν ὁ λόγος. οὗτος ἦν ἐν ἀρχῇ πρὸς τὸν θεόν. πάντα δι' αὐτοῦ ἐγένετο, καὶ χωρὶς αὐτοῦ ἐγένετο οὐδὲ ἕν, ὃ γέγονεν. ἐν αὐτῷ ζωὴ ἦν, καὶ ἡ ζωὴ ἦν τὸ φῶς τῶν ἀνθρώπων, καὶ τὸ φῶς ἐν τῇ σκοτίᾳ φαίνει, καὶ ἡ σκοτία αὐτὸ οὐ κατέλαβεν. ἐγένετο ἄνθρωπος ἀπεσταλμένος

The fyfth Chapter.

When he sawe the people, he went vp into a mountaine: and when he was set, his disciples came vnto him: and he opened his mouth, and taught them, sayinge: Blessed are the poore in spirite: for theirs is the kyngdom of heven. Blessed are they that mourne: for they shalbe comforted. Blessed are the meke: for they shall inherete the erthe. Blessed are they which hunger and thirst after righteousnes: for they shalbe fylled. Blessed are the mercyfull: for they shall obteyne mercy. Blessed are the pure in hert: for they shall se god. Blessed are the maynteyners of peace: for they shalbe called the children of god. Blessed are they which suffre persecucion for righteousnes sake: for theirs is the kyngdom of heven. Blessed are ye whē men shall reuyle you, and persecute you, and shal falsly saye all manner of evle saying against you for my sake. Reioyce and be glade, for great is your reward in heven. For so persecuted they the prophetes which were 10 before youre dayes.

All these deades here rehearsed as to wonne the peace/ to shewe mercy/ to suffre persecucio/ and so forth/ make not a man happy and blessed/ neither deserve re/ he reward of heven but declare and testifie that we are happy and blessed/ and that we shall have grace/ promocio/ heven. and certifye vs of our herres that we are goddes sonnes/ & that the holy goost is in vs. for all good thynges are geven to vs freely of god for christes blouddes sake & his merittes

B Though prophecienges fayle, or tunges ceasse, or knowlege perishe, yet loue falleth neuer awaye. For oure knowlege is vnparfecte, and oure prophecienge is vnparfecte. But whā that which is perfecte, commeth, then shal the vnparfecte be done awaye. Whan I was a childe, I spake as a childe, I vnderstode as a childe, I ymagined as a childe. But as soone as I was a man, I put awaye childishnes. Now we se thorow a glasse in a darke speakynge, but thē shal we se face to face. Now I knowe vnperfectly: but thē shal I knowe euē as I am knowne. Now abydeth faith, hope, loue, these three: 11 but the greatest of these is loue.

PHOTOGRAPHS (1, 2, 3, 4, 5, 6, 10) BY COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM

EXAMPLES OF BIBLICAL MSS. AND PRINTED BIBLES OF THE 11TH TO THE 17TH CENTURIES

1. Latin Vulgate. From a Ms. written for the monastery of Ste. Marie de Parco, Louvain, 1148. Heb. xiii 20–22. 2. The 42-Line Bible, printed at Mainz, 1450–1455. Ps., xviii 1–6. 3. Early Wycliffite version of the Bible. From a late 14th cent. Ms. which belonged to Thomas of Woodstock, Duke of Gloucester. Heb. xiii 13–17. 4. Latin Vulgate. A 13th cent. Ms. which belonged to Robert de Bello, Abbot of St. Augustine's, Canterbury. Matt. xxiv 1–6. 5. The Old English Hexateuch, 11th cent. A paraphrase in English, with Latin notes in a later hand. The sacrifice of Isaac. Gen. xxii 13–18. 6. *Cod. Argenteus*, 5th–6th cent. Gothic Version. From the facsimile in Uppström's edition, 1854. Matt. vi 10–16. 7. The English 'Authorized Version,' 1611. From a copy in St. John's College, Cambridge. Luke v 1–5. 8. The Great Bible, 1539. From the vellum copy which belonged to Thomas Cromwell, now in St. John's College, Cambridge. Luke i 46–54. 9. Erasmus's Greek New Testament, Basel, 1516. The first printed Greek New Testament to be published. From a copy in St. John's College, Cambridge. John i 1–6. 10. Tyndale's 4to edition of the New Testament, printed by P. Quentel, Cologne, 1525. Matt. v 1–12. 11. Coverdale's Bible, 1535. The first complete printed English Bible. From a copy in the British and Foreign Bible Society's Library. I Cor. xiii 8–13.

ern readings" preserved in the Harclean Syriac version are derived from Greek mss. and are not a survival from the lost Old-Syriac (Ropes, ccxvii.). The objections to Blass's theory are to be found in J. H. Ropes, *The Text of Acts* (especially p. ccxxviii. ff.). Ropes regards the Western form as a text rewritten in accordance with the reviser's own literary taste, "which was somewhat different from that of the author" (p. ccxxxi.), and inferior to the original in dignity, force and charm. But here and there, as in the Gospels, this early corrupt recension preserves isolated good readings lost elsewhere, most of which will be found in the marginal variants marked J.H.R. below Prof. Ropes's transcript of codex B. The two most important various readings in Acts are at xv. 29 and at the beginning of the book. In xv. 29 the Western phalanx omits "and from things strangled" from the list of things to be avoided by Gentile Christians, whereby it was possible to interpret the Apostolic Decree as a moral standard (forbidding idolatry, murder and unchastity) rather than as a food-law. Prof. Ropes, though he is inclined to omit *καὶ πνικτῶν* with the Westerns, shows clearly that the Decree must even so have been intended as a food-law: the only doubt that remains, after his careful discussion, is whether *καὶ πνικτῶν* be not original after all. The opening sentence of Acts is best preserved in the African Latin as quoted by Augustine: it points back, according to Ropes, p. 257, to a form like the ordinary text, but without *οὓς* and *ἀνελήμφθη*, so that the true text would run "[1]The former treatise have I made . . . of all that Jesus began . . . [2]what time he gave commands to the apostles by holy Spirit and chose them . . . [3]to whom he showed himself alive, etc."

It is appropriate to notice here that the last chapter of the Gospel of Luke contains in the ordinary text (including B) some eight or nine interpolations omitted by D and the best Old-Latin texts. These are all obviously one series, made at the same time, and they include the reference to the Ascension of Jesus in Luke xxiv. 51[b]. It is likely that both these interpolations and the rewriting of Acts i. 1 ff. were made at the same time and under the same circumstances, viz., when the two volumes of *"Lucas ad Theophilum"* were separated, the one to form a constituent member of the Canon of Four Gospels, the other to circulate as an independent account of the early days of the Church. In the original undivided work the actual Ascension will only have been chronicled in Acts i. 9–12.

Pauline Epistles.—The *Pauline Epistles* are a collected edition of the Apostle's correspondence, due in the first place (so it seems) to Marcion, and afterwards enlarged by the inclusion of the "Pastoral Epistles" to Timothy and Titus, and of the "Epistle to the Hebrews." Romans, 1 Corinthians and Ephesians seem from the evidence of the "Apostolic Fathers," especially Ignatius and Clement, never to have been forgotten, but the others (notably II. Corinthians and Galatians) seem, at least to the present writer, to have been rescued by Marcion from oblivion.

The words "in Ephesus" in Eph. i. 1 are omitted by ℵ* B, by Origen, and apparently by the Old-Syriac (as appears from the Commentary of Ephraim). Marcion called this Epistle "To the Laodiceans." Probably, therefore, it was originally a circular letter, with a blank left for the name in the opening address. This explanation may also be held to account for the diverse forms in which the Epistle to the Romans has been handed down. It is known that Marcion's text wanted chaps. xv. and xvi.; the great doxology at the end (xvi. 25–27) is given after chap. xiv. in most Byzantine documents, many of them repeating it at the end as well, while on the other hand G^{paul} and some other Western texts omit it altogether; further G^{paul} (and apparently also the text underlying D^{paul}) omits all mention of "Rome" in i. 7 and 15. It seems likely, therefore, that "Romans" was an earlier circular letter of St. Paul's, a dogmatic epistle suitable for any early Christian community that the Apostle had not yet visited, which was turned into a letter to the Roman Church by the addition of chaps. xv. and xvi., when he had made his plan to go there after his final visit to Jerusalem.

It should be noted that Hebrews comes before the Pastoral Epistles in the best Greek tradition; in the Sahidic it comes after II. Corinthians (a rearrangement of the Epistles more or less according to length); in the West, before the Vulgate appeared, Hebrews was hardly included at all. Philemon, though in Marcion's collection, comes after Timothy and Titus.

There is little special to say about the text of the *Catholic Epistles* which are usually found bound up with mss. of Acts. The *Apocalypse* has a textual history of its own. Apart from the great Bibles it is generally found separate, or in volumes of miscellaneous content. Sometimes Apocalypse-Acts-Catholic Epistles together form one volume, as in the African Latin *h* (6th century). The true grouping of our authorities in the Apocalypse is still obscure, but for the most part the variants are of minor importance. It may be noted that in xiii. 18 the Number of the Beast, given as 666 in most documents, is 616 in the 5th century uncial C, a curious variant current in the West as early as Irenaeus.

BIBLIOGRAPHY.—B. F. Westcott and F. J. A. Hort, *The New Testament in the Original Greek* (vol. ii. is Hort's *Introduction*) (1881 and 1896). From the very large mass of specialist literature, some of which is named in the preceding paragraphs, the following will be found useful by the student: B. H. Streeter, *The Four Gospels* (London, 1924); J. H. Ropes, *The Text of Acts* (London, 1926); K. Lake and R. P. Blake, *The Text of the Gospels and the Koridethi Codex*, Harvard Theol. Rev. xvi., pp. 267–286 (July, 1923); F. C. Burkitt, *W and Θ*, J. Theol. Studies, xvii., pp. 1–21, 139–152 (Oct. 1915).

4. HISTORY OF HISTORICAL CRITICISM

The New Testament is a series of early Christian writings which the Church came to regard as canonical, *i.e.*, they were placed in the same category as the Old Testament, the writings which the Christian had inherited from the Jewish Church. Just as the ancient Scriptures were considered to be the Word of God, and therefore that what they contained was the true and inspired doctrine, so also the New Testament was available for proving the Church's dogma. The assured canonicity of the whole New Testament resulted in its use by the mediaeval theologians, the Schoolmen, as a storehouse of proof-texts. Thus the New Testament seemed to exist in order to prove the Church's conclusions, not to tell its own tale.

Erasmus.—The *Novum Instrumentum* published by Erasmus in 1516 (*see* above) was accompanied with a Latin rendering of his own, in which he aimed at giving the meaning of the Greek without blindly following the Latin Vulgate, the only form in which the New Testament had been current in western Europe for centuries. This rendering of Erasmus, together with his annotations and prefaces to the several books, make his editions the first great monument of modern Biblical study. Mediaeval Bibles contain short prefaces with stereotyped information; Erasmus distinguishes, *e.g.*, between the direct statements in the Acts and the inferences which may be drawn from incidental allusions in the Pauline Epistles, or from the statements of ancient non-canonical writers. (For example, from the preface to the Acts: "Dionysius, bishop of the Corinthians, a very ancient writer, quoted by Eusebius, writes that Peter and Paul obtained the crown of martyrdom by the command of Nero on the same day." And again: "Some industrious critics have added [to the narrative of Acts] that Paul was acquitted at his first trial by Nero. . . . This conjecture they make from the 2nd Epistle to Timothy. . . .") This discrimination of sources is the starting point of scientific criticism.

The Reformers.—The champions of Church reform in the beginning of the 16th century found in the Bible their most trustworthy weapon. The New Testament picture of Apostolical Christianity offered indeed a glaring contrast to the papal system of the later middle ages. Moreover, some of the "authorities" used by the Schoolmen had been discovered by the New Learning of the Renaissance to be no authorities at all, such as the writings falsely attributed to Dionysius the Areopagite. When, therefore, the struggle between reformers and conservatives within the undivided Church was transformed into a struggle between Protestants and Romanists, the authority which in previous centuries had been ascribed to the Church was transferred by the Reformed Churches to the Bible. "The Bible, the Bible alone, is the religion of Protestants" did really express the general theory of the anti-Romanist parties. (The phrase is Chillingworth's [1637], who may be described as a Broad High-Churchman.) At the begin-

ning of the movement the New Testament itself had been freely criticized. Luther judged the contents of the New Testament by the light of his leading convictions; and in his German translation, which occupies the same place in Germany as the Authorized Version of 1611 does in English-speaking lands, he even placed four of the books (Hebrews, James, Jude, Apocalypse) in an appendix at the end, with prefaces explanatory of this drastic act of criticism. But Luther's discriminations were in the 17th century ignored in practice.

Influence of Textual Criticism.—From cover to cover the whole New Testament was regarded at the beginning of the 18th century by almost all Protestants as the infallible revelation of the true religion. The doctrines of Christianity, and in many communities the customs of the Church, were held to be inferences from the inspired text of the Scriptures. The first serious blow to this view came from the study of textual criticism. The editions of Mill (1707) and of Wetstein (1751) proved once for all that variations in the text, many of them serious, had existed from the earliest times. It was evident, therefore, that the true authority of the New Testament could not be that of a legal code which is definite in all its parts. More important still was the growing perception of the general uniformity of nature, which had forced itself with increasing insistence upon men's minds as the study of the natural sciences progressed in the 17th and 18th centuries. The miracles of the New Testament, formerly regarded as bulwarks of Christianity, now appeared as difficulties needing explanation. Furthermore, the prevailing philosophies of the 18th century supposed that a real divine revelation would express itself in a form convincing to the reason of the average plain man, whatever his predisposition might be; it was obvious that the New Testament did not wholly conform to this standard.

Rationalists.—But if the New Testament be not itself the direct divine revelation in the sense of the 18th century, the question still remains, how we are to picture the true history of the rise of Christianity, and what its true meaning is. This is the question which has occupied the theologians of the 19th and 20th centuries. Perhaps the most significant event from which to date the modern period is the publication by Lessing in 1774–77 of the "Wolfenbüttel Fragments," *i.e.*, H. S. Reimarus' posthumous attack on Christianity (*see* A. Schweitzer, *Quest of the Historical Jesus*, pp. 13–26). Lessing's publication also helped to demonstrate the weakness of the older rationalist position, a position which really belongs to the 18th century, though its best-remembered exponent, Dr. H. E. G. Paulus, died only in 1851. The characteristic of the rationalists was the attempt to explain away the New Testament miracles as coincidences or naturally occurring events, while at the same time they held as tenaciously as possible to the accuracy of the letter of the New Testament narratives. The opposite swing of the pendulum appears in D. F. Strauss: in his *Leben Jesu* (1833) he abandons the shifts and expedients by which the rationalists eliminated the miraculous from the Gospel stories, but he abandons also their historical character. According to Strauss the fulfilments of prophecy in the New Testament arise from the Christians' belief that the Christian Messiah must have fulfilled the predictions of the prophets, and the miracles of Jesus in the New Testament either originate in the same way or are purely mythical embodiments of Christian doctrines.

Tübingen School.—The main objection to the presentation both of Strauss and the rationalists, is that it is very largely based not upon the historical data, but upon pre-determined theory. Herein lies the permanent importance of the work of Ferdinand Christian Baur, professor of theology at Tübingen from 1826 to 1860. The corner-stone of his reconstruction of early Christian history was derived not so much from philosophical principles as from a fresh study of the documents. Starting from Galatians and I. Corinthians, which are obviously the genuine letters of a Christian leader called Paul to his converts, Baur accepted II. Corinthians and Romans as the work of the same hand. From the study of these contemporary and genuine documents, he elaborated the theory that the earliest Christianity, the Christianity of Jesus and the original apostles, was wholly Judaistic in tone and practice. Paul, converted to belief in Jesus as Messiah after the Crucifixion, was the first to perceive that for Christians Judaism had ceased to be binding. Between him and the older apostles arose a long and fierce controversy, which was healed only when at last his disciples and the Judaizing disciples of the apostles coalesced into the Catholic Church. This, according to Baur, happened early in the 2nd century, when the strife was finally allayed and forgotten. The various documents which make up the New Testament were to be dated mainly by their relation to the great dispute. The Apocalypse was a genuine work of John the son of Zebedee, one of the leaders of the Judaistic party, but most of the books were late, at least in their present form. The Acts, Baur thought, were written about A.D. 140, after the memory of the great controversy had almost passed away. All four Gospels also were to be placed in the 2nd century, though that according to Matthew retained many features unaltered from the Judaistic original upon which it was based.

Later Views.—The Tübingen school founded by Baur dominated the theological criticism of the New Testament during a great part of the 19th century. Baur's main position was not so much erroneous as one-sided. The quarrel between St. Paul and his opponents did not last so long as Baur supposed, and the great catastrophe of the fall of Jerusalem effectually reduced thoroughgoing Judaistic Christianity into insignificance from A.D. 70 onwards. Moreover, St. Paul's converts do not seem to have adopted consistent "Paulinism" as a religious philosophy. St. Paul was an emancipated Jew, but his converts were mostly Greeks, and the permanent significance of St. Paul's theories of law and faith only began to be perceived after his letters had been collected together and had been received into the Church's canon. All these considerations tend to make the late dates proposed by Baur for the greater part of the New Testament books unnecessary; modern investigators, notably Harnack of Berlin, accept dates not far removed from the ancient Christian literary tradition.

Literary criticism of the Gospels points to a similar conclusion. A hundred years' study of the synoptic problem, *i.e.*, the causes which make the Gospels according to Matthew, Mark and Luke at once so much alike and so different, has resulted in the demonstration of the priority of Mark, which "was known to Matthew and Luke in the same state and with the same contents as we have it now." (J. Wellhausen, *Einl. in die drei ersten Evangelien*, p. 57 [1905]). This Gospel may be dated just before A.D. 70. Luke and Matthew appear to have been published between 80 and 100. If Luke used Josephus, as F. C. Burkitt and others believe, the later date must be taken; but in any case it should be within the lifetime of a companion of St. Paul. Besides the Gospel of Mark these Evangelists made use of another document, now lost, which contained many sayings of Jesus and some narratives not found in Mark. This document was by many scholars identified with the "Logia," mentioned by Papias (Eusebius, *Ch. Hist.* iii. 39) as being the work of Matthew the Apostle, but the identification is not certain, and since Wellhausen it has been commonly dubbed Q (for *Quelle* "Source").

The Johannine writings, *i.e.*, the Fourth Gospel and the three Epistles of John, represent the view of Christ and Christianity taken by a Christian teacher, who seems to have lived and written in Asia Minor at the close of the 1st century A.D. The value of the Fourth Gospel as a narrative of events is a matter of dispute but the view of the personality of Jesus Christ set forth in it is unquestionably that which the Church has accepted.

The discoveries of papyri in Upper Egypt during recent years, containing original letters written by persons of various classes and in some cases contemporary with the Epistles of the New Testament, have immensely increased our knowledge of the Greek of the period, and have cleared up not a few difficulties of language and expression. More important still is the application of Semitic study to elucidate the Gospels. It is idle indeed to rewrite the Gospel narratives in the Aramaic dialect spoken by Christ and the apostles, but the main watchwords of the Gospel theology—phrases like "the Kingdom of God," "the World to come," the "Father in Heaven," "the Son of Man,"—can be more or less surely reconstructed from Jewish writings, and their meaning gauged apart from the significance which they received in

Christian hands. This line of investigation has been specially followed by G. Dalman in his *Worte Jesu*.

BIBLIOGRAPHY.—*See* the separate bibliographies to the separate articles on the books of the New Testament. The selection here given of the vast literature of the subject has been drawn up with the idea of setting the student on his way. 1. General and Historical —Jerome's *Prefaces* (to be found in any R.C. edition of the Vulgate); Luther's *Prefaces* (to be found in German-printed editions of Luther's Bible); F. Seebohm, *The Oxford Reformers* (3rd ed., London, 1887)—for Erasmus; M. Creighton, "Chillingworth" in the *Dict. of Nat. Biogr.*; Chr. Schrempf, *Lessing als Philosoph* (Stuttgart, 1906); J. Estlin Carpenter, *The Bible in the 19th century* (London, 1903); A. Schweitzer, *Von Reimarus zu Wrede* (Tübingen, 1906): *see* next section. 2. For the Synoptic Gospels.—W. G. Rushbrooke, *Synopticon* (London, 1880); Sir J. C. Hawkins, *Horae Synopticae* (Oxford, 1899; 2nd ed., 1909); Julius Wellhausen, *Einleitung in die drei ersten Evangelien* (Berlin, 1905; 2nd ed., 1911); *Das Evangelium Marci* (1903; 2nd ed., 1909); *Das Ev. Matthaei* (1904), *Das Ev. Lucae* (1904)—these four books make one work. 3. For the Fourth Gospel. —K. G. Bretschneider, *Probabilia* (Leipzig, 1820); Matthew Arnold's *God and the Bible*, chaps. v., vi. (still the best defence in English of a Johannine kernel, new ed. 1884); W. Sanday, *Criticism of the Fourth Gospel* (Oxford, 1905); A. Loisy, *Le Quatrième Évangile* (Paris, 1903); P. W. Schmiedel, *Das vierte Evangelium gegenüber den drei ersten* (Halle, 1906). 4. For the Semitic Elements in the N.T.— G. Dalman, *Die Worte Jesu* (Leipzig, 1898) (Eng. trans. *The Words of Jesus*, 1905); Johannes Weiss, *Die Predigt Jesu vom Reiche Gottes* (1st ed., 1892, 2nd ed., 1900). The Protestant view of the New Testament in A. Harnack, *Das Wesen des Christentums* (Berlin, 1900) (Eng. trans. *What is Christianity?* London, 1901) may be compared with the Liberal Catholic view in A. Loisy, *L'Évangile et l'Église* (2nd. ed., 1903).

5. MODERN CRITICISM

Modern critical work on the New Testament is so enormous in bulk that all that can be noticed here is a small selection of things which seem to the present writer particularly characteristic and significant. The subjects treated of may be grouped under three heads: Eschatology, Attempts to Reconstruct "Q," and the Historicity of Mark.

Eschatology.—Belief in a second advent of Christ has always been an article of the official creed of Christendom. It has further been commonly held that the New Testament contains indications of the signs of the approaching End, and from time to time enthusiasts have identified the approaching End with their own time or that immediately ahead. Nevertheless the End has not arrived; and indeed even if it did come now it would not be a real fulfilment of what is written in the New Testament, for what is expected there is a *then* immediate End. In II. Peter iii. 8 *seq.*, the "Day of the Lord" is extended to a period of 1,000 years, but experience has long shown that even that does not suffice. Moreover, the advance of knowledge in modern times about the configuration of the universe has demonstrated that the whole picture of the expected consummation is inconceivable if taken literally.

For a long time, therefore, the tendency of "enlightened" scholarship was to ignore or to explain away the clearly eschatological passages of the New Testament, or else to make distinctions between the "spiritual" ideas of Jesus and the "materialistic superstition" of the early disciples. Much effort was expended in the attempt to make the message and teaching of Jesus into something like the "liberal" ideas of religion current in the 19th century. The history of this attempt and its failure is brilliantly written in Albert Schweitzer's *Von Reimarus zu Wrede* (1906), called in the English translation "The Quest of the Historical Jesus" (1910).

The effect of Schweitzer's book has been very marked, and it is generally now acknowledged that the New Testament is a collection of writings by persons who, much as they differed in other things were agreed in this, that they lived in a world that was rapidly coming to an end, a world in which men and women might indeed rear children, but no one could look forward to a next generation. The effective reason for not taking thought for the morrow was the improbability that to-morrow would ever arrive. Hence the discouragement of marriage, the little care for the training of children, and the absence of public spirit and interest in the affairs of the world, manifested in the New Testament. It should be added that, although the writer of 1 John ii. 18 declares it was then "the last hour," it is in the Johannine writings that we see the beginnings of a tendency to reinterpret the earlier Christian expectations of an immediate conclusion of world-history.

A further development, which has gone side by side with the full recognition of the fact that Jesus and His disciples were expecting the near approaching End, is a more thorough study of Jewish popular beliefs in the age between that of the Maccabees (from 168 B.C.) and that of the 1st century A.D. It was no special superstition of the Christians, but the general expectation of the Jewish people that "the Kingdom of God was immediately to appear" (Luke xix. 11). This belief sent them to war with Rome in A.D. 66, a war which ended with the extinction of the Jewish state and the destruction of Jerusalem in A.D. 70. The belief had been engendered by two centuries of peculiar history, and it is only just to Jews and Christians alike to remember that this belief was the form in which they expressed faith in God's providential government of the world and in the ultimate triumph of justice. These ideas are best studied in the series of Jewish Apocalypses—Enoch, Assumption of Moses, Baruch, "Second Esdras" (= 4 Ezra)—which have all received their due measure of attention in the last 20 years.

Attempts to Reconstruct "Q."—That Matthew and Luke made use of Mark is now generally recognized. Besides Mark they must also have used another document, now generally spoken of as Q, which formed the basis of their accounts of John the Baptist, the Temptation of Jesus, the "Sermon on the Mount" (*i.e.*, a collection of Sayings beginning with Beatitudes and ending with the simile of the Two Houses), the Story of the Centurion's Boy, Sayings of Jesus about John, some Parables, some Sayings about the End. Many efforts, notably Harnack's, have been made to reconstruct Q in detail, but all that is really assured about it is contained in the above description. We do not know what it did *not* contain, and we do not know its more striking peculiarities (which neither Matthew nor Luke saw fit to incorporate). It is therefore hazardous to estimate its historical and theological tendencies as a whole, *e.g.*, as compared with Mark, a document actually before us. Moreover, Matthew and Luke each contains single Sayings and Parables which it is difficult not to regard as genuine reminiscences of Jesus, and yet there is no literary reason to suppose that they came from Q, *e.g.*, Luke xi. 5–8, xviii. 1–14; Matt. xiii. 44–52, xx. 1–16. Each of the three synoptic Gospels, therefore, contains an element which must not be neglected: it is simply unscientific to regard Sayings of Jesus labelled "Q" as authentic and those not so labelled as unauthentic.

Nevertheless the arguments which establish the fact of Q remain, and an attractive attempt to restate the problem has been made in B. H. Streeter's *The Four Gospels* (1924). Streeter believes in the fact of Q (his reconstruction is to be found on p. 291 of his book); as used by Matthew and Luke it was a Greek document, current probably at Antioch. But both Matthew and Luke had a special source. In the case of Matthew it seems to come from the tradition of the Christians of Jerusalem (Matt. xxvii. 8, xxviii. 15), mere legend so far as narrative is concerned, but preserving genuine Sayings of Jesus. These legends and Sayings, together with "Q," the Evangelist has worked into his main source, which is Mark, so that the Gospel of Matthew may be described as a "second edition of Mark, revised and enlarged." The place of writing was almost certainly Antioch, and the point of view is not that of the conservative Church of Jerusalem which had James for its leader, but the more liberal and catholicizing Church of Antioch which looked to Peter (Matt. xvi. 18 *seq.*: Streeter, p. 515). Streeter's view of the sources of Luke is more complicated. He sees that the Gospel of Luke is not so much a narrative based on Mark as one into which detached blocks of Mark have been inserted. He supposes, therefore, that the Evangelist had drawn up a narrative based on Q and his own researches, possibly conducted when a companion of St. Paul during his two years' imprisonment at Caesarea (Acts xxiv. 27); this may be represented graphically as Q+L, and is called by Streeter "Proto-Luke." Some years later Luke came across the Gospel of Mark: he saw its value and published a second edition of his former

work, incorporating long sections of Mark into it and at the same time prefixing his story of the Infancy of Jesus. (This is inferred from Luke iii. 1, "surely . . . written as the opening section of a book," p. 209.)

The attraction of this ingenious theory lies in its historical possibility, its explanation of the actual literary phenomena of the Third Gospel and also of the large amount of fresh matter there found, for on this hypothesis the peculiar matter of Luke is the tradition of Caesarea, a distinct centre of the earliest Christianity. But if accepted it shows all the more clearly how little we know of the public career of Jesus, apart from the narrative of Mark. The present writer has compiled a *précis* of the career of Jesus drawn from Luke alone in *Beginnings of Christianity,* vol. ii., p. 486: any one who reads that *précis* or makes a similar one for himself will see the total inadequacy of this framework, and if we withdraw from it the details supplied by Mark it comes to no more than that Jesus first preached in Galilee and then proceeded to Jerusalem. Of the course of His ministry or the train of circumstances that led up to His visit to Jerusalem there is no intelligible picture in "Proto-Luke." (A line of investigation might be pursued, enquiring whether the evidence does not suggest that Q, as known to Luke and Matthew, was itself composite, viz., a set of Sayings, originally in Aramaic, and a Greek set dealing particularly with John the Baptist and his relation to Jesus. It is in sections about John the Baptist that verbal coincidences between Matthew and Luke chiefly occur.)

The Historicity of Mark.—The whole tendency of modern critical investigation has been to emphasize the priority of the Gospel of Mark. The old conception that from earliest times there had been a coherent oral tradition of the career of Jesus, of which the written Gospels are slightly individual embodiments, has dissolved. Investigation into the written Gospels has revealed glimpses of earlier documents such as Q or "Proto-Luke," but they are not "Lives" of Jesus in the sense that Mark *is* a Life of Jesus. As far as we can see it was the writer of "Mark" who turned the Gospel into a Biography. That, in fact, was his great achievement. But in proportion as Mark is regarded as the unique source for the Biography the question of its historical value becomes acute.

History is not a deductive science and there are no generally recognized rules for detecting fact. There are rules for detecting fiction, but that is a different thing altogether. It is not surprising, therefore, that very different views of the value of Mark as an historical document have been put forward in recent times.

There are a few writers who disbelieve altogether in the existence of Jesus as an historical personage, who regard Jesus as a dogma personified. For most people it will suffice to say of this theory with C. G. Montefiore: "Without Jesus, no Mark" (*The Synoptic Gospels,* i. 169). But a good answer at length and from a rationalistic standpoint is to be found in *The Historical Christ,* by F. C. Conybeare (London, 1914). More important is the scepticism about all details exhibited by Loisy in France and by Bultmann in Germany. Prof. R. Bultmann of Marburg is one of the most influential of the younger theologians in Germany; his literary analysis of the sources is to be found in his History of the Synoptic Tradition (1921) and his view of the Gospel Sayings in his "Jesus" (1926). In Bultmann's opinion the Sayings are all that is historical: the tales of Jesus, together with the general framework of the Gospel History, he regards as a product of the missionary needs of early Hellenistic Christianity. Jesus was an eschatological prophet, a herald of the coming kingdom or rule of God: no doubt He was crucified and believed by disciples to have been seen alive again, but that is all we know about Him for certain, according to Bultmann.

The discussion of this radical scepticism belongs to another department of study: it is given prominence here, because it is a characteristic result of the literary criticism of the Gospels, which has ended in tracing the authority for the Gospel narrative to the work of Mark. The present writer is very far from sharing Bultmann's views. When the theological beliefs of the early Christians are considered, their belief in the Lord Jesus over whom death had no power, who was now sitting in heaven at God's right hand and was shortly to come again to judge all mankind, living and dead, it seems difficult to believe that an account of the career of Jesus like that in Mark can be due to anything but somebody's reminiscences, or at least that somebody's reminiscences are an important constituent part of it. Not only the poignant scene in Gethsemane and the cry of despair from the Cross, but many minor touches, such as the tame ending to the Entry into Jerusalem (Mark xi. 11), or the boat that waited on Jesus because of the crowd (Mark iii. 9), betray the eyewitness. What should we think of these things if they had recently for the first time been disinterred from a newly-discovered papyrus?

What is really valuable and edifying in Bultmann's historical scepticism—and the same may be said of Loisy—is that it points out real historical difficulties in the Gospel History, real inconsequences which require a sound historical view if the whole narrative is not to fall to pieces. It may be said with little exaggeration that scholars regard Mark as serious history according as they take Mark vii. 31 to be historical or not, *i.e.,* according as they think it probable that a whole summer and autumn were spent by Jesus practically in retirement outside the land of Israel (*see* K. L. Schmidt, *Rahmen,* p. 200, note). It is not only the "miracles" which require explanation, it is the whole historical situation, and if we have a false idea of that situation or no idea at all, as is more often the case, the tale becomes incoherent and we ask, with Bultmann and Loisy, why we are expected to believe it. "At the same time, the more we study the special aims and tendencies of the Synoptic Evangelists, the greater the gap appears between the theories which they themselves elaborate and the circle of ideas in which the Sayings of Jesus move. Again and again we find ourselves in the presence of something which may or may not be authentic historical reminiscence, but is in any case totally unlike the other remains of early Christian literature. We cannot tell whether the tale be well remembered, or how many steps there may have been in its transmission, but the difference of spirit is unmistakable, and we take knowledge of the Evangelists that they have been with Jesus" (quoted by Montefiore, *The Synoptic Gospels,* vol. i., p. 82).

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6. CHRONOLOGY

The subject of the chronology of the New Testament falls naturally into two distinct sections: the chronology of the Gospels, that is, of the life of Christ; and the chronology of the Acts, that is, of the apostolic age.

The Chronology of the Gospels.—The data group themselves round three definite points and the intervals between them: the definite points are the Nativity, the Baptism and the Crucifixion; the age of Christ at the time of the Baptism connects the first two points, and the duration of his public ministry connects the second and third. The results obtained under the different heads serve mutually to test, and thereby to correct or confirm, one another.

1. The date of the Nativity as fixed according to our common computation of Anno Domini (first put forward by Dionysius Exiguus at Rome early in the 6th century) has long been recognized to be too late. The fathers of the primitive church had been nearer the truth with the years 3 or 2 B.C. (*see* Irenaeus, *Haer.* III. xxi. 3 [xxiv. 2]; Clement of Alexandria, *Strom.* i. 21, p. 147; Hippolytus, *in Dan.* iv. ed. Bonwetsch, p. 242; [Tertullian], *adv. Jud.* 8). What may be called the received chronology during the last two centuries has pushed the date farther back to 4 B.C. But the considerations now to be adduced make it probable that the true date is earlier still.

(*a*) *Evidence of St. Matthew's Gospel* (i. 18–ii. 22).—The birth of Christ took place before the death of Herod, and the evidence of Josephus fixes the death of Herod with some approach to certainty. His various calculations are not indeed quite easy to harmonize, but the extent of choice for the year of Herod's death is limited to the years 4 and 3 B.C., with a very great preponderance of probability in favour of the former. How long before this the Nativity should be placed the Gospel does not enable us to say precisely.

(*b*) *Evidence of St. Luke's Gospel* (ii. 1–8).—The birth of Christ took place at the time of a general census of the empire ordered by Augustus: "it was the first census, and was made at the time when Quirinius was governor of Syria." Against this account it has been urged that we know that the governorship of Syria from 10 or 9 B.C. down to and after Herod's death was held successively by M. Titius, C. Sentius Saturninus, and P. Quintilius Varus; and further, that when Judaea became a Roman province on the deposition of Archelaus in A.D. 6, Quirinius was governor of Syria, and did carry out an elaborate census. The notice in the Gospel, it is suggested, grew out of a confused recollection of this later operation. But the confusion in question would only be likely, if there really was a census at the time of the Nativity; and it is no more improbable that Herod should have held, or permitted to be held, a local census than that Archelaus of Cappadocia in the reign of Tiberius (Tacitus, *Ann.* vi. 41) should have taken a census of his own native state "after the Roman manner." At the same time St. Luke's account, when the name of Quirinius is subtracted from it, ceases to contain any chronological evidence.

(*c*) *Evidence of Tertullian.*—Strangely enough, however, the missing name of the governor under whom the census of the Nativity was carried out appears to be supplied by a much later writer. Tertullian, in fact (*adv. Marc.* iv. 19), argues against Marcion that it was well known that Sentius Saturninus carried out a census under Augustus in Judaea, by consulting which the family and relationships of Christ could have been discovered. This Saturninus was the middle one of the three governors of Syria named above, and as his successor Varus must have arrived by the middle of 6 B.C. at latest (for coins of Varus are extant of the 25th year of the era of Actium), his own tenure must have fallen about 8 and 7 B.C., and his census cannot be placed later than 7 or 7–6 B.C. The independence of Tertullian's information about this census is guaranteed by the mere fact of his knowledge of the governor's name; and if there was a census about that date, it would be unreasonable not to identify it with St. Luke's census of the Nativity.

The traditional Western day for the Christmas festival, Dec. 25, goes back as far as Hippolytus, *loc. cit.*; the traditional Eastern day, Jan. 6, as far as the Basilidian Gnostics (but in their case only as a celebration of the Baptism), mentioned by Clement of Alexandria, *loc. cit.*

2. The interval between the Nativity and the Baptism.

Evidence of St. Luke's Gospel (iii. 23).—At the time of his baptism Jesus was ἀρχόμενος ὡσεὶ ἐτῶν τριάκοντα. But (i.) ἀρχόμενος does not mean (as Valentinian interpreters thought, Iren. ii. xxii. 5 [xxxiii. 3]; so also Epiphanius, *Haer.* li. 16) "beginning to be 30 years" in the sense of "not yet quite 30," but "at the beginning of His ministry," as in Luke xxiii. 5; Acts i. 22, x. 37: (ii.) ὡσεὶ ἐτῶν τριάκοντα does not mean "on attaining the full age of 30, before which he could not have publicly taught," for if there was by Jewish custom or tradition any minimum age for a teacher, it was not 30, but 40 (*Bab. Talm.* ed. 1715, fol. 19 *b*; Iren. *loc. cit.*). St. Luke's phrase is a general one, "about 30 years old."

3. The date of the Baptism.

(*a*) *Evidence of St. Luke's Gospel* (iii. 1).—A *terminus a quo* for the Baptism is the synchronism of the commencement of the Baptist's public ministry with the 15th year of the rule (ἡγεμονία) of Tiberius. Augustus died on Aug. 19, A.D. 14, and, reckoned from that point, Tiberius's 15th year might be, according to different methods of calculation, either A.D. 28, or 28–29 or 29. But any such result would be difficult to reconcile with the results yielded by other lines of investigation in this article; among alternative views the choice seems to lie between the following:— (i.) The years of Tiberius are here reckoned from some earlier starting-point than the death of his predecessor—perhaps from the grant to him of co-ordinate authority with Augustus over the provinces made in A.D. 11 (*see*, for the parallel with the case of Vespasian and Titus, Ramsay, *St. Paul the Roman Traveller*, p. 387), so that the 15th year would be roughly A.D. 25; or (ii.) St. Luke has made here a second error in chronology, caused perhaps in this case by reckoning back from the Crucifixion, and only allowing one year to the ministry of Christ.

(*b*) *Evidence of St. John's Gospel* (ii. 13, 20).—A *terminus ad quem* for the Baptism is the synchronism of the first Passover mentioned after it with the 46th year of the building of Herod's Temple. Herod began the Temple in the 18th year of his reign, probably 20–19 B.C., and the Passover of the 46th year is probably that of A.D. 27. This year suits so well with our other data that, while too much stress must not be laid on it, it is not unreasonable to regard it as one of those curiously accurate details that the Fourth Gospel has preserved.

On the whole, then, the Baptism of Christ may be placed in A.D. 26–27; and as the Nativity was placed in 7–6 B.C. (at latest), this would make the age of Christ at his Baptism to be about 32, which tallies well enough with St. Luke's general estimate.

4. The interval between the Baptism and the Crucifixion, or, in other words, the duration of the public ministry of Christ.

(*a*) *Evidence of St. Mark's Gospel* (ii. 23, vi. 39, xiv. 1).—If the order of events in St. Mark is roughly chronological (as certainly appears to be the case), then Christ's ministry lasted at least two years, since the plucking of the ears of corn (April–June) marks a first spring; the feeding of the 5,000 when the grass was fresh green (χλωρός: about March), a second; and the Passover of the Crucifixion a third.

(*b*) *Evidence of St. Luke's Gospel* (ix. 51–xix. 28 compared with iv. 14–ix. 50; iv. 19).—An impression of a briefer ministry is, however, suggested by St. Luke. The second and larger half of the narrative of the ministry is introduced at ix. 51 with the words, "It came to pass as the days of His assumption were coming to the full, He set His face firmly to go to Jerusalem," under which phrase the evangelist cannot have meant to include more than a few months at most; so that even if the earlier and shorter half of the account, which describes a purely Galilean ministry is to be spread over a longer period of time, the combined narrative can hardly have been planned on the scale of more than a single year. St. Luke himself may have understood literally, like so many of his readers in ancient times, the reference which he records to the "acceptable year of the Lord" (iv. 19= Isaiah lxi. 2): *see*, too, above 3 (*a*) *ad fin.*

(*c*) *Evidence of St. John's Gospel* (ii. 13, "the Passover of the Jews was near," and 23, "He was in Jerusalem at the Passover at the feast"; v. 1, "After these things was a feast [or 'the feast'] of the Jews"; vi. 4, "and the Passover, the feast of the Jews, was near"; vii. 2, "and the feast of the Jews, the Tabernacles, was near"; x. 22, "at that time the feast of dedication took place at Jerusalem"; xi. 55, "and the Passover of the Jews was near"; besides iv. 35, "say ye not that there is yet a period of four months and harvest cometh? Behold, I tell you, lift up your eyes and see the fields that they are white to harvest"). This catena of time-references is of course unique in the Gospels as a basis for a chronology of the ministry; and it is not reasonable to doubt that the evangelist intended these notices as definite historical *data*,

possibly with the express purpose of correcting current but erroneous impressions. Whatever difficulties either of reading or of interpretation have been raised in regard to one or other of these notices, the general conclusion that the fourth evangelist drew up his narrative on the basis of a two years' rather than a one year's ministry appears to be irrefragable.

Not only do the Fourth and Second Gospels thus agree in indications of a two years' ministry, but the notes of the middle spring of the three (John vi. 4; Mark vi. 39) both belong to the feeding of the 5,000, one of the most striking points of actual contact between the two Gospels. And in questions of this sort the evidence of Mark and John quite decisively outweighs the evidence of writers so far less precise in detail as Matthew and Luke.

The question, however, may still be raised, whether these time-indications of the two Gospels are exhaustive, whether (that is) two years, and two years only, are to be allotted to the ministry. Irenaeus (ii. xxii. 3–6 [xxxiii. 1–4]), in favour of a ministry of not less than ten years, appeals (i.) to the tradition of Asia Minor; (ii.) to the record in St. John that Christ, who was 30 years old at the time of His Baptism, was addressed by the Jews as "not yet (*i.e.* nearly) 50 years old": but both his arguments are probably derived from a single source, Papias's interpretation of John viii. 57. With this exception, however, all ancient writers, whether they enumerated two or three or four Passovers in the Gospel history, believed that the enumeration was exhaustive; and their belief appears correctly to represent the mind of the author of the Fourth Gospel. Moreover, the wide currency in early times of the tradition of the single-year ministry (Ptolemaeus *ap.* Iren. *loc. cit.; Clem. Hom.,* xvii. 19; Clem. Alex. *Strom.* i. 145, vi. 279; Julius Africanus, *ap.* Routh, *Rell. Sacr.* ii. 240, 306; Hippolytus, *Paschal Cycle* and *Chron.;* Origen, *in Levit. Hom.* ix. 5, *de Princ.,* iv. 5) becomes perhaps more difficult to account for, the farther it is removed from the actual facts.

5. The date of the Crucifixion.

(*a*) *The Roman Governor.*—Pontius Pilate was on his way back to Rome, after ten years of office, when Tiberius died on March 16, A.D. 37 (Josephus, *Ant.* xviii. ii. 2, iv. 2). For the Crucifixion "under Pontius Pilate" the Passover of A.D. 28 is therefore the earliest possible and the Passover of A.D. 36 the latest. Further, Luke xiii. 1, xxiii. 12, show that he was not quite a newcomer at the time of the Crucifixion.

(*b*) *The Jewish High-Priest.*—Caiaphas was appointed before Pilate's arrival, and was deposed at a Passover apparently not later than that of the year of Herod Philip's death, A.D. 34 (Josephus, *Ant.* xviii. ii. 2, iv. 3–v. 3). The Crucifixion at some previous Passover would then fall not later than the year A.D. 33.

(*c*) *The Day of the Week.*—The Resurrection on "the first day of the week" (Sunday) was "on the third day" after the Crucifixion; and that "the third day" implies an interval of only two days hardly needed to be shown, but has been shown to demonstration in Field's *Notes on the Translation of the New Testament* (on Matt. xvi. 21). The Crucifixion was therefore on a Friday in some year between A.D. 28 and 33 inclusive.

(*d*) *The Day of the Jewish Month Nisan.*—The Passover was kept at the full moon of the lunar month of Nisan, the first of the Jewish ecclesiastical year; the Paschal lambs were slain on the afternoon of the 14th Nisan, and the Passover was eaten after sunset the same day—which, however, as the Jewish day began at sunset, was by their reckoning the early hours of the 15th Nisan; the first fruits (of the barley harvest) were solemnly offered on the 16th. The synoptic Gospels *appear* to place the Crucifixion on the 15th, since they speak of the Last Supper as a Passover;[1] St. John's Gospel, on the other hand (xiii. 1, 29, xviii. 28), distinctly implies that the feast had not yet taken place, and thus makes the Crucifixion fall on the 14th. Early Christian tradition is unanimous on this side; either the 14th is mentioned, or the Crucifixion is made the antitype of the slaughter of the Paschal Lamb (and the Resurrection of the first fruits), in the following authorities anterior to A.D. 235: St. Paul, I. Cor. v. 7, xv. 20; Quartodecimans of Asia Minor, who observed the Christian Pascha on the "14th," no matter on what day of the week it fell; Claudius Apollinaris, Clement of Alexandria, Hippolytus, all three quoted in the *Paschal Chronicle;* Irenaeus (apparently) iv. x. 1 [xx. 1]; [Tertullian] *adv. Jud.,* 8; Africanus, in Routh, *Rell. Sacr.* ii. 297. The Crucifixion, then, should be placed rather on the 14th than on the 15th of Nisan.

These four lines of inquiry have shown that the Crucifixion fell on Friday, Nisan 14 (rather than 15), in one of the six years 28–33 A.D.; and therefore, if it is possible to discover (i.) exactly which moon or month was reckoned each year as the moon or month of Nisan, and (ii.) exactly on what day that particular moon or month was reckoned as beginning, it will, of course, be possible to tell in which of these years Nisan 14 fell on a Friday. To neither question can an answer be given in terms so precise as to exclude some latitude, but to both with sufficient exactness to rule out at once three of the six years. (i.) The difficulty with regard to the month is to know how the commencement of the Jewish year was fixed—in what years an extra month was intercalated before Nisan. If the Paschal full moon was, as in later Christian times, the first after the spring equinox, the difficulty would be reduced to the question on what day the equinox was reckoned. If, on the other hand, it was, as in ancient Jewish times, the first after the earliest ears of the barley harvest would be ripe, it would have varied with the forwardness or backwardness of the season from year to year. (ii.) The difficulty with regard to the day is, quite similarly, to know what precise relation the first day of the Jewish month bore to the astronomical new moon. In later Christian times the Paschal month was calculated from the astronomical new moon; in earlier Jewish times all months were reckoned to begin at the first sunset when the new moon was visible, which in the most favourable circumstances would be some hours, and in the most unfavourable three days, later than the astronomical new moon.

Jewish traditions represented the Sanhedrin as retaining to the end its plenary power over the calendar, and as still fixing the first day of every month and the first month of every year. But as it is quite inconceivable that the Jews of the Dispersion should not have known beforehand at what full moon they were to present themselves at Jerusalem for the Passover, it must be assumed as true in fact, whether or no it was true in theory, that the old empirical methods must have been qualified, at least partially, by permanent, that is in effect by astronomical, rules. The beginning of the Jewish year according to the state of the harvest must have been supplanted by some more fixed relation to the solar year, that is, presumably according to the date of the spring equinox. But if so, the equinox itself must have been put earlier than the Christian reckoning of the 3rd century put it, since Christian controversialists from Anatolius of Laodicea (A.D. 277) onwards accused the Jews of disregarding the equinoctial limit, and of sometimes placing the Paschal full moon before it. Therefore we must allow for the possibility that in the time of Christ the 14th of Nisan might have fallen as far back as, say, March 17. In the following table the first column gives the *terminus paschalis,* or 14th of the Paschal moon, according to the Christian calendar; the second gives the 14th, reckoned from the time of the astronomical new moon of Nisan; the third the 14th, reckoned from the probable first appearance of the new moon at sunset. Alternative moons are given for A.D. 29, according as the full moon falling about March 18 is or is not reckoned the proper Paschal moon.

A.D. 28	Sat.	Mar. 27	Mar. 28	Mar. 30
" 29	Th.	Mar. 17	Mar. 17	Mar. 19
	F.	Apr. 15	Apr. 16	Apr. 18
" 30	Tu.	Apr. 4	Apr. 5	Apr. 7
" 31	Sat.	Mar. 24	Mar. 25	Mar. 27
" 32	Sat.	Apr. 12	Apr. 12	Apr. 14
" 33	W.	Apr. 1	Apr. 1–2	Apr. 3 or 4

[1] If the Passover celebration could be anticipated by one day in a private Jewish family (and we know perhaps too little of Jewish rules in the time of Christ to be able to exclude this possibility), the evidence of the synoptic Gospels would no longer conflict with that of St. John. In any case Christians in the Apostolic Age can hardly have kept the evening of the anniversary of the Crucifixion as a feast.

It will be seen at once that Friday cannot have fallen on Nisan 14th in any of the three years A.D. 28, 31 and 32. The choice is narrowed down to A.D. 29, Friday, March 18 (Friday, April 15 would no doubt be too early even for the 14th of Nisan); A.D. 30, Friday, April 7; and A.D. 33, Friday, April 3.

(*e*) *The Civil Year* (consuls, or regnal years of Tiberius) in early Christian tradition. It is not *a priori* improbable that the year of the central event from which the Christian Church dated her own existence should have been noted in the apostolic age and handed down to the memory of succeeding generations; and the evidence does go a little way to suggest that we have in favour of A.D. 29, the consulate of the two Gemini, a body of tradition not derived from the Gospels.

The consulship of the two Gemini is given by Lactantius, *Div. Inst.* IV. x. 18, and (Lactantius?) *de morte pers.* § 2; the consulship of the two Gemini=Tiberius 18 by Hippolytus, *Comm. in Danielem,* iv. (ed. Bonwetsch, p. 242); the consulship of the two Gemini=Tiberius 15 by [Tertullian] *adv. Judaeos,* 8; the consulship of the two Gemini=Tiberius 15 (*al.* 18 or 19)=Ol. 202.4 (this last is a later interpolation from Eusebius) in the *Acts of Pilate.* Other methods of expressing the year 29 appear in Hippolytus's *Paschal Cycle* and *Chronicle,* and in the Abgar legend (*ap.* Eusebius, *H.E.* i. 13). Tiberius 15 is given by Clem. Alex. *Strom.* i. 147; Origen, *Hom. in Jerem.* xiv. 13, *cf. c. Cels.* iv. 22: Tiberius 16 by Julius Africanus (Routh, *Rell. Sacr.* ii. 301–304), and pseudo-Cyprian *de pascha computus* (A.D. 243), 20. The date by the consuls has an independent look about it; it was apparently well established by about A.D. 200, and it is just possible that it had been handed down in early Christian circles independently of the Gospels.

(*f*) *The Civil Month and Day.*—The earliest known calculations, by Basilidian Gnostics, quoted in Clem. Alex. *Strom.* i. 147, gave alternative dates, Phamenoth 25, Pharmuthi 25, Pharmuthi 19; that is, according to the fixed Alexandrian calendar of 26 B.C., March 21, April 20, April 14. But to look for genuine traditions among Egyptian Gnostics, or even in the church of Alexandria, would be to misread the history of Christianity in the 2nd century. Such traditions must be found, if anywhere, in Palestine and Syria, in Asia Minor, in Rome, not in Egypt; within the Church, not among the Gnostics. The date which makes the most obvious claim to satisfy these conditions would be March 25, as given by Hippolytus, (Tert.) *adv. Judaeos,* and the *Acts of Pilate* (according to all extant mss. and versions, but *see* below), *locc. citt.*—the same three authorities who bear the earliest witness for the consuls of the year of the Crucifixion—and by many later writers. It cannot be correct, since no full moon occurs near it in any of the possible years; yet it must be very early, too early to be explained with Dr. Salmon (*Dictionary of Christian Biography,* iii. 92*b*), as originated by Hippolytus's Paschal cycle of A.D. 221. Now Epiphanius (*Haer.* l. 1) had seen copies of the *Acts of Pilate* in which the day given was not March 25, but *a.d. xv. kal. Apr.* (=March 18); and if this was the primitive form of the tradition, it is easy to see how March 25 could have grown out of it, since the 18th from comparatively early times, in the East at any rate, would have been thought impossible as falling before the equinox, and no substitution would be so natural as that of the day week, March 25. But March 18, A.D. 29 was one of the three alternative dates for the Crucifixion which on astronomical and calendar grounds were found (*see* above, 5*d*) to be possible.

Thus A.D. 29 is the year, March 18 is the day, to which Christian tradition (whatever value, whether much or little, be ascribed to it) appears to point. Further, the Baptism was tentatively placed in A.D. 26–27; the length of the ministry was fixed, with some approach to certainty, at between two and three years, and here too the resultant date for the Crucifixion would be the Passover of A.D. 29.

To sum up: the various dates and intervals, to the approximate determination of which this article has been devoted, do not claim separately more than a tentative and probable value. Perhaps their harmony and convergence give them some additional claim to acceptance, and at any rate do something to secure each one of them singly—the Nativity in 7–6 B.C., the Baptism in A.D. 26–27, the Crucifixion in A.D. 29—from being to any wide extent in error.

The Chronology of the Apostolic Age.—The chronology of the New Testament outside the Gospels may be defined for the purposes of this article as that of the period between the Crucifixion in A.D. 29 (30) on the one hand, and on the other the persecution of Nero in A.D. 64 and the fall of Jerusalem in A.D. 70. Now the book of Acts, our only continuous authority for the period, contains three synchronisms with secular history which can be dated with some pretence to exactness, and constitute fixed points by help of which a more or less complete chronology can be constructed for at least the latter half of the apostolic age. These are the death of Herod Agrippa I. (xii. 23), the proconsulship of Gallio (xviii. 12), and the replacement of Felix by Festus (xxiv. 27).

1. The death of Herod Agrippa I. This prince, son of Aristobulus and grandson of Herod the Great, was made (i.) king over the tetrarchy which had been Herod Philip's, "not many days" after the accession of Gaius, March 16, A.D. 37; (ii.) ruler of the tetrarchy of Antipas, in A.D. 39–40; (iii.) ruler of the whole of Palestine (with Abilene) on the accession of Claudius at the beginning of A.D. 41. Josephus's *Jewish Wars* and *Antiquities* agree in the important *datum* that he reigned three years more after the grant from Claudius, which would make the latest limit of his death the spring of A.D. 44. The *Antiquities* also place his death in the seventh year of his reign, which would be A.D. 43–44. On the other hand, coins whose genuineness there is no apparent reason to doubt are extant of Agrippa's ninth year; and this can only be reconciled even with A.D. 44 by supposing that he commenced reckoning a second year of his reign on Nisan 1 A.D. 37, so that his ninth would run from Nisan 1, A.D. 44. On the balance of evidence the only year which can possibly reconcile all the data appears to be A.D. 44 after Nisan, so that it will have been at the Passover of that year that St. Peter's arrest took place.

After Agrippa's death Judaea was once more governed by procurators, of whom Cuspius Fadus and Tiberius Alexander ruled from A.D. 44 to 48; the third, Cumanus, was appointed in A.D. 48; and the fourth, Felix, in A.D. 52. Under Tiberius Alexander, *i.e.* in A.D. 46 or 47, occurred the great famine when the Antiochene church sent help to that of Jerusalem by the ministry of Barnabas and Saul (Acts xi. 30, xii. 25). Thus the earliest date at which the commencement of the first missionary journey (Acts xiii. 4) can be placed is the spring of A.D. 47. The journey extended from Salamis "throughout the whole island" of Cyprus, and on the mainland from Pamphylia to Pisidian Antioch, Iconium, Lystra and Derbe, at each of which places indications are given of a prolonged visit (xiii. 49, xiv. 3, 6, 7, 21). The same places were visited in reverse order on the return journey. Now it must be remembered that a sea voyage could never have been undertaken, and land travel only rarely, during the winter months, say November to March; and as the amount of work accomplished is obviously more than could fall within the travelling season of a single year, the winter of 47–48 must have been spent in the interior, and return to the coast and to Syria made only some time before the end of autumn A.D. 48. The succeeding winter, at least, was spent again at Antioch of Syria (xiv. 28). The council at Jerusalem of Acts xv. will fall at earliest in the spring of A.D. 49, and as only "certain days" were spent at Antioch after it (xv. 36) the start on the second missionary journey might have been made in the summer of the same year. The "confirmation" of the existing churches of Syria and Cilicia, and of those of the first journey beginning with Derbe (xv. 41, xvi. 5), cannot have been completed under several months, nor would the Apostle have commenced the strictly missionary part of the journey, in districts not previously visited, before the opening of the travelling season of A.D. 50. No delay was then made on the Asiatic side: it may still have been in spring when St. Paul crossed to Europe and began the course of preaching at Philippi, Thessalonica, Beroea and Athens which finally brought him to Corinth. The stay of eighteen months at the last-named place (xviii. 11)

will naturally begin at the end of one travelling season and end at the beginning of another, *i.e.* from the autumn of A.D. 50 to the spring of A.D. 52. From Corinth the Apostle went to Jerusalem to "salute the church," and then again to Antioch in Syria, where he stayed only for "a time" (xviii. 22), and soon left (on the third missionary journey, as conventionally reckoned), proceeding "in order" through the churches of the interior of Asia Minor. These journeys and the intervening halts must have occupied seven or eight months at least, and it must have been towards the end of the year when St. Paul established his new headquarters at Ephesus. The stay there lasted between two and three years (xix. 8, 10, xx. 31), and cannot have terminated before the spring of A.D. 55. From Ephesus he went into Europe, and after "much teaching" given to the churches of Macedonia (xx. 2), spent the three winter months at Corinth, returning to Philippi in time for the Passover (xx. 3, 6) of A.D. 56. Pentecost of the same year was spent at Jerusalem, and there St. Paul was arrested, and kept in prison at Caesarea for two full years, until Festus succeeded Felix as governor (xx. 16, xxiv. 27), an event which, on this arrangement of the chronology of the missionary journeys, would therefore fall in A.D. 58.

So far it has been shown, firstly, that the missionary journeys cannot have commenced before the spring of A.D. 47, and secondly, that between their commencement and the end of the two years' imprisonment at Caesarea not less than 11 full years must have elapsed. Consequently A.D. 58 appears to be the earliest date possible for the arrival of Festus, though a later date is not absolutely excluded. It is possible also that the first missionary journey should be placed in A.D. 48 instead of A.D. 47; so that the alternative is open that every date given above, from A.D. 47 to A.D. 58, should be moved on one year, with the result of placing Festus's arrival in A.D. 59.

It is now time to turn to the direct evidence for the dates of Gallio's proconsulship and of Festus's arrival as procurator, in order to test by them the result already tentatively obtained.

2. In a fragmentary inscription found recently at Delphi occur the words "in Gallio's proconsulship" and the words "Claudius being Imperator for the 26th time." We know from other sources that Claudius was Imp. XXIII. and XXIV. some time in 51, and Imp. XXVII. not later than Aug. 1, 52. He may therefore have become Imp. XXVI. some time in the first half of 52: but as the proconsul's year of office ran from May to May, the *data* still leave it open whether the proconsulship is to be placed between May, 51 and May, 52, or between May, 52 and May, 53, with some probability in favour of the former alternative. In other words, the inscription tallies very well with the date given above for St. Paul's appearance before Gallio, spring of 52, but is reconcilable at a pinch with a date one year later, spring of 53.

3. The replacement of Felix by Festus. This is the pivot date of St. Paul's later life, but unfortunately two schools of critics date it as differently as A.D. 55 and A.D. 60 (or 61). The former are represented by Harnack, the latter by Wieseler, whom Lightfoot follows. It can be said confidently that the truth is between these two extremes, for the arguments urged in each case appear less to prove one extreme than to disprove its opposite.

Arguments for the Later Date, A.D. 60 or 61.—(*a*) St. Paul, at the time of his arrest, two years before Felix's recall addresses him as "for many years past a judge for this nation" (Acts xxiv. 10, 27). It is certain that Felix succeeded Cumanus in A.D. 52, for Tacitus mentions Cumanus's recall under that year, Josephus immediately before the notice of the completion of Claudius's twelfth year (Jan. A.D. 53). It is argued that "many years" cannot mean less than six or seven, so that St. Paul must have been speaking at earliest in 58 or 59, and Felix will have left Judaea at earliest in 60 or 61. But Felix was at the time of his appointment *iampridem Iudaeae impositus* (Tacitus, *Annals*, xii. 54); and even Josephus implies that Felix had been in some position where the Jewish authorities could judge of his fitness when he tells us that the high priest Jonathan used to press on Felix, as a reason for urging him to govern well, the fact that he had asked for his appointment to the procuratorship (*Ant.* XX. viii. 5). If Felix had acted in some position of responsibility in Palestine before 52 (perhaps for some time before), St. Paul could well have spoken of "many years" at least as early as the year A.D. 56.

(*β*) Josephus enumerates after the accession of Nero (Oct. 54) a long catalogue of events which all took place under the procuratorship of Felix, including the revolt of "the Egyptian" which was already "before these days" at the time of St. Paul's arrest, two years from the end of Felix's tenure. This suggests, no doubt, that the Egyptian rebelled at earliest in 54–55, and makes it probable that St. Paul's arrest did not take place before (the Pentecost of) A.D. 56; and it implies certainly that the main or most important part of Felix's governorship fell, in Josephus's view, under Nero. But as two years only of Felix's rule (52–54) fell under Claudius, this procedure would be quite natural on Josephus's part if his recall were dated in 58, so that two-thirds of his office fell under Nero.

The arguments, then, brought forward in favour of A.D. 60 or 61 do not do more than bring the recall of Felix down to 58 or 59.

Arguments for an Early Date, A.D. 55 or 56.—(*a*) Eusebius's *Chronicle* places the arrival of Festus in Nero 2, Oct. 55–56. But (i.) Nero 2 is really, on the system of regnal years employed by Eusebius, Sept. 56–Sept. 57, (ii.) it is doubtful whether Eusebius had any authority to depend on here other than Josephus, who gives no precise year for Festus—and if so, Eusebius had to fix the year as best he could.

(*β*) Felix, on his return to Rome, was prosecuted by the Jews for misgovernment, but was acquitted through the influence of his brother Pallas. Pallas had been minister and favourite of Claudius, but was removed from office in the winter following Nero's accession, 54–55: Felix must therefore have been tried at the very beginning of Nero's reign. But it would be a mistake to look upon Pallas's retirement as a disgrace. He stipulated that no inquiry should be made into his conduct in office, and was left for another seven years unmolested in the enjoyment of the fortune he had amassed. There is, therefore, every likelihood that he retained for some years enough influence to shield his brother.

Of these arguments, then, the first, so far as it is valid, is an argument for the summer, not of A.D. 55 or 56, but of A.D. 57 as that of the recall, while the second will apply to any of the earlier years of Nero's reign.

In the result, then, the point that Josephus catalogues the events of Felix's procuratorship under Nero cannot be pressed to bring down Felix's tenure as far as 60 or 61, but it does seem to exclude as early a termination as 56, or even 57. Conversely, the influence of Pallas at court need not be terminated by his ceasing to be minister early in 55; but it would have been overshadowed later on by the influence of Poppaea, who in the summer of the year 60 enabled the Jews to win their cause in the matter of the Temple wall, and would certainly have supported them against Felix.

The balance of the two lines of argument suggests the year 58 for the recall of Felix and arrival of Festus.

If St. Paul was arrested in 56, and appealed to Caesar on the arrival of Festus in 58, then, as he reached Rome in the early part of the year following, and remained there a prisoner for two full years, we are brought down to the early spring of 61 for the close of the period recorded in the Acts. That after these two years he was released and visited Spain in the west, and in the east Ephesus, Macedonia, Crete, Troas, Miletus and perhaps Achaea and Epirus, is probable, in the one case, from the evidence of Romans xv. 28, Clem. *ad Cor.* v. and the Muratorian canon, and, in the other, from the Pastoral Epistles. These journeys certainly cannot have occupied less than two years, and it is more natural to allow three for them, which takes us down to 64.

Early evidence is unanimous in pointing to St. Peter and St. Paul as victims of the persecution of Nero, and tradition clearly distinguished the fierce outbreak at Rome that followed on the fire of the city in July 64 from any permanent disabilities of the Christians in the eye of the law which the persecution may have initiated. There is, therefore, no reason at all to doubt that both apostles were martyred in 64–65, and the date serves as a confirmation of the chronology adopted above of the imprisonment, release and subsequent journeys of St. Paul.

Investigation, then, of that part of the book of Acts which follows the death of Agrippa, recorded in chap. xii.—*i.e.*, of that part of the apostolic age which follows the year 44—has shown that apparent difficulties can be to a large extent set aside, and that there is nowhere room between A.D. 44 and 64 for doubt extending to more than a single year.

But if the events of A.D. 44–64 can thus be fixed with a fair approximation to certainty, it is otherwise with the events of A.D. 29–44. Here we are dependent (i.) on the general indications given in the Acts, but these general indications can at best only lead to general conclusions. The most that we can say is that the first half of the book, down to xii. 24, covers the period from the Crucifixion to the death of Herod, A.D. 29–44, and that it is divided into three sections by the general summaries of vi. 7, ix. 31, xii. 24, just as the later half of the book is similarly divided at xvi. 5, xix. 20, xxviii. 31. But though these divisions are probably intended to be in a rough sense chronologically equal divisions, it is obvious that this rough equality cannot be pressed in detail.

(ii.) A nearer attempt to date at least the chronology of St. Paul's earlier years as a Christian could be made by the help of the Galatian Epistle if we could be sure from what point and to what point its reckonings are made. The apostle tells us that on his conversion he retired from Damascus into Arabia, and thence returned to Damascus; then after three years (from his conversion) he went up to Jerusalem, but stayed only a fortnight, and went to the regions of Syria and Cilicia. Then after 14 years (from his conversion? or from his last visit?) he went up to Jerusalem again to confer with the elder apostles. Most critics are now agreed that the 14 years are to be calculated from the conversion; and an increasing number of critics is coming round to the view that the two visits to Jerusalem are those recorded in Acts ix. 26 and xi. 30. If so, the epistle was written before, but apparently only just before, the Council of Acts xv., or in other words in the early months of A.D. 49. The 14 years reckoned back from the famine visit (*c.* A.D. 46) would bring us to A.D. 33 as the latest possible date for the conversion.

BIBLIOGRAPHY.—Ideler, *Handbuch der mathematischen und technischen Chronologie* (1825); Wieseler, *Chronologie des apostolischen Zeitalters* (1848); Lewin's *Fasti Sacri* (1865); Prof. (Sir) W. M. Ramsay's various works; Harnack's *Chronologie der altchristlichen Literatur bis Eusebius*, i. 233–244 (1897); J. K. Fotheringham, "The Date of the Crucifixion," in *Journal of Philology*, xxix., 100–118 (1904); Hastings' *Dict. of the Bible*, i. (1898) 403–424. (C. H. Tu.)

BIBLE, ENGLISH. The history of the vernacular Bible of the English race resolves itself into two distinctly marked periods, the one being that of Manuscript Bibles, which were secondary translations from the Latin Vulgate, the other that of Printed Bibles, which were, more or less completely, translations from the original Hebrew and Greek of the Old and New Testaments.

I. THE MANUSCRIPT BIBLE

The first essays in Biblical translation, or rather paraphrasing, assumed in English, as in many other languages, a poetical form. Even in the 7th century, according to the testimony of Bede (*Hist. Eccl.* iv. 24) Caedmon sang "of the creation of the world and the origin of man, and . . . of many other stories from Holy Writ." It is, however, doubtful whether more than the following lines can claim to be regarded as his genuine work:

Nu scylun hergan hefaenricaes uard,
Now we must praise of the heavenly kingdom the guardian,
Metudaes maecti end his modgidanc,
Of the maker the might and his heart-thought,
uerc uuldurfadur; sue he uundra gihuaes
the work of the father of glory; even as he of wonders each
eci Dryctin, or astelidae.
the eternal Lord, the beginning established.
He aerist scop aelda barnum
He first created for mankind's children
heben til hrofe, haleg scepen.
heaven as a roof, the holy creator.
Tha middungeard, moncynnes uard,
Then the middle-world, of mankind the guardian,
eci Dryctin, aefter liadae
the eternal Lord, afterwards established
firum foldu, frea allmectig.
for men the world, the lord almighty.

(Moore ms. of *Hist. Eccl.*, *c.* 737).

The first prose rendering of any part of the Bible—and with these we are mainly concerned in the present enquiry—originated in all probability in the 8th century, when Bede, the eminent scholar and churchman, translated chapters i.–vi. 9 of the Gospel of St. John into the vernacular, but no part of this rendering is extant. (*Hist. Eccl.* l., lxxv., ed. Plummer.)

Ninth and Tenth Centuries.—The 9th century is characterized by *interlinear glosses on the book of Psalms*, and towards its close by a few attempts at independent translation. Of these Psalters, glossing either the Roman or Gallican text, the oldest and most important is the so-called *Vespasian Psalter*, which was written in Mercia some time during the course of the first half of the 9th century (H. Sweet, *Oldest Engl. Texts*, E.E.T.S., No. 83, London, 1885).

To the late 9th or early 10th century a work may be assigned which is so far an advance upon preceding efforts as to be a real translation, not a mere gloss corresponding word for word with the Latin original. This is the famous *Paris Psalter*, a rendering of the first 50 Psalms (Vulg. i.–L. 10), contained in the unique ms. *lat.* 8824 in the Bibl. Nationale, Paris. The authorship of the version is doubtful, though tradition associates its name with King Alfred (ed. B. Thorpe, Oxford, 1835; J. D. Bruce, Baltimore, 1894). The first two verses of Psalm I. may serve as a specimen of the translation.

I. (1) Eadig by se wer þe ne gaeð on ge þeaht
Blessed shall be the man who not walketh in the counsel
unrihtwisra, ne on þam wege ne stent synfulra,
of the unrighteous, nor in the way not standeth of the sinful,
ne on heora wolbaerendum setle ne sitt.
nor in their pestilential seat not sitteth.
(2) Ac his willa byð on Godes ae, and ymb his ae
But his will shall be in God's law, and about his law
byð smeagende daeges and nihtes.
he shall be meditating by day and night.

In the course of the 10th century the Gospels were glossed and translated. The earliest in date is a *Northumbrian Gloss on the Gospels*, contained in a beautiful and highly interesting ms. variously known as the *Lindisfarne Gospels*, the *Durham Book* or the *Book of St. Cuthbert* (ms. Cotton, Nero D. 4, ed. W. W. Skeat, Cambridge, 1871–87). The Latin text dates from the close of the 7th century, and is the work of Eadfrith, bishop of Lindisfarne (698–721). The English gloss was added about a century and a half later (*c.* 950) by one Aldred, who is held to have been the bishop of Durham of that name. The Lord's Prayer is glossed in the following way:—

Matthew vi. (9) Suae ðonne iuih gie bidde fader urer ðu arð
Sic ergo uos orabitis +Pater noster qui és
ðu bist in heofnum in heofnas; sie gehalgad noma ðin; (10) to-cymeð
in caelis; sanctificetur nomen tuum; adueniat
rïc ðin, sie willo ðin suae is in heofne ȝ in eorðo. (11) hlaf
regnum tuum, fiat uoluntas tua sicut in caelo et interra. panem
userne oferwistlic sel ús to daeg. (12) ȝ forgef us scylda
nostrum super-substantiale[m] dá nobis hodie. et demitte nobis debita
usra suae uoe forgefon scyldgum usum. (13) ȝ ne inlaed usih
nostra sicut nos dimittimus debitoribus nostris. et ne inducas nos
in costunge ah gefrig usich from yfle.
in tentationem sed libera nos a malo.

Of a somewhat later date is the celebrated *Rushworth Version of the Gospels* (ms. Bodl. Auct. D. ii. 9, ed. W. W. Skeat, *op. cit.*), which contains an independent translation of the Gospel of St. Matthew, and a gloss on those of St. Mark, St. Luke and St. John, founded upon the Lindisfarne glosses. From a note in the manuscript we learn that two men, Faerman and Owun, made the version. Faerman, a priest at Harewood or Harwood in Yorkshire, translated the whole of St. Matthew, and wrote the gloss of St. Mark i.–ii. 15, and St. John xviii. 1–3. The remaining part, a mere transcript, is Owun's work. The dialect of the translation of St. Matthew is Mercian.

A further testimony to the activity which prevailed in the field of Biblical lore is the fact that at the close of the century—probably about the year 1000—the Gospels were rendered anew for the first time in the south of England. Of this version, the so-called *West Saxon Gospels* (ed. W. W. Skeat, *op. cit*), not less than seven manuscripts have come down to us. A note in one of these mss., Corp. Christ. coll., Cambridge, 140, states that "Aelfric wrote this book in the monastery of Bath," but of this Aelfric nothing further is known. The Lord's Prayer is rendered in the following way in these Southern Gospels:—

Matt. vi. (9) Eornustlice gebiddaþ eow ðus; Faeder úre þu þe eart on heofonum; si þin nama gehalgod, (10) to-becume þin rice; gewurþe ðin willa on eorðan swa on heofonum. (11) úrne gedaeghwamlican hlaf syle us to daeg. (12) forgyf us úre gyltas swa swa wé forgyfaþ úrum gyltendum. (13) ne gelaéd þu us on costnunge ac alys us of yfele soþlice.

Towards the close of the century parts of the Old Testament found a translator or rather paraphraser in *Aelfric* (*q.v.*), the eminent scholar and churchman. According to his own statement in *De vetere Testamento* (ed. Grein-Wülker, *Bibl. d. Ags. Prosa,* I., Cassel-Göttingen, 1872), written about 1010, he had at that period translated the Pentateuch, Joshua, Judges, Kings, Job, Esther, Judith and the Maccabees. His rendering is clear and idiomatic, and though he frequently paraphrases and abridges, the omissions never obscure the meaning or hinder the easy flow of the narrative.

Eleventh and Twelfth Centuries.—The 11th century with its political convulsions, resulting in the establishment of an alien rule and the partial suppression of the language of the conquered race, was unfavourable to literary efforts of any kind in the vernacular. With the exception of Aelfric's late works at the very dawn of the century, we can only record two transcripts of the West-Saxon gospels as coming at all within the scope of our enquiry. In the 12th century the same gospels were again copied by pious hands into the Kentish dialect of the period.

Anglo-Norman Period.—The 13th century, from the point of view of Biblical renderings into the vernacular, is an absolute blank. French—or rather the Anglo-Norman dialect of the period—reigned supreme. There were certainly renderings of the Bible during the 12th, 13th and early 14th centuries, but they were all in French. Some of these translations were made in England, some were brought over to England and copied and recopied. Amongst the latter was the magnificently illuminated and widely spread *Norman Commentary on the Apocalypse,* some of the earliest copies of which were written in an English hand. In fact, before the middle of the 14th century the entire Old Testament and the greater part of the New Testament had been translated into the Anglo-Norman dialect of the period (mss. *Bibl. Nat. fr.* l. 9562; *Brit. Mus. Reg.* I. C. III., *cf.* S. Berger, *La Bible française au moyen âge,* Paris, 1884, pp. 78 ff.).

When English finally emerged victorious towards the middle and latter half of the 14th century, it was for all practical purposes a new language, largely intermixed with French, differing from the language of the older period in sound, flexion and structure. It is evident that any Old English versions which might have survived the ravages of time would now be unintelligible; it was equally natural that as soon as French came to be looked upon as an alien tongue, the French versions hitherto in use would fail to fulfil their purpose, and that attempts should be made to render the Bible into the only language intelligible to the greater part of the nation—English.

Fourteenth Century.—As in the early Anglo-Saxon period Northumbria was the *lux mundi* and starting point of Biblical translations, so the north Midlands and the north were the first to turn their attention to Biblical lore after the great national revival of the 14th century. The earliest of these is possibly the *Midland Psalter,* once erroneously ascribed to William of Shoreham (ed. K. D. Bülbring, E.E.T.S., No. 97, London, 1891). It occurs in three mss., the earliest of which (Brit. Mus. Add. 17376), was probably written between 1340 and 1350. It contains a complete version of the book of Psalms, followed by 11 Canticles and the Athanasian Creed. The Latin original is a glossed version of the Vulgate. In the English translation, however, the words of the gloss are often substituted for the strong and picturesque expressions of the Biblical text; in other respects the rendering is faithful and idiomatic.

The following two verses of the first Psalm may exemplify this:—

Ms. Brit. Mus. Add. 17376

I. (1) *Beatus uir, qui non abijt in consilio impiorum, et in uia peccatorum non stetit, et in cathedra ·i· iudicio pestilencie ·i· falsitatis non sedit.* Blessed be þe man þat ȝede nouȝt in þe counseil of wicked, ne stode nouȝt in þe waie of sinȝeres, ne sat nouȝt in fals iugement.

(2) *Sed in lege domini uoluntas eius, et in lege eius meditabitur die ac nocte.* Ac hijs wylle was in the wylle of oure Lord, and he schal þenche in hijs lawe boþe daye and nyȝt.

Before the middle of the century Richard Rolle of Hampole (*q.v.*), the Yorkshire hermit, had translated the *Psalter* anew and provided it with a *Commentary* (ed. H. R. Bramley, Oxford, 1884). The work was undertaken, as the metrical prologue of one of the copies tells us (ms. Laud Misc. 286), "At a werthy recluse prayer, cald dame Merget Kyrkby." The commentary, written in the northern dialect of the author's Yorkshire home, gained immediate and lasting popularity and spread in numerous copies throughout the country, the peculiarities of the hermit's harsh and vigorous speech being either modified or wholly removed in the more southerly transcripts. The translation, however, is stiff and literal to a fault, violating idiomatic usage and the proper order of words in its slavish adherence to the Latin. The following extracts may exemplify the hermit's rendering and the change the text underwent in later copies:—

Ms. Univ. Coll. Oxford. 64

I. (1) Blisful man þe whilk oway ȝed noght in þe counsaile of wicked, and in þe way of synful stode noght, & in þe chaiere of pestilens he noght sate. (2) Bot in laghe of lord þe will of him; and in his laghe he sall thynke day & nyght.

Ms. Brit. Mus. Reg. 18.B. 21

I. (1) Blessed is þat man þat haþ not gone in þe counsell of wicked men, and in þe weye of sinfull men haþ not stonde, and in þe chaire of pestilence sat not. (2) But in þe lawe of our lorde is þe wille of him; and [in] his lawe we shall þinke day and nyght.

Approximately to the same period as these early renderings of the Psalter belongs a version of the *Apocalypse with a Commentary,* the earliest ms. of which (Brit. Mus. Harl. 874) is written in the dialect of the north Midlands. This commentary, for a long time attributed to Wycliffe, is really nothing but a verbal rendering of the popular and widely spread Norman Commentary of the Apocalypse (Meyer and Delisle, *L'Apocalypse en Français au XIIIe siècle,* Paris, 1901), which dates back as far as the first half of the 13th century, and in its general tenor represents the height of orthodoxy.

To the north Midlands or the north belongs further a complete version of the *Pauline Epistles* found in the unique ms. 32, Corp. Christ. coll., Cambridge, of the 15th century (ed. M. J. Powell, E.E.T.S., 1916).

Commentaries on the Gospels of St. Matthew, St. Mark and St. Luke were also translated into English by "a man of the north cuntre."

A version of the *Acts and the Catholic Epistles* (ed. A. C. Paues, *A Fourteenth Century Biblical Version,* Cambridge, 1904) completes the number of New Testament books translated in the northern parts of England. It is found in several mss. either separately or in conjunction with a fragmentary *Southern Version of the Pauline Epistles, Peter, James and I. John* in a curiously compiled volume, evidently made, as the prologue tells us, by a "brother" for the use and edification of an ignorant "sister" or woman vowed to religion (ed. A. C. Paues, *op. cit.*). The translation of this, our only southern text, surpasses all previous efforts from the point of view of clearness of expression and idiomatic use of English, and, though less exact, it may even be said in these respects to rank equal with the Later or Revised Wycliffite version.

Apart from these more or less complete versions of separate books of the Bible, there existed also numerous renderings of the Lord's Prayer, the Ten Commandments, Gospel Harmonies (*e.g.*, M. Goates, *The Pepysian Gospel Harmony,* E.E.T.S., Oa. Serv. 157, 1922), translations of the epistles and gospels used in divine

service, and other means of familiarizing the people with Holy Scripture.

The Wycliffe Versions.—It is noteworthy that these early versions from Anglo-Saxon times onwards were perfectly orthodox, executed by and for good and faithful sons of the Church. It is first with the appearance of Wycliffe (*q.v.*) and his followers that the Bible in English came to be looked upon with suspicion by the orthodox party within the Church. For had not Wycliffe the hardihood of proclaiming the Bible, not the Church or Catholic tradition, as man's supreme spiritual authority? Did he not seek in consequence by every means in his power to spread the knowledge of "Goddes lawe" among the people? It is, therefore, in all likelihood to the zeal of Wycliffe and his circle of friends and adherents that we owe the two noble 14th-century translations of the Bible which tradition has always associated with his name, and which are moreover the *earliest complete* renderings that we possess of the Holy Scriptures in English (ed. Madden and Forshall, Oxford, 1850).

The first of these, the so-called *Early Version,* was certainly in the making about 1382; the second, or *Later Version,* was probably finished by the time its "General Prologue" was written "between February 1395 and February 1397." (*See* M. Deanesly, *The Lollard Bible,* Cambridge, 1920, p. 258.)

It is a matter of uncertainty what part, if any, Wycliffe himself took in the work. He is, however, definitely connected with the *Early Version* through the name of Nicholas of Hereford, one of his early and prominent adherents. For, miraculously, the translator's original copy and a coeval transcript of it are still extant in the Bodleian Library, Oxford (Bodl. 959, Douce 369). Both break off abruptly at Baruch iii. 19, the latter having at this place a note inserted to the following effect: *Explicit translacionem Nicholay de herford.* In view of the magnitude of the undertaking there must have been a whole circle of translators, but no other name is recorded in connection with this noble work.

The Early Version, apart from its completeness, shows but little advance upon preceding efforts. The translation of the Old Testament as far as Baruch iii. 19 is stiff and awkward, sometimes unintelligible from a too close adherence to the Latin text; in the remaining parts the rendering is somewhat easier and more skilful, though even here Latinisms and un-English phrases abound.

It is small wonder, therefore, if a revision was soon found necessary and actually taken in hand within a few years of the completion of the Earlier Version. John Purvey, the eminent scholar and leader of the Lollard party after Wycliffe's death in 1384, is generally assumed to have taken a prominent part in this undertaking, and to have written the "General Prologue" where the principles of work adopted by the revisers have been clearly and forcibly laid down.

This Revised or Later Version is in every way a readable, correct rendering of the scriptures. It is far more idiomatic than the Earlier, having been freed from the greater number of its Latinisms; its vocabulary is less archaic. Its popularity admits of no doubt, for even now in spite of faggots and burning, in spite of the ravages of time and neglect, over 150 copies remain to testify to this fact. The following specimens may afford comparisons with previous renderings:—

Early Version	*Late Version*
Psalm I. (1) Blisful the man, that went not awei in the counseil of vnpitouse, and in the wei off sinful stod not; and in the cha3er of pestilence sat not. (2) But in the lawe of the Lord his wil; and in the lawe of hym he shal sweteli thinke dai and ny3t.	I. (1) Blessid *is* the man, that 3ede not in the councel of wickid men; and stood not in the weie of synneris, and sat not in the chaier of pestilence. (2) But his wille *is* in the lawe of the Lord; and he schal bithenke in the lawe of hym dai and ny3t.

The Lord's prayer is almost identical in the two versions:—

Late Version. Matt. vi. 9-13. Oure fadir that art in heuenes, halewid be thi name; thi kyngdoom come to; be thi wille don in erthe as in heuene; 3yue to vs this dai oure breed ouer othir substaunce; and for3yne to vs oure dettis, as we for3yuen to oure dettouris; and lede vs not into temptacioun, but delyuere vs fro yuel. Amen.

Fifteenth Century.—The 15th century may well be described as the *via dolorosa* of the English Bible as well as of its chief advocates and supporters, the Lollards (*q.v.*). Stern measures of suppression were directed not only against them but against "Goddes Lawe," the book for which they pleaded with such passionate earnestness. For all this, mss. of Purvey's Revision were copied and re-copied during this century, the text itself being apparently "approved" by the ecclesiastical authorities, when in the hands of the right people and if unaccompanied by controversial matter. Of the Lollard movement in Scotland but little is known, but a curious relic has come down to our times in the shape of a New Testament of Purvey's Revision in the Scottish dialect of the early 16th century. The transcriber was in all probability a certain Murdoch Nisbet, who also showed his reforming tendencies by adding to it a rendering of Luther's Prologue to the New Testament (ed. T. G. Law, Scot. Text Soc., Edinburgh, 1901–05).

II. THE PRINTED BIBLE

It is singular that while France, Spain, Italy, Bohemia and Holland possessed the Bible in the vernacular before the accession of Henry VIII., and in Germany the Scriptures were printed in 1466 and 17 times reprinted before Luther began his great work, yet no English printer attempted to put the familiar English Bible into type. No part of the English Bible was printed before 1525, no complete Bible before 1535, and none in England before 1538. Versions of the Scriptures so far noticed were all secondary renderings of the Vulgate, translations of a translation. It was only with the advent of the "new learning" in England that a direct rendering from the originals became possible. Erasmus in 1516 published the New Testament in Greek, with a new Latin version of his own; the Hebrew text of the Old Testament had been published as early as 1488.

William Tyndale.—The first to take advantage of these altered conditions was William Tyndale (*q.v.*), who, in his desire to rouse clerics and laymen alike to an understanding of the serious corruptions and decline of the Church, resolved to translate the New Testament into English. But he encountered powerful resistance to this project, in fact he found "that there was no place to do it in all englonde" (*Pref. to Genesis,* p. 396, ed. Parker Soc.). But undaunted he sought in May 1524 refuge for himself and his work first in Hamburg and then in Wittenberg, in which cities his translation of the New Testament must have been made. For in 1525 he was undoubtedly in Cologne engaged in printing at the press of Peter Quentel, a quarto edition of the New Testament, provided with prefaces and marginal glosses. But his work was stopped at the tenth sheet by Johann Cochläus (*q.v.*) an implacable enemy of the Reformation, who not only caused the printing to be discontinued, but also communicated with Henry VIII. and Wolsey, warning them to prevent the importation of such "pernicious merchandise." Tyndale managed, however, to escape higher up the Rhine to Worms, carrying with him some or all of the sheets which had been printed. Instead of completing Quentel's work he began, however, an octavo edition of the New Testament without prefaces or marginal glosses which was printed by the Worms printer Peter Schoeffer and actually finished before the quarto. Both editions reached England early in the summer of 1526 and were eagerly welcomed and bought. Such strong measures of suppression were, however, at once adopted against these perilous volumes that of the quarto only a single fragment remains (Matt. i.–xxii. 12), now preserved in the British Museum (Grenville, 12179), of the octavo only one perfect copy (the title page missing) in the Baptist College at Bristol, and one imperfect in the library of St. Paul's Cathedral.

But Tyndale continued his labours with indomitable courage. In 1530 the whole of the Pentateuch was printed in Marburg by Hans Luft; it was provided with prefaces and marginal annotations of a strongly controversial character. The only perfect copy is preserved in the Grenville Library of the British Museum. In 1531 the *Book of Jonah* appeared, and in 1534 no fewer than three surreptitious reprints of the Worms edition of the new Testament. This is testified by George Jay in his *Apology,* who himself brought out a fourth edition of Tyndale's New Testament freed from many errors but with such alterations and new render-

ings as to arouse the indignation of Tyndale. The only remaining copy, a 16mo., is in the Grenville Library. To counteract and supersede all these unauthorized editions, Tyndale himself brought out his own revision of the New Testament with translations added of all the *Epistles of the Old Testament* after the use of Salisbury. It was published in 1534 at Antwerp by Martin Emperowr. Prologues were added to all books except the Acts and the Apocalypse, and new marginal glosses were introduced. Three copies of this edition are in the British Museum, and it was reprinted in 1841 in Bagster's *Hexapla.* In 1535 Tyndale once more set forth a revised edition printed at Antwerp by Godfried van der Haghen. In this, headings were added to the chapters in the Gospels and the Acts, and the marginal notes of the 1534 edition were omitted. Of this edition one copy is in the University Library, Cambridge, a second in Exeter college, Oxford, and a fragment in the British Museum. It is supposed to have been revised by Tyndale while in prison in the castle of Vilvorde, being the last of his labours in connection with the English Bible. For on Oct. 6, 1536, the execution took place of this martyr and "apostle of England." Yet he had not travailed or suffered in vain, for in the same year a small folio reprint of his revised edition of 1534 was brought out in *England,* the first volume of Scripture printed in this country. A perfect copy is found in the Bodleian Library. In later years, between 1536 and 1550, numerous editions of Tyndale's New Testament were printed, 21 of which have been enumerated and fully described by Francis Fry. (*See* Bibliography.)

"The history of the English Bible begins with the work of Tyndale and not with that of Wycliffe," says Dr. Westcott in his *History of the English Bible,* p. 316, and it is true that one of the most striking features of the work of Tyndale is its independence. He translated straight from the Hebrew and Greek originals, although the Vulgate and more especially Erasmus's Latin version were on occasion consulted. For his prefaces and marginal notes he used Luther's Bible freely, even to paraphrasing or verbally translating long passages from it.

Apart from certain blemishes and awkward and even incorrect renderings, Tyndale's translation may be described as a truly noble work, faithful and scholarly, though couched in simple and popular language. Surely no higher praise can be accorded it than that it should have been taken as a basis by the translators of the Authorized Version, and thus have lived on through the centuries up to the present day. The following specimen of the earliest translation of the Lord's Prayer direct from the Greek may prove of interest:—

[*Tyndale 1525* (*Grenville* 12179)]

Matt. vi. 9–13. O oure father which art in heven, halewed be thy name. Let thy kingdom come. Thy wyll be fulfilled, as well in erth, as hit ys in heven. Geve vs this daye oure dayly breade. And forgeve vs oure treaspases, even as we forgeve them whych treaspas vs. Lede vs nott into temptacion, but delyvre vs from yvell. Amen.

Miles Coverdale.—Meanwhile a *complete* English Bible was being prepared by Miles Coverdale (*q.v.*). As the printing was finished on Oct. 4, 1535, it is evident that he must have been engaged on the preparation of the work for the press at almost as early a date as Tyndale. Foxe states (*Acts and Mon.* v. 120) that Coverdale was with Tyndale at Hamburg in 1529, and it is probable that most of his time before 1535 was spent abroad, and that his translation, like that of Tyndale, was done and probably printed out of England. It is possible that the sheets were sent for binding and distribution to James Nicolson, the Southwark printer (H. Stevens, *Cat. of the Caxton Exhibition,* 1877, p. 88). This first of all printed English Bibles is a small folio in German black letter, provided with woodcuts and initials, the title page and preliminary matter in the only two remaining copies (British Museum and Holkham Hall) being in the same type as the body of the book. A second issue of the same date, 1535, has the title page and the preliminary matter in English type, and omits the words "out of Douche [German] and Latyn" found in the title of the first; a third issue bears the date 1536. A second edition in folio "newly oversene and corrected," was printed by Nicolson in English type, in 1537; and also in the same year a third edition in quarto. On the title page of the latter were added the significant words, "set forth with the Kynges moost gracious licence."

Tyndale translated straight from the original Hebrew and Greek, Coverdale proclaims his dependence on "fyne sundry interpreters," that is, Luther, the Zürich Bible, the Latin Version of Pagninus, the Vulgate, and, in all likelihood, the English translation of Tyndale. (Wescott *op. cit.* p. 163.)

Though Coverdale's work was but a translation of translations, he showed great skill in the handling and use of his authorities, and moreover a certain delicacy and happy ease in his rendering of the Biblical text, to which we owe not a few of the beautiful expressions of our present Bible. The following extract from the edition of 1535 may serve as example of his rendering:—

The First Psalme. I. (1-2). Blessed is þe man, þe goeth not in the councell of þe ungodly: þe abydeth not in the waye off synners, & sytteth not in þe seate of the scornefull. But delyteth in the lawe of þe Lorde, & exercyseth himself in his lawe both daye and night.

It should be added that Coverdale's Bible was the first in which the non-canonical books were left out of the body of the Old Testament and placed by themselves at the end of it under the title *Apocripha.*

Matthew's Bible.—The large sale of the New Testaments of Tyndale, and the success of Coverdale's Bible, showed the London book-sellers that a new and profitable branch of business was opened out to them. Richard Grafton and Edward Whitchurch were the first in the field, bringing out a fine and full-sized folio in 1537, "truely and purely translated into English by Thomas Matthew." Thomas Matthew is, however, in all probability, an alias for John Rogers (*q.v.*), a friend and fellow-worker of Tyndale, and the volume is in reality no new translation at all, but largely a compilation from the renderings of Tyndale and Coverdale (Westcott *op. cit.* 169 *ff.*). John Rogers's own work appears in a marginal commentary distributed throughout the Old and New Testament. The volume was printed in black letter in double columns. Three copies are preserved in the British Museum. In 1538 a second edition in folio appeared; it was reprinted twice in 1549 and again in 1551. It is significant that this Bible, like Coverdale's second edition, was "set forth with the kinges most gracious lycence."

Taverner.—Meanwhile a rival edition was published in 1539 in folio and quarto by "John Byddell for Thomas Barthlet" with Richard Taverner as editor. This was, in fact, what would now be called "piracy," being Grafton's *Matthew Bible* revised by Taverner, a learned member of the Inner Temple and famous Greek scholar. His revision, characterized by critical acumen and strong and idiomatic expressions, seems, however, to have had little or no influence on subsequent translators. It was only once, in 1549, reprinted in its entirety. Quarto and octavo editions of the New Testament alone were published in the same year, 1539, as the original edition, and in 1540 the New Testament in duodecimo. The Old Testament was reprinted as part of a Bible in 1551, but no other editions than those named are known.

The Great Bible, 1539.—It will have been observed that the translations of Holy Scripture which had been printed during these years (1525–1539) were all made by private men and printed without any real public or ecclesiastical authority. Some of them had indeed been set forth by the king's licence, but the object of this is shown by a letter from Archbishop Cranmer to Cromwell, touching Matthew's Bible. It is "that the same may be sold and read of every person . . . until such time that we, the bishops, shall set forth a better translation, which I think will not be till a day after doomsday." This letter was written on Aug. 4, 1537, and the impatient words at the end refer to a *duly authorized version* which was, in fact, at that very time in preparation, though not proceeding quickly enough to satisfy Cranmer. Coverdale had been placed at the head of the enterprise, the result of his labours being an entirely new revision, based on Matthew's Bible. In his revision he consulted the Latin Version of the Old Testament with the Hebrew text by Sebastian Münster, the Vulgate and Erasmus's editions of the Greek text for the New Testament.

This authorized Bible, planned on too large a scale evidently for the resources of the English presses, was begun in Paris in 1538 and after many vicissitudes completed in London, the Colophon stating that it was "Fynisshed in Apryll, *Anno* M. CCCCC. XXXIX." It is a splendid folio Bible of the largest volume, and was distinguished from its predecessors by the name of the *Great Bible*. The title page states it to be "truly translated after the veryte of the Hebrewe and Greke texts by ꝑe dylygent studye of dyverse excellent learned men, expert in the forsayde tongues. Prynted by Rychard Grafton and Edward Whitchurch." This was the first of seven editions of this noble Bible which issued from the press during the years 1539–1541—the second of them, that of 1540, called *Cranmer's Bible,* from the fact that it contained a long preface by Archbishop Cranmer, having the important addition, "This is the Byble apoynted to the use of the Churches" on the title page. Seventy years later it assumed the form ever since known as the *Authorized Version,* but its Psalter is still embedded, without any alteration, in the Book of Common Prayer.

Meanwhile the closing years of Henry VIII.'s reign were characterized by restrictive measures as to the reading and use of the Bible. Tyndale's version was prohibited by an act of parliament, 1543; at the same time it was enacted that all notes and marginal commentaries in other copies should be obliterated, and that "no woman (unless she be noble or gentle woman), no artificers, apprentices, journeymen, servingmen, under the degree of yeomen . . . husbandmen or labourers" should read or use any part of the Bible under pain of fines and imprisonment (Burnet's *Ref.* i. 584).

In 1546 Coverdale's Bible was included in the proscription, the *Great Bible* being the only translation not interdicted. During Edward VI's reign there was a brief respite, but with the accession of Mary the persecutions of the English Bible and its friends were renewed. Cranmer suffered martyrdom at the stake, as John Rogers had done before him. Other prominent reformers, amongst them Coverdale, sought refuge in Geneva, the town of Calvin and Beza, where they employed their enforced leisure in planning and carrying out a new revision of the Bible. The first-fruits of these labours was a New Testament issued in June 1557, with an introduction by Calvin, probably the work of William Whittingham. The volume, in a convenient quarto size, printed in clear Roman type and provided with marginal annotations, was the first Bible which had the text divided into "verses and sections according to the best editions in other languages" (*cf.* "Address to the Reader").

The Geneva or "Breeches" Bible.—Whittingham's enterprise was, however, soon superseded by an issue of the whole Bible, which appeared in 1560, the so-called *Geneva Bible,* popularly also known as the *Breeches Bible,* from its rendering of Gen. iii. 7, "They sewed fig leaves together and made themselves breeches." Chief among the editors were William Whittingham, Anthony Gilby and Thomas Sampson, and the expenses towards printing and publication were borne by members of the congregation at Geneva. Based on the latest results of Hebrew and classical scholarship the revision gained immediate and lasting popularity, not only on account of its intrinsic merit but because of its quarto size and clear Roman type. Like Whittingham's earlier publication it had the division of chapters into verses and a marginal commentary which proved a great attraction to the Puritans.

The Bishops' Bible.—Though not allowed for use in the churches, the Geneva version with its ever growing popularity, became a serious rival to the authorized *Great Bible.* As a consequence, some time after the accession of Elizabeth, attempts were made to improve it. The initiative was taken by the learned and energetic Archbishop Parker, about 1563–65, who, according to Strype (Parker i. 414) "took upon him the labour to contrive and set the whole work agoing . . . by sorting out the whole Bible into parcels . . . and distributing these parcels to able bishops and other learned men, to peruse and collate each the books allotted to them . . . and they to add some short marginal notes for the illustration or correction of the text." Rules were provided for the guidance of the revisers, and the work was pushed forward with energy. On Oct. 5, 1568, the volume was ready for publication. It was a magnificent folio generally known as the *Bishops' Bible,* but, though several editions were published in the course of time, it is doubtful whether the ecclesiastical authorities ever succeeded in entirely enforcing its use in the churches. In the homes the Genevan version reigned supreme. Even into the very text of this proud revision the smooth and well-known rendering of the Psalter of the *Great Bible* found its way. In the second edition of the Bishops' Bible, 1572, the two texts were actually printed side by side; in all later editions except one (1585) the older Psalter alone remained.

The Rhemes and Douai Version.—From the time of Tyndale onwards the translation of the Scriptures into English had been more or less an outcome of the great reformatory movements within the Church. It was not until Queen Elizabeth's reign that members of the Romanist party found it expedient to translate the Bible into the vernacular "for the more speedy abolishing . . . of false and impious translations put forth by sundry sectes" (*Preface* to the Rhemes Version).

The New Testament was published in 1582 in the English College of Rhemes, the Old Testament at Douai, 1609–10. Like the Wycliffite versions, this work, known as the *Rhemes and Douai Version,* was merely a secondary rendering from the Latin Vulgate, and in many places it suffered like these from extreme literalness and stilted and ambiguous renderings, *e.g.,* Luke xxii. 18, "I will not drink of the generation of the vine"; Phil. ii. 7, "But he exinanited himself." The Lord's Prayer is rendered in the following way:

Matt. vi. 9–13. Ovr Father which art in heauen, sanctified be thy name. Let thy Kingdom come. Thy wil be done, as in heauen, in earth also. Giue vs to day our supersubstantial bread. And forgiue vs our dettes, as we also forgiue our detters. And leade vs not into tentation. But deliuer vs from evil. Amen.

Its strongly Latinized vocabulary was, however, not without its influence on the next great venture in English translations of the Bible, the *Authorized Version.*

The Authorized Version, 1611.—The English Bible, which is now recognized as the *Authorized Version* wherever the English language is spoken, is a revision of the Bishops' Bible, begun in 1604, and published in 1611. It arose incidentally out of a conference between the High Church and the Low Church parties convened by James I. at Hampton Court Palace in Jan. 1604 a few months after he came to the throne.

No real opposition was offered to the proposal and the king himself sketched out on the moment a plan to be adopted. He "wished . . . for one uniform translation—professing that he could never yet see a Bible well translated in English—and this to be done by the best learned in both universities; after them to be reviewed by the bishops and the chief learned of the Church; from them to be presented to the privy council; and lastly to be ratified by his royal authority; and so this whole Church to be bound unto it and none other" (Cardwell, *History of Conferences,* p. 187 ff.). He also particularly desired that no marginal notes should be added.

The revisers were then chosen with extreme care and apparently without reference to party. Amongst them were some of the greatest scholars of the period, as Dr. Andrewes, afterwards bishop of Winchester, who was familiar with Hebrew, Chaldee, Syriac, Greek, Latin and at least ten other languages, while his knowledge of patristic literature was unrivalled; Dr. Overall, regius professor of theology and afterwards bishop of Norwich; Bedwell, the greatest Arabic scholar of Europe; and Sir Henry Savile, the most learned layman of his time. These "learned men, to the number of four and fifty" (Cardwell, *Doc:* Annals, II. 84) were divided into six companies, and set down to their task. An elaborate set of rules was drawn up for their guidance, which contained a scheme of revision as well as general directions for the execution of their work. This is one of the very few records that remain of their undertaking (Burnet, *Hist. of Reformation* ii., p. 368, 1861, reprinted by Westcott, *op. cit.* p. 114 ff.). A few of these may be quoted:—

(1) "The ordinary Bible read in the Church, commonly called "the Bishops' Bible" to be followed and as little altered as the truth of the original will permit.

(2) The names of the prophets and the holy writers, with the other names of the text to be retained as nigh as may be, accordingly as they were vulgarly used.

(3) The old ecclesiastical words to be kept, viz., the word *Church* not to be translated congregation, etc. . . .

(4) These translations to be used when they agree better with the text than the Bishops' Bible; viz., Tyndale's, Matthew's, Coverdale's, Whitchurch's, Geneva. . . ."

It is not possible to determine how far all these rules were followed. All we know of the way this noble work was carried out is contained in the preface, where Dr. Miles Smith, in 1612 bishop of Gloucester, in the name of his fellow-worker, gives an account of the manner and spirit in which it was done. "The worke hath . . . cost the workemen, as light as it seemeth, the paines of twise seuen times seuentie two days and more . . . truly (good Christian Reader) we never thought from the beginning, that we should neede to make a new Translation, nor yet to make of a bad one a good one . . . but to make a good one better. . . . To that purpose there were many chosen, that were greater in other men's eyes than in their owne, and that sought the truth rather than their own praise. . . ."

From the above it appears that the actual work of revision occupied about two years and nine months, an additional nine months being required for the final preparation for press. The edition appeared at length in 1611, having been printed in London by Robert Barker. Since that time many millions of this revised translation have been printed, and the general acceptance of it by all English-speaking people of whatever denomination is a testimony to its excellence.

Still the work of improving and correcting went on through the centuries, and a modern copy of the Authorized Version shows no inconsiderable departure from the standard edition of 1611.

The Revised Version.—More ambitious attempts at amending the new version were not lacking, but they all proved fruitless, until in Feb. 1870 the Convocation of Canterbury appointed a committee to consider the subject of revision. The report of this committee, presented in May, was adopted, to the effect "that Convocation should nominate a body of its own members to undertake the work of revision, who shall be at liberty to invite the co-operation of any eminent for scholarship, to whatever nation or religious body they may belong"; and shortly afterwards two companies were formed for the revision of the Authorized Version of the Old and New Testaments.

Negotiations were opened with the leading scholars of the Protestant denominations in America, with the result that similar companies were formed in the United States. The work of the English revisers was regularly submitted to their consideration; their comments were carefully considered and largely adopted, and their divergences from the version ultimately agreed upon were printed in an appendix to the published work. Thus the Revised Version was the achievement of English-speaking Christendom as a whole; only the Roman Catholic Church, of the great English-speaking denominations, refused to take part in the undertaking. The Church of England, which had put forth the version of 1611, fitly initiated the work, but for its performance most wisely invited the help of the sister Churches. The delegates of the Clarendon Press in Oxford, and the syndics of the Pitt Press in Cambridge, entered into a liberal arrangement with the revisers, by which the necessary funds were provided for all their expenses. On the completion of its work the New Testament company divided itself into three committees, working at London, Westminster and Cambridge, for the purpose of revising the Apocrypha.

The work of the Old Testament company was different in some important respects from that which engaged the attention of the New Testament company. The received Hebrew text had undergone but little emendation, and the revisers had before them substantially the same Massoretic text which was in the hands of the translators of 1611. It was felt that there was no sufficient justification to make any attempt at an entire reconstruction of the text on the authority of the versions. The Old Testament revisers were therefore spared much of the labour of deciding between different readings, which formed one of the most important duties of the New Testament company. But the advance in the study of Hebrew since the early part of the 17th century enabled them to give a more faithful translation of the received text. The value of their work is evident, especially in Job, Ecclesiastes and the prophetical books.

It is the work of the New Testament committee which has attracted most attention, whether for blame or praise. The revisers' first task was to reconstruct the Greek text, as the necessary foundation of their work. In this difficult duty they were no doubt influenced by Westcott and Hort's edition of the New Testament. But it is scarcely necessary to say that the Revised Version is not the work of one or two scholars. Different schools of criticism were represented on the committee, and the most careful discussion took place before any decision was formed. Every precaution was taken to ensure that the version should represent the result of the best scholarship of the time, applied to the work before it with constant devotion and with the highest sense of responsibility. The changes in the Greek text of the Authorized Version when compared with the *textus receptus* are numerous, but the contrast between the English versions of 1611 and 1881 is all the more striking because of the difference in the method of translation which was adopted. The revisers aimed at the most scrupulous faithfulness. They adopted the plan—deliberately rejected by the translators of 1611—of always using the same English word for the same Greek word. "They endeavoured to enable the English reader to follow the correspondences of the original with the closest exactness, to catch the solemn repetition of words and phrases, to mark the subtleties of expression, to feel even the strangeness of unusual forms of speech."

The revision of the New Testament was completed in 407 meetings, distributed over more than ten years. It was formally presented to Convocation on May 17, 1881. The revision of the Old Testament occupied 792 days, and was finished on June 20, 1884. The revised Apocrypha did not make its appearance until 1895.

The text of the Revised Version is printed in paragraphs, the old division of books into chapters and verses being retained for convenience of reference. By this arrangement the capricious divisions of some books is avoided. Various editions of the New Version have been published, the most complete being the edition of the whole Bible with marginal references. These references had their origin in the work of two small sub-committees of the revisers, but they received their present form at the hands of a specially appointed committee. The marginal references given in the original edition of the Authorized Version of 1611 have been retained as far as possible.

The work of the revisers was received without enthusiasm. It was too thorough for the majority of religious people. Partisans found that havoc had been played with their proof texts. Ecclesiastical conservatives were scandalized by the freedom with which the traditional text was treated. The advocates of change were discontented with the hesitating acceptance which their principles had obtained. The most vulnerable side of the revision was that on which the mass of English readers thought itself capable of forming a judgment. The general effect of so many small alterations was to spoil the familiar sonorous style of the Authorized version. The changes were freely denounced as equally petty and vexatious; they were, moreover, too often inconsistent with the avowed principles of the revisers. The method of determining readings and renderings by vote was not favourable to the consistency and literary character of the Version. A whole literature of criticism and apology made its appearance, and the achievement of so many years of patient labour seemed destined to perish in a storm of resentments. On the whole, the Revised Version weathered the storm more successfully than might have been expected. Its considerable excellences were better realized by students than stated by apologists. The hue and cry of the critics largely died away, and was replaced by a calmer and more just appreciation.

BIBLIOGRAPHY.—The principal works dealing with the separate versions have been referred to in the text of the article. The following authorities may also be cited:—

For the version as a whole: F. G. Kenyon, *Our Bible and the Ancient Manuscripts* (1911); J. H. Lupton, article on "English Versions," in Hasting's *Dict. of the Bible*, extra vol. 1904; B. F.

Westcott, *A General View of the History of the English Bible,* 3rd ed. revised by W. Aldis Wright (London, 1905).

For the Manuscript Bible: The historical accounts prefixed to Bagster's issue of *The English Hexapla* and of Forshall and Madden's edition of the *Wycliffite Versions* are to a large extent antiquated. The only trustworthy authority on the Anglo-Saxon Bible is A. S. Cook's "Introduction on Old English Biblical Versions" in his *Biblical Quotations in Old English Prose writers, I.* (London, 1898; II. New York, 1903), with a full bibliography.

For the 14th and 15th centuries, *see* M. Deanesly, *The Lollard Bible and other Mediaeval Biblical Versions* (1920), with copious bibliography; A. C. Paues, *A Fourteenth Century English Biblical Version,* consisting of a Prologue and Parts of the New Testament, with some *Introductory Chapters on Middle English Biblical Versions* (Prose-translations) (1902), and *A Fourteenth Century Biblical Version* (1904), which has an introductory chapter on Middle English translations; Hope Allen, *The Canon of Richard Rolle;* D. Everett, "The Middle English Prose Psalter of Richard Rolle of Hampole," *Mod. Lang. Review,* XVII. 217–227, 337–350, (1922), XVIII. 381–393 (1923); H. B. Workman, *John Wyclif:* a study of the English Med. Church (1926).

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For the Revised Version: J. B. Lightfoot, *On a Fresh Revision of the English New Testament* (London, 1871; 3rd ed. 1891); Westcott, *Some Lessons of the Revised Version* (London, 1897); Kennedy, *Ely Lectures on the Revised Version* (London, 1882). The Revisers fully explained their principles and methods in the Preface. The American Committee of Revision issued an historical account of their work (New York, 1885). The case against the Revisers is ably stated in *The Revision Revised,* by Dean Burgon (London, 1883). The literary defects of the Version are elaborately exhibited by G. Washington Moon in two works: *The Revisers' English* (London, 1882), and *Ecclesiastical English* (London, 1886). *See* also *Some Thoughts on the Textual Criticism of the New Testament,* by G. Salmon, D.D. (London, 1897); Bishop Ellicott's *Charge* (1901). The Greek Text of the New Testament adopted by the Revisers was edited for the Clarendon Press by Archdeacon Palmer (Oxford, 1881). Parallel editions of the Bible, showing both the Authorized and Revised Versions, a large-type edition for public use, a reference edition, and (1900) a "Two Version" edition, have been issued by one or both the University Presses. (A. C. P.; H. H. H.)

III. THE BIBLE AND ENGLISH LITERATURE

The purpose of this study is to give an indication of the principal ways in which the Bible, in its various English versions, has influenced the development of English prose and English literature generally. The history of the English Bible is dealt with elsewhere; here, however, we must recall some of the more important relevant facts. There are two periods in the history of the English versions: one during which English translations of the Bible, or parts of it, made directly from the Latin Vulgate, circulated in manuscript form; the other beginning with the circulation of printed Bibles, which were translations of the original Hebrew and Greek of the Old and New Testaments.

One of the marvels of history, it has been said, is the rapidity and thoroughness with which Christian civilization was adopted by the English; from the writings which have survived, it would seem as if men strove to forget that England had ever been heathen. Augustine landed in 597; and within 50 years, native versions of the Psalms and Gospels were in circulation. The earliest version still extant is one of the Psalms by Aldhelm of Malmesbury (d. 709). Next in date comes the interlinear English translation added about 950 to the famous "Lindisfarne Gospels," which had been written in Latin about 680, and the similar translation added to the "Rushworth Gospels." To the 10th century belongs also the version of the Psalms by Aelfric of Canterbury (d. 1005), and versions of the Gospels and other books which have been supposed to be by the same hand. All the translations which have been mentioned are in the ancient form of the English language, which has been called "Anglo-Saxon." In estimating their literary influence, we must bear in mind that although the surviving Old English poetry is almost entirely Christian, the images and diction are mainly those of the older heroic poetry; and Christ and the saints are often introduced in the guise of northern warriors. Incongruous as this may appear in modern ages, it is an interesting example of the reaction of inherited national or racial feeling on religious ideas and images sprung from a different source.

The 14th Century.—The vernacular tongue of the country was fundamentally, though gradually, altered through its contact with the French spoken by the upper classes, and new versions of the Bible became necessary. From statements made later by Cranmer, More, Foxe, and others, we learn that a number of such versions had been made; but only fragments now remain—the most important being two versions of the Psalms, one by William of Shoreham, Kent, the other by Richard Rolle of Hampole (d. 1349). This version, with the other writings of Richard Rolle and his school, was very popular, and materially influenced the literary development of contemporary English. The great rhyming chronicle of biblical and other stories, the *Cursor Mundi,* which circulated widely, had the same effect. The author insists on English for the English, not as a truism but as a novelty for which sound reasons must be given; but it is typical "Middle English" in which he writes. The two great versions (sometimes called "Wickliffite versions") which were made later in the 14th century, have survived in their entirety; viz., that of which John Wickliffe and Nicholas of Hereford were the principal translators, and that of John Purvey, resembling the former but making no reference to it. These were the last English Bibles issued during the period in which it was a translation from the Latin Vulgate, and before the invention of printing was applied to its circulation. These versions and Wickliffe's own non-academic writings made English the popular language of religious thought and feeling (for different views of the attitude of the Church to the circulation of the Wickliffite Bibles, *see* F. A. Cardinal Gasquet, *The Old English Bible,* and M. Deanesley, *The Lollard Bible,* 1920). Wickliffe appealed to the people of England in the speech of the people, sending out pamphlets and sermons couched in short clear sentences, full of the homely words used in his own Bible. In his work the literary expression of popular religion at this period reaches its height in the realm of prose, as in William Langland it reaches its height in the realm of poetry. In the dreams and ideals of the *Piers Plowman* poems—whether Langland be their sole author or not—a voice speaks from the heart of the people themselves; the poems are in the old alliterative English verse, and the wayfaring man could understand them. But there moves in them a prophetic impulse closely akin to that of the prophets of Israel. In them we hear the social movement—as in Wickliffe the distinctly religious movement—of revolt, in the name of the Bible, against Roman Christianity. When we turn from Wickliffe and Langland to the greatest figure in the creative literature of the age, it is not possible to say how far the influence of the Bible was effective in the development of his mind and art from his early imitations of French models to the latest and most original of the *Canterbury Tales,* with their rich humanity and simplicity of diction. But the author of these tales was well versed in "Christes lore and his apostles twelve."

The promise of a new era in English literature, arising from the later years of the 14th century, was not fulfilled. We are concerned only with lines of influence which can be traced directly to the English Bible. The most original and powerful poetry of the 15th century was composed in popular forms for the ear of the common people—songs, carols, popular ballads. Of those dealing with religious subjects, some are curious and delightful blendings of religious worship and aspiration, with earthly tenderness for the embodiments of helpless infancy and protective motherhood, which gave Christianity so much of its power over the affections and imagination of the middle ages. We can only mention the additions made in the 15th century to the ancient cycles of Scripture plays, the so called "mystery plays" (on these, *see* DRAMA; and

for a brief, but instructive introduction to the whole subject, R. H. U. Bloor, *Christianity and the Religious Drama,* 1927).

The 16th century forms, as it were, a watershed in the life of the nation, and in its literature as the expression of its life. From the age of Elizabeth we seem, more thoroughly than in any earlier time, to find in history men who are in all things our own fellows. Spenser and Shakespeare, Hooker and Raleigh, stand to us in a relation different from that in which Caedmon or even Chaucer stands. And, above all, the 16th century gave us in the English Bible a model of the language which has been the chief literary, as well as the chief religious food of millions of Englishmen. It came at a psychological moment in the moral and political development of the people. It not only entered into the warp and woof of literature, but served to give pointed emphasis and expression to the new social and religious impulses which were moving in the country. The reign of Elizabeth is itself the most marked epoch in English literature. The stirring of men's minds which led to the great political and religious events of the age, led also to the outburst of a whole literature in prose and verse. The English drama began, modern English theology began, the writing of history in the modern sense and in the English language began. As regards the English Bible, the first-fruits of the printing press had already been achieved in the New Testament and the Pentateuch of William Tyndale, published in England in 1526 and 1530 respectively. Tyndale's work, and the subsequent publication of Coverdale's Bible (1535), the "Great Bible" (1539), the Geneva Bible (1560), and the "Bishops' Bible" (1568) is described elsewhere. At length, in order to secure one uniform translation, a large committee of the most competent scholars in the country was appointed in 1604, to revise previous versions, taking the Bishops' Bible as the basis. The world-famous "Authorized Version" was published in 1611, "the late fruit of the long toil which had begun with the work of Tyndale, and, on the side of style, with the Wycliffite translations." More scholarly than all the preceding versions which it utilized, it won its incomparable form, not so much because of "the grand style which was in the air," which would have been the worst of models, as because the style had already been tested and ennobled by generations of translators.

Characteristics of Biblical Literature.—In any description of the literary influence of the English Bible we are not specially concerned with the literary forms which can be distinguished in the writings of the Old and New Testaments themselves (*see,* for example, R. G. Moulton, *The Modern Reader's Bible* and *The Literary Study of the Bible*); but there are some aspects of that literature which must be borne in mind for our present purpose. "Few abstract terms exist in ancient Hebrew, and no compound words. Abstraction and constructive power are almost as absent from the grammar and syntax as from the vocabulary. The subordination of clause to clause, in which the subtlety and flexibility of other languages appears, is hardly found; but to the end, both in prose and verse, the clauses are almost invariably strung together by the bare copulas *and* and *then* in a co-ordination which requires both skill and spirit to redeem it from monotony." (Sir G. A. Smith in *The Legacy of Israel,* edited by E. A. Bevan and C. Singer, 1927.) Ancient Hebrew is the dialect—concrete and even sensuous—of a few small tribes of herdsmen, peasants, and warriors, which the literary genius of a religiously and morally gifted people made into the vehicle of the sublimest truths, the most spiritual ethics, and, in the end, of a gospel for mankind. Part of the power of the English Bible is that it reflects these qualities so faithfully. Another characteristic is important for our present purpose, although it is one of material rather than of literary form. The Hebrew mind was entirely unfamiliar with the idea of evolution or development: "it fixed upon results rather than upon processes; things which came into being only gradually appeared to it as the offspring of a word, of a moment. In Deuteronomy, the effect of centuries of ethical influence on the law and ritual of Israel is presented as a single discourse of Moses. To the Hebrew, power and authority were personal and immediate, the effect of a single fiat or proclamation, and secondary causes were ignored" (*op. cit.*). The Old Testament is the surviving literature of such a people during the intensely creative periods of their religious experience; and, when we pass to the New Testament, so far as literary atmosphere is concerned, the writers of the first three gospels belong to the Old Testament school. But in Acts we are emerging into a new world, which begins to be realized, not only in doctrine, but in substance and form, in all the epistles, especially in those of Paul; and in this sense it is true that "when we pass from Proverbs and Job to St. John and Romans and Hebrews, we have passed from the world of Solomon to the world of Socrates." The Old Testament is the literature of a nation; the New Testament is the literature of a movement, gathering round one central and supreme personal figure and spreading out into the world of Greece and Rome.

The Puritans.—This is the literature which, bound together within the covers of a single volume, had become the book of books in England before the end of Elizabeth's reign, and which, for most of the 17th century, was the one book familiar to every Englishman. It was read in churches and read at home; and everywhere its words, as they fell on ears not deadened by custom, kindled a startling enthusiasm. There was more than one side to this. The Bible was accepted in the new English version in its baldest and most literal sense, as all equally "the Word of God," above all by the Puritans, those most typical of Protestants. They found a close analogy between their fortunes and those of Israel of old. The immediate influence of the national translation of the Bible was in the life rather than the literature of England. The English Reformation (and every important aspect of it was of native origin and can be traced at least as far back as Wickliffe) was political as well as doctrinal and imaginative. But the debating weapons of vernacular English were sharpened in the pamphlet battles which ensued (*see* W. B. Selbie, "The Influence of the Old Testament on Puritanism," in *The Legacy of Israel*). The powers of the same style for religious appeal were proved in the "blunt, sound rhetoric and forthright jests" of Latimer's sermons, with their essentially biblical note. Foxe's *Book of Martyrs* is a type of early Protestant English; but reforming divines were not "men of letters." Their spirit comes out in the byways of literature, as in Spenser's *Shepherd's Calendar.*

As regards the Anglican Church, the fruit of the struggle was not long delayed. In the sermons of Fisher (d. 1535) and Cranmer (d. 1556), we see the beginnings of the work continued by Hooker (d. 1600), which made of the reformed Church a school where English prose was well trained for the purposes of learning and oratory, and as a medium of poetic feeling. Jeremy Taylor (d. 1667) one of the first pleaders for toleration in his *Liberty of Prophesying,* was the ideally humane Anglican of his age; while the lineage of Anglican strength was carried on by Isaac Barrow (d. 1677), John Tillotson (d. 1694), William Sherlock (d. 1707), and Robert South (d. 1716). For such men the Church came first, though the Bible was behind it. On the other hand, the Puritan temper is ideally represented in *Paradise Lost.* The strength of the Bible is assimilated without its tenderness. The subject is biblical, the form that of the classical epic, the doctrine Protestant, though not orthodox, and the feeling strangely divided by the claim of the vanquished—even Satan—to judge and deny the victor. In *Samson Agonistes,* the subject is biblical, the form that of a Sophoclean tragedy, and the suffering portrayed is Milton's own. Milton stands apart; but noble varieties of vernacular prose are found in the Puritans of the Restoration: John Bunyan (d. 1688), George Fox (d. 1690), Richard Baxter (d. 1691), and John Howe (d. 1706) had the English Bible behind them, which gave them the best of their inspiration. Baxter and Howe were also men of learning; but Bunyan, whose reading was the Bible and the popular allegories of giants, pilgrims, and adventure, stands out as the greatest literary artist of them all, bringing into the service of spiritual intensity, a keen, humorous vision and a power of simple speech consummately chosen.

The 18th Century.—When we pass to the 18th century, we soon find ourselves in a changing world. The charm of the literature is of the national and sociable kind. It is, before all else, the age of prose; not of the greatest prose, but an age where every variety of English prose is brilliantly exemplified. Little illus-

trative material, for our present purpose, can be derived from it. Religious thought, among educated people, was ruled by the spirit of Locke's *Essay Concerning Human Understanding*. In other words, thought was governed by a great respect for facts and realities; and the most real fact, from which we cannot get away, with which we must always start and to which we must ever return, was the *infinite* machine called Nature. Paley argued that we can reason from the universe to its Divine Maker, as we can from any other machine to its human maker. Theism was based on the world of sense-perception; and the nature of the Deity was further defined by appeal to revelation, guaranteed by the miracles believed to have accompanied it. The same reliance on tangible facts emerged in the realm of morality, the true ground of which is declared by Locke to be "the will and law of a God who sees men in the dark, has in his hands rewards and punishments and power to call to account the proudest offender." An intellectual atmosphere of this kind fails to supply the life-breath of vital religion. In the missionary work of John Wesley (d. 1791) and George Whitefield (d. 1770), the fervid gospel of personal religion and personal salvation was borne to the neglected masses, with the Bible once more in the foreground, and found its literary expression in the hymns of Charles Wesley (d. 1788). These events, great in themselves, were still greater in their importance as signs of new and vitalizing currents entering into the religious life and thought of England; and from this time onwards it is scarcely possible to separate the influence of the Bible from the many streams of feeling and belief which made "not so much a movement as a spirit afloat, rising up in hearts where it was least suspected, and working itself, though not in secret, yet so subtly and impalpably as hardly to admit of encounter on any ordinary human modes of opposition" (J. H. Newman, *History of My Religious Opinions*, 1839, ch. iii.). For the Bible it meant no abatement of reverence for its religious value, but a revival of the old natural human feeling for its great humanities, such as had found expression in the ancient English religious poetry and in the mystery plays; but which proceeded now from a far wider and deeper range of knowledge and experience.

The 19th Century.—In the opening years of the 19th century this was not apparent. Keats died in 1821, Shelley in 1821 and Byron in 1824. In 1825 Charles Lamb was 50 years old, and Coleridge 53; and of the two greatest names in the literature of the time, Scott had already written most of his Waverley Novels, and Wordsworth had done most of his influential work. But John Ruskin was a child of six; Charles Dickens and Robert Browning were boys of 13; Charles Darwin, Alfred Tennyson, and William Ewart Gladstone, boys of 16; James Martineau was a young man of 20, as was Richard Cobden; Ashley (earl of Shaftesbury) and John Henry Newman were young men of 24; and Carlyle, aged 31, was beginning to feel that he had a message to deliver to mankind. It is a matter of common knowledge that these are only some of the leaders of an army of pioneer workers who have, directly or indirectly, made the literature of the 19th century what it has been. In this the influence of the Bible has been reflected back in the form of a searching light on its own contents. It is no longer startling to say (as it was when Benjamin Jowett said it in *Essays and Reviews*, 1853) that the Bible must be interpreted like any other book. The obviously different strata in the complex elements composing it have been distinguished. Questions are asked about its value as an explanation of the origin of things; about the value of its contributions to our knowledge of human history; about its religious value; about its literary value; but these are different questions. The answer to one of them does not prejudge the answer to another. And abundant illustrative proof might be given showing that in the literature of the 19th century the Bible has made itself felt in such a way as to produce an assured conviction about it; whatever else it may be, the Bible, as a whole, is the greatest and, indeed, the unique record of man's religious experience; and above all, whatever else may or must be believed of the Founder of Christianity, his historic personality and teaching have made the New Testament the richest mine of religious and moral insight and inspiration which has been given to the world.

The critical and other considerations arising from the revision of the Authorized Version, carried through by committees of convocation, fall outside the scope of this article. The Revised Version of the N.T. was issued in 1881 and that of the O.T. in 1884. Translations, altogether independent of the Authorized Version, have been published by J. Moffatt (*The New Testament*, 1913; *The Old Testament*, 1924), and by W. G. Rutherford (*St. Paul's Epistle to the Romans*, 1900; *St. Paul's Epistles to the Thessalonians and Corinthians*, 1908). The following books deal directly or indirectly with the subject of the foregoing article: A. S. Peake (edit. by), *The People and the Book* (1925), illuminating essays on the O.T.; S. H. Mellone, *The New Testament and Modern Life* (1921); R. G. Moulton, *The Literary Study of the Bible* (1901); J. H. Gardiner, *The Bible as English Literature* (1906); E. von Dobschütz, *The Influence of the Bible on Civilization* (1913). *See* also A. S. Cook, *Biblical Quotations in Old English Prose Writers* (2 vols., 1898, 1903); J. Moffat, *The Bible in Scots Literature* (1920); C. Wordsworth, *Shakespeare's Knowledge and Use of the Bible* (1864).

(S. H. M.)

BIBLE CHRISTIANS. One of the denominations now merged in the United Methodist Church (*q.v.*) Bible Christians are so called because the church's early preachers appealed solely to the Bible in confirmation of their doctrines. The denomination arose in the agricultural districts and fishing villages of north Cornwall and Devon; a district only slightly influenced by John Wesley and the original Methodist movement. The founder was William O'Bryan (afterwards Bryant), a Methodist lay preacher of Luxillian, Cornwall. Finding that the people had no evangelical preaching he began an itinerary to supply the need. The coastmen were expert smugglers and wreckers, the agriculturists were ignorant and drunken, the parish clergy were slothful, in many cases intemperate, and largely given to fox-hunting. Only in a parish or two was there any approach to religious ministry. O'Bryan commenced his labours in North Devon, and in 1815 a small society was formed at Lake Farm, Shebbear. The movement had the seeds of great vitality in it. In 1819 the first conference was held at Launceston. By this time the work had spread through Cornwall; and shortly afterwards Kent, Northumberland, and the Channel Islands appeared on the list of stations. For a few years the movement was weakened by internal controversies over administration. These ended when O'Bryan left England in 1836 and settled in America.

On O'Bryan's departure, James Thorne, the first fully recognized minister, became its leader. Although reared as an ordinary farm lad, he proved to be a man of singular devotion and spiritual genius. He laid the foundations broadly in evangelism, finance, temperance and education, founding in the latter connection a middle-class school at Shebbear, at which generations of ministers' sons and numerous students for the ministry have been educated. James Thorne was five times president of the conference and 15 times secretary. He died in 1872. Another powerful leader was Frederick William Bourne, who served the Bible Christians as editor, missionary treasurer, book steward, and three times president of conference. (*See* METHODISM.)

BIBLE SOCIETIES, associations of a philanthropic character for translating and circulating the Holy Scriptures. The translation of the Bible has generally followed the expansion of the Church. By the 15th century, versions, more or less complete, existed in manuscript in about 20 languages. The invention of printing aided reproduction. Probably the first book printed in Europe from movable metal type was the Latin "Mazarin" Bible of *c.* 1456.

The Reformation greatly quickened men's interest in the Scriptures, so that notwithstanding the adverse attitude adopted by the Roman Church at and after the Council of Trent, the translation and circulation of the Bible made rapid progress. The pace was still further accelerated by the growth of modern Christian missions to non-Christian lands, for missionaries, especially those of Protestant Churches, have been among the most skilful translators and the most assiduous distributors of the Bible. Thus the earliest complete Arabic Bible was produced at Rome in 1671 by the Congregation for the Propagation of the Faith. The Tamil Bible, the earliest in any language of India, translated by two Danish Lutheran missionaries, Ziegenbalg and Schultze, was published 1715–28 with the assistance of the Society for Promoting Christian Knowledge. It is estimated that by 1800 the whole or

some part of the Bible had been printed in 71 languages, by 1900 in 567 and by 1928 in 856.

The Reformation also brought an element of philanthropy into circulation of the Scriptures. Thus, on the verso of the title page of the revised French Geneva Bible of 1588 there is a note that the expenses of the work, which was printed at the same time in three different forms to suit all kinds of persons, were liberally provided by certain good people not in order to gain profit for themselves but solely to serve God and His Church. Similarly, the Corporation for the Promoting and Propagating of the Gospel of Jesus Christ in New England (founded in 1649) bore the expense of printing both the New Testament and the whole Bible (Cambridge, Mass., 1663—the earliest Bible printed in America), which John Eliot, one of the Pilgrim Fathers, translated into "the language of the Massachusetts Indians" whom he evangelized. Again, The Society for Promoting Christian Knowledge (founded 1698) has done much to cheapen and multiply copies of the Scriptures, not only in English and Welsh, but in many foreign languages. In the present century, however, apart from its general literary activities, it has concentrated on the provision of Prayer Books and helps to Bible study in Asiatic and African languages.

The earliest noteworthy organization, formed for the specific purpose of circulating the Scriptures, was the Canstein Bible Institute, founded in 1710 at Halle, in Saxony, by Karl Hildebrand, Baron von Canstein (1667–1719), who was associated with some of the leaders of Pietism in Germany. He invented a method of printing whereby the institute could produce Bibles and Testaments in Luther's version at low cost and sell them cheaply. In 1722 editions of the Scriptures were also issued in Bohemian and Polish. In England various Christian organizations, which arose out of the evangelical movement in the 18th century, took part in the work. One such was founded in 1780 under the name of the Bible Society, but as its sphere was restricted to soldiers and seamen the title was afterwards changed to the Naval and Military Bible Society. The French Bible Society was instituted in 1792, but its designs were wrecked by the outbreak of the Revolution, and it was finally dissolved in 1803.

The British and Foreign Bible Society.—In 1804 was founded in London the British and Foreign Bible Society, the most important association of its kind. It originated in a proposal made to the committee of the Religious Tract Society, by the Rev. Thomas Charles of Bala, who found that his evangelistic and philanthropic labours in Wales were sorely hindered by the dearth of Welsh Bibles. His colleagues in the society united with other earnest evangelical leaders to establish a new body whose sole object would be "to encourage the wider circulation of the Holy Scriptures without note or comment."

Supported by representative Christian leaders such as William Wilberforce and Henry Thornton, and with Lord Teignmouth as its first president, the new society made rapid progress. It spread throughout Great Britain, mainly by means of auxiliaries, *i.e.*, local societies affiliated but self-controlled, with subsidiary branches and associations. This system continues to flourish. In 1927–28 the society had 5,142 auxiliaries, branches and associations in England and Wales. There were also about 5,000 auxiliaries and branches outside the United Kingdom, mainly in the British dominions, and many of these carry on vigorous Bible distribution in their own localities, besides sending generous contributions to London. In 1904 the Canadian Bible Society was formed to act as an auxiliary to the parent society, with special responsibility for Bible work in Canada. Similarly, an Australian commonwealth council was established in 1924 and a New Zealand dominion council in the same year.

By one of its original laws the society could circulate no copies of the Scriptures in English except in King James' Version, but in 1901 this law was widened to include the Revised Version. In other languages the society has from the first successfully laboured to promote new and improved versions. By March 31, 1928, it had circulated versions in 608 languages, the complete Bible in 145, the New Testament in 146 more, and at least one complete book of the Bible in the remaining 317. In all but about 40 cases it was the actual publisher. Translations or revisions in scores of languages are constantly being carried on by companies of scholars and representative missionaries under the society's auspices and often at its expense. New versions are made, wherever practicable, from the Hebrew or Greek text. The society's interdenominational character has commonly secured the acceptance of the same version by missions of different Churches working side by side.

Except under special circumstances the society does not encourage free distribution. It prefers to provide numerous editions at prices below the cost of production and within the reach of the poor, and makes further concessions to religious and philanthropic agencies. Its total issues from 1804 to 1928 were over 385 million. Of the 9,936,714 volumes issued in 1927–28, 3,790,275 were sent out from the London Bible House; 2,178,726 were in English; about 1,598,000 were circulated in Continental Europe; 442,000 in Africa; 1,075,000 in India and Ceylon; 3,640,300 in China; 986,000 in Japan and Korea; 473,000 in South America. The society owns 53 Bible houses and residences in the principal cities of the world, and rents depots in many others. It employs about 900 colporteurs. Its total income in 1927–28 was £417,295 and its expenditure £411,817.

In Scotland the Edinburgh Bible Society (1809), the Glasgow Bible Society (1812), and other Scottish auxiliaries, many of which had dissociated themselves from the British and Foreign Bible Society at the time of the Apocrypha controversy of 1826, were finally incorporated (1861) into the National Bible Society of Scotland, which since then has carried on vigorous work, especially in Europe, China, Central Africa and South America. Its total issues from 1861 to 1927 were 88,070,068 volumes. During the five years 1923–27 the average issues were 3,552,354 and the average income £39,299.

In Ireland the Hibernian Bible Society (originally known as the Dublin Bible Society) was founded in 1806, and with it were federated kindred Irish associations formed at Cork, Belfast, and other places. In 1927–28 the society had an income of £7,000, and issued 73,570 books, making a total, since its foundation, of 6,978,961. It sends an annual subsidy to aid the foreign work of the British and Foreign Bible Society.

In France the *Société biblique de Paris* was founded in 1818 with generous aid from the British and Foreign Bible Society. In 1927 its issues numbered 7,420. The *Société biblique de France*, which dates from 1864, issued, in 1927, 8,677 copies.

Central and Northern Europe.—The impulse which founded the British and Foreign Bible Society soon spread over Europe, and, notwithstanding the turmoils of the Napoleonic wars, kindred organizations on similar lines, promoted and subsidized by the British and Foreign Bible Society, quickly sprang up in Switzerland, Germany, Hungary, Holland, Poland, the countries round the Baltic, and Iceland. Many of these secured royal and aristocratic patronage and encouragement—the tsar of Russia, the kings of Prussia, Bavaria, Württemberg, Sweden and Denmark all lending their influence to the enterprise. The most noteworthy was that established in Russia. In 1812 Alexander I. sanctioned plans for a Bible society which was promptly inaugurated at St. Petersburg (now Leningrad) under the presidency of Prince Galitzin. Nobles and ministers of State, with the chief ecclesiastics of the Russian and other Churches, served on its committees. The society made rapid progress until 1823; in 1826 its operations were suspended by Nicholas I., who in 1828 sanctioned the establishment of a Protestant Bible society. From 1839 until the Revolution an agency of the British and Foreign Bible Society enjoyed special facilities in Russia, and at the beginning of the present century was circulating about 600,000 copies of the Scriptures annually in the empire.

Some of these societies are still at work. The circulation effected by the German Bible societies in 1927 was as follows: Württemberg Bible Institute (Stuttgart), 521,858; Prussian Bible Society (Berlin), 162,517; Berg Bible Society (Elberfeld), 191,474; Canstein Bible Institute (Halle), and smaller societies, 139,000.

The Netherlands Bible Society in 1927 circulated 173,897 vols., the Danish Bible Society 75,577, the Norwegian Bible Society 62,563, the Swedish Bible Society 87,056.

In Italy three Societies are circulating Scriptures with the approval of the Roman Church, the Pious Society of St. Jerome, the Society of Cardinal Ferrari and the Alba. It has been stated that about half-a-million copies of the St. Jerome Society's edition of the Gospels and Acts have been issued.

In America, the earliest Bible Society was founded at Philadelphia in Dec. 1808. It was followed in 1809 by the Connecticut (May), Massachusetts (July), Maine (August), New York (November) and New Jersey (December). Others quickly followed in succeeding years. Twenty-nine State and local Bible Societies organized in this early period have completed their century of service and are still at work. The Massachusetts Bible Society (State) with a circulation of 433,197 volumes, and the New York Bible Society (city) with a circulation of 892,706 volumes, accomplished the largest work in 1927.

The American Bible Society.—In 1816, a convention of delegates representing 31 State and local Societies met at New York and established the American Bible Society, with Elias Boudinot as president. Almost all kindred organizations in the States have gradually become connected with it as auxiliaries. At one time, they numbered over 2,000. Changed conditions and methods, by which contributions now come largely through denominational channels, have resulted in the disappearance of many of these auxiliaries. The original constitution of the society specified that its work should be "to encourage a wider circulation of the Holy Scriptures, without note or comment." This is still its sole object. In English, it circulates only the Authorized or King James and the Revised Versions. It is non-denominational with a lay board of managers. In 1927, 29 denominations appointed representatives on this Council.

Noteworthy versions of the Bible, such as those in Arabic, Armenian, Zulu, several dialects of Chinese, a number of American Indian, Philippine, Micronesian and African languages, have appeared under the auspices of the American Bible Society. It has shared jointly with the British and Foreign and the Scottish Bible Societies in Chinese, Japanese, Korean and Turkish Versions. Up to Dec. 1927, it had participated in the translation, printing or distribution of the Scriptures in 295 languages including various systems for the blind.

The purpose and work of the society is entirely missionary. It supplies the Scriptures without purpose of profit and largely through whole or part donations. It has 12 foreign agencies through which it works in Central and South America, the West Indies, the Levant, the Philippines, Siam, China and Japan. It has ten home agencies covering the United States, with headquarters at New York, Philadelphia, Washington, Richmond, Cincinnati, Chicago, Dallas, Denver and San Francisco; the agency among the coloured people also centring in New York. The appropriations for 1928 were $1,345,426. During 1927, it issued 10,034,797 Bibles, Testaments and Portions, about half of which were for use in the United States and half for other countries. The total issues of the society since 1816 to the end of 1927 were 194,063,757 volumes.

The Gideon Society, organized in 1899 at Janesville, Wis., to carry the gospel message to commercial travellers and transients and to place Bibles in hotel guest rooms, had distributed by 1928 about 965,000 copies in the United States and Canada, as well as a number in China, Japan and Korea.

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BIBLIOGRAPHY. The word *βιβλιογραφία* was used in post-classical Greek for the writing of books, and as late as 1761, in Fenning's *English Dictionary,* a bibliographer is defined as "one who writes or copies books." The transition from the meaning "a writing *of* books" to that of "a writing *about* books" had been made in France by 1763 when De Bure published his *Bibliographie instructive.* In England the new meaning was popularized by the Rev. T. F. Dibdin early in the 19th century, while Southey preferred the rival form *bibliology,* now disused. According to the objects pursued bibliography has two aspects. Of these the first looks to the author by whom a book was written, the time and place at which it was produced, the methods of its production, whether in ms. (*see* PALAEOGRAPHY) or in print (*see* TYPOGRAPHY), its decoration and illustration (*see* ILLUSTRATION), its binding (*see* BOOKBINDING), its distribution by means of the book-trade and the price at which it was sold and the obstacles imposed on its circulation (*see* CENSORSHIP). The second is concerned solely with its subject and value to those who read it. The two aspects overlap, but each has its own literature, for the publication of which separate societies are at work, and the use of some distinguishing terms, such as bibliography of the form of books and bibliography of their subjects, would save confusion.

Bibliography of the Form of Books.—The foundation of this is the careful examination and description of individual copies. Starting from the facts stated under the heading BOOKS (*q.v.*) we may say that a standard description of any book which has both literary and typographical interest should comprise the following sections: (*a*) a literal transcript of the title-page (if it have one), also of the colophon (if it have one), and of any headings or other portions of the book serving to distinguish it from other editions or issues; (*b*) statements as to the size or form of the book, the gatherings or quires of which it is made up, with the total number of leaves, the measurement of the copy described and of the type-page, a note of the types in which different parts of the book are printed and a reference to any trustworthy information already in print; (*c*) a statement of the literary contents of the book and of the points at which they respectively begin; (*d*) a note giving any additional information which may be needed.

(*a*) In transcribing the title-page and other parts of the book the opening words should be given in full, any subsequent omissions being indicated by three dots placed close together. The end of a line should be indicated by an upright stroke, or in early books with the old long commas by double strokes to avoid confusion with these. It is a considerable gain to indicate to the eye the types in which the words are printed, *i.e.,* whether in roman, gothic letter or italic, and in each case whether in majuscules or minuscules. This, however, increases both the cost of printing and risk of error. In books before 1641, if upper-case letters are transliterated into lower the printer's own practice as to initial and medial *i* and *j, u* and *v* should be followed. Misprints in the original title should be reproduced either with a following [*sic*] or preferably with a footnote to the description.

(*b*) The "size" of a book was originally a technical expression for the relation of the individual leaves to the sheet of paper of which they formed a part. A book in-folio meant one in which the paper had been folded once, so that each sheet had made two leaves. In a book in-quarto each sheet had been folded twice so as to make four leaves. In an octavo another fold had produced eight leaves, and so on for books in 16mo, 32mo and 64mo. For books in twelves, twenty-fours, etc., the paper had at some stage to be folded in three instead of two, and their form differed according to the way in which this had been done. The size of old books can mostly be ascertained by noting whether the thicker white lines visible in the paper when held up to the light run perpendicularly or horizontally. These wire-lines (so called from being made by the wires of the trays in which paper was made) run perpendicularly in folios and octavos, horizontally in quartos and sextodecimos. In tall duodecimos they are perpendicular, in "dumpy" ones horizontal. In small quartos and the lesser sizes only one sheet was usually sewn at a time, so that the number of leaves corresponds with the name of the size; in folios and large quartos, to reduce the amount of sewing, one or more additional sheets were placed inside the first, so that the earliest folios often have ten leaves in the quire, and the earliest large quartos eight.

When a ms. or early printed book was being prepared for binding it was usual for the order in which the quires or gatherings were to be arranged to be indicated by signing them with the letters of the alphabet in their order, the alphabet generally used being the Latin, in which I stands for both I and J; V for both U and V, and there is no W. If more than 23 letters were needed the contractions for *et, con, rum* and (less often) that for *us,* were used as additional signs, and for large books minuscules were used as well as majuscules, and the letters were doubled. In 1472 printed signatures are found and they are still in use. If the quires or gatherings in the book to be described are signed in print, the signatures used should be quoted without brackets. If they are not signed, the order of the gatherings should be noted by the letters of the alphabet in square brackets. In each case the number of leaves in each gathering should be shown by index-figures. Thus, six gatherings of eight leaves followed by one of four should be represented by the symbols A-F^{8} G^{4}. The "make-up" of an old book in original binding is usually sufficiently shown by the strings in the middle of each quire. In re-bound copies of old folios and quartos the best guide to it is to note the sequence of the watermarks, *i.e.,* the devices with which the papermaker as a rule marked each sheet (*see* PAPER). In a folio book one of every pair of leaves should have a watermark in the middle of the paper. In a quarto some pairs of leaves will have no watermark; in others it will be found divided by the fold of the paper.

After the size and sequence of the gatherings has been stated the total number of leaves should be noted, with a mention of any numeration of them given in the book. Errors in the printed numeration of the leaves of old books are common, and it is seldom necessary to point them out in detail. Printed leaf numeration is found as early as 1470, and became common about ten years later. Printed pagination did not become common till nearly the middle of the 16th century.

The foregoing details are all directed to showing which leaves of a book would be printed by the same pull of the press, how it was made up for binding, and how imperfections in any copy may be detected. They give little or no indication of the dimensions of the book, and it is therefore necessary to add the measurements in inches or millimetres of a page of an uncut copy. In old books uncut copies are not easily found, and it is useful instead of this to give the measurement in millimetres of the printed portion of the page (technically called the "type-page"), from which, if the habits of the printer are known, the size of an uncut copy can usually be deduced. To this is added a statement of the number of lines in the page measured. The character of the type (roman, gothic or italic) is next mentioned, and in the case of 15th-century books the measurement of 20 lines of type. Finally, a reference to any authoritative description already printed completes this portion of the entry. Thus the description of the collation of the first-dated book printed at Augsburg, the *Meditationes* of S. Bonaventura, printed by Günther Zainer in 1468, should read: Folio, [a^{10}, b-d^{8}, e-g^{10}, h^{8}] 72 leaves. Type-page 205×122 mm.; 35 lines. Type 1 (gothic letter, 117 mm.). Hain *3557.

(*c*) While many books, especially early ones, contain little or nothing beyond the bare text of a well-known work, others are well provided, not only with commentaries which are almost sure to be mentioned on the title-page, or in the colophon (which the editor himself often wrote), but also with dedicatory letters, prefaces, complimentary verses, indexes and other accessories, the presence of which it is desirable to indicate. In these cases it is often convenient to show the entire contents of the book in the order in which they occur, noting the leaves or pages on which each begins. Thus in the first edition (1590) of the first three books of Spenser's *Faerie Queene,* the literary contents, their order and the space they occupy can be concisely noted by taking the successive gatherings according to their signatures and showing what comes on each page. Thus: A$_{1}$, recto, title; verso, dedication, "To the Most Mightie and Magnificent Empresse Elizabeth"; A$_{2}$–Oo$_{8}$, text of books i.–iii.; Pp$_{1}$, letter dated Jan. 23, 1589 [1590] to Sir Walter Raleigh expounding the intention of the work; Pp$_{3}$ verso, commendatory verses signed W. R[aleigh], Hob-ynoll (Gabriel Harvey), R.S., H.B., W.L. and Ignoto; Pp$_{5-8}$, complimentary sonnets severally inscribed to Sir C. Hatton, the earls of Essex, Oxford, Northumberland and Ormond, Lord Ch. Howard, Lord Grey of Wilton and Sir W. Raleigh, and to Lady Carew and to the Ladies in the Court; and "Faults escaped in the print"; Qq$_{1-4}$, 15 other sonnets.

The Results of Collation.—When books have been examined with the care needed to produce descriptions of this kind they fall into their places in the general history of printing or the output of an individual press, and if their characteristics are inconsistent with the place or date claimed for them their pretensions can be exposed, as in the case of the Lyonnese counterfeits of the octavo editions of the classics printed by Aldus at Venice, the numerous unauthorized editions of works by Luther, professing to be printed at Wittenberg, or again the numerous controversial books printed in England in the 16th century purporting to have been produced in German towns or, with pleasant humour, "at Rome before the Castle of S. Angel at the Sign of S. Peter." In the same way the not very numerous cases of incorrect dating in early books when placed side by side with other books of the period can gradually be transferred to the earlier or later groups into which they fit, and the wrong dates are mostly found to be due either (i.) to simple misprints, as in the omission of an *x* in the date Mcccclxviij in the first book printed at Oxford; (ii.) to the use in reprints (mostly in legal books, 1560–80) of the date of the first edition to indicate that the text was unaltered; (iii.) to a desire to help surreptitious new editions to escape notice, as in the Geneva Bibles printed in Holland for importation into England after 1617, which were dated 1599, or the later reprints of Shakespeare's *Venus and Adonis* dated 1602.

Collation helps also to determine the order of undated editions, since in reprints a printer had opportunities, which he seldom failed to use, of saving space here and there and so reducing his bills for paper and presswork, and could also set up the successive sheets of preliminaries and text consecutively in their order instead of printing text first and preliminaries after as was usual in first editions. It may even discover evidence of authorship, as when Skeat found that the initial letters of successive chapters of the *Testament of Love* made up a sentence, and Henry Bradley by correcting a wrong arrangement of the sheets showed that the sentence implied the authorship of the book by Thomas Usk, and thus relieved Chaucer, to whom it had most injuriously been attributed, of the burden of it. Collation also brings to light irregularities in the sequence of the sheets of which a book is composed, which can be traced to after-thoughts of the publisher or author, necessitating the insertion of additional leaves and sometimes also the excision of others already printed. Thus, as originally printed, the first sheet of the 1609 quarto of Shakespeare's *Troilus and Cressida* consisted of a title-page, beginning "The Historie of Troylus and Cresseida. As it was acted by the Kings Maiesties seruants at the Globe," and three leaves of text. The title-leaf was subsequently cut out and two leaves (a half-sheet) substituted, the first bearing a new title, the second (with signature ¶$_{2}$) a preface stating that this was "a new play, never stal'd with the Stage." Literary students had long disputed as to which of these variants was the earlier, but the bibliographical evidence is decisive. So again, variations between different copies of the first edition of Herrick's *Hesperides* (1648), which had puzzled his editors, are easily explained as due to the presence of three such cancels. In the 18th century resort to cancels was extraordinarily frequent, and it still occurs. Owing to the extreme slowness of the presswork of the early printers there were more opportunities in their days for making corrections and alterations while a book was still passing through the press than there are now. Thus the first printer at Mainz can be shown to have increased the size of the edition of the first great Latin Bible after a start had been made, so that a few of the leaves are found in two states owing to additional copies having been printed after the type of the first setting had been dispersed, and of the extant copies of the first quartos of Shakespeare's *Richard II.* (1597) and *King Lear* (1608) some have corrected readings on certain leaves which in others are left uncorrected.

On the other hand the leather inking-balls used by the pressmen sometimes caught up one or more pieces of type from the form and if these were replaced wrongly the sheets subsequently printed would have incorrect readings instead of correct ones, and some of the small variations noticed in different copies of the First Folio Shakespeare and again in the first edition of Milton's *Paradise Lost* have been ascribed to this cause. All the sheets, correct or incorrect, would be used indiscriminately when the book came to be bound, and thus it has been said with some approach to truth that no two copies of an Elizabethan book are absolutely identical. These minor variations thus only constitute different "states" of the leaves or sheets on which they occur, while the substitution of a different title-page, as in the 1609 *Troilus* mentioned above, constitutes a different "issue," both "states" and "issues" being parts of one and the same "edition."

Enumeration and Arrangement.—If every book bore the true name of its author, the correct date and place of its publication, and the names of its printer and publisher, and no mishaps occurred in the course of printing and publication, it would still remain the task of what is here called formal bibliography to collect information as to all the books written by a certain author, or printed by a certain printer, or published in a certain city or country, and arrange them in chronological order under the names of the author, or the printer, or the city or country, according to the plan undertaken. The ideal to which bibliography of this kind is directed is the compilation for each country of a national register of its literature in the form of annals of publication with indexes of authors and (in so far as they are of interest) of printers and publishers, illustrators and any other persons connected with the book, so that under the name of each all their contributions would be shown. The old ideal was directed to a universal register of books, and for those published in the 15th century the zeal of students of early printing has provided the material for an almost exhaustive list, the *Gesamtkatalog der Wiegendrucke* (*see* INCUNABULA). Of those printed in the years 1501–36 there is a tentative enumeration in the continuation of Panzer's *Annales Typographici* (1803), and materials are gradually being collected for improving and extending this. But the projects once formed for a universal bibliography have dwindled in proportion as the output of the press has increased, and the nearest approaches to such a work are the printed catalogue of the library of the British Museum, and that of the Bibliothèque Nationale at Paris, now in progress. When a universal bibliography was recognized as an impossibility patriotism suggested the compilation of national bibliographies, and the *Bibliotheca Britannica* of Robert Watt (Edinburgh, 1824) remains an extraordinary example of what the zeal of a single man could accomplish in this direction. Quérard's *La France littéraire* (1827–39), while it gives fuller titles, is much less comprehensive, embracing mainly books of the 18th and early 19th centuries, and only a selection of these. In the works of Heinsius (*Allgemeines Bücherlexikon, 1700–1815,* Leipzig, 1812–17) and Kayser (*Bücherlexikon, 1750,* etc., Leipzig, 1834, etc.) Germany possesses a fine record of her output of books during the 18th and 19th centuries, and since the organization of the book-trade contemporary lists of books, with *résumés* and indexes issued at intervals, exist for most European countries. For English books up to the close of the year 1640, with the aid of catalogues previously published by the British Museum, the Cambridge university library, and other institutions, a *Short-title Catalogue* was compiled by members of the Bibliographical Society and issued in 1926. This comprises over 26,000 entries and gives references to libraries in which copies are preserved.

Subject-Bibliography.—In the 18th and early 19th centuries there was a tendency, especially among French writers, to impose upon bibliography the task of indicating the exact place which every book published should occupy in a logical classification of all literature based on a previous classification of all knowledge. It came to be recognized that the classification of human knowledge is a task for philosophers and men of science, and that, for example, to make a good bibliography of chemistry requires a knowledge of chemistry and of its history quite extrinsic to bibliography itself, which can only at most suggest certain general principles of arrangement, and point out to some extent how they may be applied. The essential requisite is a clear idea of the use to which the bibliography is to be put. If its chief object be to give detailed information about individual books, a strictly alphabetical arrangement "by authors and titles" (*i.e.,* by the names of authors in their alphabetical order and the titles of their books in alphabetical sequence under the names) will be the most useful. If it is desired to illustrate the history and development of a subject, or the literary biography of an author, the books should be entered chronologically. If direction in reading is to be given, this can best be offered by a subject-index, in which the subjects are arranged alphabetically for speedy reference and the books chronologically under the subject, so that the newest are always at the end. Lastly, if the object is to show how far the whole field has been covered and what gaps remain to be filled, a class catalogue arranged according to what are considered the logical subdivisions of the subject has its advantages. It is important, however, to remember that, if the bulk of the bibliography is very large, a principle of arrangement which would be clear and useful on a small scale may be lost in the quantity of pages over which it extends. In 1886 a great impetus was given to subject-bibliography by the publication by the British Museum of a *Subject-Index of the Modern Works* added to its library since 1880, compiled by Mr. G. K. Fortescue, under whose editorship an enlarged index covering the 20 years 1881 to 1900 was subsequently published, while supplementary indexes have since been issued quinquennially, bringing the total number of books registered under subjects to nearly half a million. In 1895 the Institut international de Bibliographie at Brussels issued its first bulletin, and the international character of modern science has gradually led to the revival of old ideals in less ambitious forms. Nearly 20 years earlier (in 1876) Mr. Melvil Dewey, while helping to found the American Library Association and American Metric Bureau, outlined his decimal system for the classification of books, and this, as he gradually worked it out, was widely adopted by librarians not only in the United States, but in England and elsewhere despite much criticism and the competition of rival systems. With Dewey's permission the Institut international de Bibliographie, in a *Manuel de la Classification,* amplified his scheme so as to make it available for indexing literature on the widest scale, and in 1927 a British Society for International Bibliography was founded as a branch of the Institut, in order "to promote the study of bibliographical methods and of the classification of information, to secure international unity of bibliographical procedure and classification and to foster the formation of comprehensive and specialist bibliographies of recorded information." In this way the ambitious ideals of subject-bibliography are in process of being realized, not by bibliographers parcelling out knowledge into pigeon-holes but by the workers in each subject helping to form a classification which will answer to their own peculiar needs.

The only competent treatise on the bibliography of the form of books is *An Introduction to Bibliography for Literary Students,* by R. B. McKerrow (1927), based on a paper entitled *Notes on Bibliographical Evidence for Literary Students and Editors of English Works of the 16th and 17th Centuries,* read before the Bibliographical Society in 1913. *See* also F. Madan's paper *On Method in Bibliography,* in vol. i. of the Society's *Transactions* (1893), and *Some Points in Bibliographical Descriptions,* by A. W. Pollard and W. W. Greg, and a memorandum on *Degressive Bibliography,* by F. Madan in vol. ix. (1909). Subject-bibliographies will be found listed at the beginning of the entries of books on the subjects with which they are concerned in the successive volumes of the British Museum's *Subject-Index of the Modern Works added to the Library.* For books published before its issue W. P. Courtney's *A Register of National Bibliography, with a selection of the chief bibliographical works and articles printed in other countries* (1905) is still useful. (A. W. P.)

BIBLIOMANCY, a form of divination (*q.v.*) by means of the Bible or other books. The method employed is to open the Bible haphazard and be guided by the first verse which catches the eye. Among the Greeks and Romans the practice was known under the name of *sortes Homericae* and *sortes Virgilianae,* the books consulted being respectively those of Homer and Virgil.

BIBRACTE, an ancient Gaulish hill-top town, 2,500ft. above sea-level, the modern Mt. Beuvray, near Autun, in France. Excavation has revealed an area of 330 acres, girt with a stone and wood rampart 3m. long, and containing the remains of dwelling-houses, a temple of Bibractis, and workshops of iron and bronze workers and enamellers. It was the capital of the Aedui in the time of Julius Caesar. Later on Augustus removed the inhabitants to his new town Augustodūnum (Autun), to destroy the free native traditions. Another far more obscure town in Gaul, near Reims, also bore the name.

See J. G. Bulliot, *Fouilles de Beuvray* (Autun, 1899); J. Déchelette, *L'Oppidum de Bibracte* (1903); also references, *s.v.* AEDUI.

Battle of Bibracte.—This battle was the climax of Julius Caesar's first campaign in Gaul 58 B.C. Before he could contemplate the expansion of Rome's dominion he found that he had to deal with an imminent threat to the security of the existing province, for the Helvetii, assembling around Lake Geneva, were about to begin a tribal migration into the fertile plains of Gaul. By negotiations more diplomatic than sincere, Caesar gained time to block their path across the Rhône. The delay enabled him to return to Cisalpine Gaul and raise two new legions, concentrate three others, and then march back across the Alps to reinforce the solitary Tenth Legion on the Rhône. The Helvetii meanwhile had pursued their leisurely course along the north bank of the Rhône. Caesar caught them in the act of crossing the Arar (modern Saône) just north of its junction with the Rhône near modern Lyon, and inflicted a sharp check. The Helvetii now turned northwards, followed cautiously by Caesar until, embarrassed by shortage of supplies, he decided to press on ahead of them to Bibracte (near modern Autun). His difficulty encouraged the Helvetii to move against him, and their harassing of his march became so unpleasant that he turned at bay on a hill before reaching Bibracte. Posting the two untried legions and the auxiliaries with the baggage on the crest, he formed the remainder in three lines. The Roman javelin (*pilum*) throwing was so effective that it did much to break up the solidity of the assault, and enabled the legionaries to press the enemy steadily back in the close quarter combat. But as the legions followed up the retirement of the Helvetii they laid bare their own rear. The opportunity to fall upon this was seized by a large body of the allied Boii and Tulungi who had been guarding the wagon-park of the Helvetii. To meet the danger Caesar turned his third line about and after a stern struggle repulsed the double attack now launched. The success was eventually completed by the capture of the wagon-park.

BIBULUS, a surname of the Roman gens Calpurnia. The best known of those who bore it was Marcus Calpurnius Bibulus, the persistent enemy of Caesar, with whom he was consul, 59 B.C. He was the candidate of the aristocratic party and his election was secured by bribery (Suetonius, *Caesar,* 9). He made an attempt to oppose the agrarian law introduced by Caesar but was overpowered. He then shut himself up in his own house during the remaining eight months of his consulship, taking no part in public business beyond issuing edicts against Caesar's proceedings. When the relations of Caesar and Pompey became strained, Bibulus supported Pompey (Plutarch, *Cato Minor,* 41) and joined in proposing his election as sole consul (52 B.C.). Next year he went to Syria as proconsul. In 49 Pompey gave him command of his fleet in the Ionian Sea, but he proved unsuccessful and died soon afterwards (48) of fatigue and mortification (Caesar, *Bell. Civ.,* iii. 5–18; Dio. Cassius, xli. 48). His youngest son, Lucius Calpurnius Bibulus, surrendered to Antony soon after the battle of Philippi and was by him appointed to the command of his fleet. He died (about 32) while governor of Syria.

Bibulus wrote a short memoir of his step-father Brutus, which was used by Plutarch (Appian, *B.C.,* iv. 136; Plutarch, *Brutus,* 13, 23).

BICARBONATE, in chemistry, an acid carbonate, a salt in which one only of the two hydrogen atoms in the molecule of carbonic acid has been replaced by metal. Na_2CO_3 is the formula of normal sodium carbonate, washing soda; $NaHCO_3$, is that of sodium bicarbonate, or baking soda. (*See* CARBONIC ACID.)

BICE, a term erroneously applied to particular shades of green or blue pigments from the French terms *vert bis* and *azur bis,* dark green or blue. These colours are generally prepared from basic copper carbonates, but sometimes from ultramarine and other pigments.

BICEPS, the name given to one of the muscles of the upper arm, from which the latter derives its rounded appearance in front. It has two heads or origins, the shorter attached to the coracoid process of the scapula, the longer to the edge of the glenoid cavity. The two heads unite to form a central portion or belly, which ends in a tendon, the distal end of which is inserted on the radius. The muscle on contraction has the effect of flexing the forearm and assisting in the supination of the hand. *See* MUSCLE, STRUCTURE OF and MUSCLE AND MUSCULAR EXERCISE.

BICESTER (bĭs'tŭr), urban district of Oxfordshire, England, 12 mi. N.N.E. of Oxford by the L.M.S.R.; pop. (1938) 3,344. Area 2.6 sq.mi. It lies in a pastoral country on the northern edge of the open plain of Ot Moor. The termination *cester,* commonly indicating Roman origin, does not appear to do so here, and is perhaps copied from Alchester and Chesterton, a village two miles west of Bicester, where a Roman site has been recognized at the junction of roads from the south (Dorchester) and from the west, northeast and east. There are records of the settlement (Berncestre, Burencestre, Bissiter) from the time of Domesday. In 1182 Gilbert Basset founded an Augustinian priory which was the centre of industrial life until its dissolution in 1538. Richard II. granted a fair and a Monday market, and in 1440 an additional market was granted, to be held in that part of the town called Bury-End, from this date known as Market-End. In the 16th century the cattle market was specially famous.

The church of St. Edburg contains examples of Norman and each succeeding style. There are scanty remains of the Augustinian priory. Bicester never possessed any manufactures of importance. It has considerable agricultural trade and is famous as a hunting centre. It lies on the G.W.R. line from London to Birmingham. The urban district was extended in 1932.

BICHAT, MARIE FRANÇOIS XAVIER (1771–1802), French anatomist and physiologist, was born at Thoirette (Jura) on Nov. 14, 1771, the son of a physician. He studied anatomy and surgery under M. A. Petit (1766–1811), chief surgeon to the Hôtel-Dieu at Lyons. The revolutionary disturbances drove him to Paris in 1793. He there became a pupil and then assistant of P. J. Desault, who died in 1795. He completed the fourth volume of Desault's *Journal de Chirurgie,* to which he added a biographical memoir of its author. He then wrote the *Oeuvres chirurgicales de Desault, ou tableau de sa doctrine, et de sa pratique dans le traitement des maladies externes* (1798–99), in which, although he professes only to set forth the ideas of another, he develops them with the clearness of one who is a master of the subject. In 1797 he began a course of anatomical demonstrations, and then began to lecture on operative surgery and physiology. His *Anatomie générale* (1801) contains the fruits of his most profound and original researches. His *Anatomie descriptive* (1801–03), in which the organs were arranged according to his peculiar classification of their functions, was completed by his pupils, M. F. R. Buisson (1776–1805) and P. J. Roux (1780–1854).

Before Bichat had attained the age of 28 he was appointed physician to the Hôtel-Dieu, a situation which opened an immense field to his ardent spirit of enquiry. He engaged in a series of examinations, with a view to ascertain the changes induced in the various organs by disease, and in less than six months he had opened about 600 bodies. A fall from a staircase at the Hôtel-Dieu resulted in a fever, and he died on July 22, 1802. His bust, together with that of Desault, was placed in the Hôtel-Dieu by order of Napoleon.

BICHROMATES: *see* CHROMATES AND DICHROMATES.

BICKERSTAFFE, ISAAC (*c.* 1735–*c.* 1812), British dramatist. He was the author of many plays and burlesque farces interspersed with songs, produced between 1760 and 1771. The best-known are *Maid of the Mill* (founded on Richardson's *Pamela*), *The Padlock, He Would if he Could, Love in a Village, The Hypocrite,* and *The Captive.* In 1772 Bickerstaffe, suspected

of a capital offence, fled to the Continent. The exact date of his death is unknown, but it is recorded that he was living in abject misery in 1812.

A full account of his dramatic productions is given in *Biographia Dramatica,* ed. Stephen Jones (1812).

BICKERSTETH, EDWARD (1786–1850), English hymn writer, was one of the secretaries of the Church Missionary Society, from 1816 to 1830, and rector of Watton, Herts., from 1830 to his death. His *Christian Psalmody* (London, 1833), a collection of over 700 hymns, went through 59 editions in seven years, and formed the basis of the *Hymnal Companion* (London 1870), compiled by his son, E. H. Bickersteth, bishop of Exeter (1885–90).

EDWARD BICKERSTETH (1814–1892), dean of Lichfield, was his nephew, and EDWARD BICKERSTETH (1850–1897), bishop of South Tokyo, his grandson.

BICKNELL, a city of Knox county, Indiana, U.S.A., on the Pennsylvania railroad and state highways 67 and 159, 15 mi. N.E. of Vincennes, in a coal-mining, industrial and agricultural region The population was 5,212 in 1930; 5,110 in 1940.

BICYCLE, a light vehicle formed of two wheels mounted in single line in a simple frame of steel tubes, which is equipped with handles, pedals attached to cranks and a saddle. The rider sits on the saddle, grasps the handlebars, and turns the cranks with his feet by means of the pedals, thus imparting motion to the rear wheel through a chain driven over toothed rings or sprockets.

After several decades of intensive research, development and improvment, bicycles have become the most numerous class of vehicle on the roads of England, France, Germany, Holland, Italy, Belgium and Denmark, while they are very widely used in North America and elsewhere. The bicycle is easily mastered, and can be ridden with very little effort at ten to twelve miles per hour by any normal person. Being easy to house and carry, inexpensive to purchase and maintain, and simple in construction, it is a valuable instrument of self-transport, and it provides pleasant recreation and exercise even while being used for purposes of utility. Cycle-touring is most widely practised in England, but has a large and increasing number of followers in Germany, France and other European countries. Bicycles are also widely used for racing in France, Germany, Belgium, and to a lesser extent in England and the United States (*see* CYCLING).

The oldest existing trace of the cult of self-propulsion occurs in a stained-glass picture in a church window at Stoke Poges, Buckinghamshire, England. This depicts a figure seated upon a wheeled instrument and apparently using the feet against the ground to propel itself. That, at any rate, is the interpretation placed upon the picture by all authorities. The next development was a ponderous four-wheeled carriage propelled by a footman, whose unenviable task it was to depress two heavy timber levers alternately, thus turning the rear wheels by a crude rack-and-pinion device. This is referred to in contemporary English literature from 1769 onwards, and an improved form was exhibited in Paris and actually paraded before the court of Louis XVI. and Marie Antoinette at Versailles in 1779.



FROM "THE DAILY MIRROR"

FIG. 1.—THE FIRST BICYCLE, MADE IN SCOTLAND *c.* 1839

The Hobby-horse, 1816.—Nothing was gained by such contrivances, for the best speed, even with two drivers, was barely equal to walking pace, and there is no further trace of a velocipede in history until 1816, when an important development occurred in Paris. This was the introduction of the hobby-horse, a simple device consisting of two wheels and a cross-bar, upon which the rider sat while he propelled himself with his feet against the ground. Invented by M. Niepce, a pioneer of photography, the celeripede, as it was called, quickly gained favour. In 1818 it was further improved by Baron de Saverbrun, who is said to have performed some remarkable feats of speed upon it; and in the same year it came to London, where many models were made by Dennis Johnson of Long Acre. The price was high and the machine was not within the reach of ordinary folk; thus it became known as the dandy-horse, and was used by the prince regent, among others.

The craze—for such it undoubtedly was—spread to America and lasted for a year or two in the Old and the New World, until the natural crudities of the device killed it, and nothing more is recorded until 1840, when the first real bicycle was made in Scotland by Kirkpatrick MacMillan, of Dumfries. This pioneer took a dandy-horse, added cranks, pedals and driving rods to it, built a comfortable seat, elaborate armrests, handlebars, etc., and rode the machine for many years, once being prosecuted and fined for "furious driving" on the roads. In 1846 Gavin Dalzell improved MacMillan's machine, and the Dalzell became widely known, many specimens being made. These two men are the real pioneers of the bicycle.

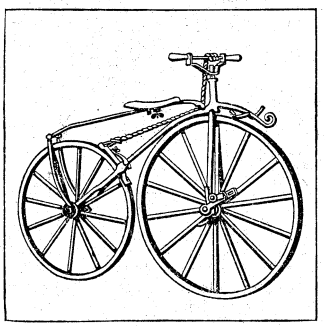


FIG. 2.—THE VELOCIPEDE, OR "BONESHAKER," *c.* 1865
This was the first crank driven bicycle, and large numbers were sold in France, England and America

After them no important event in bicycle history took place for nearly 20 years. It was during this period that isolated examples of velocipedes were built in remote parts of England and other countries, and most of the apparently baseless claims to have "built the first bicycle" relate to this era.

But hitherto there had been no bicycle with rotary cranks. That came in 1865, and was the invention of Pierre Lallement, a workman employed by M. Michaux, of 29, Avenue Montaigne, Paris, an address which is given here in full because it was the first shop at which bicycles were made and sold in an ordinary commercial way. Lallement sold the patent to Michaux and then emigrated to the U.S.A., where he propagated the same idea. Meanwhile Michaux did good business with the velocipede at 200 francs each. At about the same time an extraordinary wave of interest in velocipedes swept over England, and inventions and freak constructions were numerous. The industry in England was begun on regular lines by the Coventry Sewing Machine Company, who, in order to fulfil an order placed by their Paris agent for 500 machines of the Michaux type, reconstructed their business in 1868 under the name of the Coventry Machinists' Co. Ltd. Afterwards it became the Swift Cycle Co. Ltd. However, when only a few of the bicycles had been despatched to Paris, the Franco-Prussian war broke out, and this mischance actually established the trade in England, for it compelled the Coventry Machinists' Co. to find a home market for the remainder of the 500 machines ordered for Paris.

These Michaux-pattern bicycles belong to the class which came to be known as "boneshakers." They had two wheels of nearly equal size (the front being larger), and the driving-cranks and pedals were fitted to the axle of the front wheel. With heavy wooden wheels, thick iron tyres and a massive iron backbone, these machines were extremely heavy, and they vibrated in a terrifying manner over the rough roads. This vibration and weight caused intense fatigue to the rider, but despite this the new vehicle gained in popularity, for it opened up new possibilities.

The Tall "Ordinary."—Then some important improvements came, as more firms began to manufacture boneshakers, and new ideas were brought into the industry. The heavy wooden wheels gave place to lighter ones of metal, with thin wire spokes set at a tangent to the centre. Solid rubber tyres were cemented to the rims, and the increased speed potentialities were utilized by enlarging the front or driven wheel, so that a higher ratio of gearing was employed or, in other words, a greater distance was travelled with each revolution of the cranks. This tendency continued, and the front wheels grew from 30in. to 40, 48, 52, 60 and even 64in. in diameter, while the rear wheel shrank to 12in. or less. This was the type known as the "ordinary," and it remained in vogue for 20 years, during which time bicycling became a firmly-established pastime in England, America, France and other countries. Ball-bearings were introduced in 1877.

The "ordinary" bicycle naturally gave a great advantage to tall men, who could sit a higher wheel, and thus command a larger gear and travel at a faster speed for the same pedalling rate. If lacking in inches, however, the shorter men were not without brains, and several schemes were devised to place them on an equality with their taller brethren. One of these was the "geared ordinary," in which the cranks and pedals were mounted considerably below the front axle, to which power was transmitted by a chain running over sprockets. Short riders began to turn in increasing numbers, however, to the tricycle, or three-wheeled cycle, which, while the "ordinary" bicycle remained current, gained a popularity out of all proportion to its vogue in more modern times.

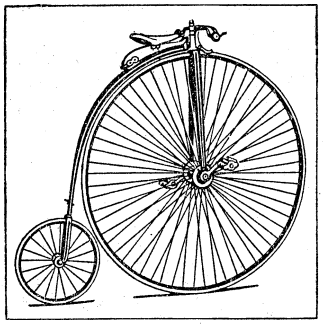


FIG. 3.—THE "ORDINARY" BICYCLE, POPULAR FROM *c.* 1872–1885 With front wheels sometimes built over 5ft. in height, the racing models of this bicycle could attain a speed of 20 miles an hour

The "Safety."—The "safety," or low bicycle familiar to moderns, was made possible by geared-up transmission; that is, the pedals and cranks drove a large sprocket, from which motion was imparted by a chain to a smaller sprocket on the hub of the rear or driven wheel. Thus, although the rear wheel was much smaller than the driven wheel of an "ordinary," the drive could be geared up so that the bicycle's speed in relation to the pedalling strokes was as fast or faster than that of an "ordinary." Curiously enough, the custom has survived of describing a bicycle's "gear" by comparing it with an "ordinary"; for example, a bicycle geared to 65 travels as far, with one revolution of the cranks, as would an "ordinary" bicycle with a 65-in. front wheel.

First invented by H. J. Lawson in 1876, the "safety" rear-driven bicycle was first marketed in a practicable form by Messrs. Starley and Sutton, of the Rover Company, in 1885, and from that time the "ordinary" was doomed, although it lingered until the early 'nineties, and was brought to a really excellent state of precision and lightness (the best racing "ordinaries" weighing only 19 lb.). The following figures tell their own story, however. They represent the percentage of the different types at the two great cycle exhibitions in England during the critical years:—

TYPE.	1889.	1891.	1893.
Ordinary	11·5	3·3	...
Rear-driven safety	53·6	86·7	84·6
Single tricycle	22·1	7·7	5·3

The greatest revolution in bicycle history was the introduction of the pneumatic rubber tyre in 1889 by John Boyd Dunlop, of Belfast. Although received with scepticism at first, it was quickly appreciated at its true worth, riders finding that it gave an enormous increase of comfort and speed. In an attempt to stem its advance, makers introduced a cushion-tyre which enjoyed a brief vogue, but soon the air-tyre carried all before it. The following percentages at the English exhibitions are significant:—

TYRE.	1890.	1891.	1891 (later).	1892.	1893.	1894.
Solid	98·6	29·1	16·6	4·0	3·1	0·4
Cushion	·06	54·2	32·5	14·9	14·7	3·3
Pneumatic	1·2	14·0	39·7	65·5	69·3	89·5

The combination of "safety" bicycle and pneumatic tyre placed the bicycle on an unassailable foundation, and since that date its use has rapidly spread. The "safety" bicycle of 1893 was the modern bicycle in general outline, although there have been many important alterations in detail, as will be shown. Free wheels, which enabled the bicycle to coast or overrun the driving mechanism, were introduced in 1894, and variable gears in 1899.

The bicycle-making industry in the United States was started in 1877 when Col. Albert A. Pope of Boston, Mass., organized the Pope Mfg. Company. The new industry went through about the same changes in models and types, as in England—the Ordinary, the Geared Ordinary, a lever propelled machine called the "Star" with a large driving wheel at the rear and a small steering wheel in front, solid and cushion tyre safety, and in 1890 finally the pneumatic tyre safety. The industry had a period of great prosperity in 1892–94, when it established a sound export business. This was assisted by the fact that when, just afterwards, a similar boom began in England, the demand exceeded the supply, and American machines were eagerly snapped up. The English boom was a very important epoch in cycle history. Bicycling became fashionable among the wealthy classes, prices soared and many companies were floated and refloated. Later came the inevitable slump, after which the English factories were reorganized and learnt to produce a reliable bicycle at a very moderate price.

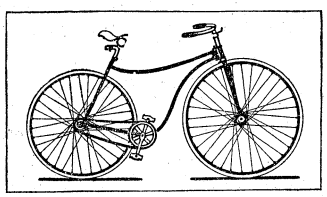


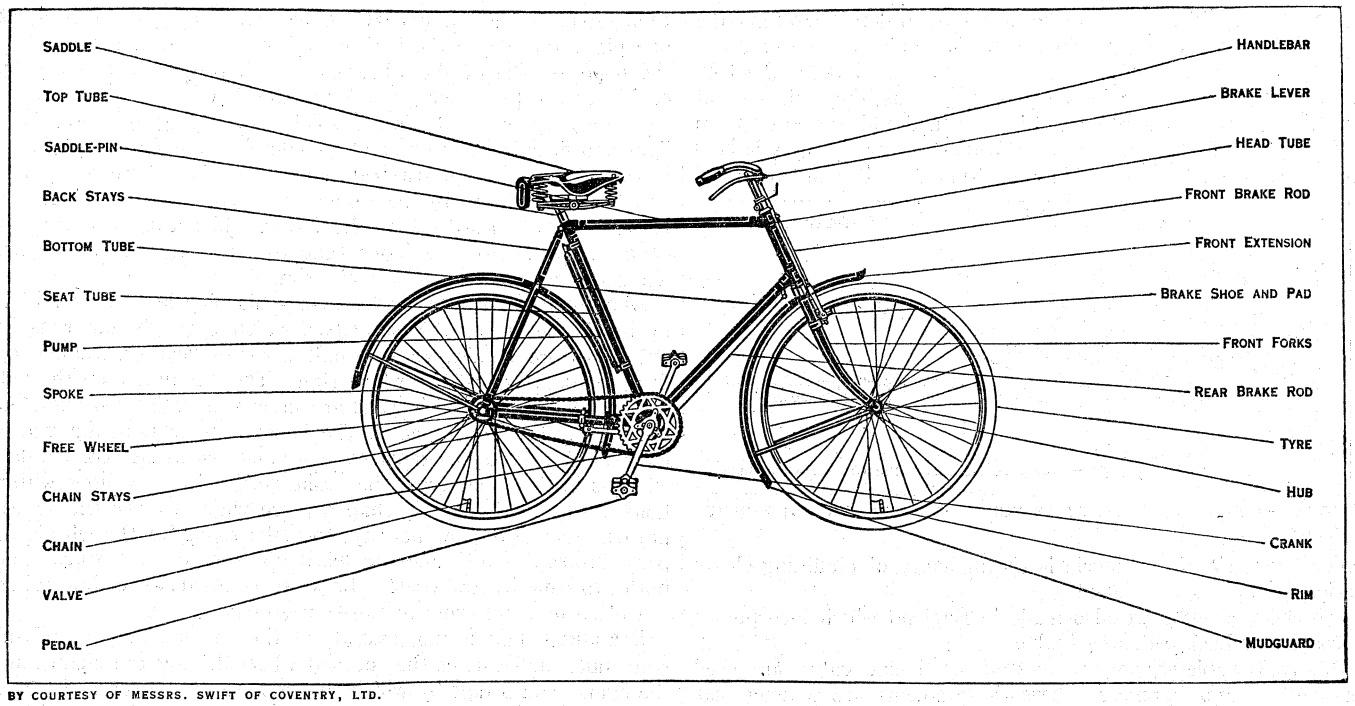
FIG. 4.—AN EARLY "SAFETY" BICYCLE, *c.* 1885. SUCCESSOR TO THE "ORDINARY"

The Modern Bicycle.—In its modern form the bicycle is a remarkable piece of engineering, for it carries a load up to ten times its own weight, and is propelled over all kinds of surfaces with very few mishaps. The two wheels run in perfect alignment, as also do the two transmission sprockets, while all bearings are truly parallel to each other and to the direction of travel. Bicycles weigh from 15 to 35 lb., the lightest being suitable only for racing on specially-prepared tracks. The constructional details are as follows:—

Frame.—This gains its great strength from its triangulated design, by which there is no unsupported beam except the front forks. If the latter were braced or supported, they would impart all road shocks direct to the rider, unless a satisfactory springing arrangement was evolved—a difficult problem. As it is, the forks are curved so that they spring slightly, while the section of weldless steel tubing used is round, oval or D-shaped (with the flat side facing inwards). It is usual to draw the tubing in a thickness which tapers from 21 gauge at the hub end to 18 gauge at the top. This prevents the concentration of strain at the top end. The fork crown (at the top of the forks) is fixed to the steering column, which turns freely in two ball bearings in the head tube, and in which is set the handlebar. The slope or steering angle is the cause of a bicycle running naturally in a straight line, because any movement of the wheel out of the straight tends to raise the bicycle slightly; therefore the weight of bicycle and rider discourages any such deflection of the front wheel except when directed by the rider, and a truly-made bicycle will run in a straight line so long as it is upright, except when the front wheel is forced aside by stones, etc. From this point of view even more steering angle, or "rake," would be permissible, but the desirability of curving the front forks, and also the need for avoiding breakage, keeps the angle within moderate limits.

The steering column is a very important part, and ought to be of 13-gauge thickness at the bottom end, and it is usual to make the gauge to taper to 16 at the top end, where threads are cut to accommodate the head ball bearing cup, the locking-rings, etc. Breakages usually result from the negligence of makers who, finding the column too long for the particular bicycle they are making, shorten it by cutting away the valuable thickened part at the bottom, to avoid the trouble of making new threads which would be necessitated were they to shorten the column at the top. For steering columns and forks a steel with a minimum carbon content of ·32% is recommended.

Main Frame Tubes.—In the better quality bicycles these are butted or thickened at each end, where the gauge is usually 19, as against 22 in the centre. Mild steel, *i.e.*, steel with a carbon content of ·35%, is generally used, and it has been found that the double-butted tubing is much stronger than a plain tubing of 20 gauge. This is because "fatigue" is better distributed in a tapering gauge tube, and also because the ends of the tubes have to be filled in order to "clean-up" after brazing, so that the extra thickness of the butted tubes is an insurance against undue weakening by over-filing. The frame tubes are joined by "lugs" or



BY COURTESY OF MESSRS. SWIFT OF COVENTRY, LTD.

FIG. 5.—A MODERN ROADSTER SAFETY BICYCLE. IN ITS PRESENT DAY FORM, WITH BALL-BEARINGS, PNEUMATIC TYRES, LIGHT FRAME AND WHEELS, POWERFUL BRAKES, AND COMFORTABLE SADDLE, THE BICYCLE IS A REMARKABLE PIECE OF ENGINEERING. IT EASILY CARRIES A LOAD OF TEN TIMES ITS OWN WEIGHT, OVER ALL SORTS OF ROAD SURFACES

sockets, which are made in various angles as necessary. Lugs were originally made of malleable iron castings, but light steel pressings have been found to save weight and to serve the same purpose. In brazing, the parts are heated to a dull red, and this work must be done very carefully to ensure, first, that sufficient brass is run into the joints, and secondly, that the tubes are not burned and weakened through over-heating.

Instead of brazing, acetylene welding can be employed, and lugs dispensed with. Welding leaves a smooth surface and is stronger, but in the event of breakage the whole frame must be renewed, whereas any single tube may be replaced in a brazed frame. Welding is rare in England, but commonly employed in France and Belgium.

Many improvements have been made in the method of housing the rear wheel in the frame, and on all racing bicycles, and many non-racing (called "roadster") bicycles, it is possible to remove or replace the rear wheel in a few seconds.

Wheels.—These consist of rims, spokes and hub. Rims may be of steel, aluminium alloy, wood or wood steel armoured. The first named is the most commonly used in England; whereas, in France and Germany wood and steel are both in wide use, while America, Belgium and Holland favour wood or wood steel armoured more than steel.

In the United States the wood steel armoured rim is used in a large majority of the bicycles manufactured. This rim has all the resiliency of a wood rim and having a thin covering or armour of sheet steel, is thereby protected against the action of the weather, splitting or warping.

Steel rims are made in 18 or 20 gauge and are rolled over at the edges to provide shoulders for the stiff wired edges of the tyres. Wood rims have similar shoulders where they are intended for this class of tyre, but in England these rims are more commonly used for the tubular racing tyre. Sizes of rims, throughout most bicycle-using countries, are expressed by the overall size of the tyre which fits the rim in question; thus, a rim described in England as 26 by 1½in. is actually only about 23in. in diameter, because the size of 26in. refers to the diameter of the tyre when it is properly in position upon that rim. Aluminium alloy rims are non-rusting, and lighter than steel, but bulk must be added to provide the necessary strength.

Spokes are of steel wire, threaded and adjustable at the point where they pass through holes in the rims, while at the other end they are bent at right angles to be hooked into holed flanges in the hubs. In England it is customary to fit 32 spokes to front wheels and 40 to rear wheels, but elsewhere the usual arrangement is 36 spokes in all wheels. Spokes may be plain (usually about 15 gauge) or double butted, *i.e.*, 15 or 16 gauge at each end and 17 or 18 gauge for the remainder. For tandem bicycles, carriers, etc., spokes of 14 gauge are used.

In hubs there is one row of ball bearings on each side, these bearings being adjustable by screwing either the outside ball-race (called the cup) in the hub-shell, or the inside ball-race (called the cone) on the spindle. The driving sprockets are screwed upon the shell, many modern European bicycles, particularly of the racing class, possessing a sprocket at each side of the hub. These sprockets are of different sizes, so that upon reversing the wheel in the frame, a different gear is obtained, or, in other words, the amount of travel obtained in one revolution of the crank is raised. Another common arrangement is a fixed sprocket on one side, and a free-wheel or floating sprocket on the other, which is very helpful to tourists. In the free-wheel the sprocket runs upon separate ball-bearings and has a ratcheted edge inside, so that the outer sprocket can drive the hub, but cannot itself be driven.

Another form of hub, called the coaster, is widely used in America, less popular in England and on the continent of Europe. This is a back-pedalling or coaster brake. When pedalling action is reversed, a member is moved sideways on a quick thread in the hub, and is made to expand a phosphor-bronze ring and bring it into contact with the inner surface of the hub-shell.

Variable Gears.—One of the most ingenious inventions in connection with bicycles is the device of varying the gear. It was first installed in the bottom bracket of the frame, forming part of the chain wheel. Soon afterwards a hub gear giving two different ratios—only one of them on a free-wheel—was invented, then a number of others, of which only the three-speed gear has survived in hub form. It is widely used in the British Isles and in parts of the British empire, and weighs about 2 lb. 2 oz. The drive runs solidly on the middle gear, but is taken through a train of small toothed wheels for the high gear (33⅓% increase) or the low gear (25% reduction). A small lever on the handlebar or the top frame tube effects the change through a stranded wire cable.

All gear-changing mechanism in bicycles is on the epicyclic principle, by which the toothed wheels or pinions are always in

mesh. The principle need not be described in detail here, but the following simple example will explain it: If a toothed wheel A is revolved round, and in engagement with a toothed wheel B, both being allowed to spin freely on their axis, they will spin at the same speeds. If, however, B is then held and prevented from spinning, A will spin much more slowly. Conversely, if A is held in the same way, B will spin more quickly. The drawback of

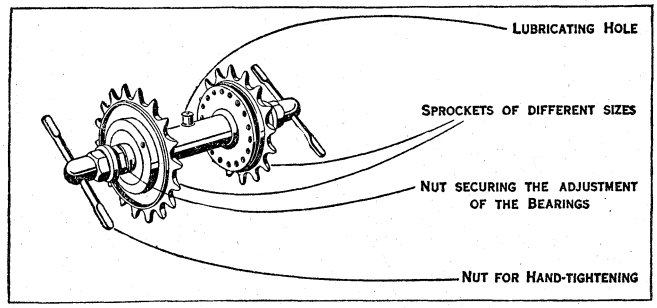


FIG. 6.—THE REVERSIBLE BICYCLE HUB WHICH GIVES TWO DIFFERENT GEAR RATIOS

epicyclic gearing in a bicycle is the difficulty of obtaining closer ratios than those mentioned.

Three-speed hubs are also made in England which incorporate a coaster or back-pedalling brake.

Many variable-gearing devices of particular value are used in the Alps and Pyrenees, where the gradients are so long that the cyclist who could not gear sufficiently low to surmount them on his bicycle would be compelled to spend many hours walking. The principle of most of these devices is a loose driving-chain which can be transferred from one sprocket to another mounted by its side. In some cases there are no fewer than three sprockets on the bracket axle, and three others on the hub. A wide range of gears is thus obtainable. This form of gearing is not favoured in England.

Bicycle Tyres.—These are nearly all of the pneumatic india-rubber type. There are two parts, the inner tube and the outer cover—terms which explain themselves. The inner tube contains a larger percentage of pure rubber. It is drawn from a tubing machine under high pressure, and emerges in circular form. Some cheaper tubes, however, are still manufactured from flat sheet rubber. Outer covers are built up on a cotton or flax fabric, the process being more or less elaborate according to the quality. The tread, or rubber surface that touches the road, is vulcanized on by a moulding press. Although this process destroys a small percentage of the resilience of the rubber, it also compresses it, with the result that if a piece of flint or glass cuts the tread afterwards,

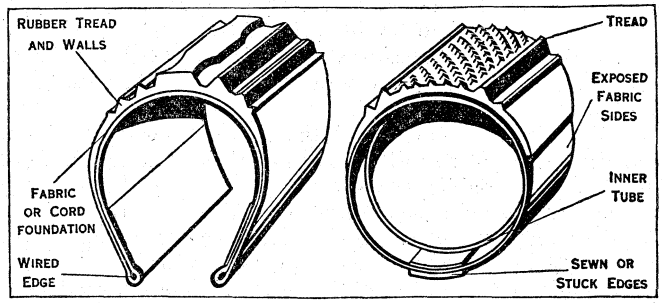


FIG. 7.—THE PNEUMATIC TYRE, INTRODUCED IN 1889
On the left is a wired-on tyre cover for road use, and on the right, a tubular, or racing, tyre complete with inner tube

the cut tends to close itself, instead of opening wider. With hand-made tyres there is no vulcanization, the parts being joined by a solution of rubber in naphtha. As bicycles fitted with these tyres are considered easier to propel, they are sought for racing purposes, where the slightly greater vulnerability and cost are of less importance to the rider than speed.

Stiff wires are sewn into each edge of the outer cover, so that when the tyre is in place on the wheel-rim, the pressure from the air tube within forces the wires against the raised edges of the rim, which hold them securely. As the wires are of exactly the right circumference, it is easy to see that if they are forced, at one place, down into the bed or centre of the rim, the wire on the opposite side of the wheel-circle will project sufficiently to enable it to be lifted over the edge of the rim.

Tubular tyres, used almost solely for racing purposes, are light and flexible. The outer cover completely encloses the inner tube, and it must be unstitched or unstuck when there is a puncture to be repaired. In the Constrictor tyre there are layers of loose threads at the base of the cover, which can be parted to enable a section of the inner tube to be extracted for repair. Tubular tyres are cemented to the rim.

Bicycle Brakes.—The rider brings his bicycle to a standstill by moving levers on the handlebar, which, through thin rods or stranded wire cables, cause small pads of leather, rubber or fibre to press against the wheel rims. These may act on the flat part of the rim, or, with what are known as calliper brakes, on the edges. The advantage of the latter type is that the wheel may be removed or replaced without disturbing the brake, whereas in the other type, the brake rods, with the shoes which hold them and the stirrup-shaped piece which carries the shoes, must be moved out of the way, to make room for the wheels to pass through. Rim brakes are used on front or rear wheels, or both. In America the coaster brake in the rear wheel hub takes the place of the European rim-type brake.

Bracket.—This is the junction of the bottom, seat and chain stay tubes, and carries the toothed wheel driving the chain, and the cranks and pedals by which the rider turns the toothed wheel (known as the chain-wheel). The bracket consists of a cylindrical shell, in which a steel axle is mounted on ball bearings. A toughened steel crank is secured to each end of the axle, the length of this crank varying from $6\frac{1}{4}$ to 7 inches. At the other end of each crank is the pedal, consisting of a framework mounted by ball bearings on a spindle, which screws into the crank. No locking device is necessary, as the right-hand pedal has a right-hand thread, and the left-hand pedal a left-hand thread, so that the pedalling action tends to tighten up each pedal more securely in the crank. The right-hand crank carries the chain wheel, being fastened by bolts and nuts, or welded to it, or forced into it by means of a male or female taper with a serrated surface. This cannot be taken apart after fixing.

In the United States the "one-piece" type of crank is in almost universal use—that is, both cranks and axles are made from a one-piece forging, heat-treated to give spring temper, and the ball cups, cones, etc., so designed as to be easily assembled in the bracket.

The driving sprocket is attached to the crank by being pressed on a shoulder of special design or the sprocket is driven through a lug on the crank, and is easily detachable.

The chain is very light, and accurately made, consisting of mild steel links, fastened by hand steel rivets. Each rivet is covered by a sleeve called the bush, and on most chains, but not all, this bush is covered by a roller which turns freely when the tooth of the chain-wheel or the hub-sprocket bears against it. Chains of half-inch links are almost universal, but one inch is frequently used for racing purposes. The width of the driving surface of a bush or roller is almost invariably one-eighth of an inch.

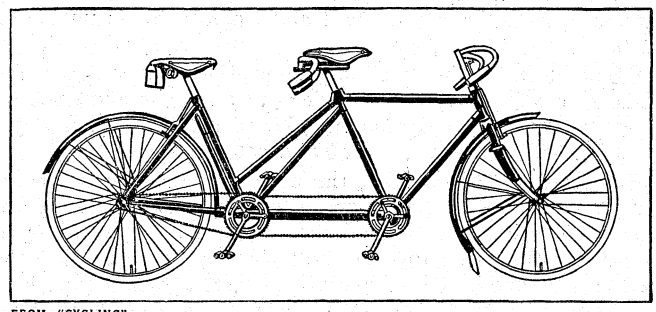
Bicycle seats are of leather or of a rubber and fibre composition, mounted upon springs. Many shapes, sizes and degrees of springiness are available, including special shapes for persons suffering from perineal maladies.

Handlebars are bent of mild steel, usually one inch in diameter, and carry the brake-levers, in addition to the warning bell. Handlebars are frequently covered with some material giving a comfortable hold to the rider, such as celluloid, rubber-sponge, etc. They are used in a great variety of shapes. Generally they bend upwards on "roadster" bicycles and downwards on racing bicycles or when faster speed or more power is desired. Flat handlebars are a useful compromise.

The tandem is designed to carry two persons, both of whom pedal in unison. The pedalling gear, saddle, handlebar, etc., are therefore duplicated. The frame tubes, wheel spokes, rims, tyres, etc., on a tandem are heavier and stronger than on single bicycles.

Statistics.—It is estimated that over 60,000,000 bicycles are in use throughout the world, but there are no means of obtaining exact figures. In a few countries a system of registration is in force, and, accepting this as a basis, the following figures are approximately correct for 1943:—

Country	*Bicycles in use*	*Country*	*Bicycles in use*
United States	12,000,000	Netherlands	4,500,000
British Isles	10,000,000	Norway	200,000
Austria	1,400,000	Poland	600,000
Belgium	2,130,000	Rumania	300,000
Finland	25,000	Russia	900,000
France	8,100,000	Spain	150,000
Germany	17,000,000	Sweden	1,150,000
Hungary	300,000	Switzerland	1,000,000
Italy	7,000,000	Yugoslavia	114,000



FROM "CYCLING"

FIG. 8.—THE TANDEM BICYCLE, IN WHICH STEERING AND CONTROL ARE BY THE FRONT HANDLEBARS. THE BACK PART OF THE FRAME IS CONSTRUCTED FOR A WOMAN RIDER

Experiments in adding engines to bicycles to render them independent of human propulsion began in 1885 (*see* MOTORCYCLES).

(B. W. BE.; X.)

BIDA, a town of West Africa in the Niger (formerly Nupe) province of Northern Nigeria, on the Baro-Minna branch of the Lagos-Kano railway. It lies 25 mi. E. of the Niger in 9° 5′ N., 6° East. It was founded in 1859 when Fula rule was established in Nupe; it is a walled town of considerable size. The inhabitants, mostly Hausa, carry on an extensive trade and are especially noted for their embossed brass and copper work. The Bida goblets, in which brass and copper are beautifully blended, are of extremely elegant design. The manufacture of glass and the dyeing of cloths are other industries. The streets are planted with huge shade-trees, so that as Bida is approached it looks like a forest.

In 1897 there was a two-days' fight outside the walls of Bida between the forces of the emir of Nupe and those of the Royal Niger company, ending in the defeat of the Fula army (mostly cavalry). It was not, however, until 1901 that Bida, and with it Nupe, came under effective British control (*see* NIGERIA: *History*).

BIDDEFORD, a city of York county, Maine, U.S.A., on the Saco river, 6 mi. from its mouth, opposite Saco and 15 mi. southwest of Portland. It is on federal highway 1 and the Boston and Maine railroad. The population was 16,145 in 1900; 18,008 in 1920, of whom 6,338 were foreign-born white; and by the census of 1940 was 19,790.

The city has abundant water power, and manufactures cotton goods, shoes, lumber, cotton-mill machinery and other articles. There are large granite quarries in the vicinity. Biddeford Pool and Fortune Rocks, two summer resorts on the coast, are within the city limits. The Saco river was discovered in 1603, and the first settlement was made (on the Biddeford side, at the mouth of the river) in 1616 by Richard Vines. In 1630 he took possession of a grant including the present site of the city. "Biddeford" was adopted as the name in 1751, and in 1855 the city was incorporated.

BIDDER, GEORGE PARKER (1806–1878), English engineer, was born at Moreton Hampstead, Devon, on June 14, 1806, and died at Dartmouth on Sept. 28, 1878. As a child he had an extraordinary capacity for computation, and his father, a stone-mason, exhibited him as a "calculating boy." From this career he was rescued by Sir John Herschel and Sir Henry Jardine, and sent to school and to Edinburgh university. He was employed by George Stephenson in parliamentary work in connection with railway development in the 1840s, and then by R. Stephenson in the designs for the Great Eastern railway (L.N.E.R.) and railways in Belgium and Scandinavia. He was one of the founders of the Electric Telegraph company, and the designer of the Victoria docks (London).

BIDDERY or **BIDRI** (an Indian word, from Bedar or Bidar, a town in the Nizam's dominions), an alloy of copper, lead, tin and zinc used in making various articles and ornaments which are inlaid with gold and silver.

BIDDING-PRAYER, the formula of exhortation to prayer said in England before the sermon in cathedrals, at university sermons, in the Inns of Court, and elsewhere on special occasions. Such formulae are of great antiquity in both eastern and western churches. The characteristic feature is that the minister tells the people what to pray for. Thus in England in the 16th century they were told what to remember in "bidding their beads" (O.E. *biddan,* to pray, *cf.* Ger. *beten*). In course of time the word "bid" in the sense of "pray" became obsolete, and the bidding-prayer has come to mean the exhortation itself.

BIDDLE, JAMES (1783–1848), United States naval officer, and nephew of Captain Nicholas Biddle, of the Continental navy, was born in Philadelphia Feb. 18, 1783, and in 1800 was appointed a midshipman in the navy. His early training was under Thomas Truxtun on the frigate "President." Retained in 1801, when the navy was reduced, Biddle served on the "Constellation" in the Mediterranean in 1802. He had the misfortune to be on the "Philadelphia" when that frigate ran on the rocks off Tripoli, and spent 19 months in prison there with William Bainbridge, David Porter and other officers. Following the Barbary Wars, he secured leave and made a voyage as a mate in the China trade. Upon his return he was promoted to lieutenant, and was second in command of the "Wasp" when that vessel took the "Frolic" in one of the famous single-ship actions of the War of 1812. When a British 74-gun ship captured the "Wasp" and retook the "Frolic," Biddle had a second experience as a prisoner of war. When he was exchanged, in 1813, he found himself a master commandant and in command of the brig "Hornet." In this vessel he engaged the "Penguin," of equal weight of metal, and, on April 27, 1815, escaped an enemy ship-of-the-line for the last naval engagement of the war. In 1817, Biddle, serving in the Pacific, took formal possession of the Oregon territory. Subsequently he served in the South Atlantic, Mediterranean and Gulf of Mexico. In 1846 he negotiated the first treaty with China, and during the Mexican War was in command on the Pacific coast. He died at Philadelphia on Oct. 1, 1848.

See *Charles Biddle's Autobiography* (Philadelphia, 1883); Brown's *American Naval Heroes* (1899); Theodore Roosevelt, *The Naval War of 1812* (New York, 1882).

(W. B. CK.)

BIDDLE, JOHN (1615–1662), frequently called the father of English Unitarianism, was born at Wotton-under-Edge, in Gloucestershire. He was educated at the grammar school of his native town and at Magdalen Hall, Oxford, being subsequently appointed to the mastership of the free school in the city of Gloucester. A treacherous friend obtained the ms. of his *Twelve Arguments drawn out of Scripture, wherein the commonly received opinion touching the deity of the Holy Spirit is clearly and fully refuted;* and in Dec. 1645 he was summoned before the parliamentary committee then sitting at Gloucester, by which he was committed to prison. He was released on bail after a short imprisonment, but in July 1647 was called before parliament, which desired to enquire into his views. After tedious proceedings, during which Sir Henry Vane befriended him, Biddle was committed to custody, and his *Twelve Arguments,* which he had now published, was ordered by parliament to be seized and burned. Notwithstanding this and the ordinance of May 2, 1648, visiting denial of the doctrine of the Trinity with death, Biddle issued two tracts, one a *Confession of Faith touching the Holy Trinity,* and the other *The Testimonies of Irenaeus, etc., concerning the one God and the Persons of the Trinity* (1648). These were suppressed, and the Westminster assembly of divines

eagerly pressed for the death penalty for heretics like Biddle. This was resisted by the army and by many of the Independent parliamentarians, and after the death of the king, Biddle was allowed to reside in Staffordshire under surveillance. He engaged in preaching and in literary work, particularly an edition of the Septuagint, published by Roger Daniel. In Feb. 1652 the general act of oblivion gave him complete freedom, and his adherents soon began to meet regularly for worship on Sundays. They were called Biddellians, or Socinians, or Unitarians, the name which has now become associated with their opinions. Biddle was not left long in peace. He translated some Socinian books, among others the *Life of Socinus,* and published two catechisms which excited a fury of indignation. He was summoned before the parliament in Dec. 1654 and imprisoned. The dissolution of that body again set him at liberty, but he was presently re-arrested and was only rescued by Cromwell, who sent him (Oct. 1655) to one of the Scilly islands, allowed him 100 crowns a year, and in 1658, on the solicitation of many friends, released him. For a few years he lived and taught in the country, but, returning to London, he was, in June 1662, again arrested, and fined £100. As he was unable to pay this sum, he was at once committed to prison, where he died of fever.

BIDDLE, NICHOLAS (1786–1844), U.S. financier and litterateur, was born of a famous family in Philadelphia on Jan. 8, 1786, and died there Feb. 27, 1844. A precocious student of the classics and French literature, he completed his studies at the University of Pennsylvania at the age of 13, and at 20 he contributed to *Port Folio,* America's first literary periodical, of which he later was editor. From their notes, he wrote the *History of the Expedition of Captains Lewis & Clarke.* Making the law his profession, he had an early career in diplomacy, becoming secretary of the American legation in London (1806) under Minister (later President) James Monroe, with whom he formed a lifelong friendship.

Monroe made Biddle a governmental director of the Second Bank of the United States, and in 1822 he became president, making the institution the first effective central bank in U.S. history. It established a national circulating medium, organized the discount market for domestic and foreign bills, and provided a perfectly safe depository for government monies. Biddle stabilized the currency by increasing the note issue of the federal bank and forcing the state banks to redeem their issues in specie. His vigorous policy drew fire from the ever suspicious agrarians, the aggressive Andrew Jackson who was then president, and from the state banks who didn't relish Biddle's authority. A protracted battle resulted in the bank's losing its federal charter and in being rechartered by the state of Pennsylvania. Retaining the presidency, Biddle became less circumspect and was caught on the speculative wave that swept the country into the bitter panic of 1837, in which every bank in the nation suspended specie payments. Two years later he retired to "Andalusia," his country estate which became celebrated for its salons for American and European intellectuals.

His son was CHARLES JOHN BIDDLE (1819–73), soldier, congressman and journalist. He served as captain of infantry in the Mexican War, being rewarded with the brevet of major, and as colonel in the Union army in 1861 until he was called to fill a Democratic vacancy in the house of representatives. After the Civil War, he edited the *Philadelphia Age,* an influential Democratic newspaper. As author of "The Case of Major André" (in the *Memoirs of the Historical Society of Pennsylvania,* 1858), he attracted notice of historians everywhere for his vindication of General Washington's action against the British agent. (*See* ANDRÉ, JOHN.) (W. D. G.)

BIDEFORD, municipal borough on north coast of Devonshire, England, 8¼ mi. southwest of Barnstaple. Population (est. 1938) 9,294. Area 6.4 sq.mi. It is on the banks of the river Torridge, 3 mi. above its junction with the estuary of the Taw.

Bideford (Bedeford, Bydyford, Budeford, Bytheford) is not mentioned in pre-Conquest records, but according to Domesday it rendered geld for three hides to the king. From the Conquest down to the 18th century, it remained in the possession of the Grenville family, and it first appears as a borough in an undated charter (probably of the reign of Edward I) from Richard de Grenville, granting liberties similar to those in use at Breteuil and a market every Monday. A charter (1573) created Bideford a free borough corporate with a common council. In the 16th century Sir Richard Grenville, the famous Virginian settler, did much to stimulate the commercial development of Bideford. Cuff and collar making was formerly a flourishing industry, but the town later came to rely largely on its claims as a holiday resort, though glove making and boat building are carried on.

The small harbour has about 17 ft. of water at high tide, but is dry at low tide. Anthracite and a coarse potter's clay are found near the town. Bideford is a subport of Barnstaple (*q.v.*) with some coastal shipping. It has a station on the Southern railway but the Bideford, Westward Ho! and Appledore line no longer exists.

BIDJUGO, an island fishing population of the Ilhas dos Bissagos of Portuguese Guinea living in 17 villages, and ruled by an elected queen. *See* de Coutouly, "La population de l'Archipel des Bissagos," *Revue d'Ethn. et Trad. pop.* (1921).

BIDPAI, FABLES OF, the name under which a famous collection of fables of Indian origin became known in Europe in the middle ages. The original Sanskrit work, composed by a Brahman in the 3rd century A.D., still very popular in India as the *Panchatantra* and its shorter recension, the *Hitopadeśa* ("book of good counsel"), was a mirror for princes, conveying practical wisdom in the form of beast-fables under five heads (panchatantra). It was translated with additions from the Sanskrit into Pehlevi for the Sassanian king *K*husraw I Anūsharwān (A.D. 531–597) by his physician Burzoe. This Pehlevi version is no longer known, but a Syriac translation from it made in the 6th century still survives. About 200 years later ʿAbd Allāh b. al-Muḳaffaʿ (born *c.* A.D. 725) translated Burzoe's book into Arabic, with certain additions as an exercise in style. This version, known as *Kalīlah wa Dimna* from the names of the two jackals in the first book, although intended only for amateurs of belles-lettres, attained wide popularity on account of its subject matter. It is in a preface to an edition of it by an otherwise unknown Bahnūd b. Saḥwān that its composition is ascribed to an Indian sage named Bīdpā. Ibn al-Muḳaffaʿ's version was soon translated into Persian, Eastern and Ottoman Turkish, Mongol, Malay and Ethiopic. A Hebrew version made at the beginning of the 12th century by a certain Rabbi Jō'ēl was translated into Latin by a converted Jew named John of Capua for Cardinal Ursinus in the third quarter of the 13th century with the title *Directorium Vitae Humanae;* on this Latin text are based all the translations into the languages of western Europe (except an independent Spanish version of Rabbi Jō'ēl and of course those by modern orientalists). About the same time Ibn al-Muḳaffaʿ's book was translated into Greek by Simeon, son of Seth, and thence into Latin, German and the Slavonic languages.

Among the Persian translations of the *Kalīlah wa Dimna,* that by Kāshifī (d. 1504), called *Anwār-i Suhailī* (The Lights of Canopus [Suhail]) in honour of his patron Aḥmad Suhailī, attained great popularity as a model of style—(it is absurdly artificial and bombastic to the European taste). Through its use as a Persian text-book by the East India company, this became known in Europe and was translated into most European languages just as its ancestor, *Kalīlah wa Dimna,* had been five centuries before. Through one or other of these versions, the *Panchatantra* has been translated into all the languages of Europe and India and all the languages of the Moslem world from Berber to Mongol and Madurese. The shorter recension of the *Panchatantra,* the *Hitopadeśa,* became known to Europeans at the end of the 18th century and has since been translated into most European languages.

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BIÉ: *see* ANGOLA.

BIEBRICH, a town of Germany, in Hesse-Nassau, on the right bank of the Rhine, 3 mi. S. of, and river-port for, Wiesbaden. Population 357. The palace of the former dukes of Nassau occupies a fine position on the river bank. Biebrich is an important steamboat station for both passenger and cargo traffic; trade is in cement and aniline dyes, and in the wines of the district. Wiesbaden absorbed most of old Biebrich.

BIEDERMANN, FRIEDRICH KARL (1812–1901), German publicist and historian, was born at Leipzig Sept. 25, 1812, and after studying at Leipzig and Heidelberg became professor of philology in the university of his native town in 1838. His early writings show him as an ardent advocate of German unity, and he was a member of the national parliament which met at Frankfurt in 1848. Becoming a member of the upper house of the parliament of Saxony, he advocated union under the leadership of Prussia. He was imprisoned in 1854 for editing *Deutschen Annalen,* and subsequently retired to Weimar, where he edited the *Weimarische Zeitung.* Returning to Leipzig in 1863 he edited the *Deutsche Allgemeine Zeitung,* and regained his professorship in 1865. He was again a member of the Saxon upper house, and from 1871 to 1874 a member of the German Reichstag. He died at Leipzig on March 5, 1901.

Biedermann's chief works are: *Erinnerungen aus der Paulskirche* (1849); *Deutschland im 18. Jahrhundert* (1854–80); *Friedrich der grosse und sein Verhältnis zur Entwickelung des deutschen Geisteslebens* (1859); *Geschichte Deutschlands 1815–71* (1891); *Deutsche Volks- und Kulturgeschichte* (1901). He also wrote the dramas, *Kaiser Heinrich IV.* (1861), *Kaiser Otto III.* (1862) and *Der letzte Bürgermeister von Strassburg* (1870).

BIEKKICH: *see* BIEBRICH.

BIEL, GABRIEL (d. 1495), scholastic philosopher, born at Spires (Speier). He was the first professor of theology at the newly founded (1477) University of Tübingen, of which he was twice rector, and at some uncertain date entered the Order of the Brothers of the Common Life. His work consists in the systematic development of the nominalistic theories of his master, William of Occam, these theories being expounded in his *Epitome et Collectorium ex Occamo super libros quatuor Sententiarum* (1508, 1512, and various dates). The empirical individualism of the work, together with scattered utterances on special points, which gained for Biel the title of *Papista Antipapista,* had considerable influence in giving form to the doctrines of Luther and Melanchthon. It is the best specimen of the final aspect of scholasticism. His other works also have been frequently reprinted. Besides theological works, Biel has a treatise *De Potestate et Utilitate Monetarum,* which gives him a place in the history of economic theory. The title *Ultimus Scholasticorum* is often wrongly bestowed on Biel: scholasticism did not cease with him even in Germany and continued to flourish long after his time in the universities of Spain.

See Linsenmann in *Theol. Quartalschrift* (Tübingen, 1865); H. Plitt, *Gabriel Biel als Prediger* (Erlangen, 1879); W. Roscher, *Geschichte der National-okonomik* (Munich, 1874), pp. 21–28.

BIELEFELD, chief town of a subdivision of the district of Minden, northeastern Westphalia, Prussia, Germany, *c.* 40 mi. E. by N. of Münster. Pop. (1939) 128,714. It is situated at the foot of the Teutoburger Wald, and consists of two portions, separated by the river Lutter, which were first united into one town in 1520. Bielefeld is mentioned as early as the 9th century, as *Belanvelde.* It joined the Hanseatic league in 1270. In 1347 the town passed with the countship of Ravensberg to the duchy of Jülich, and in 1666 to that of Brandenburg. Above the town lies the old castle of Sparenburg, built in the 12th century by Bernhard, count of Lippe. It was restored after its destruction by fire in 1877 and now contains a historical museum. Bielefeld is the centre of the Westphalian linen industry, which dates from the 13th century, and was extended by Dutch settlers in the 16th and 17th centuries. It has also important plush, silk and hosiery manufactures and extensive bleaching works, and does an extensive export trade. Engines, automobiles, glass, furniture and paper are also made. Because of its aerodrome and machine works it was bombed several times by the British in World War II.

BIELITZ, a town of Poland in Silesia (Czech. *Bilsko,* Polish *Bielsko*), 40 m. S.E. of Ratibor. It is one of a series of towns in the border zone between the Carpathian mountains and the plain of Eastern Europe. It is situated on the river Biala a small tributary of the upper Wisla (Vistula), just opposite the town of Biala. Bielitz, founded in the 13th century, was an important fortified town in the 15th and 16th centuries. It has a castle associated with the Sulkowsky family in favour of whom the lordship of Bielitz was raised to a duchy in 1752. It is an important weaving centre with much trade in woollens and linen. It also manufactures jute and machinery. After World War I Bielitz passed from Austrian to Polish hands as a result of the Treaty of St. Germain-en-Laye, Sept. 10, 1919. It was occupied by Germany in Sept. 1939. Pop. 22,573.

BIELLA, episcopal see, Piedmont, Italy, province of Vercelli, 55 mi. N.E. of Turin by rail, and 38 mi. direct, on the southern edge of the lower Alps. Pop. (1936) 24,328 (town); 28,289 (commune). The old upper town (1,558 ft.) and new lower town are linked by cable tram. Fine palaces with terra-cotta decorations and a modern bath establishment are in the old town. The new town contains the cathedral and the fine Renaissance church of S. Sebastiano; near the former is a baptistery of the 9th century. It is (and has long been, for the statutes of the wool industry go back to 1312) a considerable manufacturing centre for woollens, silks and cottons.

BIENNE or **BIEL,** an important industrial town in the Swiss canton of Berne, at the north-eastern end of the Bielersee, where the river Suze or Scheuss issues from a deep cleft (the Taubenloch) in the Jura range, 19 mi. N.E. of Neuchâtel, and 21 mi. N.W. of Berne. Its chief industries are watch-making, chain-making, the manufacture of machines and other objects for use on railways, etc. The West Cantonal Technical institute gives instruction in these subjects. The population, which in 1850 was but 3,589 and rose in 1941 to 40,800, was mainly Protestant, and two-thirds German-speaking. The parish church of St. Benedict dates from 1451, but was restored in 1775—it has some fine 15th-century painted glass. In the town is the Schwab museum, chiefly notable for its fine collection of objects from the pile-dwellings. To the north-west, two funicular railways lead up to Évilard (or Leubringen) and Macolin (or Magglingen), both situated on the slope of the Jura.

First mentioned in the 12th century, Bienne was for centuries under the jurisdiction of the prince-bishop of Basle. In 1279 (permanently in 1352) it made an alliance with Berne, in 1334 and 1344 with Soleure, and in 1311 and 1382 with Fribourg. It failed to gain admission into the Swiss confederation, though after it adopted the Reformation in 1528 it was closely associated with the Protestant cantons. In 1798 it was seized by the French, but in 1815, with the greater part of the bishopric of Basle, it became part of the canton of Berne.

See C. A. Bloesch, *Geschichte der Stadt Biel* (to 1854) (Biel, 1855–56); also *Bieler Neujahrsblätter* (1908–10); *Bieler Jahrbuch* (1927, 1928).

Lake of Bienne, or BIELERSEE, a Swiss lake, is situated at the foot of the Jura range. It is 7½ mi. long, 2½ mi. wide, its greatest depth 249 ft., its surface 1,424 ft. above the sea, and its area 16 sq.mi. In it is the Isle of St. Pierre with many traces of lake dwellings. It receives the R. Suze or Scheuss and the R. Thièle or Zihl (from Lake Neuchâtel). The Hagneck canal leads the waters of the Aar into the lake and the Nidau conducts them out again.

BIENNIALS, the name applied to plants which normally complete their life-cycle in two years, usually devoting the first to laying up a store of food, the second to flowering. This period is not, however, fixed, as if food is scarce the plant may delay flowering for more than one year, or may flower in the first year as in the bolting of such a plant as the beet.

BIERCE, AMBROSE (1842–1916?), American satirist, story-writer and poet, was born on a farm in Meiggs county (Ohio), on June 24, 1842, the son of Marcus Aurelius and Laura Sherwood Bierce. His father had little money, but a good library, and instead of a formal education the boy read widely. In 1861 Bierce entered the Union army as a volunteer, served throughout the

Civil War, was twice severely wounded, and was breveted a major for bravery. At the end of the war he went to San Francisco; tossed a coin, it is said, to decide his vocation, and entered journalism as editor of the *News Letter*. He went to London in 1872, where, because of his caustic humour revealed in the periodical, *Fun*, and in three thin volumes, *Nuggets and Dust*, 1872, *The Fiend's Delight*, 1873 and *Cobwebs from an Empty Skull*, 1874, he became famous as "Bitter Bierce," and was engaged by friends of the exiled empress Eugénie to edit *The Lantern*, a periodical inaugurated to defend her against rumoured newspaper attacks on a visit to England. But her enemies were prematurely frustrated by the arrangement, and Bierce returned to San Francisco (1876).

Except for a short period of mining near Deadwood (S.D.), he remained in San Francisco for 25 years writing for *The Wasp* and the *Argonaut* and conducting on the *Examiner* a weekly column, "Prattle," which has been described as the most eagerly devoured column of causerie ever printed in America, and in which it is said he made and devastated reputations, literary and political.

Throughout the early '80s he wrote short stories without once finding an editor who would publish any of them. In 1891 the publication of a collection of them, *Tales of Soldiers and Civilians* (published as *In the Midst of Life*, 1899, 1909 and 1927), was financed by a San Francisco merchant. The next year *The Monk and the Hangman's Daughter*, a masterly rewriting and elaboration of a translation by G. Adolphe Danziger from the German, was published in Chicago, and *Can Such Things Be?* a collection of stories of the supernatural, was published in 1893. His book of verse, *Black Beetles in Amber*, appeared in 1892; *Fantastic Fables* (1899); *Shapes of Clay* (1903); *The Cynic's Word Book*, 1909 (published as *The Devil's Dictionary* 1925); *Write It Right*, a black list of literary faults (1909); and *The Shadow on the Dial* (1909), a book of essays covering among other things "government, dreams, writers of dialect and dogs." In 1909–12 his collected works were published in Chicago. In 1896 Bierce was sent to Washington to fight through the Hearst papers the Funding Bill of the Central Pacific railroad, and a year later he returned to Washington to live, corresponding for the New York *American* and conducting a department in the *Cosmopolitan*. In 1913, at 71 he left for Mexico "with a pretty definite purpose, which, however, is not at present disclosable." He never returned, and, though persistent rumours have appeared in the press as to his death at the hands of Mexican revolutionists, none of them has been substantiated. His death was reported in 1916.

See *The Letters of Ambrose Bierce*, with an introduction by Bertha Clark Pope (1922); Van Wyck Brooks, *Emerson and Others* (1927); V. Starrett, *Ambrose Bierce* (Chicago, 1920); P. H. Boynton, *More Contemporary Americans* (Chicago, 1927); C. McWilliams, *Ambrose Bierce* (1929); W. Neale, *Ambrose Bierce* (1929). (W. Tu.)

BIERSTADT, ALBERT (1830–1902), American landscape painter, was born in Solingen, Westphalia, Germany, on Jan. 7, 1830, and was taken to the United States when about a year old. In 1853–1856 he studied painting at Düsseldorf. His pictures of the western part of the United States, and particularly the Rocky Mountains, made him widely popular. His "Estes Park, Colorado," is in the collection of the earl of Dunraven; his "Sierra Nevada" (1878) is in the Corcoran gallery in Washington, and "The Valley of Yosemite" in the James Lenox collection in New York. He rendered panoramic views with a certain ability, though his work was rather topographically correct and impressive than artistic. He was a member of the National Academy of Design of New York, and is represented by two historical paintings, "The Discovery of the Hudson River," and "The Settlement of California," in the Capitol in Washington (D.C.). He died in New York city on Feb. 18, 1902.

BIFROST, in Old Norse mythology, the rainbow, which was supposed to form the bridge guarded by Heimdal, god of light, by which the gods passed between heaven and earth.

BIGAMY, in law, is defined in the English statute now in force (Offences against the Person Act 1861, s. 57), is the offence committed by a person who "being married shall marry any other person during the life of the former husband or wife, whether the second marriage shall have taken place in England or Ireland or elsewhere." It is a felony and is punishable by penal servitude not exceeding seven years or by imprisonment with or without hard labour for not more than two years. By the same act of parliament the offence may be dealt with in any county or place where the defendant shall be apprehended or be in custody. The following clause embodies the necessary exceptions to the very general language used in the definition of the offence: "Provided that nothing in this section contained shall extend to any second marriage contracted elsewhere than in England and Ireland by any other than a British subject, or to any person marrying a second time whose husband or wife shall have been continuously absent from such person for the space of seven years then last past, and shall not have been known by such person to be living within that time, or shall extend to any person who at the time of such second marriage shall have been divorced from the bond of the first marriage, or to any person whose former marriage shall have been declared void by any court of competent jurisdiction." By the Criminal Justice Administration Act 1914 the wife or husband of a person charged with bigamy is a competent but not a compellable witness (*R.* v. *Leach*, 22 Cox C.C. 721).

A valid marriage must be proved in the first instance in order to support a charge of bigamy. A *voidable* marriage, such as one voidable for impotence, will be sufficient, but a marriage which is absolutely *void* will not. For example, if a woman marry B during the lifetime of her husband A, and after A's death marry C during the lifetime of B, her marriage with C is not bigamous, because her marriage with B was a nullity. In regard to the second marriage (which constitutes the offence) the English courts have held that it is immaterial whether, but for the bigamy, it would have been a valid marriage or not. An uncle, for example, cannot marry his niece; but if being already married he goes through the ceremony of marriage with her he is guilty of bigamy. In an Irish case, however, it has been held that to constitute the offence the second marriage must be one which, but for the existence of the former marriage, would have been valid, but this was disapproved by the Court for Crown cases reserved in *R.* v. *Allen*, L.R. 1 C.C.R. 367. It is a good defence to a charge of bigamy that the accused after proper inquiries in good faith and on reasonable grounds believed the first spouse was dead, even although seven years have not elapsed (*R.* v. *Tolson*, 16 Cox C.C. 629). Further, if a person charged with bigamy in England can prove that he has been legally divorced by the law of the country where the divorced parties were domiciled at the time (even though the ground on which the divorce was granted was not one that would justify a divorce in England) it will be good defence to the charge. But a bona fide belief on reasonable grounds that a divorce is valid affords no defence (*R.* v. *Wheat & Stocks*, 26 Cox C.C. 717). Criminal jurisdiction is always regarded as purely territorial, but bigamy (with homicide and treason) is an exception. A British subject committing bigamy in any country may be tried in the United Kingdom (Russell's case, 1901, 20 Cox C.C. 51, where the words "or elsewhere" were held to mean "in any other part of the world"). American law as regards bigamy is similar to English law. (W. de B. H.)

BIG BERTHA. The original Big Berthas were 42cm. howitzers produced at the Skoda works in Austria-Hungary and used by the Germans in battering the forts at Liége and Namur in 1914. It was assumed that this artillery originated from the Krupp works in Germany—hence the nickname, after Frau Bertha von Bohlen, head of the Krupp family. In 1918, when the Paris gun began shelling the French capital from the forest of Coucy at a range of 76 miles, newspaper correspondents resurrected the title and applied it to this gun. The bombardment began March 23 and extended over 140 days, firing taking place about every third day. In all, 256 people were killed; the most serious loss was caused on Good Friday, March 29, when 156 were killed or wounded in the church of St. Gervais. The Paris gun was a high-velocity piece of 8.26in. calibre (later retubed to larger bore), was about 110ft. long, weighed 142 tons, and fired a 264lb. shell.

BIG BUSINESS, a term first used in the United States to denote the huge aggregations of capital and enterprise growing up in many industrial countries. The first impulse to form these

large aggregations in the United States was due to the nation's great area, abundant raw materials, and immense markets, and was in the nature of things probably inevitable. A good example of "big business" is the United States Steel Corporation, which was a fusion, in 1901, of ten extensive plants, many smaller plants, and other valuable properties, with a capitalization of $1,370,000,000 in stocks and bonds. Another example, until its dissolution in 1899, was the Standard Oil Company, originally incorporated in 1870, which by 1879 produced 95% of the refined oil of the United States. (*See* also COMBINATION IN INDUSTRY; COMPANY-PROMOTING; TRUSTS.)

BIG DIPPER or **GREAT DIPPER,** popular names for a group of seven stars in the circumpolar constellation of Ursa Major (*q.v.*) in the Northern hemisphere. The two end stars of the dipper's "bowl," α and β, are called the Pointers; an imaginary line drawn through them and extended about five times toward the North Pole will pass approximately through Polaris, the North Star.

BIGELOW, ERASTUS BRIGHAM (1814–1879), American inventor and industrialist, was born in West Boylston, Massachusetts. His family was in poor circumstances and he was obliged as a child of ten to seek employment as a farm-hand and clerk, and to forgo his ambitions for a formal education. Naturally adept in mathematics and mechanics, he was only 23 when he invented his first loom for the manufacture of lace. This device was followed by other power-looms for the weaving of a variety of figured fabrics—counterpanes, ginghams, silk brocatel, and tapestry carpetings. In 1839 he began experimental work at Lowell, Mass., which led to invention of the first power-loom for weaving carpets of an ingrain type. From 1845 to 1851 he developed the greatest of his inventions, a power-loom for the manufacture of Brussels and Wilton carpets. In 1843 he and his brother, Horatio Bigelow, established a mill for the manufacture of ginghams, and around this plant grew the present town of Clinton, Massachusetts. Several years later he founded the Bigelow Carpet Mills in the same town. His inventions provided an enormous impetus to the manufacture of carpets not only in America but in Europe, where his looms for a while gave English manufacturers an important advantage over their French competitors. Bigelow was also an economist of note and was one of the small group of men who incorporated the Massachusetts Institute of Technology at Boston in 1861.

He died at Boston on Dec. 6, 1879.

BIGELOW, JOHN (1817–1911), American journalist and diplomat, was born at Malden (N.Y.), on Nov. 25, 1817. He graduated at Union college in 1835, practised law in New York, was joint owner (with William Cullen Bryant) and managing editor of the New York *Evening Post* (1849–61); was United States consul at Paris in 1861–64, and minister to France in 1864–67. While consul, Bigelow wrote *Les États-Unis d'Amérique en 1863* to counteract the apparent desire of the French for a dissolution of the American Union, by showing them the relative importance of the commerce of the northern and southern states. On discovering, in 1863, that a French shipbuilder, with the connivance of Napoleon III., was constructing two ironclads and two corvettes for the Confederacy, he succeeded in preventing the delivery of three of these vessels to Confederate agents. In his work, *France and the Confederate Navy* (New York, 1888), he gives an account of this episode. In 1865–66, it devolved upon him as minister to France, to represent his Government in its delicate negotiations concerning the French occupation of Mexico, and he discharged this task with credit. From 1875 to 1877 he served as secretary of state of New York. He wrote books of travel, of popular biography, and of historical or political discussion, etc., but his principal literary achievements were editions (1868 and 1888) of Franklin's autobiographical writings, copiously annotated; and of the complete works of Franklin (New York, 1887–89), based in part upon the editor's personal investigations of manuscript sources in France and elsewhere. Bigelow, a close friend of Samuel J. Tilden, became the latter's literary executor, editing his speeches and other political writings (1885), publishing a biography in 1895, and editing a two-volume collection of Tilden's letters and literary memorials (1908). He also wrote a biography of William Cullen Bryant (1890). In 1897 he published a volume entitled *The Mystery of Sleep* (2nd ed., 1903). In 1909 he published *Retrospections of an Active Life,* covering his career to 1866. He died in New York on Dec. 19, 1911; and two additional volumes of the *Retrospections,* ending with 1879, were issued by his son in 1913.

BIG GAME HUNTING. The pursuit of large game probably shares with the lust for gold the credit for drawing the majority of explorers into the unknown, and there can be no doubt that such pursuit has always exercised the greatest fascination for mankind. In the past fifty years conditions have changed greatly and at the present time there would be comparatively few easily accessible big game fields left in the world had it not been for timely protection.

The actual methods of hunting depend on the type of country in which the game is found, and on the size and habits of the creatures themselves. In open country which is free from any trees or bush it is obvious that game can be viewed from afar, the actual distance depending on the contour of the ground. In these conditions a slow and stealthy approach is necessary before a shot can be obtained, use being made of every tuft of grass, rock, or hollow as a means of concealment and attention being paid to the direction of the wind. This is known as "stalking."

In dense bush or scrub it is, however, impossible to see beyond a few yards. Any animal which is sighted will be well within shot when it is seen, so there is no need of a long approach to get within range. Game in these conditions is come upon suddenly, and the best chance of getting a shot is to walk slowly and cautiously through the forest, ever on the alert. This form of hunting has been described by different names but none is so graphic or realistic as the American "still hunting."

There are some animals which cannot be followed in this manner. Such are mostly big beasts which herd together, as do elephants. They leave well defined tracks, or spoor, in soft ground and even on hard ground a skilful hunter can follow their trail and eventually track them down. "Tracking" describes this work.

There are other animals which inhabit or else retire to patches of dense jungle so thick that it is impossible for any man to make a sufficiently silent advance to within shooting distance or view his quarry without first giving the alarm and frightening it away. Tracking and still hunting are out of the question and here the best chance of success is to drive the animal out into the open where a shot can be obtained, or at any rate along some path where the sportsman is waiting. This can only be done with the help of a number of men or else with a line of elephants as used in certain parts of India, and this method is universally known as "driving" or "beating." If, however, men or elephants are not available in circumstances such as these, the only course for the sportsman to adopt is to wait in hiding over some spot where the animal will probably pass or return. Such a place may be either a water hole, or a salt lick, or, in the case of beasts of prey, a half-eaten kill. This waiting method is known as "sitting up." It should, however, be stated that sitting up over water or a salt lick is not generally considered a sportsmanlike procedure and is prohibited by law in some countries.

In America there is yet another form of hunting which is commonly practised in pursuit of moose, but can be used with almost all species of deer; this is known as "calling." Calling consists in waiting in hiding and making a noise in imitation of the call of a cow or hind during the rutting season or else of the challenge of a bull or stag. In either case a male will answer and will gradually come right up to the sportsman believing him to be a possible mate or a probable antagonist. Every form of big game hunting is a modification of one of these principal methods; the next consideration is that of the distribution of the game fields of the world, which can be dealt with best by continents.

EUROPE

Before 1914 there were two principal hunting fields for big game in Europe proper, Russia and Scandinavia. The conditions in the latter area which comprises the countries of Norway and Sweden

do not differ materially from those prevailing before the war. The game to be found includes reindeer, red deer, European elk and brown bear (*Ursus Arcturus*). Of these the elk is probably the most important and in Norway is more widely distributed than any other species of big game, its habitat including all the larger continuous areas of coniferous forest. But it is a great wanderer and will on occasions invade districts where it has been previously unknown. This is especially the case with the elk which have in recent years been seen in parts of Finnmark, where they have probably penetrated from the neighbouring districts of Finland. The best localities for elk have lately been the districts north of Trondhjem, and further south in Hedemarken, Kristians Amt, Storelvedan, Ytre Rendalen and Gausdal in Gudbrandsdalen. The best heads usually come from the more northern districts. The close season for elk varies, but at present they can be killed from Sept. 10 to Sept. 20. Elk are hunted either by still hunting or with special hounds which run them to bay.

The European reindeer is of the barren-ground type, being smaller in the body than the woodland types of Canada and Alaska and carrying long, slender horns which show less palmation than those of the American caribou. In former times reindeer were very widely distributed throughout the whole of Scandinavia, but now its range has become much more restricted and it only exists on the mountain plateaux above the timberline, and in summer prefers those mountains where there are plenty of "braes" or snowfields.

Red deer are not very widely distributed, existing only along the western coast of Norway from Buknfiord in the south to Namdalen in the north, and in a few other scattered areas. The only localities where red deer are found in any numbers are the two islands of Tusteren and Hitteren. Bears still exist, but in such small numbers as almost to be negligible from a sporting point of view, although a certain number are killed by peasants annually.

Russia is at present an entirely unknown quantity. Without question much of the big game of central and southern Russia has been exterminated during and after the World War. In northern Russia, however, circumstances have been different. The rolling tundras and dense forests, mostly devoid of human habitation, have been little affected by the great upheaval, and it is more than possible that some of the best European hunting grounds of the future may lie in northern Russia and Siberia. From Scandinavia to the eastern coast of Siberia, elk and reindeer are to be found. Further north in the tundras reindeer only are to be found. These tundras consist of open, undulating country covered with heather and lichens, interspersed with bogs, while here and there are to be seen scattered clumps of silver birch: a country, in fact, which is very like some of the northern deer forests of Scotland. Reindeer exist everywhere on these tundras and they are particularly common in the Kola and Yalmal peninsulas and the island of Novaya Zemlya.

Other species of game to be found are lynx and bear, both of which are very plentiful, while wolves are ubiquitous and follow the elk. These wolves, it should be noted, are the big grey timber wolves. Polar bears are fairly common in the northern parts of Novaya Zemlya and walrus may sometimes be encountered on the ice floes. The White Straits are frozen from Christmas to May, while the whole of the Arctic Ocean and Kara Sea are closed with ice from November to May, and are liable to further blocks from ice during periods of northerly winds even later on in the spring.

Central Europe suffered a similar fate to that of central and southern Russia, and the reserved forests which formerly held magnificent red deer, brown bear and roe buck have been sadly depleted of game. In the Carpathians game still exists in considerable numbers. Chamois and red deer both run large in these mountains and it is probable that better heads are to be found here than anywhere else in Europe. Similarly Tirol has been less affected than the lower levels. Chamois are to be found in the Alps in fair numbers, but it must be remembered that all the best districts are preserved. In Spain proper the conditions are the same, and the travelling sportsman would stand no chance of sport without influential friends or exceptional letters of introduction. The big game of Spain are brown bear, red deer, chamois and Spanish ibex. Bear are very scarce and are confined almost entirely to the mountains of the north, the Pyrenees and Cantabrian mountains. Red deer are somewhat local but they exist in the forests of the Sierra Morena and Andalusia. Although not plentiful, chamois or "Izard" exist in the Pyrenees and Cantabrian mountains. They are somewhat smaller than the chamois of Tirol, both in size of bodies and heads. The Spanish ibex, however, is a magnificent creature but is very strictly preserved. Formerly it used to be found in almost all the mountains of Spain from the Pyrenees to the Mediterranean, but it was so heavily hunted and shot that it became nearly extinct. The most rigid preservation was then introduced with the pleasing result that this grand animal has increased considerably. In the Pyrenees it is found only in one valley, the Val d'Arazas, which was the private property of H.M. the King of Spain and was regarded as a sort of national park. The horns of the Spanish ibex are quite unlike those of any other of the goat tribe, more resembling those of the East Caucasian Tur, than any other.

The chamois of the Pyrenees is one of the only two specimens of European big game which can give the sportsman who is unable to afford the rent of a special shoot, or forest, much chance; the quarry is one which will exercise all his stalking skill and as much hard work as the veriest glutton for exercise can desire. With the exception of the Val d'Arazas, to which reference has already been made, the shooting of the Pyrenees is open to the public for all practical purposes, but a passport both for France and Spain must be obtained. Chamois are by no means common although they are to be found in certain localities.

The other European animal which offers a chance of big game hunting to the sportsman of moderate means is the Sardinian Moufflon. This handsome wild sheep also exists in Corsica, where it had become almost extinct in 1914, but happily it increased during the war and at present it is strictly preserved by the French Government. In Sardinia moufflon shooting is legally open only for one month of the year, normally September, but the game laws are disregarded by the local inhabitants and it would appear to be but a matter of time before the Sardinian moufflon is extinct. These wild sheep at present inhabit the higher mountains, especially the Gennargentu mountains, and good heads may still be obtained although they are becoming more scarce every year.

Useful books dealing with big game hunting in Europe are: Abel Chapman, *Wild Spain* and *Wild Norway;* E. N. Buxton, *Short Stalks;* and H. P. Highton, *Shooting Trips in Europe and Algeria.*

ASIA

Asia offers greater variations both in climate and physical features than any other continent and although its big game may not be quite so numerous either in species or actual numbers as those of Africa it undoubtedly offers attractions to the big game hunter with an exploring turn of mind which can be equalled in no other part of the world. Beginning in the west moufflon, similar to the Sardinian species but larger, are to be found in the mountains of Asia Minor, while the Caucasus still provides some of the most difficult yet splendid sport in the world. In the higher ranges there is that fine wild goat, the West Caucasian tur, which in the east gives way to the East Caucasian tur, an animal which carries horns very similar to the Himalayan burrhel, but which has a short beard and is a true goat with all the characteristic smell of that species. In the wooded valleys may be found the maral, a magnificent specimen of the red deer species almost as large as the American wapiti, while it is just possible that the aurochs is not yet extinct. Then the *pasang,* or Persian wild goat (*Capra aegagrus*), extends right through the Caucasus from the mountains of Asia Minor, and onwards throughout the ranges of northern Persia down to Baluchistan and the hills on the Indian frontier in Sind, where it is known as the Sind ibex.

Persia itself is full of opportunities and is as yet little known from the big game hunter's point of view. Tiger exist in the low lying forests to the south of the Caspian sea and probably further east as well, while the maral of the Caucasus extends well into Persia. The mountain ranges hold at least one variety of wild

sheep which is very similar to the Indian oorial, but slightly larger in body and with very much finer heads, and the plains carry several varieties of gazelle. Leopard are common in many parts. Mesopotamia and Palestine offer few attractions, although gazelle are found in the deserts of the former, but Arabia is a *terra incognita.* A species of ibex inhabits the mountains of the Sinaitic peninsula, and possibly extends further inland, while specimens of the Arabian oryx can be obtained from Aden. The Arabian thar inhabits the mountains of Oman and the desert holds gazelle.

Returning to Persia it will be seen that the mountain ranges of this country run eastwards through Afghanistan to India where they increase in height and form the range known as the Hindu Kush. This system extends again to the north and east where it merges into the Karakorum, the range in which is K2, the second highest mountain in the world, and which continues eastward until it unites with the Kuen Lun Range, that great northern buttress of the Tibetan plateau. North of the Hindu Kush lie the Pamirs, and north of these and parallel to the vast chain of mountain systems already mentioned are the Tian Shan mountains. Yet further north and still parallel are the Altai mountains, and north of these are the Siberian steppes. It will accordingly be seen that there are three huge principal mountain systems of Central Asia, all running approximately east and west, with lower lying levels in between them, although in the centre the wide extent of the Pamir plateau forms a mighty backbone from which the other systems extend.

The whole of this vast area is a wonderful hunting ground. Wild sheep are to be found in the higher ranges which carry heads with wide sweeping horns. Of these the *Ovis poli* of the Pamirs is probably the best known, and this species certainly carries the longest horns, but they are not so massive as those of the *Ovis karelini* of the Tian Shan, or of the *Ovis ammon* of the Altai, which has the most massive horns of all. The range of these central Asiatic wild sheep is large, extending right through Manchuria to Kamchatka, and throughout the mountains and hills of Manchuria and northern China different species and sub-species exist. Southwards, on the plateau of Tibet, they are represented by the *Ovis ammon hodgsoni,* the "ammon" of the Indian sportsman and the "nyan" of the Tibetans. Ibex range from the northern bank of the river Sutlej through the Himalayas, Karakorum and Pamirs, to the Tian Shan, the heads getting bigger as one travels north, the biggest heads of all being found in the Tian Shan.

China itself is little known. In the mountains of the north wild sheep are found, and it is certain that tiger extend throughout the forests of eastern China from Manchuria to the extreme south. There are, in fact, strong grounds for belief that Manchuria is the real home of the tiger which has extended its range southwards in comparatively recent times. At birth tiger cubs are woolly, indicating a natural protection against cold, and although tigers are found in the hottest jungles of India they dislike heat and their pads will blister when they are forced across open ground in the hot weather. The tiger is common throughout China and extends throughout Cochin China and Siam to Burma, India, the Malay States and Sumatra. In south-east China the forests and cultivation give way to higher altitudes which culminate finally in a mountain range which forms the eastern border of the Tibetan massif. Here are to be found typical game of southern Tibet, the bharal and the uncouth takin. Apart from tiger Cochin China holds leopard and is probably the eastern outpost of the Asiatic elephant, gaur and rhinoceros. These animals all exist in Siam and here, too, may be found the curious Schomberg's deer with its widely spreading and many pointed antlers, and a small representative of the Indian sambhur. This grand deer seems to have India as its real home, for it is in this country that it attains to the biggest size both of body and horn, but it has a very wide habitat, being found throughout the Malay Peninsula, Sumatra, Java and Borneo as well as in Ceylon.

Between the Kuen Lun Mountains on the north and Burma, Siam and Cochin China on the south lies the Tibetan plateau, the highest and most extensive plateau in the world. Only one animal seems to be almost ubiquitous throughout Tibet, and that is the bharal, or blue wild sheep of the Himalayas, but whose real home is undoubtedly Tibet; it is regarded by some naturalists as the connecting link between the sheep and goats. Vast herds of Tibetan antelope roam over the Chang Tang, the desert of northern Tibet which has a mean altitude of nearly 17,000 feet, and here, too, are to be found herds of wild yak. Further south the *Ovis ammon hodgsoni* and Tibetan gazelle may be obtained, while in the lower districts to the east of Lhasa there are forests which hold Thorold's deer, a large deer very few specimens of which have ever been obtained by European sportsmen. There is also a small bluish bear of Tibet, but very little is known of its habitat. Wolves are numerous, and in the west, bordering on the Himalayas, the snow leopard and Tibetan lynx exist but are rarely encountered.

The Himalayas, the greatest mountain system in the world, form a natural barrier between the lofty desolation of Tibet and the low lying fertile plains of India. The Himalayas themselves provide magnificent stalking, the quarry being, in addition to those Tibetan animals already mentioned, ibex, thar, markhor and shapoo (a wild sheep identical with the oorial), while other game animals are goral, serow and two species of bear, one black and one brown, which latter exists only in the higher ranges near the snow line and is a variety of the brown bear of Europe. In the western Himalayas, in Kashmir territory, may be obtained specimens of the Kashmir stag, a deer very similar to, but larger than, the red deer of Scotland, while in the east there is an isolated "pocket" of territory in the Chumbi valley which is the home of a still larger stag, the Shou.

India proper contains the oldest and best known hunting grounds of all. Sportsmen had been accustomed to shooting tigers long before any big game hunter had set foot in Africa. And on the whole conditions have changed little during the past hundred years. The game fields of old are game fields yet: they have shrunk in size and the numbers of animals they hold: that is all. There are no vast areas where game formally teemed and which are now denuded of animal life, and in this respect India is different from other countries. The explanation lies in the fact that the climate renders it an impossible country for the white man to colonise and so the denizens of the Indian jungles have had the chance of existing without the menace of the advance of settlers as has been the case in America and many parts of Africa. The principal game fields are the Terai, a huge belt of tropical jungle which runs along the foot of the Himalayas from the river Jumna to Assam and which holds tiger, elephant, rhinoceros, sloth and black Himalayan bear, sambhur, cheetah, swamp deer and other smaller varieties; the jungles of Central India and the Central Provinces in which tiger, gaur (commonly called the "bison"), sambhur and sloth bear are the most important big game; the damp and intensely thick jungles of southern India, including the Mysore plateau, where elephant, gaur and tiger are abundant, and in the Nilgiri Hills there is a species of wild goat locally known as the "ibex" which is really a variety of tahr. Assam and the Sunderbands, the semi-flooded delta of the Ganges, are the home of the buffalo, which was also common at one time in the Central Provinces, but which is now almost extinct in that district, and Burma is the best ground for elephant, gaur and tsine, an animal akin to the gaur. Leopard abound in all the areas mentioned while the Indian antelope, or black buck, and gazelle exist in large numbers all over the plains, especially in the deserts of Bikanir and the Punjab.

Probably the best sport is to be obtained in the dependent Indian States, but permission to shoot in these is only gained by special invitation and the visiting sportsman would stand no chance of getting such without exceptional influence. All the jungles of British India proper are controlled by the Imperial Forest Service of India and are divided up into blocks, which are let out to sportsmen for a limited period. The total number of animals which can be killed in each block *per annum* is strictly limited and the blocks are allotted to applicants according to priority of asking. In India there are no firms or individuals who make a business of conducting visiting sportsmen on an extended

hunting tour as is the case in America or East Africa, and big game hunters who visit India must be prepared to make their own arrangements and take their chance with those British officers of the army and different civilian services who spend the greater part of their lives in administering the land. The big game of Ceylon is very similar to that of India except that tiger do not exist in the island and all the horned or antlered game carry very much smaller heads, while the elephants are almost invariably tuskless. Sumatra probably offers the wealthy hunter better opportunities for obtaining specimens of Asiatic elephant, gaur, rhinoceros and possibly tiger, than does India proper. A large launch is essential and such can be hired locally.

Many books have been published dealing with big game hunting in Asia but the following should provide the information necessary: R. L. Kennion, *By Mountain Lake and Stream* (Persia); T. and K. Roosevelt, *East of the Sun and West of the Moon* (Central Asia); G. Burrard, *Big Game Hunting in the Himalayas and Tibet;* R. L. Kennion, *Sport and Life in the Further Himalayas;* A. A. Dunbar-Brander, *The Wild Animals of Central India;* A. E. Stewart, *Tiger and other Game;* J. W. Best, *Shikar Notes* (Central Provinces of India); G. P. Sanderson, *Thirteen Years among the Wild Beasts of India* (Southern India); Fletcher, *Sport in the Nilgiris and Wynaad,* vol. ii. of *Big Game Hunting* of the Badminton Library; *The Indian Field Shikar Book;* G. P. Evans, *Big Game Hunting in Upper Burma;* Forsyth, *Highlands of Central India;* H. G. C. Swayne, *Through the Highlands of Siberia;* E. Demidoff, *A shooting Trip to Kamchatka.*

AFRICA

Although the game fields of the African continent were the last to be discovered they have suffered more than those of any other part of the world, except some parts of North America, from the attacks of the white man. Such attacks, however, have not been delivered by the man who shot for sport, and if sport alone had been the object of pursuit it is doubtful whether the numbers of game would have decreased very materially. In South Africa the Dutch settlers must take the responsibility for the complete extinction of such species as the quagga and the general extermination of game from the greater part of the country which lies to the south of the Limpopo. These settlers shot for the sake of meat and hides, and wherever commercialism enters into the question the fate of wild game is sealed. Similarly the early elephant hunters had much for which to answer. But shooting alone has not been responsible for the elimination of big game from huge areas of Africa. Colonization by different nationalities of European settlers drove the wild animals into unsuitable country, just as it did in America, and it is this advance of civilisation which is really the most serious menace to the *fauna* of Africa. There are, however, gigantic tracts of country quite unsuitable for colonization by white settlers and in such the game should flourish for many years to come, protected as it now is by efficient game laws in most parts of the continent.

In the first place it must be realized that the real wealth of Africa as far as big game is concerned lies in its wonderful variety of antelopes and gazelles. There are over 60 different species. The next interesting point is that no specimen of the deer tribe seems to be indigenous in the whole of Africa. It is true that a few red deer do exist in northern Africa in the neighbourhood of Tunis, but it is probable that these were either imported or else are the descendants of some which migrated from Spain before the formation of the Straits of Gibraltar. Africa shares with Asia the boast of rhinoceros and elephant, but both the African varieties of rhinoceros (black and white) are as different from any variety of Asiatic rhinoceros as is the African elephant from the Indian. The giraffe and okapi are quite distinctive and peculiar to Africa, while the African buffalo, with all its varieties, is as distinctive as is the African elephant. The leopard is distributed throughout the continent and is similar to the Asiatic species although an experienced sportsman can usually detect the difference in the skins. The lion, extinct in Mesopotamia, Palestine and Arabia, and driven into one small corner of India, reigns supreme among the wild creatures throughout the whole of Africa from Morocco in the north to Zululand in the south, and from Somaliland in the east to the Gold Coast in the West.

The most accessible district of all is the Sudan which offers a great variety of hunting grounds. On the east the Red Sea Hills hold ibex, while the deserts of Kordofan and Dongola provide gazelles, oryx and the elusive addax, as well as Barbary sheep in the barren hills. But the chief hunting grounds of the Sudan lie in the south up the Blue and White Niles. There is a big game reserve in the valley of the Blue Nile, but plenty of excellent ground exists, although the upper courses of the White Nile, notably the Bahr-el-Ghazal, will probably attract the collector of rare varieties as here may be obtained specimens of the giant eland (Lord Derby's) and the white rhinoceros, an animal which was once common in South Africa but is now unknown except in the southern Sudan, Northern Congo and Uganda. Elephants and buffalo are both common but the tusks of the former and horns of the latter are not big in the Sudan.

Just as the Sudan is the nearest of the African big game fields, so Kenya is the most popular. Game may be seen in numbers to be encountered nowhere else in Africa in spite of the fact that the herds are not nearly so large or numerous as they were. Every kind of country and climate is met with in Kenya and each has its own *fauna.* Starting from the Indian Ocean the first district is the coast belt, where game is plentiful but not so easily obtained as in other parts. Porters are the best form of transport and the bag should include elephant, buffalo, rhino, eland, lion, bushbuck and some of the smaller antelopes. The next and by far the most popular district is the highlands which consist of great rolling plains interspersed with patches of bush and situated at an elevation of from 4,500 to 7,000ft., in places reaching 9,000ft. A great part of this area has been settled by Europeans but nearly 11,000,000 acres are permanently reserved for the Masai tribe. The eastern half of this area is a game reserve but the western half is the most popular hunting ground, and here may be obtained specimens of almost every variety of East African game. But a very large portion of Kenya is taken up by desert which lies to the north of the Highlands. The game of this desert is confined to oryx, Grévy's zebra, dikdik and Grant's gazelle, which gives place to Sömmerring's gazelle in Jubaland.

The real tropical African country is not found much in Kenya but covers an extensive part of Tanganyika, where there is nearly as much possibility of varied sport as in Kenya. Here one comes to the land of the sable antelope, which extends right down through Nyasaland, Northern and Southern Rhodesia to the frontiers of the Kalahari, but for really big sable antelope Angola is the best district. Rhodesia, both north and south, is a fine hunting ground and offers a chance of big kudu and roan antelope. Portuguese East Africa is heavily poached, but in the big swamps round the mouth of the Zambesi buffalo roam in great herds. South Africa has now little to show in the way of big game, although Zululand is probably still the best chance for nyala and the Kalahari Desert is the only place where gemsbuck exists.

The West Coast holds plenty of game but not nearly in such profusion as the East, and this fact combined with the doubtful climate prevent its attracting sportsmen in numbers. Further the heads of animals run smaller as a rule than they do in the east, while elephants carry lighter tusks. The West African buffalo, or bush cow, is, however, a distinctive type which is found nowhere else. The immense tracts of the French and Belgian Congo are seldom visited by sportsmen other than professional elephant hunters, but bordering on the eastern boundary of the Belgian Congo lies Uganda which is the district, *par excellence* for elephant and buffalo, as well as that shy and retiring water antelope, the situtanga. To the north of the Congo extends the great Sahara Desert, the home of gazelles, but in the hills of Morocco and Algiers, the sportsman who has not time for a long journey has a chance of Barbary sheep.

Useful books of reference dealing with African big game hunting include H. C. Maydon, *Simen, its Heights and Abysses* (Abyssinia); H. G. C. Swayne, *Seventeen Trips through Somaliland;* W. D. M. Bell, *Wanderings of an Elephant Hunter;* Abel Chapman, *Savage Sudan;* W. B. Cotton, *Sport in the Eastern Sudan;* Sir Samuel Baker, *Nile Tributaries of Abyssinia* (Blue Nile); A. B. Percival, *A Game Ranger's Notebook;* F. C. Selous, *A Hunter's Wanderings in Africa, Sunshine and Storm in Rhodesia;* H. A. Bryden, *Kloof and Karroo;* P. H. G. Powell Cotton, *Travel and Adventure in the Congo;* J. C. B. Statham, *Through Angola, The South and East African Year Book and Guide.*

NORTH AMERICA

Just as Africa is the home of the antelopes so North America may be described as the home of the deer. The moose, wapiti (known as "elk"), caribou (both woodland and barren ground varieties), mule deer, white tail and black tail being among the varieties to be found. Other game animals are the grizzly and black bears, several varieties of big horn sheep, Rocky Mountain goat and in the extreme north polar bear. The pronghorn antelope which is a peculiarly interesting animal in that it forms the connecting link between the deer and cattle (having regular horns, as opposed to antlers, which it sheds annually) was at one time extraordinarily common and roamed the prairies in great herds, but it is now confined to a few districts in the farther west and to that great national game reserve, the Yellowstone park. Here also may be seen the remnants of the stupendous herds of bison, or American "buffalo", which formerly darkened the prairie and which suffered almost complete extinction.

At the beginning of the 20th century Newfoundland provided the finest caribou shooting to be obtained, the heads of the woodland variety being remarkable for their size and number of points. But they were slaughtered during their annual migrations to such an extent that they were threatened with extinction and at present killing of caribou in Newfoundland is prohibited. The chief game fields of North America now consist of New Brunswick, where moose are fairly plentiful but little else, and the country from the east of the Rocky mountains to the Pacific coast right up into Alaska. Here all the varieties of North American big game may be obtained. Wapiti do not range much to the north of British Columbia, but moose are especially plentiful, the biggest heads coming from Alaska, while there is an exceptionally large variety of grizzly bear which inhabits Kodiak Island off Alaska. The wild sheep are akin to the various Asiatic varieties found in Mongolia and Kamchatka.

Useful books in North American big game hunting are: C. R. E. Radclyffe, *Big Game Shooting in Alaska;* and Bryan Williams, *Game Trails in British Columbia.*

OTHER GAME FIELDS

South America has little in the way of attractions to the big game hunter, the jaguar being the only animal worthy of pursuit, and this leaves Australia as the only continent which has not been considered. The only indigenous big game of Australia is the kangaroo which is scarcely an animal for the sportsman's rifle, but in the Northern Territories there are herds of buffalo, the descendants of domesticated animals which escaped into the bush and have been completely wild for many generations. Some of these bulls carry quite good heads.

New Zealand, however, is on a very different footing and is a country of peculiar interest in that all its game has been imported. These experiments in importation have been most successful with the result that for many years magnificent red deer heads have been obtained, and at the present time the following animals seem to have become acclimatised: red deer; American moose and wapiti; chamois; Indian sambhur, cheetah, thar and burrhel; mule deer. It is highly probable, therefore, that in a few years' time New Zealand will be able to offer as fine a variety of good heads as any other country of the same size in the world.

See T. E. Donne, *Red Deer Stalking in New Zealand;* and *The Game Animals of New Zealand.*

General Information.—One of the most important steps in the planning of an expedition after big game is to ascertain the best time of year for hunting. Quite apart from the question of health, should the sportsman visit the country at an unfavourable season he may stand but a small chance of sport because some peculiar local conditions, such as high grass, may prevent him from seeing anything. Another factor is water: as a rule this is fairly plentiful in any district where game exists in abundance, but at some seasons of the year it may be very scarce, and only exist in certain localities. Information on these points will always be given gladly by the Game Department of the country in which it is proposed to hunt, and the following further information should also be obtained: (1) what stores and equipment can be obtained locally; (2) what means of transport is generally used between the proposed base and the actual shooting grounds; (3) whether this transport is easily obtained, and how; (4) whether any trackers or native hunters are available. Good maps of the country are another essential item.

The question of the most suitable battery is largely a matter of personal preference built up on experience, but generally speaking the best weapon for stalking is a rifle of the modern "magnum" small bore type which develops a very high muzzle velocity and so gives a flat trajectory, thus eliminating the difficulties of judging distance. It is always a mistake, however, to select a rifle which does not fire a fairly heavy bullet, as very light bullets are too liable merely to wound, and 150 grains is a fairly safe minimum weight. For dangerous game which is shot at close quarters the tyro will be well advised to use a heavy double cordite rifle of a calibre of about ·470. There are many experienced hunters who use nothing but small bores, but the beginner can adopt such methods when he has gained experience for himself.

Useful books dealing with big game hunting generally are: G. Burrard, *Notes on Sporting Rifles;* Rowland Ward, *Records of Big Game;* Sir S. Baker, *Wild Beasts and their Ways;* Badminton Library *Big Game* (Two Volumes); Rowland Ward, *The Sportsman's Handbook.* (G. Bu.)

BIGGLESWADE, urban district, Bedfordshire, England, 41 mi. N. by W. of London by the L.N.E. railway. Pop. (1938) 5,980. It lies on the east bank of the Ivel, a tributary of the Ouse, on a plain in which vegetables are largely grown for London markets and for pickling purposes. Biggleswade (Bichelswade, Beckeleswade, Bickleswade) is an ancient borough by prescription. The borough court was held by the lord of the manor. At the time of Edward the Confessor, Archbishop Stigand owned the manor. Henry I granted it to the bishop of Lincoln, under whose protection the borough evidently grew up. In 1547 the bishop surrendered his rights to the king, and in the 17th century Biggleswade formed part of the jointure of the queens of England. Annual fairs were held here from early times. Biggleswade was formerly engaged in straw-plaiting and lace manufacture. Area 7.3 sq.mi.

BIG HOLE BATTLEFIELD, a tract five acres in extent in southwestern Montana, U.S.A., set apart in 1910 as a National monument. It is the scene of a battle which was won on Aug. 9, 1877, by a small force of United States troops over a large number of Nez Perce Indians. The reservation is administered by the War department.

BIGHORN, the common name of the Rocky Mountain sheep (*Ovis canadensis*) so-called from the size of the horns in the male. The female bears shorter, ribbed horns. The bighorn is one of the two species of wild sheep found in the new world (the other being the Dall sheep); it was formerly found from central Alberta (Canada) to Mexico in the mountains, but is rare south of Montana, except in game preserves. The bighorn is gregarious and displays great activity and wariness. The horns of the ram may measure 42 in. round the curve. There are several varieties, sometimes separated as distinct species. (*See* SHEEP.)

BIGHT, a nautical term for the loop or bent part of a rope, as distinguished from the ends; it is used as a geographical term for a slightly receding bay between two distant headlands, *e.g.,* the Bight of Benin, the Great Bight of Australia. The name is occasionally used for any slight bend or curve as a geographical feature, *e.g.,* the corner or recess of a bay, the bend of a river.

BIGNON, JÉROME (1589–1656), French lawyer, made his reputation by his *Chorographie ou description de la Terre Sainte,* (1600). Henry IV. made him tutor to the dauphin (Louis XIII.), under whose reign he held important legal offices. His other principal works were *Traité sommaire de l'élection du pape* (1605), and an edition of the *Formulae* of the jurist Marculfe.

BIGNON, LOUIS PIERRE ÉDOUARD, BARON (1771–1841), French diplomatist and historian, was born on Jan. 3, 1771, and died at Paris, Jan. 5, 1841. As minister-plenipotentiary at Cassel, between the years 1804 and 1806, he took a prominent share in the formation of the confederation of the Rhine; and after the battle of Jena he returned to Prussia as administrator of the public domains and finances. He filled a similar function

in Austria in 1809 after the battle of Wagram. At the end of 1810 he became French resident at Warsaw. After Waterloo, as minister of foreign affairs under the executive commission, it was he who signed the convention of July 3, 1815, by which Paris was handed over to the allies. Bignon did not re-enter public life until 1817, when he was elected to the chamber of deputies, in which he sat until 1830, consistent in his opposition to the reactionary policy of successive governments. He published attacks on the policy of the continental allies, two of his works attracting special attention, *Du Congrès de Troppau ou Examen des prétentions des monarchies absolues à l'égard de la monarchie constitutionelle de Naples* (1821), and *Les Cabinets et les peuples depuis 1815 jusqu'à la fin de 1822* (1822). He was for a few weeks minister of foreign affairs in the first government of Louis Philippe, and again for a few weeks minister of public instruction. Elected deputy in 1831 and member of the chamber of peers in 1839, he devoted himself to his *Histoire de France sous Napoleon* (10 vols. 1829–38, then 4 vols., 1847–50).

BIGNONIACEAE, a family of dicotyledonous plants, chiefly shrubs, trees and vines, mostly with large showy flowers. The family is particularly developed in tropical America, although also fairly well represented in tropical Africa and in the Indo-Malaysian region. A few genera, *Catalpa, Campsis, Incarvillea,* occur in temperate regions. There are about 100 genera and in excess of 800 species, many of them cultivated in tropical countries for ornamental or other purposes. The tropical American calabash tree belongs in *Crescentia,* the sausage tree to the African genus *Kigelia* and the African tulip tree to *Spathodea. Jacaranda* is widely planted in subtropical regions as an ornamental shade tree. *Campsis radicans,* the common trumpetcreeper is a well known ornamental climber throughout most of the eastern portion of the United States. (E. D. Mᴇ.)

BIGOD, HUGH (d. 1177), earl of Norfolk, was the second son of Roger Bigod (d. 1107), the founder of the English family of this name. Hugh inherited large estates in East Anglia on the death of his brother William in 1120, and enjoyed the favour of Henry I. At first a supporter of Stephen during this king's struggle with the empress Matilda, Hugh was rewarded with the earldom of Norfolk before 1141. After having fought for the king at the battle of Lincoln the earl deserted him, assumed a position of armed neutrality during the general anarchy, and then assisted Henry II in his efforts to obtain the throne. This king confirmed him in the possession of his earldom; but becoming restless under the rule of law initiated by Henry, he participated in the revolt of 1173, which so far as England was concerned centred round his possession. Though defeated and compelled to surrender his castle, Bigod kept his lands and his earldom, and lived at peace with Henry II until his death, which probably took place in Palestine. His son Roger (d. 1221), who succeeded to the earldom of Norfolk, was confirmed in his earldom and other honours by Richard I, after he had fallen under the displeasure of Henry II. He took part in the negotiations for the release of Richard from prison, and after the king's return to England became justiciar. The earl was one of the leaders of the baronial party which obtained John's assent to Magna Carta, and his name appears among the signatories to this document.

Roger was succeeded as 3rd earl by his son, Hugh, who died in 1225, leaving a son, Roger (d. 1270), who became 4th earl of Norfolk. Through his mother, Matilda, a daughter of William Marshal, earl of Pembroke, Roger obtained the office of marshal of England in 1246. He was prominent among the barons who wrested the control of the government from the hands of Henry III, and assisted Simon de Montfort. The earl married Isabella, daughter of William the Lion, king of Scotland, but left no sons.

Hugh, the 3rd earl, left a younger son, Hugh (d. 1266), who was chief justiciar of England from 1258 to 1260, and who fought for Henry III at the battle of Lewes. The latter's son, Roger, succeeded his uncle Roger as 5th earl of Norfolk in 1270. This earl was the hero of a famous altercation with Edward I in 1297, which arose out of the king's command that Bigod should serve against the king of France in Gascony, while he went to Flanders. The earl asserted that by the tenure of his lands he was only compelled to serve across the seas in the company of the king himself, whereupon Edward said, "By God, earl, you shall either go or hang," to which Bigod replied, "By the same oath, O king, I will neither go nor hang." The earl gained his point, and after Edward had left for France he and Humphrey Bohun, earl of Hereford, prevented the collection of an aid for the war and forced Edward to confirm the charters in this year and again in 1301. The earl died without issue in Dec. 1306, when his title became extinct and his estates reverted to the crown. The Bigods held the hereditary office of steward (*dapifer*) of the royal household, and their chief castle was at Framlingham in Suffolk.

Bibliography.—*See* J. R. Planche, "The Earls of East Anglia" (*Brit. Arch. Ass.*, vol. xxi., 1865); G. E. C(okayne), *Complete Peerage,* vol. vi. (1895).

BIGOT, one obstinately and intolerantly holding particular opinions, generally religious. The early meaning of the word in English, at the end of the 16th century, was that of a religious hypocrite. It was applied in French, in the 12th century, to certain tribes of Southern Gaul, and, in an abusive sense, to the Normans. The meaning changed in French to that of "religious hypocrite" through the application, in the feminine *bigote,* to the members of the religious sisterhoods called Beguines (*q.v.*).

BIG RAPIDS, a city of Michigan, U.S.A., on the Muskegon river, 56 mi. north by east of Grand Rapids; the county seat of Mecosta county, which contains 90 lakes. It is served by the Pennsylvania and the Pere Marquette railways. Pop. (1940) 4,987. The principal manufactures are butter, lumber, furniture, automatic machinery and tools. There are three hydroelectric plants on the Muskegon river near the city, and natural gas and oil fields have been developed near by. It has many fox and mink farms and a large livestock market. A state trout hatchery is situated at Paris, 6 mi. away. Big Rapids was settled in 1854, laid out in 1859, and chartered as a city in 1869.

BIGSBY, JOHN JEREMIAH (1792–1881), English geologist and physician, the son of Dr. John Bigsby, was born at Nottingham on Aug. 14, 1792. Educated at Edinburgh, where he took the degree of M.D., he joined the army medical service, and then, in 1817, was stationed at the Cape of Good Hope. In 1822 he was appointed British secretary and medical officer to the Boundary commission, and carried out extensive and important geological researches, contributing papers to the *American Journal of Science* and other scientific journals. He returned to England in 1827. During the last 20 years of his long life he was continually at work preparing tabulated lists of the fossils of the Palaeozoic rocks. His *Thesaurus Siluricus* was published with the aid of the Royal society in 1868; and the *Thesaurus Devonico-Carboniferus* in 1878. In 1877 he founded the Bigsby medal to be awarded by the Geological society of London. He died in London Feb. 10, 1881.

BIG SPRING, a city of western Texas, U.S.A., on federal highways 80 and 385, Girauds (Beals) creek, and the Texas and Pacific railway and American Airlines; county seat of Howard county. Pop. (1940 census) 12,604. The railroad maintains shops and a division point employing 400 men. Stock farming and petroleum production are the principal occupations. A federal dry land experiment farm and state hospital for mentally ill are situated there. Oil wells and lakes are in the vicinity.

BIHĀRI-LĀL, the author of the *Sat-saī,* a collection of approximately 700 distichs, perhaps the most celebrated of Hindi poetry. The language is the form of Hindi called *Braj-bhāshā,* the idiom of Mathurā, the poet's home. Most of the verses are amorous utterances of Rādhā and her lover, Krishna. A couplet in the *Sat-saī* states that it was completed in A.D. 1662, although couplet 705 seems to refer to an event of the year 1665. It is said that Mīrzā Jai Singh, for whom the verses were composed, rewarded the poet with a gold piece (16 rupees) for every couplet. Little is known of the author beyond what he himself tells us. He was born in Gwālior and later settled in Mathurā. The collection very soon became celebrated, and its high position may be judged from the fact that 17 commentators have devoted their efforts to its full interpretation. Many different recensions exist, but the standard is that settled by an assembly of poets under the direction of Prince A'zam Shāh, the third son of the

emperor Aurangzēb (1653–1707), and hence called the A'zam-shāhī; it comprises 726 couplets. The collection has also twice been translated into Sanskrit.

The best-known commentary is that of Lallū-jī-Lāl, entitled the *Lāla-chandrikā*. A critical edition of it has been published by Dr. G. A. Grierson (Calcutta, 1896).

BIHARI LANGUAGE (properly *Bihārī*), the most western speech of the eastern group of modern Indo-Aryan languages. "Bihārī" means the language spoken in the province of Bihār. To the west it extends over the province of Agra as far as the longitude of Benares, and to the south it covers nearly the whole of the province of Chota Nagpur. It is also the language of the inhabitants of the neighbouring Tarai districts of Nepal (*see* INDO-ARYAN LANGUAGES). While an outer language, it shows points of contact with the intermediate ones. As regards *s*, the Māgadhī Prakrit pronounced it as *ś*, like the *sh* in "shin." The Prakrits of the west preserved its dental sound, like that of the *s* in "sin." Here Bengali and Eastern Hindi exactly represent the ancient state of affairs. The former has the *ś*-sound and the latter the *s*-sound. At the present day Bihari pronounces its *s*'s as clearly as in the west. The pronunciation of *s* is a literal shibboleth between Bengal and Upper India. For centuries Bihar has been connected politically with the west, and has rid itself of the typical pronunciation of the east. On the other hand, in the Kaithi character, *s* is always written *ś*. In the declension of nouns, Bihari follows Bengali more closely than Eastern Hindi, and its conjugation is based on the principles which obtain in the former language. Bihari has three main dialects, which fall into two divisions, an eastern and a western. The eastern division includes *Maithilī* or *Tirhutiā* and *Magahī*. Magahī is the modern representative of the purest Māgadhī Prakrit. It is nearly related to Maithili but it is quite uncultivated and has no literature. Maithili is the dialect of the old country of *Mithilā* or *Tirhut*, famous from ancient times for its learning. It has retained numerous antiquated forms, and parts of its grammar are extraordinarily complex. It has a small literature. The Bhojpuri dialect has extended southeast into the southern half of Chota Nagpur. It might almost be classed as a separate language, had it any literature worthy of the name. (Abbreviations: Mth. = Maithili, Mg. = Magahī, Bh. = Bhojpuri, B. = Bihari, Bg. = Bengali, Skr. = Sanskrit, Pr. = Prakrit, Mg.Pr. = Māgadhī Prakrit.)

Vocabulary.—Tatsamas, or words borrowed in modern times from Sanskrit (*see* INDO-ARYAN LANGUAGES), are few in number, while all the dialects are replete with honest home-born *tadbhavas*, used both in the literary and in the colloquial language. Very few words are borrowed from Persian, Arabic or other languages.

Phonetics.—The stress-accent of Bihari follows the usual rules of modern Indo-Aryan vernaculars. As a general statement we may say that Bihari spelling is not fixed and that there are often many ways of writing, and sometimes two or three ways of pronouncing, the same word.

The genius of the Bihari language is adverse to the existence of a long vowel in a *tadbhava* word, when it would occupy a position more than two syllables from the end. This is subject to various subsidiary rules which will be found in the grammars. The principle is a most important one, and, indeed, pervades all Indo-Aryan vernaculars of the present day, but it is carried out with the greatest thoroughness and consistency in Bihari. The whole system of declension and conjugation is subject to it.

Declension.—Bihari has a stronger sense of gender than the other languages of the eastern group. In the modern language the distinction is in the main confined to animate beings, but in the older poetry the system of grammatical, as distinct from sexual, gender is in full swing. Except in the case of the interrogative pronoun, there is no neuter gender—words which in Skr. and Pr. were neuter being generally, but not always, treated as masculine. The plural can everywhere be formed by the addition of some noun of multitude to the singular. Cases are usually formed, as elsewhere, by suffixing postpositions to a general oblique case, usually the same as the nominative. There is no case of the agent, as in Hindustani, the subject of all tenses of all verbs being always in the nominative. Every noun can have three forms, a short, a long and a redundant. The short form is sometimes weak and sometimes strong. Occasionally both weak and strong forms occur for the same word. The long and redundant forms are mainly used in conversation. They are familiar and often contemptuous. Sometimes they give a definite force to the word, as *ghoṛawā*, the horse. In the feminine they are much used to form diminutives. The singulars of the personal pronouns have fallen into disuse. The plurals are used politely for the singulars, and new forms are made from these old plurals to make new plurals. The old singulars survive in poetry and in the speech of villagers, but even here the nominative has disappeared and new nominatives have been formed from the oblique bases. All the pronouns have numerous optional forms.

Conjugation in Maithili and Magahī.—It is in the conjugation of the verb that the amazing complexity of the Mth. and Mg. grammars appears. In all three dialects the verb makes little or no distinction of number, but instead there is a distinction between non-honorific and honorific forms. In Mth. and Mg. this distinction applies not only to the subject but also to the object, so that for each person there are, in the first place, four groups of forms, viz.—

I. Subject non-honorific, object non-honorific.
II. Subject honorific, object non-honorific.
III. Subject non-honorific, object honorific.
IV. Subject honorific, object honorific.

Forms in which the object is non-honorific may be, as in the case of nouns, short, long or redundant. There are numerous optional forms. Moreover, the feminine gender of the subject introduces new complications. These *minutiae* must be learned from the regular grammars.

There are numerous irregular verbs. There is a long series of transitive verbs formed from intransitives and of causal verbs formed from transitives. Compound verbs are numerous.

The Bh. conjugation is simple. In the first and second persons the plural is generally employed for the singular, but there is no change in the verb corresponding to the person or honour of the object. The termination of the present changes in sympathy with the old present to which it is attached. Irregular verbs, the formation of transitive and causal verbs and the treatment of compound verbs are on the same lines as in Mth.

Literature.—In all three dialects there are numerous folk-epics transmitted by word of mouth. The only dialect which has any real literature is Maithili. The earliest writer is Vidyāpati Ṭhakkura (Bidyāpati Ṭhākur), who lived at the court of Rājā Śiva Siṁha of Sugaonā in Tirhut in the 15th century. His fame rests chiefly on his dainty lyrics in Maithili dealing with the loves of Rādhā and Krishna. These have exercised an important influence on the religious history of eastern India. They were adopted and enthusiastically recited by the reformer Caitanya (16th century) and through him became the home-poetry of the Bengali-speaking Lower Provinces. Their language was transformed (we can hardly say translated) into Bengali, and in that shape they have had numerous imitators. A collection of poems by the old Master-singer in their Maithili dress has been published by Grierson in his *Chrestomathy* of that language. The most admired of Vidyāpati's successors is Manbōdh Jhā, who died in 1788. He composed a *Haribans*, or poetical life of Krishna, which has great popularity. Many dramas have been composed in Mithila. The fashion is to write the body of the work in Sanskrit and Prakrit, but the songs in Maithili. Among modern writers in the dialect, we may mention Harṣanātha, an elegant lyric poet and author of a drama, entitled Uṣā-haraṇa, and Candra Jhā, whose version of the *Rāmāyaṇa* and translation of Vidyāpati's Sanskrit *Puruṣa-parīkṣā* are deservedly popular.

BIBLIOGRAPHY.—*The Linguistic Survey of India*, vol. v. part ii. (1903), gives a complete conspectus of Bihari in all its dialects and sub-dialects. *See* also G. A. Grierson, *Seven Grammars of the Dialects and Sub-dialects of the Bihārī Language*, parts i. to viii. (1883–87—these deal with every form of Bihari except standard Maithili); and S. H. Kellogg, *A Grammar of the Hindī Language, in which are treated High Hindī . . . also the Colloquial Dialects of . . . Bhojpur, Magadha, Maithila, etc.* (2nd ed., London, 1893).

For Maithili, *see* G. A. Grierson, *An Introduction to the Maithilī*

Language of North Bihár, containing a *Grammar, Chrestomathy and Vocabulary;* part i. *Grammar* (1881; 2nd ed., 1909); part ii. *Chrestomathy and Vocabulary* (1882). For Vidyāpati Ṭhakkura, *see* J. Beames, "The Early Vaishnava Poets of Bengal," in *Indian Antiquary*, ii. (1873), pp. 37 ff.; the same, "On the Age and Country of Vidyāpati," *ibid.*, iv. (1875), pp. 299 ff.; anon. article in the *Baṇga Darśana*, vol. iv., (1282 B.S.), pp. 75 ff.; Śāradācaraṇa Maitra, Introduction to *Vidyāpatir Padāvali* (1285 B.S.); G. A. Grierson, *Chrestomathy*, as above; "Vidyāpati and his Contemporaries," *Indian Antiquary*, vol. xiv. (1885), pp. 182 ff.; "On some Mediaeval Kings of Mithilâ," *ibid.*, vol. xxviii. (1899), pp. 57 ff. A later and more complete collection of Vidyāpati's poems (but containing many that are of doubtful origin) is *Vidyāpati Thākurer Padāvalī* by Nagēndranāth Gupta (Calcutta, 1316 B.C.=A.D. 1909).

For Bhojpuri, *see* J. Beames, "Notes on the Bhojpuri Dialect of Hindi spoken in Western Bihár," in *Journal of the Royal Asiatic Society*, vol. iii. n.s. 1868, pp. 483 ff.; A. F. R. Hoernle, *A Grammar of the Eastern Hindi compared with the other Gaudian Languages* (here "Eastern Hindi" means "Western Bhojpurī"), (London, 1880); J. R. Reid, *Report on the Settlement Operations in the District of Azamgarh* (Allahabad, 1881), contains, in appendices, full grammar and vocabulary of Western Bhojpurī.

No special works have been written about Magahī.

BIISK (Biysk), a town in the Siberian area of the Russian Socialist Federal Soviet Republic, situated at the point where the Ob river is formed by the junction of the Biya and the Katun. Lat. 52° 40′ N., long. 85° 40′ E. Pop. (1939) 80,190. It has storage plant for butter and eggs and is the terminus of a caravan route from Kobdo in Mongolia. The Ob river is navigable to Biisk, and Siberian merchants dispatch their wool and skins by steamer as soon as the ice melts and in spring form caravans to go to Mongolia, taking with them manufactured goods and lump silver. Chinese brick tea is sometimes used as currency. The rate of exchange of silver and brick tea at Biisk is an interesting index of the relative prosperity of the Siberian area and Mongolia.

BIJAPUR, an ancient city and modern district of British India in the southern division of Bombay. It is a station on the Southern Mahratta railway, 60 mi. S. of Sholapur. The ancient city was supplied with water by an elaborate underground system of reservoirs and aqueducts, which has been restored in part. The population in 1941 was 48,968. The city used to be the extensive and splendid capital of an independent sovereignty of the same name, but now retains only the vestiges of its former grandeur, though it is now increasing in population, and includes one of the most picturesque collections of ruins in India. The city owed its greatness to Yusuf Adil Shah, the founder of the independent state of Bijapur. It consists of three distinct portions—the citadel, the fort and the remains of the city. The citadel, a mile in circuit, is of great strength and encompassed by a ditch 100 yd. wide, formerly supplied with water, but now nearly filled up with rubbish. Within the citadel are the remains of Hindu temples, which prove that Bijapur was an important town in pre-Mohammedan times. The fort, which was completed by Ali Adil Shah in 1566, is surrounded by a wall 6 mi. in circumference and from 30 to 50 ft. high, with massive bastions and a deep moat. Outside the walls are the remains of a vast city, now for the most part in ruins, but affording abundant evidence of the ancient splendour of the place. The Gol Gunbaz, or tomb of Sultan Mohammed Adil Shah, which was built 1626–56, is a square building, surmounted by a great circular dome 198 ft. high. The inside area is greater than the Pantheon at Rome. It has been thoroughly restored, and one portion is used as a museum. The Ibrahim Roza, or tomb and mosque of Ibrahim Adil Shah, which took 36 years to build, is exquisitely beautiful. It was completed about 1620. The Gagan Mahal, or ancient audience hall, is in ruins but the archway, about 90 ft. high, remains. Through it the last king of Bijapur was brought bound with silver chains, while on a raised platform sat Aurangzeb, the Mogul emperor, who had left Delhi three years previously to conquer the Deccan.

History.—The founder of the Bijapur dynasty, Yusuf Adil Shah, is said to have been a son of the Ottoman sultan Murad II, who went to India, took service under the Bahmani king of the Deccan, and ultimately became a person of great importance at the court of Mahmud II. In 1489 he took advantage of the break-up of the Bahmani power to establish himself as an independent sultan at Bijapur, his dominions including Goa on the west coast. His descendants maintained the prosperity of the state, until the rise of the Mahratta power under Sivaji began to make inroads upon it, and it was exposed to the yet more formidable ambition of Shah Jahan. In 1686 the Mogul emperor, Aurangzeb, who as Shah Jahan's general had unsuccessfully besieged the city under Mohammed Adil Shah, took Bijapur and annexed the kingdom to the Delhi empire. The celebrated gun, Malik-i-Maidan, now in the capital, and said to be the largest piece of cast bronze ordnance in the world, was captured from the king of Ahmednagar by the king of Bijapur about the middle of the 17th century. An inscription on the gun recording that fact was erased by Aurangzeb, who substituted the present inscription stating that he conquered Bijapur in 1686. The city and territory of Bijapur remained annexed to Delhi till 1724, when the nizam established his independence in the Deccan, and included Bijapur within his dominions; but, being defeated by the Peshwa in 1760, he was compelled to purchase peace by its cession to the Mahrattas. Upon the fall of the Peshwa in 1818 Bijapur passed into the hands of the British, and was by them included in the territory assigned to the rajah of Satara. In 1848 the territory of Satara was escheated through the failure of heirs. The city was made the administrative headquarters of the district in 1885.

The district of Bijapur occupies a barren plain, sloping eastward from a string of feudatory Mahratta states to the nizam's dominions. Area 5,704 sq.mi.; pop. (1941) 975,982. The fluctuating population reveals the effects of famine. There is very little irrigation in the district. The principal crops are millet, wheat and cotton. There are considerable manufactures of cotton and silk goods and blankets, several factories for ginning and pressing cotton, and a grain and cattle trade. The East Deccan line of the Southern Mahratta railway traverses the district from north to south.

BIJAWAR, a state of Central India, in the Bundelkhand agency. Area, 980 sq.mi.; pop. (1941) 120,990. Forests cover nearly half the state, which is believed to be rich in minerals, but lacks transport facilities. The state takes its name from the chief town, Bijawar (pop. in 1931, 5,748), founded by Bijai Singh, one of the Gond chiefs of Garha Mandla, in the 17th century. It was conquered in the 18th century by Chhatarsal, the founder of Panna, a Rajput of the Bundela clan, whose descendants still hold it. It was confirmed to Ratan Singh in 1811 by the British government under the usual *sanad*. In 1857 Bhan Pratap Singh helped the British during the Mutiny, being rewarded with certain privileges and a hereditary salute of 11 guns. In 1866 he received the title of maharajah, and the prefix *sawai* in 1877.

BIJNOR, a town and district of British India in the Rohilkhand division of the United Provinces. The town is about 3 mi. from the left bank of the Ganges. The population in 1941 was 27,900. There is a large trade in sugar. The district of Bijnor has an area of 1,869 square miles. The country is mainly a level plain, but the northern part rises towards the Himalayas, the greatest elevation being 1,342 ft. above the sea-level. The Koh and Ramganga are the principal rivers, and the Ganges forms its western boundary. In 1941 the population was 910,223. The country is watered in most parts by streams, but a series of small canals has been constructed. Sugar is largely exported.

Of the early history of Bijnor, even after it passed under Mohammedan rule, little is known with any certainty. About 1748 the Rohilla chief, Ali Mohammed, made his first annexations in Bijnor, the rest of which soon fell under the Rohilla domination. The northern districts were granted by Ali Mohammed to Najib Khan, who gradually extended his influence west of the Ganges and at Delhi, receiving the title of Najib-ud-daula and becoming paymaster of the royal forces. For the part played by him in the victory of Panipat he was made wazir of the empire. After his death in 1770 his son, Zabita Khan, was defeated by the Mahrattas, who overran all Rohilkhand. In 1772 the nawab of Oudh made a treaty with the Rohillas, covenanting to expel the Mahrattas in return for a money payment. He carried out his bargain; but the Rohilla chiefs refused to pay. In 1774 the nawab concluded with the government of Calcutta a treaty of alliance, and he now called upon the British, in accordance with

its terms, to supply a brigade to assist him in enforcing his claims against the Rohillas. This was done; the Rohillas were driven beyond the Ganges, and Bijnor was incorporated in the territories of the nawab, who in 1801 ceded it to the East India company. During the Mutiny of 1857 it was occupied by the nawab of Najibabad, a grandson of Zabita Khan; he held it until April 1858, when he was defeated by the British at Nagina; whereupon British authority was restored.

BIKANER, SRI GANGA SINGH, MAHARAJA OF (1880–1943), Indian soldier and statesman, succeeded by adoption his elder brother, Dungar Singh, in 1887, as 21st ruler of the state, being invested with full powers in 1898. The first of his many visits to England was made in 1902, when he attended King Edward's coronation, and became A.D.C. to the prince of Wales, an appointment continued by King George. In World War I the maharaja served in France as a staff officer, and in 1915 in Egypt. In 1917 he was made a member of the Imperial War Conference, and assisted the secretary for India at the Imperial War Cabinet. He represented the Indian states at the Peace Conference, 1919, and the Indian princes at the League of Nations assembly, Geneva, 1924. It was largely due to his personal influence that the constitution of the Chamber of Princes, as a deliberative, consultative and advisory body, was secured under royal proclamation in 1921. He died Feb. 2, 1943.

BIKANER, an Indian state in the Rajputana agency, with an area of 23,181 sq.mi., a desolate tract, without a single permanently running stream. It is overspread with undulating sand-hills, 20 to 100 ft. above the average level, and so loose that men and quadrupeds stepping off the beaten track sink as if in snow. Two streams, the Katli and Ghaggar, attempt to flow through this dismal region, but are lost in its sands. Water is very scarce, and is raised from wells of from 150 to 340 ft. in depth. A few shallow salt lakes are filled by rain water, but they dry up on the setting in of hot weather, leaving a thick crust of salt on their beds, which is used for commercial and domestic purposes. The Ghaggar canal from the Punjab irrigates 5,000 ac. on the northern border; and a magnificent new canal, connected with the Sutlej valley scheme, has been opened, which is intended to protect about 1,100 sq.mi. of the state. The inhabitants live chiefly by pasturage, rearing camels, horses and sheep. The other industries are leather work, sugar refining, goldsmith's work, ivory carving, iron, brass, copper, stone masonry, tanning, weaving, dyeing and carpentry. The principal towns are Bikaner, the capital, Churu, Rajgarh, Ratangarh and Reni. In 1941 the population was 1,292,938. The military force includes a famous Camel corps, which distinguished itself in China in 1900, and in Egypt during 1914–18. The educational institutions embrace the Dungar Memorial college, a school for the sons of nobles, and a girls' school called after Lady Elgin. The city of Bikaner is surrounded by a stone wall, 6 ft. thick, 15 to 30 ft. high and $3\frac{1}{2}$ mi. in circuit, with five gates and three sally ports. The citadel, half a mile northeast of the city, is surrounded by a rampart with bastions. The population in 1941 was 127,226. The Bikaner carpets are famous, and there are also manufactures of fine blankets and sugar candy. The wealth of the towns in this state is due to their being the ancestral homes of Marwari merchants, who trade all over India and amass great riches, with which they retire to the abodes of their forefathers.

In the 15th century the territory which now forms the state of Bikaner was occupied by Rajput clans, partly Jats, partly Mohammedans. About 1465 Bika, a Rathore Rajput, sixth son of Rao Jodha, chief of Marwar, started out to conquer the country. By taking advantage of the rivalries of the clans he succeeded; in 1485 he built the small fort at the capital which still bears his name, and in 1488 began the building of the city itself. He died in 1504, and his successors gradually extended their possessions. In the reign of Akbar the chiefs of Bikaner were most loyal adherents of the Delhi empire, and in 1570 Akbar married a daughter of Kalyan Singh. Kalyan's son, Rai Singh, who succeeded him in 1571, was one of Akbar's most distinguished generals and the first rajah of Bikaner; his daughter married Selim, afterwards the emperor Jahangir. Two other distinguished chiefs of the house were Karan Singh (1631–1669), who in the struggle of the sons of Shah Jahan for the throne threw in his lot with Aurangzeb, and his eldest son, Anup Singh (1669–1698), who fought with distinction in the Deccan, was conspicuous in the capture of Golconda, and earned the title of maharaja. Wars of Bikaner with Jodhpur raged intermittently through the 18th century. On May 9, 1818 a treaty was concluded, and order was restored in the country by British troops. Ratan Singh, who succeeded his father in 1828, applied in vain in 1830 to the British government for aid against his *thakurs;* but during the next five years dacoity became so rife on the borders that the government raised a special force to deal with it (the Shakhawati brigade), and of this for seven years Bikaner contributed part of the cost. In 1842 Ratan Singh supplied camels for the Afghan expedition; in 1844 he reduced the dues on goods passing through his country, and he gave assistance in both Sikh campaigns. His son, Sardar Singh (1851–1872), was rewarded for help given during the mutiny by an increase of territory. Sardar Singh had no son, and on his death in 1872 his widow and principal ministers selected Dungar Singh as his successor, with British approval. The rebellion of the *thakurs* in 1883, owing to an attempt to increase the dues payable in lieu of military service, led to the permanent location at Bikaner of a British political agent. Dungar Singh died in 1887 without a son; but he had adopted his brother, Ganga Singh (1880–1943), who succeeded as 21st chief of Bikaner with the approval of the government. Ganga Singh was succeeded by his son, Sri Sadul Singhji Bahadur, in 1943.

BILASPUR, a town and district of British India in the Chhattisgarh division of the Central Provinces, situated on the right bank of the river Arpa. From a small village said to have been founded by a fisherwoman named "Bilasa," it became a Mahratta post and, after the lapse of the Nagpur state to the British, it was made the headquarters of the district in 1862. Its population was then under 5,000. When the Bengal-Napur railway was constructed in 1889 it became an important junction on the direct route between Bombay and Calcutta, a branch line connecting it through the Pendra Ghat and the Rewa state with the East Indian railway at Katni. Its trade and importance have continued to increase and its population (1941) is 37,460. The American mission has important educational institutions here, and there are the government high school and its subsidiaries. There are also railway schools.

The district of Bilaspur, as now constituted, has an area of 7,513 sq.mi. It forms the upper half of the basin of the river Mahanadi. It is almost enclosed on the north, west and east by ranges of hills, while its southern boundary is well cultivated and closely dotted with villages embedded in mango groves. This area constituted the northern portion of the great Chhattisgarh plain (Chhattisgarh division). The Mahanadi is the principal river of the district, and governs the whole drainage and river system of the surrounding country. Flowing north from Raipur it crosses the Bilaspur boundary near Seorinarain, then turning south and east, after a course of 25 mi., enters the Sambalpur district on its way to Bengal. The most important affluents of the Mahanadi are the Seonath and Hasdeo. The district is poorly protected from drought and suffers intensely in famines. In 1897 there was a heavy death rate, and relief in 1899–1900 was carried out on a most lavish scale; there has been good recovery since.

Upon the formation of the Drug district, transfers of territory were made; the population of the areas now included in the district is (1941) 1,549,509. Formerly migration was very limited, but since the famines there has been much emigration to the Assam tea districts and there is an annual movement of surplus labour to Khargpur and Calcutta. The chief wealth of the district consists in its agricultural produce. Rice, the principal crop, is exported to Bombay, Berar and northern India. The tussur silk industry is of some importance. Sal, and other timber, is exported, and Lac is sent in quantities to Calcutta and Mirzapur. There is coal in the Korba Zamindari. Among local industries hand weaving is important, and there is a match factory at Kotah.

The district includes several large Zamindari estates held on a special privileged tenure. Many of these are in wild and hilly

country with forests of considerable value. The Pandaria Zamindari in the west is more level and fertile.

Bilaspur has not been so fortunate as its neighbours in regard to the construction of large government irrigation works, but the deficiencies were being made up before the outbreak of World War II. (R. H. C.)

BILBAO, officially Vizcaya, formerly occasionally written Bilboa, capital of Biscay province, in N. Spain. Pop. (1940) 183,200 (mun., 195,186). Bilbao is one of the principal seaports of Spain, and the greatest of Basque towns. It is among hills on both sides of the river Nervión and about 8 mi. from the mouth of the river in the Bay of Biscay. The old town on the right bank includes the 14th century *Siete Calles* (Seven Streets), and its extensions to the north, which date from the 16th century. The *Siete Calles* is one of the most remarkable examples of a mediaeval site laid out entirely to plan, remarkable both for its regularity and for the care taken by careful levelling to secure drainage and ventilation; its paved streets were long closed to horsemen and to wheeled traffic, and their cleanliness was the wonder of all visitors. With its high houses and narrow streets, the old town is to-day the principal business and shopping centre. The prosperity which followed World War I has led to far-reaching proposals for its alteration, in particular for the improvement of through communications by cutting two broad streets from the Puente de San Antón in the south, leading respectively to the Puente de la Merced and to the Puente de Isabel Segunda, the most important bridge carrying traffic to the new town. The new town (*Ensanche*) stands a little lower down the river on the left bank; it is built on modern and spacious lines, in rectangular blocks with main arteries of traffic radiating from central plazas. The plan for the new town was approved in 1876, and was conceived on a scale adequate to the subsequent needs of the town. At Olaveaga, about a mile off, is the Jesuit university. During the second half of the 19th century the population of Bilbao increased nearly fivefold, principally because of the development of the mining and metallurgical industries. The mining industry, producing chiefly iron ore, declined in the 20th century in sympathy with the depressed state of the British foundries which consumed three-fourths of the ore produced and in face of increased cost of production and of the growing competition from North Africa; the high-class ores also became worked out. More satisfactory was the condition of the metallurgical industry, which applied to modernization of plant a large portion of the enormous profits made during World War I. The exports ordinarily are chiefly iron; the imports, coal; large quantities of wine from Navarre and the Ebro valley are also sent abroad, and the importation of timber of all kinds from Scandinavia and Finland, and coastwise from Asturias, is of great importance. In the coasting trade the exports are mostly pig iron, codfish and some products of local industries and agriculture. The port of Bilbao includes an outer harbour (with free port), protected by a breakwater and counter-mole constructed outside the bar of the river Nervión, between Santurce and the opposite headland at Algorta; the depth at low water alongside the quay of the free port is 33 ft. At Bilbao itself there are quays, 6,560 ft. in length, chiefly on the left bank; the depth alongside at low water varies from 13 to 15 ft. Five dry docks are now available, varying in length from 325 ft. to 614 ft. and in depth from 21 ft. to 25 ft. Both the shipping and ship-building industries revived somewhat, after a period of decline, through government bounties granted in 1925. Besides the mining and metallurgic industries, Bilbao has breweries, tanneries, flour mills, glass works, brandy distilleries, and paper, soap, cotton, and mosaic factories.

Bilbao was founded by Don Diego López de Haro about 1300, and was given special privileges which enabled it soon to outstrip Portugalete, the port at the river mouth. The establishment of a Consulado modelled after that of Burgos speeded its growth after 1511. A commercial code, drawn up first in 1459 by the merchant guild and revised from time to time by the Consulado, became in its final form—the *Ordenanzas de Bilbao* of 1737—the basis of Spanish commercial law and of several codes in South American states. It was superior to that of Barcelona in that it covered both land and sea trade. Bilbao suffered notable sieges by the Carlists in 1835–36 and 1874. In 1936–37 the Basques resisted the nationalists with vigour and were confident that Bilbao, with its "iron ring" of fortifications, could not be captured. However, the nationalist armies, because of superior artillery and air strength, and because the Basques lacked supplies and the mobility necessary in modern warfare, captured the city June 19, 1937.

See O. Jürgens, *Spanische Städte* (1921, bibl.); L. Martín Echeverría, *España* (1940).

BILBERRY, BLAEBERRY or **WHORTLEBERRY,** known botanically as *Vaccinium myrtillus* (family Ericaceae), a low-growing shrub, found in open woods, copses and on heaths, chiefly in hilly districts of Great Britain and northern continental Europe and Asia. In season many thousands of people harvest this in the wild. The stiff stems, from 6 in. to 18 in. high, bear small ovate leaves with a serrate margin, and with small, globose, rosy flowers tinged with green. The berries, ripening in July and August, are dark blue, with a waxy bloom, and about one-third of an inch in diameter; they are used for tarts, preserves, etc., and are a principal food of the grouse. The plant is widely distributed throughout the north temperate and extends into the arctic zone. The berries are borne singly in contrast to those of the cultivated blueberries of the United States which are borne in racemes, hence being much more productive than the bilberry. It is frost susceptible, in part at least self-sterile and has been hybridized with *V. prunus idaeus.* Cowberry, mountain cranberry, partridge berry, or whimberry is a circumpolar allied species, *V. vitis-idaea,* growing in similar situations, but not found in southeastern England. It is distinguished by its evergreen leaves and red acid edible berry. (*See* BLUEBERRY; CRANBERRY; VACCINIUM.)

(G. M. D.)

BILBES, a town of lower Egypt, on the eastern arm of the Nile, 36 mi. N.N.E. of Cairo by rail. The Coptic name, Phelbēs, seems derived from Egyptian, but nothing is known of the place before mediaeval times. Considered the bulwark of the kingdom on that side, Bilbes was strongly fortified by the Mohammedans. In 1163–64 it was besieged for three months by the crusaders under Amalric, and in 1168 was captured and pillaged by another army of crusaders. Napoleon in 1798 ordered the restoration of the fortifications, but they have again fallen into decay.

BILBO (from the Spanish town Bilbao, formerly called in England "Bilboa," and famous, like Toledo, for its sword blades), in the earliest English use, a sword, especially one of superior temper. In the plural form (as in Shakespeare's phrase "methought I lay worse than the mutines in the bilboes") it meant the irons into which offenders were put on board ship.

BILDERDIJK, WILLEM (1756–1831), Dutch poet, was the son of an Amsterdam physician. His parents were ardent partisans of the house of Orange, and Bilderdijk grew up with strong monarchial and Calvinistic convictions. After studying law at Leyden university, he practised as an advocate at The Hague. He refused in 1795 to take the oath to the new administration, and was consequently obliged to leave Holland. He went to Hamburg, and then to London, where his great learning procured him consideration. There he had as a pupil Katherina Wilhelmina Schweickhardt (1776–1830), the daughter of a Dutch painter and herself a poet. He married this lady in 1802. In 1806 he returned to Holland. He was kindly received by Louis Napoleon, who made him his librarian, and a member and eventually president (1809–11) of the Royal institute.

A picture of the Bilderdijk household is given in the letters (vol. v, 1850) of Robert Southey, who stayed some time with Bilderdijk in 1825. Madame Bilderdijk had translated *Roderick* into Dutch (1823–24). For his work as a poet *see* DUTCH LANGUAGE AND LITERATURE. His many-sided activity showed itself also in historical criticism—*Geschiedenis des Vaderlands* (1832–51), a conservative commentary on Wagenaar's *Vaderlandsche Historie;* in translations from the Greek and Latin classics, in philology, and in drama. His most important poetical works are the didactic poem, *De Ziekte der geleerden* ("The Disease of the Learned"), 1807; a descriptive poem in the manner of Delille in *Het Buitenleven* (1803); and his fragmentary epic, *De Ondergang der eerste wereld* (1820).

His poetical works were collected by I. da Costa (Haarlem, 1856–59) with a biography of the poet. *See* also "Mijne Levensbeschrijving" in *Mengelingen en Fragmenten . . .* (1834); his *Brieven* (ed. 1836–37)

by I. da Costa and W. Messchert; Dr. R. A. Kollewijn, *Bilderdijk, Zijn Leven en werken* . . . (1891).

BILECIK, chief town of the vilayet of the same name in Turkey, altitude 1,900 ft., on a hill 2½ mi. from its station on the Ismid-Angora railway. Pop. 21,427. It is an important centre of the silk industry, and has several silk-spinning factories.

BILFINGER or **BÜLFFINGER, GEORG BERNHARD** (1693–1750), German philosopher, mathematician and statesman, was born on Jan. 23, 1693, at Kanstatt, Württemberg. He studied philosophy under Wolff, became professor of philosophy (1721) and then of mathematics (1724) at Halle. His *Dilucidationes philosophicae de deo, anima humana, mundo* (Tübingen, 1725) is a clear presentation of Wolff's philosophy. On Wolff's recommendation he was invited by Peter the Great to lecture at St. Petersburg, and he remained there from 1725 to 1731. In the latter year he returned to Germany, became professor of theology at Tübingen, and a member of Duke Charles Alexander's council. On the duke's death he became a member of the Regency Council, and helped to reorganize education and agriculture in the State. He died at Stuttgart on Feb. 18, 1750.

Beside the *Dilucidationes,* he wrote:—*De Harmonia animi et corporis humani commentatio* (Frankfort and Leipzig, 1725;) *De origine et permissione mali* (1724), an account of the Leibnitzian theodicy.

See Tafinger, *Leichenrede* (Stuttgart, 1750); Abel, in Moser's *Patriot, Archiv.*, ix. p. 369 (1788); Spittler, *Verm. Schriften,* xiii. p. 421; R. Wahl, "Bilfinger's *Monadologie*" *Zeitschrift für Philos.* (1884); E. Zeller, *Geschichte d. deutsch. Philos. seit Leibnitz.*

BILGE, the widest part or "belly" of a cask; the broad horizontal part of a ship's bottom above the keel; also the lowest interior part of the hull; hence, "bilge-water," the foul water which collects in the bilge. "Bilge-keels" are pieces of timber fastened to the bottom of a ship to reduce rolling. The word is a corruption of bulge, from Fr. *bouge,* Lat. *bulga,* a bag, probably deriving from an original Celtic word.

BILGRAMI, SAYYID HUSAIN (1843–1926), Indian statesman, a member of a well-known Mohammedan family, was educated at the Presidency college, Calcutta, and became professor of Arabic at Lucknow. In 1884 he was attached to the service of the Nizam of Berar, where he was director of education for 20 years. He helped to build up the Mohammedan Oriental college at Aligarh, which is now a university; in other ways he promoted Mohammedan interests in India, and from 1907 to 1909 was a prominent member of the India Council in London. He died on June 9, 1926.

BILHARZIASIS or **SCHISTOSOMIASIS,** a disease characterized by haematuria or by discharge of blood and mucus by the rectum caused by the fluke parasite schistosoma and endemic throughout Africa, South America and the West Indies, China, Japan, the Philippines, Formosa, Burma, India and Western Australia. One European country only, south Portugal, is known to be infected by schistosomiasis (1925).

Causation.—Schistosomiasis is caused by certain metazoal parasites of the family Schistosomidae Looss-1899 (type genus Schistosoma Weinland 1858) belonging to the trematode class of the phylum Platy-helminthes. In the schistosomidae the sexes are separate, and the alimentary canal is united posteriorly into a single tube. In the known human species the egg is furnished with a characteristic spine (point) or knob. A ventral (gynaecological) canal for carrying the cylindrical female worm is formed by the infolding lateral margins of the leaf-shaped male.

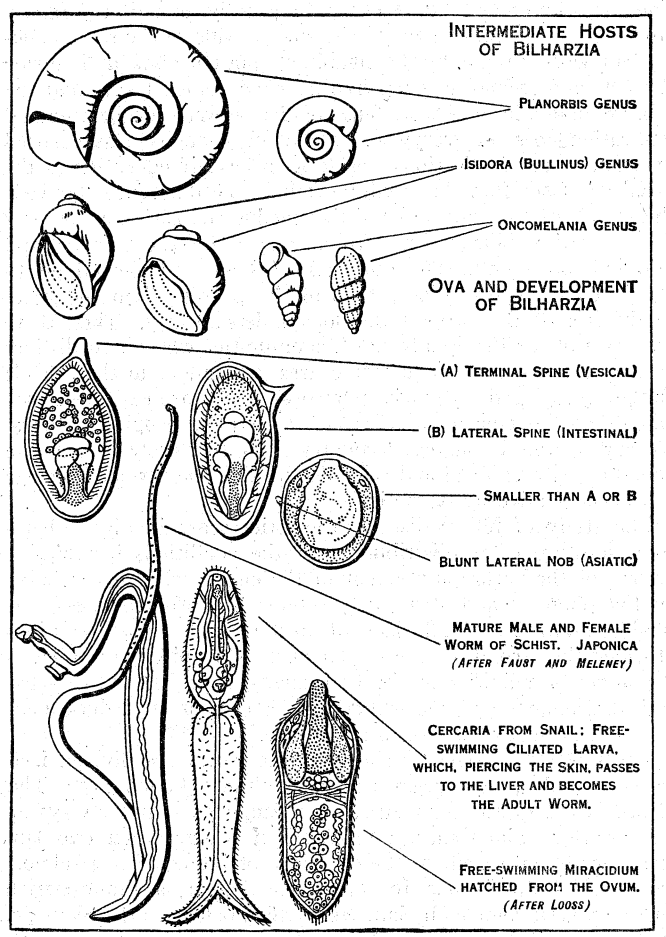
There are three known human species; *Schist. haematobium,* the chief African species infects principally the bladder; *Schist. mansoni,* also found in Africa, the only species infecting America, affects the large intestine; *Schist. japonicum,* the Asiatic species, affects the large intestine and liver and spleen.

The adult worms inhabit the portal venous system, reach maturity in the liver and pass in the portal tributaries to the pelvic veins in the bladder and large intestine to lay their eggs, which reach the exterior world in the urine and faeces. In fresh water under favourable conditions the ovum hatches the ciliated embryo (miracidium).

If during its short active life it approaches an appropriate water-snail, it penetrates and bores its way to the pancreatico-hepatic gland and encysts. Bifid larvae (cercariae) develop within the daughter cysts and escape when the snail ruptures. The parasite again becomes free swimming. Cercariae survive not longer than 36 hours. They are attracted by and penetrate human skin and mucous membranes immersed in the water. They discard the tail and are carried by the blood and lymph to the lungs and from thence to the liver where they mature. Definite symptoms of schistosomiasis may be expected two months or later from the time of contact with infected water.

Treatment.—In 1917 Christopherson in Khartum found that antimony tartrate administered intravenously was an infallible parasiticide for both species of Egyptian schistosomiasis, and worked out the method of treatment by antimony which has since been adopted. Later it was found that antimony tartrate was an equally trustworthy parasiticide for Asiatic schistosomiasis. Recovery is the rule provided reinfection is obviated. Death takes place from toxaemia due to a heavy infection, from intercurrent disease, from impairment of liver function, from complications caused by the damaged organs and secondarily from stone in the bladder or cancer.

Preventive Measures.—Theoretically schistosomiasis can be stamped out of a locality by (1) curing all the cases, (2) killing



THE SCHISTOSOMA PARASITE, RESPONSIBLE FOR BILHARZIASIS, A DISEASE TO WHICH MAN IS SUBJECT IN AFRICA AND OTHER COUNTRIES

Above are shown the main water snails that serve as intermediate hosts of the parasites; below, the stages from the ovum to the adult worm

the intermediary hosts (water snails), (3) preventing the mollusc infecting man, and man the mollusc. This is effected by the intravenous injection of antimony tartrate (Pot. or Sod.) daily for five days, afterwards three times a week until the necessary total (adult) amount (25–30 grains) is reached. Antimony is contra-indicated in cardiac and renal disease and when the liver is extensively disorganized. Emetine is given when antimony tartrate is not tolerated. Extermination of the snails is accomplished by

chemicals which kill the mollusc but are beneficial to or do not interfere with the fertility of the soil, chiefly calcium and ammonium compounds. In Egypt where irrigation is under government control, Leiper recommended the periodical drying up in rotation of irrigation canals for 15 days. The natural enemies of the snail (ducks) are to be encouraged. Water contaminated by bilharzia, if kept for two days, is innocuous for domestic purposes.

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BILIN: *see* BILINA.

BILINA, a small town of Bohemia, in the Sudetenland, on the Biele within the Germanized belt of the country. Pop. (1930) 10,698. It is famous for its mineral springs, the Biliner Sauerbrunnen, which have a temperature of 45.6° F and contain bicarbonate of soda. The water is bottled and exported in large quantities and is also evaporated for its salt. South of the town rise the volcanic heights of the Mittelgebirge, a region of wide panoramas notably from the Rudelstein (2,460 ft.), while northward it has easy access to the lignites of the Brüx-Teplitz basin. The Munich pact in 1938 transferred the town to Germany.

BILINGUALISM. In many parts of the world people use one language inside the family circle and speak another, sometimes of a different type, freely and naturally, outside the family circle. Or two languages may exist side by side in the same country and be used freely by the inhabitants both at home and outside the home. One may develop into a lingua franca (*q.v.*) and the other remain a local dialect. The conflict between localization and unification goes on everywhere and affects language as a social instrument and institution. Inside a society, if education is the privilege of the few, there will be found such differences between the speech of the educated and the uneducated classes as to produce a kind of bilingualism. A man may write like an angel and talk like poor Poll. The purists in Athens and Bengal go to classical models while the speech of the people—living—subject to the life of the people—develops independently. Then there are cases of politically advanced communities where two distinct languages are spoken in the same area, are taught in the schools and are recognized for official purposes. There are cases, too, unhappily not infrequent in history where a ruling people has thrust its language on a conquered country. But so closely is language bound up with national and religious life that the former language will be kept alive by patriotism.

The study of bilingualism in the strict sense involves, therefore, scrutiny of its distribution, of the conditions in which it occurs, of the nature and extent of the effects which it produces on the phonetic and structural systems of both languages, the familial and the external. Regard must be had to the conditions in which the second or external language is acquired and used, to the linguistic affinities of the two languages and to the psychological, economic and political conditions of contact. Educational and psychological problems are involved.

Distribution.—The languages of the world are divided into families and groups regardless of political boundaries. The identification of the boundaries of a language is not always an easy matter. Since natural bilingualism occurs when two languages come into contact, the occasion for bilingualism is almost world wide. In Europe for instance, Magyar, a Finno-Ugrian language, is surrounded by languages which belong to the Slavonic, Romance and Teutonic groups.

Finnish speech is in touch with Russian and Swedish, and Russian in turn farther East is in contact with Mongol and Chinese. In India, Brahui, a Dravidian language is ringed round with Iranian tongues, and in the south the Dravidian languages encounter Indo-Aryan languages along a great frontier. There are Dravidian areas surrounded or in touch with Austric (Munda) speech. Assam and Burma, too, have linguistic frontiers. Austric speech meets Papuan in New Guinea. In American conditions there are people such as the Mayas who are even trilingual for they speak Maya in their homes, learn Spanish in the mission schools and use English in trade.

Social Conditions.—The family is the most important group in all societies as the first instrument of cultural transmission. The conditions in which the first or familial language is learnt are not repeated exactly when a second language has to be learnt.

The form of the family, the modes of marriage observed, polygamy, matrilocal and patrilocal marriage, induce variations in linguistics as in other social matters.

Marriage with strangers may be allowed, encouraged or, more usually, forbidden and disliked. Some societies are exclusive, jealous of strangers, resistant to new ideas. Others, those in which bilingualism flourishes, are willing, even eager to seek intercourse with others. Here and there occur special cases where only historical knowledge can explain a difficult linguistic phenomenon as among the Caribs who killed off the Arawak men and took the women as captives. The women spoke Arawak, their own language, and taught it to their daughters, but the boys were taken by their fathers often at an early age for long voyages and expeditions and so learnt Carib. In Burma mixed marriages of Burmese women with Chinese men are known and the girls are brought up as Burmese while the boys follow the father.

Phonetics.—Every language has a distinctive phonetic system and a distinctive pattern of structure. Neither is absolutely rigid, incapable of modification. Changes occur, from internal causes and by reasons of external contacts. These changes are however directed by the pre-existing system and structure. But while a single sound change such as may be introduced in association with bilingualism may upset the old phonetic pattern by bringing in disharmony, there can be seen in all languages a general drift in a definite direction, compensated and controlled by a readjusting tendency and a conservative tendency.

Structure.—Something like an ideal linguistic entity dominates the speech habits of the members of each group and modifications and variations of all linguistic phenomena have to be correlated with this ideal entity.

Slight phonetic readjustment or unsettlement may in the course of millennia bring about the most profound structural changes. Thus a growing tendency to throw the stress automatically on the first syllable of a word may eventually change the fundamental type of a language, reducing its final syllables to zero. One of the most potent causes of unsettling a language is any widespread bilingualism, whether open or, as is often the case, secret and unsuspected.

Certain languages have structural features due to the suggestive influence of neighbouring languages.

How great the influence of one language on another may be, even when the two belong to different language families, is shown by the present condition of Finnish, Estonian and Magyar and Finno-Ugrian languages. It is said that a reader familiar with other European speech will find nothing fundamentally original in the syntax of the sentences of a journal in these languages, apart from a few idiomatic expressions.

Vocabulary.—Borrowed words are made to conform to the phonetic pattern of the borrowing language and are often sorely changed in the process. Then a psychological principle seems to be at work by which certain types of words are selected or are preferred for assimilation as conforming to the inner type of the borrowing language. Some languages find it easier to create new words out of their own resources.

Words have an association with other words in their pristine vocabulary and lose this value at least in part when adopted into a new home where they acquire association with another and generally very different set of ideas and thus gain a new meaning.

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BILL. There are three words in English with distinct meanings and derivations. (1) A written, originally sealed, document. The word is derived from the Early English *bille*, Anglo-Latin *billa*, from Latin *bulla*, in the mediaeval sense of "seal." It is a doublet, therefore, of "bull." (2) A common Teutonic word

for a long-handled cutting weapon of which the name and shape is preserved in the bills or bill-hooks used for pruning hedges and lopping the branches of trees. For an account of the weapon see (2) in the next column. (3) The beak of a bird.

(1) In the sense of a document the word is used in various connections in law and commerce.

In the English parliament, and similar legislative bodies, a bill is the draft of a proposed statute (*q.v.*) submitted to either house, which when finally passed becomes an act. The modern system of legislating by means of bill and statute appears to have been introduced in the reign of Henry VI., superseding the older mode of proceeding by petitions from the Commons, assented to by the king, and afterwards enrolled by the judges. (For procedure *see* PARLIAMENTARY PROCEDURE: *Legislation.*)

A *Bill in Chancery,* in former days, in English law, was a written statement of the plaintiff's case whereby he complained of the wrong upon which the suit was based and prayed for relief. By the Judicature Acts 1873 and 1875 its place was taken by a writ and statement of claim (*see* PRACTICE AND PROCEDURE).

A *Bill of Indictment* is a presentment against a prisoner, charging him with an offence, and presented at quarter sessions or assizes to the grand jury (*see* INDICTMENT).

A *Bill of Costs* is an account setting forth the charges and disbursements incurred by a solicitor in the conduct of his client's business.

A *Bill of Exceptions* was formerly a statement in writing of objections to the ruling of a judge, who, at a civil trial, had mistaken the law, either in directing the jury, or in refusing or admitting evidence or otherwise. It was abolished by the Judicature Act 1875, and a "motion for a new trial" substituted.

A *Bill of Health* is a document given to the master of a ship by the consul or other proper authority of the port from which he clears, describing the sanitary state of the place. A bill of health may be either "clean," "suspected" or "touched," or "foul." A "clean" bill imports that at the time the ship sails no disease of an infectious or contagious kind is known to exist; a "suspected" or "touched" bill, that no such disease has as yet appeared, but that there is reason to fear it; a "foul" bill, that such a disease actually exists at the time of the ship's departure. Bills of health are necessary where the destination of the ship is a country whose laws require the production of such a bill before the ship is allowed into port, and where, in default of such production, the ship is subjected to quarantine.

A *Bill of Mortality* in England was a weekly return issued under the supervision of the company of parish clerks showing the number of deaths in a parish. During the Tudor period England suffered much from plague, and various precautionary measures became necessary. Quarantine or isolation was the most important, but to carry it out successfully it was necessary to have early warning of the existence of plague in each parish or house. For this purpose searchers—usually women—were appointed, who reported to the clerk the cause of each death in the parish. He, in turn, sent a report to the parish clerks' hall, whence was issued weekly a return of all the deaths from plague and other causes in the various parishes, as well as a list of those parishes which were free from plague. Bills of mortality are usually said to date from 1538, when parish registers were established by Cromwell (Lord Essex), but there is extant a bill which dates from Aug. 1535, and one which is possibly even earlier than this. It is certain that they first began to be compiled in a recognized manner in Dec. 1603, and they were continued regularly from that date down to 1842, when under the Births and Deaths Registration Act 1836 they were superseded by the registrar-general's returns. It was not till 1728, when the *ages* of the dead were first introduced, that bills of mortality acquired any considerable statistical value. It was on the data thus furnished that the science of life insurance was founded.

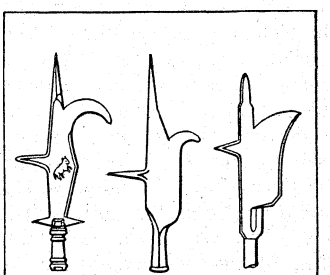
A *Bill of Particulars* was, in law, a supplementary statement in writing, informing each party to a suit of the precise nature of the case he had to meet.

A *Bill of Peace* is, in equity, a suit brought by a person to establish and perpetuate a right which he claims, and which from its nature may be controverted by different persons at different times and by different actions; or where several attempts have already been unsuccessfully made to overthrow the same right, and justice requires that the party should be quieted in the right if it is already sufficiently established. Bills of this nature were usually filed where there was one general right to be established against a great number of persons, or where one person claimed or defended a right against many, or where many claimed or defended a right against one. Thus, a bill might be filed by a parson for tithes against his parishioners; by parishioners against a parson to establish a *modus;* by a lord against tenants for an encroachment under colour of a common right; or by tenants against a lord for disturbance of a common right. Bills were also filed in cases where the plaintiff had, after repeated and satisfactory trials, established his right at law, and yet was in danger of further litigation and obstruction to his right from new attempts to controvert it. Actions in the nature of bills of peace are still maintainable.

A *Bill of Sight* is a document furnished to a collector of customs or other proper officer by an importer of goods in England, who, being unable for want of full information to make a perfect entry of goods consigned to him, describes the same to the best of his knowledge and information. The goods may then be provisionally landed, but perfect entry must be made within three days by indorsing on the bill of sight the necessary particulars. In default of perfect entry within three days the goods are taken to the king's warehouse, and if perfect entry is not made within one month and all duties and charges paid, they are sold for payment thereof. *See* the Customs Consolidation Act 1876. (*See* BILL OF EXCHANGE.)

A *Bill of Store* is a licence granted by the custom-house to re-import British goods into the United Kingdom. All British goods re-imported into the United Kingdom are entered as foreign, unless re-imported within ten years after their exportation and unless the property in the goods continues and remains in the person by whom they were exported. But in such case they may usually be entered as British goods, by bill of store.

A *Bill of Victualling* or *Victualling Bill,* in its original meaning, is a list of all stores for shipment, but now an order from an export officer of the customs for the shipment from a bonded warehouse or for drawback of such stores as may be required and allowed with reference to the number of the crew and passengers on board a ship proceeding on an oversea voyage. It is made out by the master and countersigned by the collector of customs. Its object is to prevent frauds on the revenue. No such stores are supplied for the use of any ship nor are any articles taken on board deemed to be stores unless they are borne upon the victualling bill, and any such stores relanded at any place in the United Kingdom without the sanction of the proper officers of the customs will be forfeited and the master and owner will each be liable to a penalty of treble the value of the stores or £100. A victualling bill serves as a certificate of clearance when there is nothing but stores on board the ship.



TYPES OF OLD ENGLISH BILL
On the left is a bill of the time of Edward IV.; the centre bill is Elizabethan, and that on the right, a Watchman's bill of the 17th century

See also ATTAINDER; INDEMNITY; LETTER OR BILL OF CREDIT; BILL OF EXCHANGE; BILL OF RIGHTS and BILL OF SALE; for a bill of lading *see* AFFREIGHTMENT.

(2) Meaning a weapon, a common Teutonic name for a long-handled weapon with a cutting edge (O.E. *Bil, billes,* sword or falchion, O. Sax. *bill,* M.H.G. *Bil,* Mod. Ger. *Bille,* a pickaxe; no connection with Ger. *Beil,* an axe), of which the name and shape is preserved in the hedging-bills used for pruning hedges and lopping the branches of trees.

The primitive forms of a bill suggest short scythe-blades or

hedgers' bill-hooks mounted on tall staves. In such shape it is found in the hands of the English before the Conquest. English mediaeval documents make much confusion between the bill and the halbert and other forms of staved weapons with cutting heads. Before the 15th century the bill had been reinforced with a pike head above the curved blade and another jutting at a right angle from the blade's back. In this form it became a popular English weapon, the "brown bill" of many ballads.

Billmen are not found in the king's host at Crecy and Calais, the bowmen carrying malls or short swords, and Henry VII.'s contracts for troops do not name the bill, which may be regarded rather as the private man's weapon. But when, in the middle of the 15th century, Walter Strickland, a Westmorland squire, contracts to raise armed men, it is noticeable that more than half his horsemen carry the bill as their chief arm, while 71 bowmen are to march on foot with 76 billmen. In the 16th century the bill, with the halbert, fell out of use among regular troops, the pike taking their place on account of the longer staff, which made it a better defence against cavalry. It remained during the 17th century as a watchman or constable's weapon, although rudely-fashioned bills were seen in the Sedgemoor fight. (O. B.)

BILLAUD-VARENNE, JACQUES NICOLAS (1756–1819), French revolutionary, was the son of an *avocat* at the parlement of Paris. In 1785 he left the Oratorian College where he was prefect of studies, married and bought a position as *avocat* in the parlement. Early in 1789 he published at Amsterdam a three-volume work on the *Despotisme des ministres de la France,* and he adopted with enthusiasm the principles of the Revolution.

At the Jacobin club he became from 1790 one of the most violent of the anti-royalist orators. After the flight of Louis XVI. to Varennes, he published a pamphlet, *L'Acéphocratie,* in which he demanded the establishment of a federal republic. In the night of Aug. 10, 1792, he was elected one of the "deputy-commissioners" of the sections who shortly afterwards became the general council of the commune. Elected a deputy of Paris to the National Convention, he at once spoke in favour of the immediate abolition of the monarchy, and the next day demanded that all acts be dated from the year 1 of the republic. At the trial of Louis XVI. he added new charges to the accusation, proposed to refuse counsel to the king, and voted for death "within 24 hours." On June 2, 1793, he proposed a decree of accusation against the Girondists; on June 9, at the Jacobin club, he outlined a programme which the Convention was destined gradually to realize: the expulsion of all foreigners not naturalized, the establishment of an impost on the rich, the deprivation of the rights of citizenship of all "anti-social" men, the creation of a revolutionary army, the licensing of all officers *ci-devant* nobles, the death penalty for unsuccessful generals. Sent in August as "representative on mission" to the departments of the Nord and of Pas-de-Calais, he showed himself inexorable to all suspects. On his return he was added to the Committee of Public Safety and published a book, *Les Éléments du républicanisme,* in which he demanded a division of property, if not equally, at least proportionally among the citizens. But he became uneasy for his own safety and turned against Robespierre, whom he attacked on the 8th Thermidor as a "moderate" and a Dantonist. Surprised and menaced by the Thermidorian reaction, he denounced its partisans to the Jacobin club. He was then attacked himself in the Convention for his cruelty, and a commission was appointed to examine his conduct and that of some other members of the former Committee of Public Safety. He was arrested, and as a result of the insurrection of the 12th Germinal of the year 3 (April 1, 1795), the Convention decreed his immediate deportation to French Guiana. After the 18th Brumaire he refused the pardon offered by the First Consul. In 1816 he left Guiana and took refuge in Port-au-Prince (Haiti), where he died of dysentery.

In 1821 were published the *Mémoires de Billaud-Varenne écrits à Port-au-Prince* (Paris), but they are probably forgeries. An interesting autobiographical sketch of his youth, "Tableau du premier age," composed in 1786, was published in 1888 in the review, *La Révolution française.* (*See* also FRANCE: *History.*)

BILLBOARDS, the popular term for advertising displays which in American business circles are designated as outdoor advertising. In Great Britain the term "hoardings" is used for outdoor advertising, derived from the hoardings upon which posters are frequently placed. In the United States, Canada and the Philippine islands, outdoor advertising is highly organized and standardized. It is composed of: (*a*) posters, which are printed sheets pasted upon a specially constructed panel; (*b*) painted bulletins, which are displays of different sizes painted directly on a panel; and (*c*) electrical spectaculars—the advertisements composed of electric lights, both bulbs and luminescent tubes.

Most countries and States have legal restrictions preventing obstruction of the view by billboards along highways. The association of the outdoor advertising industry has greatly supplemented such laws and ordinances by trade regulations. Posters in America are of two sizes: the 24 sheet, which is 9′4″x12′6″, and the three sheet, 3′5″x7′. The latter is usually placed on the side of a building where the advertised article is on sale and is called "point of sale" advertising. Both sizes of posters are pasted on panels with frames and steel backs.

Standard poster service provides equal displays for all advertisers, by dividing the territory into "showings" of approximately equal circulation. The purpose is to give advertisers the same "coverage" as nearly as possible in the same territory. These showings are of three classes known as intensive, representative and minimum, the ratio of which is 3:2:1 for a unit of population. In Brooklyn, N.Y., which has approximately 700,000 families, a minimum showing has 20 illuminated and 40 unilluminated posters.

The amount of circulation is the basis for establishing showings and for fixing rates. Circulation is defined as "the number of advertising messages delivered." In outdoor advertising such delivery consists of exposing the message to people so that it can be read. As a large part of the possible readers of a display are in motion, three basic factors are used in calculating circulation: (1) the distance through which approaching traffic may see the display; (2) the speed of the traffic stream; (3) the angularity of display to the direction of the traffic stream. Auditing circulation for outdoor advertising is in charge of the Traffic Audit Bureau. This organization is jointly owned and controlled by (1) the American Association of Advertising Agencies (*q.v.*); (2) the Association of National Advertisers; (3) the Outdoor Advertising Association of America.

Net, or "effective," circulation constitutes: (1) 50% of foot traffic where the advertising display is situated; (2) 50% of the gross automobile traffic; (3) 25% of traffic provided by buses, street-cars and other mass transportation. This classification assumes that with a display parallel with the line of traffic, all pedestrians on the near side of the street will see it, but none on the far side. The same is assumed to be true of private vehicular traffic. With mass traffic only those of the passengers are counted who sit on the side of the conveyance nearest to the display. As with pedestrians and private vehicles, only those buses and trains on the near side of the street are included. If the display is at an angle to the stream of traffic, all pedestrians and private vehicles which move toward the display are assumed to have an opportunity to read it, while none who approach from the rear side are counted. Where the vision is interrupted for a part of the approach, only partial credit is given for the display.

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BILL-BROKER; a broker who deals in bills of exchange. Bill-brokers specialize in bill-discounting, and their operations are very varied in character. They may deal for themselves as principals or for others as agents. When they sell bills of exchange on commission, they are purely brokers; this function has become almost obsolete. When they buy bills of exchange to sell again at a profit they become, in effect, bill-merchants. When, enlarging their functions, they deal in bills on the grand scale, employing much capital derived from depositors, they become what are called "discount houses." (*See* BILL OF EXCHANGE; MONEY MARKET; DISCOUNT AND DISCOUNT HOUSES.)

BILLET. (1) A small paper or "note," commonly used in the 18th and early 19th centuries as a "billet of invitation" (Fr. *billet,* diminutive of *bille,* a writing). A particular use of the word is to denote an order issued to a soldier entitling him to quarters with a certain person (*see* BILLETING). From meaning the official order, the word billet came to be used of the quarters thus obtained, giving rise to such expressions as "a good billet." Another sense of the word is that of a voting-paper occurring in the 17th century with reference to the Act of Billets passed by the Scottish parliament in 1662.

(2) A piece of wood roughly cylindrical, cut for use as fuel (Fr. *billette* or *billot,* diminutive of *bille,* the trunk of a tree). In mediaeval England it was used of the club or bludgeon which was the weapon proper to the serf. The name has been transferred to various objects of a similar shape, *e.g.* ingots of gold, or bars of iron or steel; and in heraldry (*q.v.*) to a bearing of rectangular shape. The term is applied in architecture to a form of ornamental moulding used in Norman and sometimes in Early English work. It resembles small billets of wood arranged at regular intervals in a sunk moulding. In early French architecture it sometimes forms the decoration of a string course.

BILLETING, a method of providing temporary accommodation for military forces by lodging them in parties on the inhabitants of a district. (*See* CANTONMENT; BARRACKS.)

BILLET-MOULDING, in architecture, a type of moulding much used in the Norman, Anglo-Norman and early Gothic styles; it consists of a series of small sections of *torus* or bead-moulding (*q.v.*) with spaces between them. Frequently, two or three rows of billet-moulding are combined, the projecting portions of one row directly above or below the flat portions of the next; occasionally the *torus* or bead will be bent at right angles to connect two such rows. The French term, which is much used in architectural books in English, is *bâton rompu.*

BILLIARDS, an indoor game of skill, played on a rectangular table, and consisting in the driving of small balls, with a stick called a cue, either against one another or into pockets according to the methods described below. The name probably originated in the Fr. *bille* (connected with Eng. "billet") signifying a stick. Of the origin of the game comparatively little is known. In an American text-book, *Modern Billiards,* it is stated that Catkire More (Conn Cetchathach), king of Ireland in the 2nd century, left behind him "fifty-five billiard balls, of brass, with the pools and cues of the same materials." The same book refers to the travels of Anacharsis through Greece, 400 B.C., during which he saw a game analogous to billiards. French writers differ as to whether their country can claim its origin, though the name suggests this. While it is generally asserted that Henrique Devigne, an artist, who lived in the reign of Charles IX, gave form and rule to the pastime, the *Dictionnaire universel* and the *Académie des jeux* ascribe its invention to the English. Bouillet in the first work says: "Billiards appear to be derived from the game of bowls. It was anciently known in England, where, perhaps, it was invented. It was brought into France by Louis XIV, whose physician recommended this exercise." In the other work mentioned we read: "It would seem that the game was invented in England." It was certainly known and played in France in the time of Louis XI (1423–83). Strutt (*Sports and Pastimes of the People of England*) considers it probable that it was the ancient game of Paillemaille (Pall Mall) on a table instead of on the ground or floor—an improvement, he says, "which answered two good purposes: it precluded the necessity of the player to kneel or stoop exceedingly when he struck the bowl, and accommodated the game to the limits of a chamber." Whatever its origin, and whatever the manner in which it was originally played, it is certain that it was known in the time of Shakespeare, who makes Cleopatra, in the absence of Antony, invite her attendant to join in the pastime—

"Let us to billiards: come, Charmian."
—*Ant. and Cleo.* Act. ii. sc. 5.

In Cotton's *Compleat Gamester,* published in 1674, we are told that this "most gentile, cleanly and ingenious game" was first played in Italy, though in another page he mentions Spain as its birthplace. At that date billiards must have been well enough known, for we are told that "for the excellency of the recreation, it is much approved of and played by most nations of Europe, especially in England, there being few towns of note therein which hath not a public billiard table, neither are they wanting in many noble and private families in the country."

ENGLISH BILLIARDS

The English table consists of a framework of oak or mahogany or other hard wood with eight legs strong enough to bear the weight of the slate bed of the table, which consists of five separate slabs of slate fitted together to make a smooth playing surface. The slate bed measures 12 ft. by 6 ft. 1½ in. In the middle of each long side and at each corner a suitable amount of the slate is hollowed out for the pockets. The whole is covered by a superfine green woollen cloth with the nap running from the baulk end toward the top of the table or spot end.

Rubber cushions covered with the same cloth are fixed by means of screws on to the bed and there is a pocket at each corner and in the middle of each long side, provision for these having been made previously in the slates. The cushions must not project over the slate bed more than 2 in. or less than 1½ in., and the rubber actually over the bed of the table is bevelled underneath toward the base so that the ball comes into contact only with a thin strip of rubber. Standard pockets must conform with the templets of the Billiards Association and Control council.

All official championships are played on standard tables which must be officially tested before the match. The height of the table from the ground must be between 2 ft. 9½ in. and 2 ft. 10½ in. The balk (baulk) line is a line drawn across the table 29 in. from the bottom cushion and parallel with it, and the space between this line and the bottom cushion is the balk.

There are four official spots on the table all on an imaginary line drawn down the centre from top to bottom. They are: the spot or billiard spot 12¾ in. from the top cushion; the middle spot (midway) between the middle pockets and in the exact centre of the table; the pyramid spot halfway between the middle spot and the face of the top cushion; the middle of the balk line. From this last spot with a radius of 11½ in. is described a semicircle within balk, and this semicircle with the part of the balk line upon which it is described forms the D. The spots should be marked by a small cross, French chalk being used.

There have been different attempts to alter the shape of the table and John Roberts, Jr., played matches on octagonal and oval tables, but these have long since been forgotten by the general public. Up to 1836 the bed was made of wood, but in that year slate was introduced by John Thurston; this, coupled with the introduction about the same time of rubber for the cushions instead of layers of flannel or cotton waste stuffing paved the way for the progress made by the game during the rest of the 19th century. After that time there have been other improvements until the production of the modern cushion. In the old days when the cue ball came to rest touching a cushion it was very difficult to play accurately from that position, but the modern low cushions make such strokes much simpler. In former days too the balls were made of ivory and in many ways were unsatisfactory. They quickly became foul, were affected by changes of temperature, and their life, for good play, was not long. Many attempts were made to find a good substitute for ivory, for example, steel was tried, until eventually a really good composition ball was found. John Roberts, Jr., played many of his matches with bonzoline, and the great red-ball player George Gray of Australia played with crystalate. These composition balls gradually took the place of ivory in many clubs in Britain, especially in the north. The composition ball is cheap. It is truer than ivory, lasts longer and makes certain phases of the game easier. Finally in 1925 the Control council introduced the crystalate ball as the standard ball for the amateur championships. Professionals still played with ivory until the championship of 1929, when it was decided by the council after a discussion with the leading professionals that in the future all championships, both amateur and professional, would be played with crystalate balls.

In modern play cues must conform more or less to a standard.

They must not, for example, be less than 3 ft. in length, and must show no substantial departure from the traditional and generally accepted shape and form. Cues are generally made of straight grained ash, though maple is used also, and some have been made of split cane. The striking end is generally protected by a thin brass ferrule. The tendency in the 20th century was toward heavier cues. In the earlier days 15 or 15½ oz. was a usual weight. John Roberts, Jr., used one of 16 oz. In 1945, 18 oz. was a common weight, and cues of 18½ oz. and 19 oz. were also used. The game of snooker, for which a heavy cue is very useful, probably contributed to this development.

Early Players.—The history proper of billiards began roughly about 1800 with the birth of such men as Jack Carr of Bath and Edwin (known as Jonathan) Kentfield, a Yorkshireman who had a public billiard room in Brighton. Kentfield was accepted as the champion for about 24 years, until, in fact, he was challenged by the elder John Roberts (born 1815). From the time John Roberts, Sr., appeared on the scene until the end of the century the Robertses, father and son, virtually filled the billiard stage until the early years of the 20th century. What W. G. Grace was in the cricket world, John Roberts, Jr., was in the world of billiards, and it was due largely to him that the game became so popular. Not only that, but Roberts was in great measure responsible for saving the game from monotony during the time when both the spot and the push strokes were not barred. He introduced what is known as the top of the table game to take the place of what might be termed one-stroke billiards. He always made the play interesting. No one was more fascinating to watch and his game was never commonplace. He was so popular with the public that he could practically make his own terms when arranging matches with other professionals. He also paid many visits to India, Australia and the far east and did much to popularize the game there.

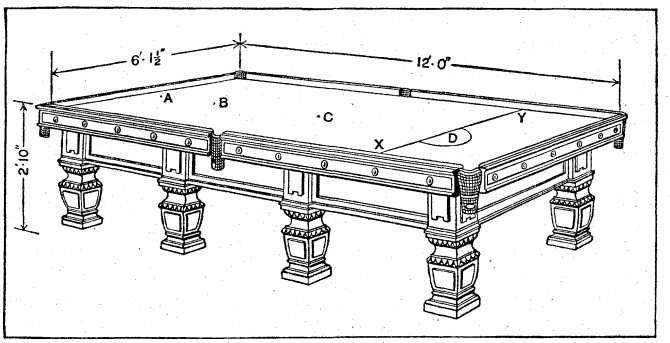
There were many other famous names in billiards during Roberts' day—William Cook, William Mitchell, W. J. Peall, T. Taylor, J. North, Fred Shorter, J. P. Mannock, George Collins. Peall was the holder for many years of the record break of 3,304 made in 1890 and not beaten till Walter Lindrum made his mammoth record break of 4,137 in 1932. Peall's break was moreover due chiefly to the use of the repetition spot stroke. Other well-known players of the time were J. Bennett, D. Richards, Charles Dawson, Edward Diggle, Cecil Harverson, H. W. Stevenson and, linking the old game with the more modern, Melbourne Inman and Tom Newman, who as a boy player toured with and was considered a coming champion by John Roberts. John Roberts in 1905, at the age of 58, made a break of 821, push stroke and spot stroke barred, and indeed seemed to be still improving as a player. He died in 1919.

The game, as developed by many of these early players, became very largely a one-stroke game. For the greater part of the scoring they depended on what is known as the spot stroke. This consisted of potting the red ball successively from the billiard spot into the top pockets. Two players, namely W. J. Peall and William Mitchell, were outstanding at this game and made some extraordinary breaks for that day. It was nothing to make a 1,000 break. Peall on one occasion made one 1,000 break in six successive sessions in a match with Mitchell. His highest break was 3,304. Naturally, these players were not just one-stroke players, they were also outstanding at the ordinary game. Peall, who was still playing in 1945, could even then at the age of 90 make a 200 break under modern rules. Roberts was wise enough to look ahead. He could play the spot stroke, of course, but saw clearly that the professional, in order to make a living at billiards, must keep the spectators interested. He abandoned the spot stroke and took to the top of the table game for quick scoring; that is, he varied the spots with cannons, the white object ball being cleverly kept near the spot and the scoring done by a pot then a cannon and so on, the ideal being two pots to one cannon.

After the barring of the spot stroke there still remained the push stroke to get rid of. This was made great use of in nursery cannons, making it both easy to get position and also to keep position. The unfairness of the stroke was due to the fact that the player struck his ball twice in playing it, sometimes more than twice. On the continent and in the United States where the game was generally played on tables without pockets, and where as a result the cannon game had been developed to a pitch undreamed of in Great Britain, the push stroke had long been abandoned. Frank Ives, the U.S. champion in 1893, in winning a match in Great Britain against John Roberts gave a great demonstration of the nursery cannon game. It is only fair to John Roberts to say that for this match and to help Ives the pockets were made slightly smaller than usual and larger balls were used. Finally, by 1898 the game was free of both the spot and the push strokes.

Two-ball play, however, was not yet finished. In 1911 a young Australian, George Gray, visited England and proceeded to beat all the best players. This time the repetition stroke was a losing hazard. This was not exactly a new thing; John Roberts himself had made a break of more than 300 off the red without the use of the spot stroke. The chief factor in Gray's game, apart from his extraordinarily accurate cueing, was the use of a three-quarter ball run-through contact instead of the so-called standby of the ordinary player, the half-ball. Gray used to get the red into a favourable position in the middle of the table below the middle pockets. The suitable space became known as the magic circle; the idea was to keep the red ball in the middle of the table so that if the stroke were a little weak the position could be recovered by means of a hazard into the top pocket. If the stroke were a little strong and the red brought too close to the balk line, a pot could be made into the middle pocket instead of a loser and the position regained by a cross loser from the spot into a top pocket. Gray himself used to recover position by playing a very thin loser into the middle pocket. So good was Gray that he could make a 1,000 break almost at will. In modern billiards only 25 successive hazards are allowed, and in the championship matches only 15.

New Methods of Play.—After Gray's time and until the mid-20th century professional players had shown remarkable ingenuity in discovering new methods of quick scoring and big break-building by means of repetition strokes, for example the cradle or anchor cannon, the pendulum cannon, the rocking cannon and so on. Although direct cannons were limited and after a certain number (in 1946, 35) had to be varied with a hazard or an indirect cannon, the discovery of a method of making at will an indirect cannon without losing position compelled the controlling authority to



STANDARD SIZE ENGLISH BILLIARD TABLE, WITH MEASUREMENTS SHOWN

The length and breadth of the English Billiard table are as shown: the height may vary between 2 ft. 9½ in. and 2 ft. 10½ in. A shows the "billiard spot," on the centre line, 12¾ in. from the top cushion; C, the "centre spot," in the centre of the table, and B the "pyramid spot," midway between A and C: XY is the "balk line," and D the "D"

give a new definition to the word "indirect." Where the old definition allowed a cannon to be made after hitting a cushion first, the rule existing in 1945 required that the striker ball must first hit a ball, then the cushion, and then the other ball.

About 1930 reports began to speak of the remarkable play of Walter Lindrum in Australia, and when he visited England it was seen that in every phase of the game he was supreme. He could stay at the top of the table and make a 1,000 break there in the orthodox way. He could make 1,000 by so-called all-round play, largely by the use of losing hazards, and he could make 1,000 by means of nursery cannons, without any apparent effort. Players like Joe Davis and Tom Newman quickly improved their technique after seeing and playing with him, until once more the con-

trol council introduced suitable legislation, with the full co-operation of the professionals concerned, so that in addition to the limitation of successive direct cannons of successive hazards, the balk line rule was introduced. In every long break at certain stages the striker must make his ball cross the balk line, with amateurs this being once in every break of 400 points. In the case of the professionals the limitation is still more severe. A player must cross the line once in every 200 break, but in addition he must cross it during the last 20 points of the 200. That is, part of the scoring stroke by which he crosses the line must be within the last 20 points of the 200 or form part of the last 20 points, *e.g.*, a 2 at 189 or a 3 at 188 or a 7 at 184 would be in order or, of course, a 2 at 199. In spite of all these limitations (excepting the balk-line rule) Lindrum in 1932 made the world's record break of 4,137.

Types of Game.—Up to about 1900 there were chiefly three games played on a billiard table, billiards proper, pyramids and pool. Pyramids was a game of winning hazards only. Fifteen red balls in the form of a triangle were placed at the top end of the table with the base of the triangle parallel to the cushion and the apex ball on the pyramid spot. Players generally played at so much a ball and in such cases the game was called "shell out."

Pool is another winning hazard game and can be played by several players, each having a differently coloured ball. The order of play is according to the colours of the balls—white, red, yellow, green, brown, blue, pink, etc. To begin the game white is spotted on the billiard spot; red plays on white, and the other players in their order, each trying to pocket the ball he is on and if successful the other balls according to the rules. Each player puts so much into the pool and pays so much when his ball is pocketed, this point of the game being called a life.

LATER DEVELOPMENTS

At the beginning of the 20th century a new game called snooker began to be generally known, and as the years went on became increasingly popular until it rivalled billiards itself. Though snooker pool is the name sometimes used the term is not really correct, for this is not a pool game. It is more or less a combination of pyramids and pool, for in addition to the 15 red pyramid balls which count one, each six balls are used in their pool order, yellow (2), green (3), brown (4), blue (5), pink (6) and black (7). Each colour has its particular spot and the pyramid is placed as before. The object is to pocket a red and then a colour, and, when all the reds are pocketed, then the colours in their respective order. The game gained extraordinary popularity, not only in Britain but throughout the empire. Both professional and amateur championships have been played for many years, and one player, Joe Davis, made as great a name at snooker as John Roberts did at billiards. From 1927 he won every professional snooker championship. Century breaks which used to be something unheard of became almost commonplace, Joe Davis himself having made something like 165 breaks of 100 or more. Even several amateurs exceeded the 100. On more than one occasion Davis took the opening shot, broke the triangle and proceeded to pocket every ball without his opponent having a stroke. On two occasions, at least, in this way he made a break of 137. Joe Davis in 1945 was the holder of the official record snooker break of 138, and his brother Fred of the official championship record, 113. The amateur record official snooker break then was 104 made by Frank Edwards.

When the long reign of John Roberts came to an end the championship was held successively by Charles Dawson, H. W. Stevenson, M. Inman and Willie Smith. From 1924 to 1932 Joe Davis and Tom Newman shared the championship. In 1933 the world's championship was won by Walter Lindrum of Australia, probably the finest player the world has ever known. He won it again in Australia in 1934, Joe Davis again being his opponent. The United Kingdom championship, first played in 1934, was won six times in succession by Joe Davis. Up to 1945 there had been no competition after 1939 owing to World War II.

The Amateurs.—Amateur play during the 20th century advanced equally with that of the professionals. Whereas in 1900 breaks of 100 were rare events for amateurs and even in the championship were not too frequent, in 1945 there were few good clubs in the United Kingdom where there were not some amateurs who could make 100 breaks fairly regularly. In the championship class were players who could more than approach achievements of the old professional. For instance, playing in the empire championship at Sydney in 1931, Laurie Steeples (England) who won the championship made a break of 461 unfinished in 22 minutes. In one of the matches during the same championship Steeples averaged 50. In the English amateur championship, 1934, Sydney Lee had a run of 103 nursery cannons. In 1937 Kingsley Kennerley, the later holder (1940) of the billiards and snooker titles, made a record break of 549 in the English amateur billiards championship. In the empire championship at Melbourne, 1938, Robert Marshall, an Australian amateur, in one of the matches lasting five days (12 hours) made 21 breaks of over 100 including one of 427 and another of 400. In 16 sessions his aggregate was 17,626. In one session his average was 109.64. Marshall scored 1,864 points in one session lasting two hours.

The improvement in both professional and amateur play was due largely to the simplification of the game. By simplification is meant that the player is always near his work. He does not go in for all-round cannons or spectacular shots. The player has these strokes at his command, the long jenny, the deep screw, the raking long loser, the cannon off four or five cushions and the rest, but he does not need them often. Indeed if he does need one of these shots during a break it is due to a bad stroke and consequent loss of control. This control is largely a matter of knowledge as well as delicacy of touch.

The great player Willie Smith could make a 1,000 break by the use of only four or five strokes, of course repeated. He would get the white in a favourable position touching the cushion behind the red with the red favourably placed for a pot or a cannon. If for a cannon, the cannon would be made and the red left for a pot, the pot would be made and the cue ball left for a loser into the top corner pocket. In making this loser the red would be sent to the middle pocket, it would be potted into the middle pocket and the original position regained, and this would be repeated with slight variations almost *ad infinitum*. If the red were sent far enough below the middle pocket for a favourable pot, a loser would be played to obtain the required position.

Thus the spot stroke is used alternating with cannons for the top of the table game; this is varied by runs of nursery cannons and the spot stroke, losing hazards, nursery cannons; the losing hazard is used to recover position or to obtain it. The progress in break building applies to the ordinary good amateur also. His game is more simple and looks easy to the spectator, but it means much thoughtful practice and playing experience to get good control.

Women Players.—Billiards became also a popular game with women during the 20th century. There were women's billiards and snooker championships, amateur and professional, and professional standard is high. In 1937 Miss Ruth Harrison, playing Miss Margaret Lennan in the professional billiards championship, made a break of 197. Miss Lennan in a previous championship (1935) made a break of 153, and in the 1937 championship Miss Joyce Gardner made a break of 154. Miss Thelma Carpenter won the professional billiards championship in 1940. Miss Harrison, who was the Joe Davis of women's snooker, made a break of 80 in the championship which she held after it was started in 1934, having won it seven years in succession. In 1945 Mrs. McDougall and Miss Agnes Morris held the respective titles of amateur billiards champion and amateur snooker champion.

Control of the Game.—For many years control was more or less a haphazard business, the professionals agreeing among themselves about rules and conditions, and even after the formation of the Billiards association the rules were largely the concern of the professionals. The Billiards association was established in 1885 but as a general rule exercised but little control over the professionals and at times was considered to be too much influenced by the trade and other considerations not altogether good for the game. Dissatisfaction came to a head in 1908 when an influential

body of prominent amateurs founded the Control club, and from then till 1919 there were two governing bodies, each claiming control over the game and each running championships. Finally in 1919 a solution was found by the amalgamation of the two bodies. After 1919 the ruling body was the Billiards Association and Control council.

The Earl of Lonsdale was president until his death in 1944. G. N. E. Hall-Say was the first chairman, backed by a control council of 16 amateurs, "amateurs," as John Roberts put it, when speaking of the original Control club in 1910, "of irreproachable standing." Hall-Say was succeeded in 1925 by John C. Bisset. During Bisset's term of office great progress was made and the game flourished throughout the empire. Affiliated councils were formed in India, Australia, New Zealand and Canada, as well as throughout the British Isles. The British empire championship was inaugurated in 1926 and has been won by England as well as by South Africa and Australia.

The official publication on billiards published by the council, *The Billiard Player,* deals exclusively with the game and its interests.

During World War II billiards playing substantially assisted various charitable funds, and a "billiards for the services" fund lent tables to various branches of the services.

MODE OF PLAY

The revised rules of all recognized billiards games, as authorized by the Billiards Association and Control council, are issued from the council's headquarters in London.

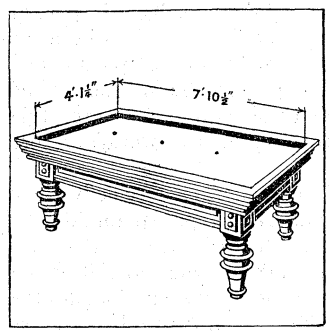
The game is played with three balls perfectly matched in size and weight. They must not be less than 2 1/16 in. in diameter or more than 2 3/32 in. The weight is about 5½ oz. One ball is red and the other two are white, one of these having a spot at each end of one of its axes; hence they are named the red, spot and plain. The object of the game is to force one's own ball into a pocket after hitting one of the other two, called the object ball. This is known as a losing hazard, because in the early history of the game the pockets were known as hazards, and if what was known as the winning game were being played the loser or in-off meant that the striker forfeited the points instead of adding them to his score. The winning game meant forcing the object ball into the pocket with the cue ball. For example, pool was a winning game, pyramids and in later days snooker. If the losing hazard be made off the white object ball 2 points are scored, and if off the red ball 3 points; the same scores are made by making winning hazards. With the white ball losers or winners count 2 points, with the red ball 3 points.

A cannon is made by hitting both object balls with the cue ball with one stroke, and counts 2 points. If the red be struck first and a losing hazard as well as a cannon be made, 5 points are scored; if the white be struck first, 4 points. Ten points can be scored by one stroke, viz., striking the red first, cannon, two winning hazards and a losing hazard, or as modern players would say, cannon, pot red, pot white, in-off red. If the white were struck first only 9 points would be scored. If the striker is successful with his first stroke and scores, he plays another and continues in this way till he misses or breaks down. The series of scoring strokes is called a break. Each stroke is made from the position left when the balls come to rest, if only a cannon has been scored. If a losing hazard be made, the striker places his ball within the D and plays from there. If the red be pocketed it is placed on its spot, the billiard spot. If the white be pocketed, it is what is technically known as "in hand," and is of no further service in that particular break to the striker, but remains off the table until used in his turn by the opponent. Hence pocketing or potting the white is as a rule greatly to the striker's disadvantage and is resorted to only in safety play.

The length of the game may be any number of agreed points or may be decided by a time limit. The time limit is used in all professional and amateur championships and generally in all professional exhibition games.

Terms Used in Play.—*Half-ball.* Half-way between a full ball contact and the finest grazing contact, it can be made by striking the cue ball in the centre and at the same time aiming with the tip of the cue at the extreme edge of the object ball one of the two strokes when the striker has a definite point of aim easily recognizable. The other is the full ball contact.

Run-through. Where the cue ball goes on to its second object after a full or fullish contact with the first object ball. *Jenny.* Losing hazard into middle pocket, generally from the D when the object ball is only a few inches from the side cushion and below the middle pocket, played with extreme side. *Long Jenny.* A similar stroke into a top pocket.



FRENCH BILLIARD TABLE

Both French and American billiards are played on a pocketless table. Only cannons are played, each scoring one point

Spot Stroke. A repetition stroke. A series of winning red hazards made with the cue ball in a favourable position near the spot, the art being to retain this position and at the same time make the hazard. It cannot be played under modern rules.

Nursery cannons. Where all three balls are close together and near a cushion. The art is to keep them in this position and continue scoring. The cushion is a great help and the pockets have their old significance. They are hazards, and great skill is needed to pass them during a series. *Cradle or Anchor.* Where all three balls are in a position for nurseries near a top pocket. For a right-handed player, the left top pocket. The first object ball is touching the top cushion just off the shoulder of the pocket, and the second object in a similar position on the side cushion. The stroke is made by a kiss from the first object to the second, the cue ball returning each time to its original position. *Pendulum.* Repetition stroke, where both object balls are jammed in a corner pocket, and the cannons are made by a grazing stroke from side to side. *Rocking Cannon.* Greatly used by William Cook, Jr. A similar position to that of the anchor, but with the balls not near the pocket. It is played in the same way: *i.e.,* a kiss from the first object ball, cue ball just grazing second object and returning to the same position for the next stroke. *All-round Cannon.* Where cue ball hits two or three cushions before coming into contact with the second object ball. *Long Loser.* Where striker plays from hand into one of top pockets, the object ball being on, below or not far above the middle spot. *Drop Cannon.* Generally red on spot, white not far above middle pocket and nearer side cushion than middle of table; much used for getting top of table position. The cue ball generally after a thickish contact with the first object drops gently into the red, and object white rebounds from the side cushion and drops into its place near the spot, leaving all three placed for top of the table game.

Screw. Hitting cue ball low down so as to get backward rotation of the ball. In this way the cue ball can be made to rebound in a backward direction from the object ball; the opposite of a run through, called a screw back. There are all degrees of screw between a fine screw and a screw back. *Drag.* Same as screw, but is used at a distance so that by the time cue ball reaches the first object all the backward rotation is expended. The effect is that the cue ball arrives at the object at a slow speed though it has taken a short time to get there; *i.e.,* a fairly fast stroke can produce a gentle contact, an obvious advantage, especially if the balls or the table be slightly untrue. Some writers state that side is retained longer by using drag. This is true only if longer refers to distance, and not to time.

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AMERICAN BILLIARDS

The game of American billiards is played on a table without pockets. It is called a carom table and is of two sizes, one $4\frac{1}{2}$ by 9 ft. and the other, 5 by 10 ft. For the carom game three balls are used, one red, one plain white and one white with a black dot. In the four ball game, played by the less expert, there are two red balls and two white balls.

Three Ball Game.—The red ball in the three ball game is placed on the foot section of the table on a spot at the middle of a line drawn across the table at a right angle from the second diamond on each long rail, and one white ball is placed on a corresponding spot at the head of the table. An imaginary line drawn across the head of the table at right angles to the second diamond on each long rail is termed the "string." In what would be the centre of this line a spot is placed, known as the head spot. The game is begun by "stringing" for the lead, banking from the head to the foot rail and back. The player whose ball settles nearest to the head rail wins the choice of white balls and the right to elect whether to lead or to make his opponent lead. Should the two white balls come in contact when stringing for lead, the player whose ball is clearly out of its true course or whose ball strikes the red ball when that ball is on its proper spot, forfeits the lead. When the contact of the balls is equally the fault of both players or when the balls come to rest at an equal distance from the head cushion, the players string again. Contestants play in rotation until a specified number of points constituting a game is completed. The player leading must place his ball on the string and six inches to the right or left of the other white ball and must make the cue ball strike the red ball in order to effect a count. On any other than the opening shot, excepting when the balls are for any reason spotted, the striker may play upon either ball. Each carom counts one point. A ball forced off the table is spotted on its proper spot. If the spot is occupied by another ball, the ball forced from the table is placed on one of the other spots. A foul ends an inning. No points are counted on foul strokes.

In the three ball straight rail carom game the crotch is barred. The object balls are considered crotched wherever the centres of both lie within a $4\frac{1}{2}$ in. square at either corner of the table, and when so crotched only three counts are allowed unless one or both object balls be forced out of the crotch. In case of failure the player's hand is out and his opponent plays with the balls as he finds them. In the four ball game a carom counts one, but in case of a carom on both object balls the player counts two.

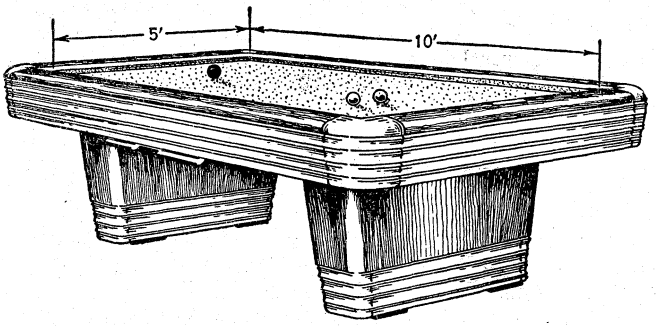
14.2 Balk Line Game.—To mark the table properly for 14 in. balk line, the lines are drawn on a 5×10 table from each of the first diamond sights on the end and side rails to the corresponding diamond sight on the opposite end or side rail. The large centre space on the table is not a balk space. The object balls are in balk whenever both have stopped within any one of the balk spaces. The referee then calls "in" and when one or both object balls are driven out of balk space, the referee calls "out." A ball on the line is in balk. A ball is on the line only when its centre or point of contact with the table touches this line. When two object balls are on the same line the striker shall have the option to determine in which balk they are to be called, and must govern his play accordingly. But two shots are allowed when two object balls are within the same balk space, hence the name 14.2 balk line. If at least one of the object balls is not driven out of balk on the second shot the shot is void and the player's hand out.

18.2 Balk Line Game.—The game of 18.2 balk line is played on a 5×10 table and the balk lines are drawn 18 in. from the edges of the cushions with eight anchor spaces on each table. These anchor spaces measure seven inches square. Two each are located on the head rail and on the foot rail and two each on the side rails with the 18 in. balk line across the ends of the table as a centre. The general rules of 18.2 balk line are somewhat similar to those of the 14.2 balk line game. The object balls are considered to be in anchor when the centres of both balls lie in one of the anchor spaces. When the balls are anchored the striker may have two consecutive shots, but if he fails on the second shot to force one or both of the object balls outside the anchor space, the second shot is void and the opponent plays the balls as he finds them. There is also an 18.1 balk line game in which but one shot is allowed in balk and one in anchor. It is claimed for the 18.1 balk line game that it is the medium by which the highest skill of both professional and amateur can be measured. After Frank Ives had won the 14.2 balk line championship in 1892 it was agreed the game had become too easy. Experiment began and the new game of 18.2 was invented. In 1896 Maurice Daly held the first 18.2 championship in New York city, Ives, Schaefer and Garnier competing. The game was for 500 points, five shots allowed in anchor. The anchor spaces were $3\frac{1}{2}$ by 7 in.

In 1903 the first world tournament at 18.2 was played in Paris. Vignaux was awarded the championship by a decision based upon grand averages. Sutton and Slosson, representing the United States, played against him. Sutton challenged Vignaux and lost to him, 1904, by 496 to 500. Since then all 18.2 tournaments have been played in the United States. George F. Slosson won in New York in 1906, losing to Sutton only. Sutton challenged and won from Slosson the same year. Sutton was challenged but held the title to 1908, when he lost to Hoppe on the latter's second challenge. Hoppe resigned the title. Successive winners were Morningstar, 1909; Demarest, the same year; Hoppe, 1912; at 500 points. In 1919 the anchor spaces were enlarged to seven inches square and the total of points reduced to 400. Hoppe won the tournament and also that of 1920. In the eighth tournament in 1921 Jacob Schaefer, Jr., not only won the championship played for in Chicago, but also established a single average of 200, grand average of 51.23, and tied Hoppe in games, winning the play-off, 400 to 26. Schaefer defeated Cochran 400 to 0 in their game. Hoppe won in 1922 and 1923 in New York city. In 1925 the most remarkable billiard tournament in history was played in Chicago. Schaefer, Jr., won the title again, being undefeated in five games. Schaefer won the seventh of the series from Hagenlacher by winning the bank and making 400 points and game without miss. In the closing game between Hoppe and Schaefer, the latter entered the eighth inning 296 points behind and ran the game out. His grand average was 57.14, a world's record to add to the single average records. Cochran won in 1927 and in his challenge match with Erich Hagenlacher established a high record run of 407 points in one inning.

Development of Game.—Tom Foley, an American authority on billiards, dates the real start of the game in the United States from the year 1859. The first national match was played at Detroit, Mich., April 12, 1859. John Seereiter of Detroit and Michael Phelan of New York city were matched for a stake of $15,000 and the championship of America. The game was for 2,000 points caroms, with four balls and 6×12, six-pocket table, pushing and crotching allowed. Phelan won 2,000 to 1,904 for Seereiter. The winner's best run was 129 and his average 12–32–164. Phelan was declared the first billiard champion of America and returned to New York in triumph where he reigned as champion through 1860, 1861 and 1862. Dudley Kavanaugh was champion in 1863, 1864 and 1865, to be succeeded the latter year by Louis Fox and John Deery. In 1866 Deery and Joe Dion were champions. In 1867 the champions were Joe Dion and John McDevitt, the latter again in 1868. Beginning in 1869 the championship was played for at four ball caroms on a $5\frac{1}{2}\times11$ pocket table, pushing and crotching barred, single caroms counting 3 and double caroms 6, for 1,200 points. John Deery was champion that year and in 1870, until he lost to A. P. Rudolphe. In 1871 the championship was held by Frank Parker and Cyrille Dion. The latter was undisputed champion in 1872 but in 1873 was succeeded by Maurice Daly and Albert Garnier. In 1874 the champions were Maurice Vignaux and Joe Dion. In 1876 the rules were changed to what was called straight rail play, three balls, on a 5×10 carom table. William Sexton was champion in 1876–77–78. Following him began the

long reign of Jacob Schaefer, Sr., known as the "Wizard," who was champion in 1879–80–81–82. In 1883 the 5×10 table was in use with an 8 in. balk line to prevent nursing. Schaefer won in 1883–84. In 1885 the balk line was widened from 8 to 14 inches. Slosson won from Schaefer and then lost. The latter was champion in 1886–87–88–89 and 1890. From then until 1897 no championship was played for. Champions at 18.1 have been George Slosson in 1897, Jacob Schaefer and Frank Ives, 1898;



BY COURTESY OF THE BRUNSWICK-BALKE-COLLENDER CO.

CHAMPIONSHIP CAROM BILLIARD TABLE WITH DIMENSIONS
The playing surface of championship tables in the U.S. is 5' wide by 10' long. Other tables are 4½'x9' and 4'x8'

W. F. Hoppe, 1906; Geo. B. Sutton, W. F. Hoppe and Jacob Schaefer, Sr., 1907; George Slosson and George B. Sutton, 1908 and W. F. Hoppe, 1910, after which year no championship has been contested. Champions at 18.2 balk line have been Jacob Schaefer from 1901–05; Slosson and Sutton, 1906; Sutton, Hoppe and Schaefer, Sr., 1907; Slosson and Sutton, 1908; Morningstar and Demarest, 1909; Hoppe from 1910–20; Schaefer, Jr., 1921; Hoppe from 1922–25; Schaefer, Jr., 1925; Edward Horemans (of Belgium) 1925; Erich Hagenlacher (of Germany) 1926; Welker Cochran, 1927; Schaefer, Jr., 1929–33; Cochran, 1934. There has been no championship play in this game after 1934. The amateur champions at 14.2 were Martin Mullen in 1899, Wilson P. Foss, 1900; C. Fred Conklin, 1901; Arthur R. Townsend, 1901; Chas. Norris, Wilson P. Foss, Edward W. Gardner, 1902; Wilson P. Foss, 1903; J. Ferdinand Poggenburg, 1904; C. Fred Conklin, 1905; Edward W. Gardner, 1906; Calvin Demarest, 1907–08. The invention of the balk line game is attributed by Tom Foley to M. Bensinger, early head of the Brunswick-Balke-Collender company. He undertook to devise a system of lines to be drawn upon the surface of the table that might handicap Schaefer, at that time the leading billliard player of the world and thus make other players his possible equal. In consultation with Charles E. Mussey, T. Z. Cowles and Foley he evolved the 8 in. balk line game in 1883. A tournament was held under the new rules in Chicago in that year. Following the 8 in. lines, which were quickly discovered not to be severe enough, came the 14 in. and then the 18 in. balk lines.

Three Cushion Carom.—About 1910 the three cushion carom game began to attract attention in the United States and in 1912 the first three cushion carom championship tournament was held and John Horgan won. Subsequent champions have been Alfredo De Oro, George Moore, A. Kieckhefer, John Layton, Tiff Denton and R. L. Cannefax. During the '20s, John Layton, Kieckhefer, Tiff Denton, Cannefax and Otto Reiselt held the championship, while Layton won in 1930, Arthur Thurnbald in 1931 and Kieckhefer in 1932. The balk-line stars invaded the three-cushion game in 1933, Cochran winning the tournament. Layton won in 1934, but after that time, with the exception of 1939 when Joe Chamaco of Mexico won, the title was held by the 18.2 stars. Cochran won in 1935, lost the title in a match with Hoppe in 1936, but regained it later in 1936. There was no competition in 1937 and 1938. Hoppe astounded the billiard world in 1940 when he won the championship with 20 consecutive victories (no losses). Hoppe won in 1941 and 1942, losing only a single game in each tournament. There was no title competition in 1943. Cochran won the 1944 tournament.

A valid three cushion carom is effected by making the cue ball touch three cushions before striking the second object ball. Three cushions mean three impacts. The number of cushions does not mean three different cushions, as a count may be executed on one cushion. Each carom counts one. In case the balls are frozen (*i.e.*, in contact), the striker has the option of playing away from the ball with which the cue ball is in contact or having the balls spotted as at the opening of the game.

Pocket Billiards.—Fifteen-ball pool is known in the United States as pocket-billiards. Championships have been won by Gottlieb Wahlstrom, Albert Frey, J. L. Malone, Peter Rodgers, Alfredo De Oro, Frank Sherman, William Clearwater, K. Stofft, Thomas Hueston, John Horgan, Charles Weston, Jerome Keogh, Ben Allen, W. E. Blankenship, Frank Taberski, Ralph Greenleaf. Erwin Rudolph interrupted the long-time reign of Ralph Greenleaf in the '20s. Champions during the '30s included Greenleaf, Rudolph, Andrew Ponzi, and James Caras. Willie Mosconi and Irving Crane came to the fore in the early '40s. Still active in title competition are Greenleaf, Rudolph, Mosconi, Ponzi, Caras and Crane. The game is played on a six-pocket table with 15 object balls, continuous pocketings being the rule. The cue ball is white and the 15 balls numbered. Balls from 1 to 8 are solid colours, while the balls from 9 to 15 are striped. The object balls are numbered. The player calls the number of the ball and the pocket into which he will drive it. When 14 object balls are pocketed, they are set up in triangular form with the apex vacant, and the striker is allowed to proceed as long as he can legally pocket a ball. If other balls than those called are pocketed he is entitled to them, providing he legally scores called ball.

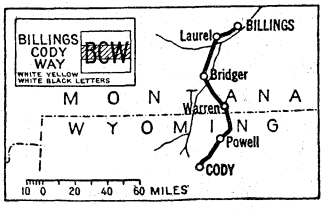
BIBLIOGRAPHY.—*Rules Governing the Royal Game of Billiards* (1925); *Billiard Records from 1859 to 1925* (1925); *History of the 18.2 Balk Line Game of Billiards* (1925). (J. B. Fo.; X.)

BILLING MACHINE: *see* OFFICE APPLIANCES.

BILLINGS, JOHN SHAW (1839–1913), American surgeon and librarian, was born in Switzerland county, Ind., on April 12, 1839. He graduated at Miami university in 1857 and at the Medical College of Ohio in 1860. During the Civil War he served as a surgeon in the field and in hospitals from 1861 to 1864 when he entered the surgeon-general's office in Washington. In this position he had charge of the Army medical museum and library, and developed the latter into one of the largest medical libraries in the world, for which he prepared an unusually valuable index-catalogue. In 1896 upon the consolidation of the Astor and Lenox libraries and the Tilden Trust into the New York Public library, he became its first director and displayed marked constructive capacity in this position until his death which occurred in New York city on March 11, 1913. Among his published works are *Mortality and Vitality Statistics of the United States* (1885); *National Medical Dictionary* (1889); *Some Library Problems of Tomorrow* (1902); and *Physiological Aspects of the Liquor Problem* (1903).

BILLINGS, a city in southern Montana, U.S.A., on the Yellowstone river, 3,000 ft. above sea level; the county seat of Yellowstone county. It is on federal highways 10 to the Pacific Northwest, 12 to Yellowstone park, 87 to Glacier park and is served by the Burlington, the Great Northern and the Northern Pacific railways. Pop. (1930) 16,380; (1940) 23,261 by federal census. It is the metropolis of the "midland empire," a productive region of Montana and Wyoming, which already contains 2,000,000 acres of irrigated land. Sugar beets, wheat, wool and live stock are the leading products in the immediate vicinity, and there is a factory which makes 90,000,000 lb. of beet sugar a year. The city has 70 manufacturing and wholesale establishments, and is the trading centre of an area as large as the State of Minnesota. Shipments of live stock, flour, sugar, grain, hay, wool, beans, potatoes, butter, and eggs amount to over $10,000,000 annually. Natural gas is used. The Eastern Montana Normal school, Polytechnic institute and the first orthopaedic hospital in the North-west are situated here.

Billings is a gateway to the Beartooth division of the Custer national forest, one of the picturesque regions in the North-west, in which is Grasshopper glacier, with millions of grasshoppers embedded in its ice. On the outskirts is the State fish hatchery. There are many vacation resorts in and near the forest including numerous "dude ranches," which offer tenderfoot visitors the pleasures of western life without its hardships.



BILLINGS-CODY WAY, a thoroughfare extending from Billings, Mont., to Cody, Wyoming. It is about 130 mi. in length. Touching upon Laurel, Bridger and Powell, it passes by the Pryor

mountains and furnishes interesting scenery along its entire course.

BILLINGTON, ELIZABETH (*c.* 1768–1818), British opera-singer, was born in London, her father being a German musician named Weichsel, and her mother a popular singer. She was a precocious child, and received a solid musical training from her father. Before she was twelve she had published two volumes of pianoforte sonatas. In 1783 she contracted an unfortunate secret marriage with James Billington, a double-bass player in the Drury lane orchestra. With him she went to Dublin where she made her first stage appearance as Eurydice. In London she made a sensation (Feb. 13, 1786) in the part of Rosetta in Arne's *Love in a Village*. She then went to Paris to study under Sacchini, and throughout her career was a serious student. In 1794 she and her husband went to Italy, and Mrs. Billington appeared at Naples in a new opera, *Inez di Castro,* written for her by F. Bianchi, and then at Florence, at Venice and at Milan. Her husband died suddenly during the tour, and in 1799 she married a Frenchman named Félissent. The second marriage was even more unfortunate than her first. Félissent ill-treated her, and she left him in 1801. In 1817, however, she returned to him, and died the next year, on Aug. 25, at St. Artien, near Venice. According to some accounts her death was caused by a blow received from her husband. Mrs. Billington sang regularly at Covent garden and Drury lane from 1801 to 1810. Accounts vary of the quality of her voice and of her acting, but there is unanimous testimony to the finished character of her art. There are many portraits and engravings of her, including Sir Joshua Reynolds's picture of her as St. Cecilia.

BILLITON (or BELITOENG), island, Netherlands Indies, between Banka and Borneo and separated respectively by the Gaspar and Karimata straits. It forms a division of the residency, Banka and Billiton. Roughly square in shape, it is 55 mi. long by 43 wide, and its area is 1,860 sq.mi. Included with it are 135 small adjacent islands with an area of 95 sq.mi., which are separated by narrow and mostly unnavigable channels. In physical structure and products it resembles Banka. Its coasts are sandy and very marshy, and though in the centre of the island a height of 1,670 ft. is reached (Mt. Tanjem), most of the land lies less than 130 ft. above sea-level, with groups of hills of granite or sedimentary formation rising from the flat or slightly undulating country; in the central parts there are treeless plains, covered with alang-alang grass. The geological formation is Devonian and granitic, with laterites. The average mean annual rainfall is 114.5 in., with an average of 192 rainy days; the average mean temperature is 77°. Billiton, like Banka, has extensive tin deposits and forms the southern limit of the occurrence of this metal. Exploitation was placed in the hands of the Joint Mining Co., Billiton, with the government owning five-eighths of the shares. The mines are worked largely by electric power. In 1939, 13,026 short tons of tin were produced. Most of the tin ore is taken from alluvial deposits, but there is some lode mining. The ore was formerly sent to the Straits Settlements for smelting, but after 1936 it went to a new tin smelter built in Holland.

The pop. (1930) of Billiton was 73,429, 28,780 being foreign Asiatics, largely Chinese. The aborigines (Mohammedans, with some pagan beliefs) are akin to those of Banka, resembling the Bataks of Sumatra; on the coast there are *Orang laut,* or sea-gypsies. The coast is a difficult one, beset with rocks and coral banks, but one river, the Cheruchup, is 1,300 to 1,600 ft. wide at its mouth (barred by a sandbank), and is tidal for seven miles and navigable as far as Cheruchup village. The best harbour is that of Tanjongpandan, the capital of Billiton (15,708), on the west coast. Billiton was formerly under the Sultan of Palembang, Sumatra, by whom it was ceded to the British in 1812. In the treaty of 1814, between the British and the Dutch, no mention was made of it, but the British recognized the Dutch claim in 1824. Japan occupied the island in 1942.

BILLITONITE: *see* TEKTITE.

BILL OF EXCHANGE, a form of negotiable instrument, defined below, the history of which, though somewhat obscure, was ably summed up by Lord Chief Justice Cockburn in his judgment in *Goodwin* v. *Robarts* (1875), L.R. 10 Ex. pp. 346–358. Bills of exchange were probably invented by Florentine Jews. They were well known in England in the middle ages, though there is no reported decision on a bill of exchange before the year 1603. At first their use seems to have been confined to foreign bills between English and foreign merchants. It was afterwards extended to domestic bills between traders and finally to bills of all persons, whether traders or not. But for some time after they had come into general employment, bills were always alleged in legal proceedings to be drawn *secundum usum et consuetudinem mercatorum.* The foundations of modern English law were laid by Lord Mansfield with the aid of juries of London merchants. No better tribunal of commerce could have been devised. Subsequent judicial decisions have developed and systematized the principles thus laid down. Promissory notes are of more modern origin than bills of exchange, and their validity as negotiable instruments was doubtful until it was confirmed by a statute of Anne (1704). Cheques are the creation of the modern system of banking.

From 2,600 cases scattered over some 300 volumes of Reports and 17 Statutes dealing with isolated points the English law relating to Bills of Exchange, promissory notes, and cheques was codified by the Bills of Exchange Act 1882 which laid down, with one exception applicable only to Scotland, uniform rules for Great Britain and Ireland. Two salient characteristics distinguish negotiable instruments from other engagements to pay money. In the first place, the assignee of a negotiable instrument, to whom it is transferred by indorsement or delivery according to its tenor, can sue thereon in his own name; and, secondly, he holds it by an independent title. If he takes it in good faith and for value, he takes it free from "all equities," that is to say, all defects of title or grounds of defence which may have attached to it in the hands of any previous party. These characteristic privileges were conferred by the law merchant, which is part of the common law, and are now confirmed by statute.

Definition.—By s. 3 of the Act a bill of exchange is defined to be an unconditional order in writing "addressed by one person to another, signed by the person giving it, requiring the person to whom it is addressed to pay on demand or at a fixed or determinable future time a sum certain in money to or to the order of a specified person, or to bearer."[1] The person who gives the order is called the drawer. The person thereby required to pay is called the drawee. If he assents to the order, he is then called the acceptor. An acceptance must be in writing and must be signed by the drawee. The mere signature of the drawee is sufficient (s. 17). The person to whom the money is payable is called the payee. The person to whom a bill is transferred by indorsement is called the indorsee. The term "holder" includes any person in possession of a bill who holds it either as payee, indorsee or bearer. A bill which in its origin is payable to order becomes payable to bearer if it is indorsed in blank. If the payee is a fictitious or non-existing person the bill may be treated as payable to bearer (s. 7). A payee is a fictitious person if his name is inserted by way of pretence merely, *i.e.,* with no intention that payment should be made to him (*Bank of England* v. *Vagliano* [1891] A. C. 107).

The following is a specimen of an ordinary form of a bill of exchange:—

£100. LONDON, *1st January,* 1901.

Three months after date pay to the order of Mr. J. Jones the sum of one hundred pounds for value received.

Brown & Co.

To Messrs. Smith & Sons, Liverpool.

A bill in its origin was a device to avoid the transmission of cash from place to place to settle trade debts. Now a bill of exchange is a substitute for money. It is immaterial whether it is payable in the place where it is drawn or not. It is immaterial whether it is stated to be given for value received or not, for the law itself raises a presumption that it was given for value. But though bills are a substitute for cash payment, and though they

[1] This is also the definition given in the United States, by s. 126 of the general Act relating to negotiable instruments, prepared by the conference of State commissioners on uniform legislation, which has been universally adopted.

constitute the commercial currency of the country, they must not be confounded with money. No man is bound to take a bill in payment of debt unless he has agreed to do so. If he does take a bill, the instrument ordinarily operates as conditional, and not as absolute payment. If the bill is dishonoured the debt revives. Under the laws of some Continental countries, a creditor, as such, is entitled to draw on his debtor for the amount of his debt, but in England the obligation to accept or pay a bill rests solely on actual agreement. A bill of exchange must be an unconditional order to pay. If an instrument is made payable on a contingency, or out of a particular fund, so that its payment is dependent on the continued existence of that fund, it is invalid as a bill, though it may of course avail as an agreement or equitable assignment. In Scotland it has long been the law that a bill may operate as an assignment of funds in the hands of the drawee, and s. 53 of the Act preserves this rule.

Bills of exchange must be stamped, but the Act of 1882 does not regulate the stamp. It merely saves the operation of the stamp laws, which necessarily vary from time to time according to the fluctuating needs and policy of the exchequer. Under the Finance Act 1918, bills payable on demand and three-day bills are subject to a fixed stamp duty of twopence. The stamp may be impressed or adhesive. All other bills are liable to an *ad valorem* duty. All other inland bills must be drawn on impressed stamp paper, but foreign bills, of course, can be stamped with adhesive stamps, if the stamp is affixed before the bill is negotiated in England. English law does not concern itself with foreign revenue laws. It is immaterial whether a bill drawn abroad is stamped in accordance with the law of its place of origin or not. On arrival in England it has to conform to the English stamp laws.

A bill of exchange is payable on demand when it is expressed to be payable on demand, or at sight, or on presentation, or when notice for payment is expressed. In calculating the maturity of bills payable at a future time, three days, called days of grace, must be added to the nominal due date of the bill. For instance, if a bill payable one month after sight is accepted on Jan. 1, it is really payable on Feb. 4, but when the last day of grace falls on Sunday, Christmas day, Good Friday, or a day appointed by Royal Proclamation as a public fast or thanksgiving day, the bill is due and payable on the preceding business day. On the other hand on Bank holidays (other than Christmas day or Good Friday), or when the last day of grace is a Sunday and the second day of grace a bank holiday, the bill is due and payable on the succeeding business day (s. 14).

Acceptance.—By the acceptance of a bill the drawee becomes the principal debtor on the instrument and the party primarily liable to pay it. The acceptor of a bill "by accepting it engages that he will pay it according to the tenor of his acceptance," and is precluded from denying the drawer's right to draw or the genuineness of his signature (s. 54). The acceptance may be either general or qualified. As a qualified acceptance is so far a disregard of the drawer's order, the holder is not obliged to take it; and if he chooses to take it he must give notice to antecedent parties, acting at his own risk if they dissent (ss. 19 and 44). The drawer and indorsers of a bill are in the nature of sureties. They engage that the bill shall be duly accepted and paid according to its tenor, and that if it is dishonoured by non-acceptance or non-payment, as the case may be, they will compensate the holder provided that the requisite proceedings on dishonour are duly taken. Any indorser who is compelled to pay the bill has the like remedy as the holder against any antecedent party (s. 55). A person who is not the holder of a bill, but who backs it with his signature, thereby incurs the liability of an indorser to a holder in due course (s. 56). An indorser may by express term either restrict or change his ordinary liability as stated above. *Prima facie* every signature to a bill is presumed to have been given for valuable consideration. But sometimes this is not the case. For friendship, or other reasons, a man may be willing to lend his name and credit to another in a bill transaction. Hence arise what are called *accommodation bills*. Ordinarily the acceptor gives his acceptance to accommodate the drawer. But occasionally both drawer and acceptor sign to accommodate the payee, or even a person who is not a party to the bill at all. The criterion of an accommodation bill is the fact that the principal debtor according to the instrument has lent his name and is in substance a surety for someone else. The holder for value of an accommodation bill may enforce it exactly as if it was an ordinary bill, for that is the presumable intention of the parties. But if the bill is dishonoured the law takes cognizance of the true relations of the parties, and many of the rules relating to principal and surety come into play. Suppose a bill is accepted for the accommodation of the drawer. It is the drawer's duty to provide the acceptor with funds to meet the bill at maturity. If he fails to do so he cannot rely on the defence that the bill was not duly presented for payment or that he did not receive due notice of dishonour. If the holder, with notice of the real state of the facts, agrees to give time to the drawer to pay, he may thereby discharge the acceptor.

Holder in Due Course.—The holder of a bill has special rights and special duties. He is the mercantile owner of the bill, but in order to establish his ownership he must show a mercantile title. The bill must be negotiated to him, that is to say, it must be transferred to him according to the forms prescribed by mercantile law. If the bill is payable to order, he must not only get possession of the bill, but he must also obtain the indorsement of the previous holder. If the bill is payable to bearer it is transferable by mere delivery. A bill is payable to bearer which is expressed to be so payable, or on which the only or last indorsement is an indorsement in blank. If a man lawfully obtains possession of a bill payable to order without the necessary indorsement, he may obtain some common law rights in respect of it, but he is not the mercantile owner, and he is not technically the holder or bearer. But to get the full advantages of mercantile ownership the holder must be a "holder in due course"—that is to say, he must satisfy three business conditions. First, he must have given value, or claim through some holder who has given value. Secondly, when he takes the bill, it must be regular on the face of it. In particular, the bill must not be overdue or known to be dishonoured. An overdue bill, or a bill which has been dishonoured, is still negotiable, but in a restricted sense. The transferee cannot acquire a better title than the party from whom he took it had (s. 36). Thirdly, he must take the bill honestly and without notice of any defect in the title of the transferor—as, for instance, that the bill or acceptance had been obtained by fraud or threats, or for an illegal consideration. If he satisfies these conditions he obtains an indefeasible title, and can enforce the bill against all parties thereto. The Act substitutes the expression "holder in due course" for the somewhat cumbrous older expression "*bona fide* holder for value without notice." The statutory term has the advantage of being positive instead of negative. The French equivalent "tiers porteur de bonne foi" is expressive. Forgery, of course, stands on a different footing from a mere defect of title. A forged signature, as a general rule, is a nullity. A person who claims through a forged signature has no title himself, and cannot give a title to any one else (s. 24). Two exceptions to this general rule require to be noted. First, a banker, who in the ordinary course of business pays a demand draft held under a forged indorsement is protected (s. 60). Secondly, if a bill be issued with material blanks in it, any person in possession of it has *prima facie* authority to fill them up, and if the instrument when complete gets into the hands of a holder in due course the presumption becomes absolute. As between the immediate parties the transaction may amount to forgery, but the holder in due course is protected (s. 20).

Dishonour.—The holder of a bill has special duties which he must fulfil in order to preserve his rights against the drawers and indorsers. They are not absolute duties; they are duties to use reasonable diligence. When a bill is payable after sight, presentment for acceptance is necessary in order to fix the maturity of the bill. Accordingly the bill must be presented for acceptance within a reasonable time. When a bill is payable on demand it must be presented for payment within a reasonable time. When it is payable at a future time it must be presented

on the day that it is due. If the bill is dishonoured the holder must notify promptly the fact of dishonour to any drawer and indorser he wishes to charge. If, for example, the holder only gives notice of dishonour to the last indorser, he could not sue the drawer unless the last indorser or some other party liable has duly sent notice to the drawer. When a foreign bill is dishonoured the holder must cause it to be protested by a notary public. The bill must be noted for protest on the day of its dishonour. If this be duly done, the protest, *i.e.*, the formal notarial certificate attesting the dishonour, can be drawn up at any time as of the date of the noting. A dishonoured inland bill may be noted, and the holder can recover the expenses of noting, but no legal consequences attach thereto. In practice, however, noting is usually accepted as showing that a bill has been duly presented and has been dishonoured. Sometimes the drawer or indorser has reason to expect that the bill may be dishonoured by the drawee. In that case he may insert the name of a "referee in case of need." But whether he does so or not, when a bill has been duly noted for protest, any person may, with the consent of the holder, intervene, for the honour of any party liable on the bill. If the bill has been dishonoured by non-acceptance it may be "accepted for honour *supra* protest." If it has been dishonoured by non-payment it may be paid *supra* protest. When a bill is thus paid and the proper formalities are complied with, the person who pays becomes invested with the rights and duties of the holder so far as regards the party for whose honour he has paid the bill, and all parties antecedent to him (ss. 65 to 68).

Discharge.—Normally a bill is discharged by payment in due course, that is to say, by payment by the drawee or acceptor to the holder at or after maturity. But it may also be discharged in other ways, as for example by coincidence of right and liability (s. 61), voluntary renunciation (s. 62), cancellation (s. 63), or material alteration (s. 64).

A bill of exchange is the most cosmopolitan of all contracts. It may be drawn in one country, payable in another, and indorsed on its journey to its destination in two or three more. The laws of all these countries may differ. Provision for this conflict of laws is made by s. 72, which lays down rules for determining by what law the rights and duties of the various parties are to be measured and regulated. Speaking broadly, these rules follow the maxim *Locus regit actum*. A man must be expected to know and follow the law of the place where he conducts his business, but no man can be expected to know the laws of every country through which a bill may travel. For safety of transmission from country to country bills are often made out in sets. The set usually consists of three counterparts, each part being numbered and containing a reference to the other parts. The whole set then constitutes one bill, and the drawee must be careful only to accept one part, otherwise if different accepted parts get into the hands of different holders, he may be liable to pay the bill twice (s. 71). Foreign bills circulating through different countries have given rise to many intricate questions of law. But the subject is perhaps one of diminishing importance, as in many trades the system "cable transfers" is superseding the use of bills of exchange.

Cheques.—A cheque "is a bill of exchange drawn on a banker payable on demand" (s. 73). For the most part the rules of law applicable to bills payable on demand apply in their entirety to cheques. But there are certain peculiar rules relating to the latter which arise from the fact that the relationship of banker and customer subsists between the drawer and drawee of a cheque. For example, when a person has an account at a bank he is, as an inference of law, entitled to draw on it by means of cheques. A right to overdraw can, of course, only arise from agreement. The drawer of a cheque is not absolutely discharged by the holder's omission to present it for payment within a reasonable time. He is only discharged to the extent of any actual damage he may have suffered through the delay (s. 74). Apart from any question of delay, a banker's authority to pay his customer's cheques is determined by countermand of payment or by notice of the customer's death (s. 75). Of recent years the use of cheques has enormously increased, and they have now become the normal machinery by which all but the smallest debts are discharged. To guard against fraud, and to facilitate the safe transmission of cheques by post, a system of crossing has been devised which makes crossed cheques payable only through certain channels. The first Act which gave legislative recognition to the practice of crossing was the 19 and 20 Vict. c. 95. That Act was amended in 1858, and a consolidating and amending Act was passed in 1876. The Act of 1876 is now repealed, and its provisions are re-enacted with slight modifications by ss. 76 to 82 of the Bills of Exchange Act 1882. A cheque may be crossed either "generally" or "specially." A cheque is crossed generally by drawing across it two parallel lines and writing between them the words "& Co." When a cheque is crossed generally it cannot be paid over the counter. It must be presented for payment by a banker. A cheque is crossed specially by adding the name of the banker, and then it can only be presented through that particular banker. A cheque, whether crossed generally or specially, may further be crossed with the words "not negotiable." A cheque crossed "not negotiable" is still transferable, but its negotiable quality is restricted. It is put on pretty much the same footing as an overdue bill. The person who takes it does not get, and cannot give a better title to it, than that which the person from whom he took it had. These provisions are supplemented by provisions for the protection of paying and collecting bankers who act in good faith and without negligence. Suppose that a cheque payable to bearer which is crossed generally and with the words "not negotiable" is stolen. The thief then gets a tradesman to cash it for him, and the tradesman gets the cheque paid on presentment through his banker. The banker who pays and the banker who receives the money for the tradesman are protected, but the tradesman would be liable to refund the money to the true owner. Again, assuming payment of the cheque to have been stopped, the tradesman could not maintain an action against the drawer.

Promissory Notes.—A promissory note is defined by s. 83 of the Act to be an "unconditional promise in writing made by one person to another, signed by the maker, engaging to pay on demand, or at a fixed or determinable future time, a sum certain in money to or to the order of a specified person or to bearer." A promissory note may be made by two or more makers, and they may be liable either jointly, or jointly and severally, according to its tenor (s. 85). For the most part, rules of law applicable to a bill of exchange apply also to a promissory note, but they require adaptation. A note differs from a bill in this; it is a direct promise to pay, not an order to pay. When it issues it bears on it the engagement of the principal debtor who is primarily liable thereon. The formula for applying to notes the rules as to bills is that "the maker of a note shall be deemed to correspond with the acceptor of a bill, and the first indorser of a note shall be deemed to correspond with the drawer of a bill payable to drawer's order" (s. 89). Rules relating to presentment for acceptance, acceptance, acceptance *supra* protest, and bills in a set, have no application to a note. Moreover, when a foreign note is dishonoured it is not necessary, for English purposes, to protest it. All promissory notes are subject to an *ad valorem* stamp duty. Inland notes must be on impressed stamp paper. Foreign notes are stamped with adhesive stamps. For ordinary legal purposes a bank-note may be regarded as a promissory note made by a banker payable to bearer on demand. It is, however, subject to special stamp regulations. It is not discharged by payment, but may be re-issued again and again. In the interests of the currency the issue of bank-notes is subject to various statutory restrictions. The Bank of England is the sole note issuing bank in England and Wales. Notes for £1 and 10s are legal tender throughout the United Kingdom, but notes for £5 and upwards are not legal tender in Scotland or Northern Ireland.

French Law.—In fundamental principles there is general agreement between the laws of all commercial nations regarding negotiable instruments. As Mr. Justice Story, the great American lawyer, says: "The law respecting negotiable instruments may be truly declared, in the language of Cicero, to be in a great measure not the law of a single country only, but of the whole commercial

world. *Non erit lex alia Romae, alia Athenis, alia nunc alia posthac, sed et apud omnes gentes et omni tempore, una eademque lex obtinebit"* (*Swift* v. *Tyson,* 16 Peters 1). But in matter of detail each nation has impressed its individuality on its own system. The English law has been summarized above. Perhaps its special characteristics may be best brought out by comparing it with the French code and noting some salient divergences. English law has been developed gradually by judicial decision founded on trade custom. French law was codified in the 17th century by the "ordonnance de 1673." The existing "Code de Commerce" amplifies but substantially adopts the provisions of the "Ordonnance." The growth of French law was thus arrested at an early period of its development. The result is instructive. A reference to Marius' treatise on bills of exchange, published about 1670, or Beawes' *Lex Mercatoria,* published about 1740, shows that the law, or rather the practice, as to bills of exchange was even then fairly well defined. Comparing the practice at that time with the law as it now stands, it will be seen that it has been modified in some important respects. For the most part, where English law differs from French law, the latter is in strict accordance with the rules laid down by Beawes. The fact is that, when Beawes wrote, the law or practice of both nations on this subject was nearly uniform. But English law has gone on growing while French law has stood still. A bill of exchange in its origin was an instrument by which a trade debt due in one place was transferred to another place. This theory French law rigidly keeps in view. In England bills have developed into a paper currency of perfect flexibility. In France a bill represents a trade transaction; in England it is merely an instrument of credit. English law affords full play to the system of accommodation paper; French law endeavours to stamp it out. A comparison of some of the main points of difference between English and French law will show how the two theories work. In England it is no longer necessary to express on a bill that value has been given for it, for the law raises a presumption to that effect. In France the nature of the consideration must be stated, and a false statement of value avoids the bill in the hands of all parties with notice. In England a bill may be drawn and payable in the same place. In France the place where a bill is drawn should be so far distant from the place where it is payable that there may be a possible rate of exchange between the two. This so-called rule of *distantia loci* is said to be disregarded now in practice, but the code is unaltered. As French lawyers put it, a bill of exchange necessarily presupposes a contract of exchange. In England since 1765 a bill may be drawn payable to bearer, though formerly it was otherwise. In France it must be payable to order; if it were not so it is clear that the rule requiring the consideration to be truly stated would be a nullity. In England a bill originally payable to order becomes payable to bearer when indorsed in blank. In France an indorsement in blank merely operates as a procuration. An indorsement, to operate as a negotiation, must be to order, and must state the consideration; in short, it must conform to the conditions of an original draft. In England, if a bill is dishonoured by non-acceptance, a right of action at once accrues to the holder. In France no cause of action arises unless the bill is again dishonoured at maturity; the holder in the meantime is only entitled to demand security from the drawer and indorsers. In England a sharp distinction is drawn between current and overdue bills. In France no such distinction is drawn. In England no protest is required in the case of the dishonour of an inland bill, notice of dishonour being sufficient. In France every dishonoured bill must be protested. Opinions may differ whether the English or the French system is better calculated to serve sound commerce and promote a healthy commercial morality. But an argument in favour of the English system may be derived from the fact that as the various Continental codes are from time to time revised and re-enacted, they tend to depart from the French model and to approximate to the English rule. The effect upon English law of its codification has yet to be proved. A common objection to codification in England is that it deprives the law of its elastic character. But when principles are once settled common law has very little elasticity. On the other hand no code is final. Modern parliaments legislate very freely, and it is a much simpler task to alter statute law than to alter common law. Moreover, legislation is cheaper than litigation. One consequence of the codification of the English law relating to bills is clear again. Nearly all the British colonies have adopted the Act, and where countries are so closely connected as England and her colonies, it is an obvious advantage that their mercantile transactions should be governed by one and the same law expressed in the same words.

The following court decisions relating to bills of exchange and cheques may be singled out for special mention here. In *Jones* v. *Waring and Gillows* (*1926*) A. C. 670, the House of Lords definitely settled that the original payee of a bill or note is not a holder in due course as there has been no negotiation of the bill within the meaning (ss. 29–31). For example, if X is induced by the fraud of Y to draw a cheque in favour of Z, X is not in any way liable to Z.

A draft drawn by one branch bank on another is not a bill of exchange within the meaning of s. 60 of the Bills of Exchange Act 1882, but it is a draft or order within the meaning of s. 19 of the Stamp Act 1853, which protects bankers paying such drafts under a forged indorsement (*Capital & Counties Bank* v. *Gordon* [*1903*], A.C. 240). It is still uncertain whether this section protects a banker so paying in the case of a draft drawn abroad. A draft on a banker with a receipt annexed as a condition of payment is not a bill of exchange drawn on a banker payable on demand because it is not "an unconditional order to the banker to pay." But a cheque written on a blank sheet of paper, on the face of which the drawer wrote "to be retained" and promised to send one of his bankers' printed cheques in substitution, is an unconditional order to pay as regards the drawer's bankers, and the payee can sue thereon if it is dishonoured on presentation for payment (*Roberts* v. *Marsh* [*1915*] K.B. 42).

A foreign bill of exchange indorsed in France by an agent of the payee in the agent's own name without the words "per pro" or their equivalent but so indorsed by the payee's authority is a valid and sufficient indorsement and does entitle the payee under s. 72 of the Bills of Exchange Act to recover the amount thereof from the acceptors (*Koechlin & Cie* v. *Kestenbaum Bros.* [1927] K.B. 889).

Finally bankers' anxiety as to their liability where the amount of a cheque has been altered in fraud of a careless drawer has now been set at rest by the decision in *London Joint Stock Bank Ltd.,* v. *Macmillan and Arthur* (1918). *A.C. 777,* where the House of Lords held, that the plaintiff firm had been guilty of a breach of the special duty arising from the relation of banker and customer to take care in the mode of drawing a cheque; that the alteration in the amount of the cheque was the direct result of that breach of duty; and that the bank were therefore entitled to debit the firm's account with the full amount of the cheque.

As Lord Shaw said in his judgment: In the case of a customer's cheque, admittedly genuine, no responsibility rests upon the banker for what has happened to the cheque before its presentation to the bank, but the responsibility for what has happened to it between the dates of signature and presentation rests upon the customer.

The ordinary text-books on the law of bills of exchange are constantly re-edited. *See* especially Byles, *Bills of Exchange;* Chalmers, *Bills of Exchange;* Nouguier, *Lettres de change et des effets de commerce* (France); Thorburn, *Bills of Exchange Act 1882* (Scotland); Hodgins, *Bills of Exchange Act* 1890 (Canada).

(M. D. C.; E. M. C. D.)

United States Practice.—The American law as laid down in the Uniform Negotiable Instruments Law, prepared in 1897 and by 1927 adopted without substantial change in all the States, is largely modelled on and harmonious with the British.

Some differences require noting: National banks in the U.S.A. could issue bank notes until 1933, when Federal Reserve notes and Government notes representing actual deposited silver, known as silver certificates, became the practically universal note currency of the country. There is no longer a stamp tax on notes or acceptances. Days of grace on bills of exchange have been abolished, except in a very few States, as to sight drafts. The

American cases are divided on whether a purchaser of overdue paper can secure better rights than his transferor had. They are divided also on whether the original payee of a bill, note or check can become a holder in due course, and on whether a drawer who negligently leaves spaces which facilitate raising the amount can hold his bank liable for the difference after the bank has paid in good faith. The other points on which specific cases are cited above are not of moment in American law. An Inland bill which does not require protest means a bill payable in the same State in which it is drawn. And the Negotiable Instruments Law contains no codified provisions as to what law governs transactions involving bills and notes which cross state boundaries, although the courts have ruled on most of the relevant points. The system of crossing checks is unknown in the United States; and a banker paying over a forged instrument is not protected in charging the drawer's account. He is, however, entitled to recover the payment from the person who thus received it on an invalid, though apparent, title. It may well be that the two systems are not particularly different in their practical effects in hindering forgery. Under the English the collecting banker, to be safe from ultimate liability, must and does collect only for a customer, *i.e.*, one whom he regularly deals with, and knows. Under the American the practical result of the collecting banker's absolute liability is somewhat the same: it is equally unsafe to collect for a stranger. So far, however, as the English check is crossed specially, or carries the notation "non-negotiable," or "account payee," it would seem to carry additional safeguards.

Divergences in Practice: But the bulk of the divergences in the two countries lie rather in men's practices than in the law. The form of banker's advance in America is not by prearranged overdraft, but by some such device as the banker taking the customer's note and crediting his account. And especially, it is the note, not the acceptance, which is in America the common instrument of credit. Nor can it be overlooked that credit instruments are much less used in America than in England in mercantile transactions—as contrasted with banking, or real estate mortgage, or open market borrowing transactions. The common American mercantile practice for a seller is to evidence credit by mere book entries, and to wait for his money, whereas in England it is common for the seller to take the buyer's acceptance at once on delivery of the goods, and to proceed to realize funds by discounting the acceptance with a banker or investor. This English practice prevails in American export trade; furthermore, under the Federal Reserve Act a very considerable volume of transactions has grown up in which the buyer's banker gives acceptances in the buyer's behalf, against commission and security. But the attempt at general introduction of the acceptance into domestic trade—the "trade acceptance" movement, seems to be making very slow headway.

Checks: On the other hand the check bulks even larger in the United States than in England. This involves no real disharmony with the foregoing. For whereas the true bill of exchange, payable thirty to ninety days after acceptance, is primarily a credit instrument, which can hardly flourish where men are content to leave debts in open account, the check—drawn on a bank, and payable on demand—is an instrument of payment, and useful in payment regardless of the credit system. The reliability of the check as an assurance of payment can be greatly increased by certification, *i.e.*, by the banker on whom the check is drawn stamping or writing across the check a form of words—such as "certified" or "good"—which by law makes the banker directly responsible for payment. Certification, which is very common in America, is therefore closely similar to acceptance of a time bill of exchange. But since the drawer's order on a check is to pay on demand, the banker who certifies has not in strictness honoured the order, and when the payee acquiesces in, or induces, the banker's act the drawer is discharged as in the case of a qualified acceptance. (N.I.L. s. 187, 188, 142.) After a check has been certified for the holder payment can no longer be stopped by the drawer, nor refused for insufficient funds; it is therefore necessary and proper for the banker, on certifying, to immediately charge the drawer's account to cover his own obligation. It must be noted, however, that, if it is the drawer himself who has the check certified in order to procure an instrument which he can use as the full equivalent of cash, he retains some power to stop payment until the check passes into the hands of a holder in due course.

Investment Instruments: The American Negotiable Instruments Law undertakes, as the English act does not, to lay down the requirements to which "an instrument to be negotiable must conform" (s. 1). Chief among these requirements is that the instrument contain an unconditional promise or order to pay a sum certain in money. This language may be and often has been construed to deny negotiability to any document of any kind which fails to meet the requirements laid down, a situation which has given rise to some perplexities and conflicting decisions in regard to long-term investment instruments. Especially concerned are bonds—which have their promise to pay conditioned on various clauses of the underlying mortgage—and such more modern instruments as interim certificates, by which the maker engages, not to "pay a sum certain in money," but to deliver a described bond when issued. This ill-advised extension of a code drawn primarily with notes, bills of exchange and checks in mind has made current dealings in investment paper somewhat uncertain, despite the established practice on the exchanges of relying on a purchase bona fide and for value just as if the paper carried the full protection of negotiability. All that can yet be said with certainty is that in the absence of a specific statute such as is found in New York, or of amendment in the code, a purchaser of such paper cannot be sure of acquiring rights any better than those of his seller.

The American authorities are best collected in Brannan, *Negotiable Instruments Law* (6th ed. by Beutel, 1938); Paton, *Digest of Legal Opinions and Banking Law* (1926). (K. N. L.; X.)

BILL OF EXCHANGE, IN PRACTICE. Broadly speaking, a bill of exchange—or draft as it is popularly called—is an unconditional order in writing signed by the person giving the bill (the drawer) directing the person to whom it is addressed (the drawee) to pay on demand or at a fixed or determinable future date a given sum of money to, or to the order of, a given person (the payee), or to bearer. The payee might, of course, be the drawer himself. A bill of exchange is thus an order to pay, and as such is to be distinguished from the promissory note, which is a promise to pay issued by a debtor to a creditor. Bills can be negotiated or transferred to a third party by the simple act of endorsement, a new payee being substituted for the old. Demand or sight bills are those payable on demand, while time bills are those payable at some future time "after sight" or "after date," depending upon whether the maturity of the bill dates, respectively, from the time of presentation to the drawee or from the time the bill is drawn. If and when a bill is "accepted" by the drawee (this act signifying his assent to the drawer's order and legally binding him to it), it is known as an acceptance. When drawn on and accepted by a bank (as compared with any nonbanking party), a bill is called a bank acceptance. Demand or sight bills are usually not accepted, being payable on presentation. Special forms of bills of exchange, although not commonly called such, are ordinary bank cheques, bank drafts (which are drawn by one bank on another in which it holds deposits), money orders and travellers' checks; but these will not be discussed here. (*See* CHEQUE).

The bill of exchange is one of the oldest of credit instruments and has played a role of great historical importance in the financing of foreign and domestic trade. The bill is believed to have been developed as far back as Roman times or even earlier; in its modern form, however, its origin is to be found in Italian towns in the late 13th and early 14th centuries. From there the use of the bill spread to other parts of Europe, notably England, France, Germany and Holland. By the 19th century London had become the great centre for the trade in bills, and much of the world's foreign trade, even between other countries, was being financed by sterling acceptances drawn on London accepting houses and discounted in the highly specialized and developed British bill market. By the close of the 19th century, bills drawn

in connection with purely domestic transactions had in most countries become of much less importance than those drawn in connection with international trade, and at the outbreak of World War I they had generally lapsed into relative desuetude. In the United States and England, for example, domestic trade had for many years been financed predominantly by open book account arrangements between buyer and seller (with cash discounts for payment within a specified period), the seller financing himself from his own resources or by borrowing from his bank. Attention will thus be focused in this article on the use of bills in foreign trade financing, the principles involved being in any case essentially the same when bills are used in domestic trade. Although practice differs somewhat from country to country, and although there are many possible and complicated variations, the following simple and "standard" types of transactions drawn from U.S. practice will illustrate the basic principles underlying the use of the bill of exchange in the financing of international trade.

Let us suppose that a U.S. exporter sells a bill of goods to a British importer and that, in accordance with arrangements mutually agreed upon, draws a draft on the latter in terms of U.S. dollars (though it could also be in terms of sterling) payable at sight or after sight as the case might be. The exporter will attach to the draft the various "documents" connected with the shipment of the goods proper, such as the bill of lading, the consular invoice, the commercial invoice, the insurance certificate and any other documents that may be needed in the country of destination. (Bills with documents attached are known as "documentary bills," as opposed to "clean bills".) The exporter may then discount the bill with his bank, obtaining credit for the face amount less the flat discount rate quoted; or he may borrow the face amount or a fraction thereof from the bank, subject to an interest charge when the loan is liquidated on receipt of the proceeds from abroad; or he may merely have the bank act as an agent in the handling and collection of the bill. In each of these cases the bank will forward the draft and attached documents to its British correspondent for presentation to the importer. If the draft is payable at sight, the importer will pay the correspondent the sterling equivalent of the draft at the current pound-dollar rate of exchange and obtain the documents, thereby getting possession of the goods. The correspondent will then remit dollars to the U.S. bank which, if the bill is still owned by the exporter, will transfer the proceeds to the latter's account. If, however, the bill is payable after sight or after date, the importer will "accept" the bill by writing or stamping the word "accepted," along with his signature, across its face, and return it to the correspondent. The correspondent, acting on instructions from the U.S. bank, will hold the accepted bill until maturity for presentation to the importer for payment. In the case of the so-called "documents on acceptance" or D.A. bill, the drawee obtains the documents, and thus possession of the goods, on accepting the bill, but when a so-called "documents on payment" or D.P. bill is involved, the drawee does not get the documents until he has paid the bill at maturity date.

In the above illustration, where the draft is drawn directly on the foreign importer, the exporter is exposed to the risk of nonpayment by the latter; even if the exporter had obtained cash by discounting the draft at his bank or borrowing on the basis of it, he would still be held liable by the bank in the event of nonpayment. Many exporters, therefore, are reluctant to draw time or even sight bills on the average importer unless they are thoroughly familiar with the latter's creditworthiness. This reluctance and the corresponding credit risk may be overcome by an arrangement whereby drafts are drawn directly on a well-known bank acting for the importer under so-called letters of credit, which are instruments by which a bank, for the account of a buyer, gives formal evidence to a seller of its willingness to permit him to draw on specified terms and stipulates in legal form that all such bills will be honoured. Such letters may stipulate the drawing not only of sight bills but also time bills; in the latter case the bill not only will be drawn on, but also accepted by, the bank concerned. In either case the bank becomes liable for payment of the bill, but the party for which it is acting agrees to provide it with the necessary funds at the time of payment. What the bank does, in effect, is to facilitate the underlying trade transaction by lending its name to the bill; for this service it is paid a commission. Letters of credit may be "revocable" or "irrevocable" depending upon whether or not the bank which opens the credit reserves the right to cancel or withdraw it prior to a specified date, and they may be "confirmed" or "unconfirmed" depending upon whether or not the "notifying" (or correspondent) bank, provided one is involved in the transaction, assumes an obligation in transmitting to the beneficiary (exporter) the information that a credit has been opened in his favour by a given foreign bank on behalf of a given importer.

Except for the fact that the drawee is a bank instead of an individual importer, the principles involved in the financing of trade by bank bills are essentially the same as when the ordinary trade bill is used, as in the case described earlier. Assume, as before, that the U.S. exporter sells a bill of goods to the British importer, but that the latter now agrees to furnish him with a letter of credit in terms of dollars. Most commonly, depending on the terms of the sales contract, the importer will arrange with his local bank to have its U.S. correspondent open up an irrevocable letter of credit in favour of the exporter, or to have the bank itself issue its irrevocable letter of credit to be confirmed by the U.S. correspondent. In either case, the draft will be drawn on the U.S. bank, and, with the documents attached, will be presented to that bank by the exporter, either directly or through his own bank. If the draft is payable at sight, the exporter will receive his funds at once; if payable after sight, the bank on which the draft is drawn will accept it and return it to the presentor. The bank acceptance can then be held until maturity for presentation and collection, or may be readily discounted in the U.S. market at the prevailing discount rate for bankers' acceptances. Whether the draft is drawn at sight or after sight, the bank upon which it is drawn will expect the British bank to provide the necessary funds by time of payment; the latter, in turn, will expect the importer to provide it with the sterling equivalent of the amount of dollars involved. In either case, moreover, the documents will be transmitted by the U.S. correspondent to the British bank, which will turn them over to the importer. If the draft is drawn after sight, however, the British bank will usually request some specific security, or otherwise safeguard its interests, before surrendering the documents.

The transaction described above might conceivably have been financed by a sterling letter of credit. In this case, the draft would be drawn directly on a British bank and with the documents attached would be sent abroad for presentation to that bank. If the draft were payable at sight, the British bank would turn over the sterling on presentation of the draft; if payable after sight, the bank would accept the draft and return it to the presentor who, acting on instructions from the U.S. bank, would either hold the acceptance until maturity for presentation to the acceptor, or discount it in the London market. In either case the sterling proceeds would be credited to the U.S. bank's account in London.

Bank acceptances may also be used in a somewhat different way in connection with export shipments from the United States. A large exporter who has a steady flow of export business throughout the year and who draws time bills directly on his customers may, after his outstanding bills have accumulated to a certain point, draw a time draft on his bank for a round sum no larger than the amount of these bills (which are considered as collateral). The bank will accept the draft on the understanding that the exporter will provide it with the necessary funds by maturity, and the acceptance will then be discounted in the market. As noted earlier, however, the exporter might, alternatively, have financed his shipments by discounting at his bank the time bills drawn on his customers or by borrowing directly from his bank on the basis of these bills.

The above illustrations have dealt with the use of bills in connection with export shipments from the United States; the

procedure in the case of import shipments, however, is essentially the converse and thus need not be described.

It has been noted in the above examples that in trade between the United States and Great Britain bills might be drawn in terms of dollars or sterling. In the case of trade between countries of decidedly unequal "weight," however, bills are almost certain to be drawn in terms of the currency of the "stronger" country, whether export or import shipments from or to the latter are involved. When trade occurs between relatively minor countries, bills are likely to be drawn in terms of the currency of some third country and the transaction financed by bills drawn, under letters of credit, upon banks in that country. In this case the choice of the market on which bills are drawn depends upon such factors as existing banking connections, the credit facilities extended to the exporter or importer, whichever assumes the burden of financing, and the relative discount rates on acceptances in each market. Before 1914 London was the unrivalled acceptance centre of the world, its pre-eminence resting upon the existence of highly specialized accepting houses and discount houses, the supremacy of sterling as an international currency, widespread British international banking connections, England's position as the world's leading trading and creditor nation, and the attraction to London of large volumes of foreign funds seeking short-term investment. In contrast, there existed in the United States virtually no market for acceptances at all, and the bulk of U.S. foreign trade was financed through London. In large part the absence of such a market reflected the legal prohibition upon the acceptance of drafts by the national banks as well as prevailing business practice which did not favour the use of acceptances in domestic transactions. The Federal Reserve act in 1913, however, removed the prohibition upon bank acceptances and an effort was made to develop a broad market for bank as well as domestic trade acceptances in the United States. These efforts met with considerable success, so far as bank acceptances were concerned, being aided during World War I and the first half of the 1920s by a series of favourable institutional factors, such as the fact that the dollar was the only leading currency on a gold basis, which had the effect of transferring a substantial volume of acceptance business from London to New York. After the stabilization of the pound sterling in 1925, however, London again began to compete more actively for the international acceptance business, and aggressive efforts were also made in this field by Amsterdam, Zürich and Paris.

One unfortunate result of this international competition was a general lowering of standards of bill eligibility and a relaxation of supervision of the underlying documents and transactions. This was epitomized in the rapid growth of large lines of acceptance credits extended directly to foreign banks, notably in Germany and eastern Europe, for distribution among their customers (evidenced in the case of the United States by a phenomenal rise between 1926 and 1930 in dollar acceptances drawn for "goods stored in or shipped between foreign countries"). Far from being used to finance "self-liquidating" commercial transactions, as is the normal function of bills of exchange, a very large part of these credits was employed for working, or even long-term capital purposes, and the bills drawn on the various accepting banks under these credits amounted in many cases to little more than finance paper. As long as these credits could be "turned over" by drawing fresh bills to replace maturing ones, however, payment difficulties could not arise, but with the financial crisis which spread over Europe in 1931 these and other short-term credits became "frozen" and their underlying illiquidity was exposed. A series of so-called standstill agreements had to be negotiated between the creditor banks (notably U.S. and British) and the debtor interests in Germany, Austria and Hungary, whereby the former agreed to maintain their outstanding credit lines, and arrangements were made for the orderly liquidations of these credits over a period of years. By the outbreak of World War II the bulk of these credits had been worked off, but with substantial losses to the various creditors.

The decade of the 1930s witnessed a universally sharp decline, as evidenced by the available statistics, in the outstanding volume of bills of exchange in general, both foreign and domestic. In large part this decline was the result of the world depression, the fall in the volume and value of world trade and the widespread imposition of exchange restrictions, to say nothing of the unfortunate experience with central and eastern European acceptance credits (which had been an important factor in the expansion of acceptances during the preceding decade). More deep-rooted causes, however, which had been at work since 1918 and even earlier, were also operating to bring about a relative decline in the use of the bill of exchange as an instrument of finance. These included increased self-financing by industry, the tendency toward elimination of the wholesale merchant as intermediary (formerly the chief user of the bill of exchange) and the increased use of telegraphic transfers for making payments between centres which were formerly settled by means of bills. The process of decline in the bill of exchange was accelerated after the outbreak of World War II in 1939 by such factors as the increasing role of government as a direct participant in foreign trade with a consequent tendency to by-pass the usual channels and media of trade financing, and by special wartime restrictions on foreign trade and the foreign exchanges in general. (*See* also BALANCE OF TRADE; EXCHANGE, FOREIGN; MONEY MARKET.) (A. I. B.)

BILL OF HEALTH: *see* BILL.

BILL OF MORTALITY: *see* BILL.

BILL OF RIGHTS, an important statute in English constitutional history enacted in Dec. 1689. Its provisions were based upon the Declaration of Right and delivered by the lords and commons to the prince and princess of Orange, afterwards William III and Mary. The act (the full name of which is "An Act declaring the Rights and Liberties of the Subject, and settling the Succession of the Crown"), after reciting the unconstitutional proceedings of James II, the abdication of that king, the consequent vacancy of the crown, and the summons of the convention parliament, declared, on the part of the lords and commons, "for the vindicating and asserting their ancient rights and liberties":

"(1) That the pretended power of suspending of laws or the execution of laws by regal authority without consent of Parliament is illegal. (2) That the pretended power of dispensing with laws or the execution of laws by regal authority, as it hath been assumed and exercised of late, is illegal. (3) That the commission for erecting the late court of commissioners for ecclesiastical causes, and all other commissions and courts of like nature, are illegal and pernicious. (4) That levying money for or to the use of the Crown, by pretence of prerogative, without grant of Parliament, for longer time or in other manner than the same is or shall be granted, is illegal. (5) That it is the right of the subjects to petition the King, and all commitments and prosecutions for such petitioning are illegal. (6) That the raising or keeping a standing army within the kingdom in time of peace, unless it be with consent of Parliament, is against law. (7) That the subjects which are Protestants may have arms for their defence suitable to their conditions, and as allowed by law. (8) That elections of members of Parliament ought to be free. (9) That the freedom of speech, and debates or proceedings in Parliament, ought not to be impeached or questioned in any court or place out of Parliament. (10) That excessive bail ought not to be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted. (11) That jurors ought to be duly empanelled and returned, and jurors which pass upon men in trials for high treason ought to be freeholders. (12) That all grants and promises of fines and forfeitures of particular persons before conviction are illegal and void. (13) And that for redress of all grievances, and for the amending, strengthening, and preserving of the laws, Parliament ought to be held frequently. And they do claim, demand, and insist upon all and singular the premises, as their undoubted rights and liberties."

The further provisions of the act were concerned with the settlement of the crown upon the prince and princess of Orange, with the exception of Section 12, which negatived the right of dispensation by *non obstante*[1] to or of any statute or any part thereof, unless a dispensation be allowed in the statute itself or

[1]*Non obstante* (notwithstanding) means a licence from the crown to do that which could not be lawfully done without it.

by bill or bills to be passed during the then session of parliament.

The Bill of Rights introduced no new principle into the English constitution; it was merely a declaration of the law as it stood. In the United States, the main provisions of the Bill of Rights, so far as they are applicable, have been adopted both in the constitution of the United States and in the state constitutions.

BILL OF SALE, a legal document assigning personal chattels, and also used in connection with the transference of property in ships. The term has come to be applied to mortgages as well as to sales, and the expression "bill of sale" may now be understood to signify generally a document evidencing a sale or mortgage of personal chattels, unaccompanied by an actual transfer of possession to the purchaser or mortgagee.

The first English legislation on the subject was the Bills of Sale Act 1854. This provided that all bills of sale, as defined in the act, should be void against execution creditors unless registered. It was amended by the Bills of Sale Act 1866. These acts were repealed and a new act passed, the Bills of Sale Act 1878, which in the main followed the lines of the act of 1854. The object of this legislation was to protect persons lending on bills of sale. In 1882 the Bills of Sale Act (1878) Amendment act was passed to protect persons borrowing on bills of sale (*cf. Manchester, etc. Ry. Co.* v. *N.C. Wagon Co.,* 1888, 13 App. Cas. 554). This point is worth remembering, because the 1882 act is the beginning of the tendency to protect impecunious borrowers who have no security to give for a loan save a charge on their household goods, or no security at all, which has culminated in the Money Lenders acts of 1900 and 1926. The act of 1882 has since been amended by the Bills of Sale acts of 1890 and 1891 which effected further small amendments by excluding from the operation of the principal acts instruments hypothecating, charging or declaring trusts on imported goods, during the interval between their unloading from a ship and their deposit in a warehouse, or re-shipping.

Under the acts of 1878 and 1882 bills of sale are of two kinds, *i.e., absolute bills of sale* (where chattels are sold absolutely to a purchaser), and *conditional bills of sale* (where the bill is given by way of security for the payment of money). The Bills of Sale Act 1878 applies to both kinds and is the only act applying to *absolute* bills. Bills of sale given in security for the payment of money on or after Nov. 1, 1882, are chiefly governed by the act of 1882, which, however, does not apply to absolute bills. Section 4 of the act of 1878 defines a bill of sale as (1) including bills of sale, assignments, transfers, declarations of trust without transfer, inventories of goods with receipt thereto attached, or receipts for purchase moneys of goods and other assurances of personal chattels; the term assurance has been best explained as a document "on which the title of the transferee of the goods depends, either as the actual transfer of the property, or an agreement to transfer," *Marsden* v. *Meadows,* 1881, 7 Q.B.D. 80; (2) powers of attorney, authorities or licences to take possession of personal chattels as security for any debt; these words would not include a power of distress for rent in an ordinary lease or *bona fide* hiring or hire purchase agreements; (3) any agreement, whether intended or not to be followed by the execution of any other instrument, by which a right in equity to any personal chattels, or to any charge or security thereon, shall be conferred; (4) any mode of disposition of trade machinery and attornments and other instruments giving powers of distress to secure a debt or advance. On the other hand, certain assurances and instruments are expressly exempt by statute from the definition: marriage settlements, assignments of ships, assignments for the benefit of creditors, bills of lading and dock warrants, and by the act of 1882, debentures and debenture stock of a company. The expression "personal chattels" is defined as goods, furniture and other articles capable of complete transfer by delivery, and (when separately assigned or charged) fixtures and growing crops.

The law as to *absolute* bills being for the protection of the lender is concerned with conditions to secure that the borrowers shall not be able to repudiate them. Accordingly provisions are made that the bill containing all the essentials of the transaction verified by affidavit shall be attested by a solicitor who must testify that he, before its execution, explained to the grantor its effect; and shall be filed with the registrar within seven clear days of its execution. Failure to observe these requirements invalidates the bill only as against the execution creditors and trustee in bankruptcy of the grantor, it remains good as between the grantor himself and the grantee.

Bills of sale given by way of a security for a loan or a money debt (*conditional* bills) must be drafted in accordance with a form annexed to the act. The contents of this form are practically the same as those to be set out in an absolute bill of sale with the addition of a provision setting out that the chattels assigned by it shall not be liable to seizure or to be taken possession of by the grantee for any cause other than those specified in s. 7 of the Bills of Sale act (1878) Amendment act 1882. If this form is subsequently departed from, a conditional bill, unlike an absolute bill, is void not merely as against the grantor's creditors and trustee in bankruptcy but also as between grantor and grantee.

The bill of sale must have annexed to it an inventory of the chattels comprised in it, and is void, except as against the grantor, in respect of any personal chattels not specifically described. It must be duly attested by one or more credible witnesses (not necessarily by a solicitor, as in the case of absolute bills). Every witness must sign his name and add his address and description. It must be duly registered within seven clear days after the execution thereof, or if it is executed in any place out of England then within seven clear days after the time at which it would in the ordinary course of post arrive in England if posted immediately after the execution. It must truly set forth the consideration. The grantor must be the true owner of the goods described in the schedule; as to any personal chattels of which he is not the true owner, the bill is void, except as against the grantor. Every bill of sale made or given in consideration of any sum under £30 is void.

The causes which will render the chattels assigned by the bill liable to be seized or taken possession of are as follows: (1) If the grantor makes default in payment of the debt or in the performance of any covenant or agreement contained in the bill and necessary for maintaining the security; (2) if the grantor becomes a bankrupt or suffers the goods to be distrained for rent, rates or taxes; (3) if the grantor fraudulently removes the goods from the premises; (4) if the grantor does not, without reasonable excuse, upon demand in writing by the grantee, produce to him his last receipts for rent, rates or taxes; (5) if execution is levied against the goods of the grantor under any judgment. By s. 13 personal chattels seized or taken possession of under a bill must not be removed or sold until after the expiration of five clear days from the date of seizure, and if the goods have been wrongly seized, the grantor may within the five days apply to the high court or a judge in chambers for an order to restrain the grantee from removing or selling the goods. The Bills of Sale acts 1878 and 1882 do not apply to Scotland or Ireland. According to Scots law no security or charge can be created over movable property without delivery of possession. The Irish statutes corresponding to the English acts are the Bills of Sale (Ireland) Act 1879 and the Amendment Act 1883.

The stamp duties payable on an absolute bill of sale are *2s. 6d.* on every £25 secured up to £300; over £300, *5s.* on every £50. On bills of sale by way of security, *1s. 3d.* for every £50 up to £300 secured; over £300, *2s. 6d.* for every £100. The fees payable on filing a bill of sale are *5s.* where the consideration (including further advances) does not exceed £100; above £100 and not exceeding £200, *10s.*; above £200, £1.

The various trade protection papers always publish the registration of a bill of sale, and the usual effect is, therefore, to destroy the credit of any person giving one. (T. A. I.; J. A. St.)

BILL OF SIGHT: *see* Bill.

BILL OF STORE: *see* Bill.

BILL OF VICTUALLING: *see* Bill.

BILLOPP, CHRISTOPHER (1638–1726), British ship captain, traditionally supposed to have won Staten Island for the state of New York. The story is that in granting New Jersey to Berkeley and Carteret, the duke of York did not make clear whether Staten island was to be included in New York or New

Jersey. He therefore ruled that all islands in the New York harbour which could be circumnavigated in a day should continue to belong to him. Billopp succeeded in sailing around Staten island in the appointed time, and as a reward, the duke gave him 1,163 ac. of land at the foot of the island, the territory which is now Tottenville. On this land, Billopp erected what was later to be known as the Conference house. He spent the next years as a minor officer of the duke's army and of the state of New York, but he was eventually discharged from both positions for political misconduct. Shortly thereafter he is thought to have left for England, whence he never returned.

His grandson, CHRISTOPHER BILLOPP (1737–1827), was the owner of the Billopp or Conference house during the Revolutionary War. Here, in Sept. 1776, Lord Howe, Benjamin Franklin and Edward Rutledge met to try to establish peace between the colonies and England. The second Christopher Billopp sided with the Tories as a member of the Continental congress and served in the British army during the Revolution. After the American victory, he went with a number of other Loyalists to Canada, where he remained for the rest of his life.

BILLOT, JEAN BAPTISTE (1828–1907), French general and politician, was born on Aug. 15, 1828, at Chaumeil in the department of Corrèze, France. He was educated at the Saint-Cyr Military academy, and after his graduation remained with the French army. In 1870, when the Franco-Prussian War began, he was put at the head of the 2nd army corps of the army of the Rhine and later was transferred to the 18th army corps which, under his generalship at Villersexel, won one of France's few victories during the war. From 1882–83 he served Freycinet as minister of war and he held the same post in 1896–98 under Meline. He died on May 31, 1907, in Paris.

BILL-POSTING: *see* ADVERTISING; BILLBOARDS.

BILLROTH, ALBERT CHRISTIAN THEODOR (1829–1894), Viennese surgeon, was born on April 26, 1829, at Bergen, on the island of Rügen, his family being of Swedish origin. He studied at the universities of Greifswald, Göttingen and Berlin, and, after taking his doctor's degree at the last in 1852, started on a tour of the principal medical schools of Europe. On his return to Berlin he acted as assistant to B. R. K. Langenbeck (1853–60), and then accepted the professorship of surgery at Zürich. In 1867 he was invited to fill the same position at Vienna, and in that city the remainder of his professional life was spent. In 1887 he received a distinction which has seldom been bestowed on members of his profession—a seat in the Austrian *Herrnhaus*. He died at Abbazia, on the Adriatic, on Feb. 6, 1894. Billroth was one of the most distinguished surgeons of his day. His boldness as an operator gained for him the appellation of "surgeon of great initiatives." He was especially interested in military surgery, and during the Franco-German War volunteered to serve in the hospitals of Mannheim and Weissenburg. He improved the arrangements for the transport and treatment of the wounded in war, and in a famous speech on the war budget in 1891 he urged the necessity for an improved ambulance system in modern warfare. His *Allgemeine chirurgische Pathologie und Therapie* (1863) ran through many editions, and was translated into many languages. He was a good musician, and an intimate friend and admirer of Brahms, many of whose compositions were privately performed at his house before they were published. His work on the physiology of music (*Wer ist musikalisch?*) was published after his death. His *Briefe,* first published in 1896, reached their 9th ed. in 1922.

BILMA or **KAWAR,** a Saharan oasis, 60 mi. by 10 mi. The inhabitants are Tibbu and Kanuri. The name Bilma belongs strictly to the south part near the chief settlement, Bilma or Garu. This place is 800 mi. S. of the town of Tripoli and about 350 mi. N. of the northwest corner of Lake Chad. The water of a number of lakes on evaporation yields large quantities of fine salt, the object of an extensive trade with Central Africa. North of Bilma is the town of Dirki, said to date from the 11th century. Near Bilma is a small oasis, kept green by spring water, but to the south marked desert conditions prevail. By the Anglo-French Declaration of 1899 Bilma was included in the French sphere of influence in West Africa. Turkey claimed the oasis and garrisoned Bilma in 1902. In 1906, however, a French force occupied the town without opposition. In 1907 the district was created a circle of the French territory of the Niger (*see* SAHARA).

BILNEY, THOMAS (*c.* 1495–1531), English martyr, was born at or near Norwich. The exact date of his birth is uncertain, but at all events it was not before 1495. He was educated at Trinity Hall, Cambridge, graduating LL.B. and taking holy orders in 1519.

Finding no satisfaction in the mechanical system of the schoolmen, he turned his attention to the edition of the New Testament published by Erasmus in 1516. "Immediately," he records, "I felt a marvellous comfort and quietness." The Scriptures now became his chief study, and his influence led other young Cambridge men to think along the same lines. Among his friends were Matthew Parker, the future archbishop of Canterbury, and Hugh Latimer. Latimer, previously a strenuous conservative, was completely won over, and a warm friendship sprang up between him and Bilney. "By his confession," said Latimer, "I learned more than in twenty years before." In 1525 Bilney obtained a licence to preach throughout the diocese of Ely. He denounced saint and relic worship, together with pilgrimages to Walsingham and Canterbury, and refused to accept the mediation of the saints. The diocesan authorities raised no objection, for, despite his reforming views in these directions, he was to the last perfectly orthodox on the power of the pope, the sacrifice of the mass, the doctrine of transubstantiation and the authority of the church. But Cardinal Thomas Wolsey took a different view. In 1526 he appears to have summoned Bilney before him. On his taking an oath that he did not hold and would not disseminate the doctrines of Luther, Bilney was dismissed.

But in the following year serious objection was taken to a series of sermons preached by him in and near London, and he was arrested and imprisoned in the Tower. Arraigned before Wolsey, Warham, archbishop of Canterbury, and several bishops in the chapter-house at Westminster, he was convicted of heresy, sentence being deferred while efforts were made to induce him to recant, which eventually he did. After being kept for more than a year in the Tower, he was released in 1529 and went back to Cambridge. Here he was overcome with remorse for his apostasy, and after two years determined to preach again what he had held to be the truth. The churches were no longer open to him, he preached openly in the fields, finally arriving in Norwich, where the bishop, Richard Nix, caused him to be arrested. Articles were drawn up against him by convocation, he was tried, degraded from his orders and handed over to the civil authorities to be burned. The sentence was carried out in London on Aug. 19, 1531. A parliamentary inquiry was threatened into this case, not because parliament approved of Bilney's doctrine but because it was alleged that Bilney's execution had been obtained by the ecclesiastics without the proper authorization by the state. In 1534 Bishop Nix was condemned on this charge to the confiscation of his property. The significance of Bilney's execution lies in the fact that on essential points he was an orthodox Roman Catholic.

BIBLIOGRAPHY.—See *Letters and Papers of Henry VIII,* vols. iv-v; Foxe's *Acts and Monuments;* Gairdner's *History of the Church;* Pollard's *Henry VIII.*

BILOXI, a city of Harrison county, Mississippi, U.S.A., about half-way between Mobile and New Orleans, on a narrow peninsula extending into Mississippi sound, a part of the Gulf of Mexico. It is on the old Spanish trail and the Louisville and Nashville railway, and is connected by a bus line with the Illinois Central system at Gulfport. The population in 1920 was 10,937, of which 1,615 were Negroes, and was 17,475 in 1940.

Biloxi is both a summer and winter resort with more than the usual sea-side and country sports. Its vegetation, growing down to the water's edge, includes gigantic old live-oaks, dripping with Spanish moss, long leaf pines, magnolias, oleanders, camphor tree and palms. The dominating industry is the catching, packing and shipping of sea-food. The fleet of fishing smacks and other small craft numbers about 800. In a normal year, the shipments include more than 175,000 gal. of raw oysters packed in ice,

10,000,000 cans of oysters, and 8,000,000 cans of shrimps, besides fish, crabs and turtles in large quantities. Construction of an air corps technical school at a cost of $12,000,000 was under way in 1940.

Biloxi has been under five national flags (France, Spain, England, the Confederacy and the United States) and two state flags. In 1699, Pierre le Moyne d'Iberville (1661–1706) built Fort Maurepas across the bay from the present city, and the settlement there was the first capital of the French territory. It took its name, meaning "the first people," from the tribe of Sioux found there. In 1712 a settlement was made on the present site, and this became the French capital from 1719 to 1722. In the War of 1812 the British fleet anchored off Ship island, preparatory to its attack on New Orleans, and during the Civil War Fort Massachusetts (now abandoned) on this island was an important base of federal operations. On West Beach is Beauvoir, the home of Jefferson Davis, now appropriately occupied by the Mississippi Confederate soldiers' home. Biloxi was incorporated as a village in 1872, as a city in 1896.

BILOXI, a small tribe of Siouan Indians (*q.v.*), who formerly lived in lower Louisiana and Mississippi. Their existence was first recorded by Pierre le Moyne d'Iberville in 1699, at which time they were settled on Biloxi bay, Mississippi. In 1702 they moved east to Mobile bay but in 1763, when the English took over that territory from the French, the Mobile tribes transferred to Spanish territory in Louisiana, and it is likely that the Biloxi went with them. In the next years they were mentioned by writers as being found in Mississippi, Louisiana and Texas. The Biloxi lived in tents and made tools and implements of wood and bone. Their society was matrilineal. They may have been cannibals, although this report has not been substantiated.

The Biloxi were never a large tribe and by the early part of the 20th century they had become nearly extinct. In 1886 a study of their language proved that they were Siouan Indians rather than Muskogians as ethnologists had previously thought.

BILSON, THOMAS (*c.* 1546–1616), English bishop, was born in Winchester. He was educated at New college, Oxford, where he received the degree of Doctor of Divinity about 1580. In 1596 he was made bishop of Worcester and in 1597 bishop of Winchester. He was one of nine bishops present at the Hampton court conference in 1604. He died on June 18, 1616, and was buried in Westminster abbey.

Bilson was the author of *True Difference between Christian Subjection and Unchristian Rebellion* (1585), which he wrote at the instigation of Queen Elizabeth who was planning to protect the Dutch and who wished to justify their revolt from Spain. This document later proved an important factor in the downfall of Charles I. Bilson also wrote *Perpetual Government of Christ His Church* (1593) and *Effect of Certain Sermons concerning the Full Redemption of Mankind by the Death and Blood of Christ Jesus* (1599).

BILSTON, market town, Staffordshire, England, 2½ mi. S.E. of Wolverhampton, of which it forms the Bilston parliamentary division. Pop. (1938) 31,430. Area, 3 sq.mi. It is served by the G.W. and L.M.S. railways. In the vicinity are very productive mines of coal and ironstone. The principal trades are in iron and stone, with extensive manufactories of japanned and iron goods, while metal casting is also carried on. A new museum, library and art gallery were opened in 1937. Although the town appears in Domesday, it was not incorporated until 1933.

BIMETALLISM. The very general employment of both gold and silver for currency purposes (*see* MONEY) gave rise to serious practical difficulties which in turn led to keen theoretical discussion as to the proper remedies to be employed. Though every arrangement under which two metals form the money of a region may be described as "bimetallism," the term—as often happens in economics—has received a specialized meaning. It denotes a system under which the two metals are freely received by the mint and are equally available as legal tender. The last clause implies the establishment of a definite ratio in value between the two metals (*e.g.*, 1 oz. of gold = 15½ oz. of silver) so that their relative values as money are fixed. Bimetallism is contrasted with monometallism, which implies that one metal (after 1900 almost universally gold) is taken as a standard of value, even though coins of other metals (silver, nickel, copper, etc.) may be used as subsidiary or token coinage. Bimetallism may be national or international; the experience of the 19th century indicated that it could not be successful unless adopted by general agreement among at least the most important commercial countries. Hence international bimetallism is not only what was intended by the inventor of the term—H. Cernuschi in 1869—but also the only form that has attracted serious attention in recent times.

Regarded from the historical point of view it appears that the failure of separate countries to maintain the two metals in circulation was the cause which produced the idea of bimetallism as an international system. We find first the upholders of a national double standard, as in France and the United States, and these are followed by the advocates of bimetallism set up by a combination of countries. The theoretical considerations which underlie the controversy between the supporters and the opponents of bimetallism find their appropriate place in the article MONEY (*q.v.*), as does also the earlier history of the double standard. The circumstances that led to the prominence of the bimetallic question and the principal events that marked the course of the movement form the subject of this article.

Double and Single Standards.—In the earlier years of the 19th century, when the monetary disturbances that resulted from the Revolutionary wars had ceased, we find France (1803) and the United States (1792) with the double standard legally established. England, on the other hand, had in 1816 accepted by law the gold standard, which had come into use in the 18th century. Silver formed the currency of the other European countries. The great discoveries of gold in California (1848) and Australia (1851) brought about the displacement of silver by gold in France, and the continuance of gold as the principal currency metal in the United States, where by the law of 1834 it had been somewhat overrated (1:16), as compared with the ratio adopted in France (1:15½), and had therefore expelled most of the silver previously in circulation. Between 1848 and 1860 more than £100,000,000 of gold was coined in France, while an equivalent amount of silver was exported, principally to the east.

At this time the weight of economic and official opinion was very decidedly in favour of the single gold standard as the best system. In 1865 the Latin union was established, in which the French currency system was adopted and was followed by the international conference of 1867 in Paris, when gold was unanimously accepted as the standard for the proposed international system to be produced by co-ordinating the various currencies with that of the Latin union.

A series of political and economic events speedily changed this situation. The Franco-German War (1870–71) deposed France from its leading position, and led to the establishment of a German gold currency with a different unit from the franc, accompanied by the demonetization of the silver currencies previously in use in the German states. The United States, where an inconvertible paper currency had been introduced during the Civil War, formally established the gold dollar as the standard coin (1873) and arranged for a return to specie payments (1878). At this time, too, the great production of gold which had marked the period 1850–70 diminished, while very productive silver mines were discovered in the Pacific states of the United States. As a result of these combined influences the gold price of silver, which had risen a little during the height of the gold discoveries, began to fall rapidly, and the reverse process to that by which France had in the '50s acquired a gold currency came into operation. Silver, in accordance with Gresham's law (*q.v.*), was imported and offered for coinage.

The Limping Standard.—To obviate this the policy of limiting the coinage of silver (the limping standard) was adopted by the Latin union. A further fall in the gold price of silver naturally resulted, and this made the position of eastern trade and the finances of the Indian government insecure. American silver producers, and the German government, as holders of a large

mass of demonetized silver, were also sufferers by the depreciation. For the next 20 years international bimetallism was advocated by many able authorities but was strongly opposed by others. The work of the English parliamentary committee (1876) and the Royal commission (1886–88), of the United States Monetary Commission (1876), and of three international monetary conferences (Paris, 1878 and 1881; Brussels, 1892) brought no agreement. The United States and France favoured international bimetallism but England and Germany were opposed.

By the Bland-Allison act (1878) and the Sherman Act (1890), the United States treasury was required to make monthly purchases of silver (amounting to 460,000,000 ounces in 15 years), and thus gave some support to the falling price of silver. On June 26, 1893, however, the closing of the Indian mints to the free coinage of silver took that country off the silver standard, and the repeal of the Sherman act in the following November removed all support to the price.

The Climax of Silver Agitation in the United States.—The depression of the early '90s and the bottom of a 30-year decline in commodity prices led to strong agitation for inflationary measures. In this the silver interests received the support of the agricultural and debtor classes in advocating the adoption of national bimetallism with free coinage of silver at the value ratio of 16 to 1, without waiting for action by other countries. The Democratic and Populist parties, led by W. J. Bryan (*q.v.*), campaigned vigorously for this but were decisively defeated in the election of 1896. The gold standard was explicitly confirmed by the act of March 14, 1900.

Meanwhile, after 1873, almost all countries of any importance had adopted some form of the gold standard. The increasing production of gold provided ample supplies of that metal for all needs and there was no more talk of international bimetallism. Only China and a few minor countries remained on the monometallic silver standard.

Revived Interest in Silver.—During and immediately after World War I, the price of silver rose for a time to former levels, partly because of the general inflation, partly because of reduced production in Mexico, partly because of the demand for the white metal for subsidiary coinage in western countries, for rupee coinage in India and for settling trade balances with China. In the '20s the price reverted to normal levels and then continued downward.

In Feb. 1931 the price of silver reached an all-time low of 12*d.* per ounce, 0.925 fine, in London; and 25¾ cents per ounce, 0.999 fine, in New York (the subsequent bottom price of 35 cents in 1939 corresponded to a ratio of 100 to 1, since gold was $35 per ounce). The long depression was attributed in part to an insufficiency of gold and this gave rise to agitation in favour of increasing the metallic monetary base through a remonetization of silver. In England, advocates of various plans included L. S. Amery, Sir Hugo Cunliffe-Owen, J. F. Darling ("rex" unit at a ratio of 20 to 1), Sir Henri Deterding and Sir Robert Horne. Their agitation, however, had no result. It did not even prevent the government of India from continuing to liquidate its surplus stocks of silver (including silver acquired from the United States under the Pittman Act of 1918).

In the United States, however, the efforts of the silver bloc, headed by Senator Key Pittman of Nevada and supported by inflationists, produced far-reaching results. In the early '30s many schemes were put forward and supported by generally unsound arguments. The proposals included a silver loan to China, acceptance of silver on war-debt account, various silver-purchase plans, and "bimetallism at no fixed ratio," proposed by Francis H. Brownell. Even the old plan of national bimetallism with free coinage of silver at the ratio of 16 to 1, proposed as an amendment to the Gold Reserve Act of 1934, was defeated in the senate by only the narrow margin of 45 to 43.

During the administration of President Franklin D. Roosevelt several steps were taken to appease the politically powerful silver bloc, but they amounted merely to extensions of the limping standard rather than to actual bimetallism. The government undertook to purchase all newly-mined United States silver at a price above the market; first, by presidential proclamation on Dec. 21, 1933, to carry out an agreement signed by eight countries at the World Monetary and Economic conference held in London the preceding summer; later, in 1939, by law. The Silver Purchase Act of June 19, 1934, provided for the purchase of silver from any source until it should make up one-fourth of the total monetary stock of gold and silver together, so long as the price did not exceed the coinage value of $1.29+ per fine ounce. Purchases under these two plans and other minor legislation totalled nearly 2,700,000,000 fine ounces (with a coinage value of $3,500,000,000) in the ten years from 1933 to 1942 inclusive, but because of the concurrent acquisition of gold the proportion of silver did not reach the required one-fourth. During World War II a great need arose for silver for industrial uses, and legislation was passed permitting the sale or lease of surplus treasury stocks of the white metal under certain conditions.

The United States silver legislation caused a speculative rise in the price of silver in 1934 and 1935, soon followed by a downward reaction. Meanwhile the fluctuations in the price gave rise to a series of crises in China and induced the Chinese government to abandon the silver standard for a managed currency in Nov. 1935. As a result the chances for the revival of bimetallism became more remote than ever.

A proposal, sometimes confounded with bimetallism, is that for a standard composed of both gold and silver, which is better described as the joint-standard or as symmetallism.

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BIMLIPATAM, a town of British India, in the Vizagapatam district of Madras, on the seacoast 18 mi. northeast of Vizagapatam, and 16 mi. from a station on the Bengal-Nagpur railway. Pop. (1941) 9,914. It was formerly a Dutch factory and is now the principal port of the district. The anchorage is an open roadstead protected to some extent by headlands with a lighthouse at Santapalli. Trade is coastal, the foreign trade having declined since World War I. There is regular coolie traffic with Rangoon. The exports are oil-seeds and jute. Ships lie a mile offshore.

BINAN, a municipality of the province of Laguna, Luzon, Philippine Islands, on the west shore of Laguna de Bay, about 20 mi. S.S.E. of Manila. Pop. (1939), 16,238, of whom 8,121 were males and 1 white. The fertile surrounding region produces corn, abacá (Manila hemp), palay (rice) and various tropical fruits, some of which are marketed in Manila, to which access by the Pasig river is easy. The school population of the municipality in 1939 was 5,423, of whom 31.7% attended school. Of the 11,630 individuals 10 years old and over, 58.2% were able to read and write. The vernacular is Tagalog. The municipality has an administrative centre and 17 barrios (wards). (C. S. L.)

BINARY SYSTEM, in astronomy, a system composed of two stars revolving around each other under the influence of their mutual attraction. It is probable that at least one-third of the stars are binary systems. In some cases (visual binaries) a telescope will show the two components separated. In others (spectroscopic binaries) the duplicity is detected by observing the changing motion in the line of sight of one or both components. (*See* STAR.)

BINCHOIS, GILLES, an early 15th-century Flemish musical composer, evidently named after his birthplace, Binche, near Mons. He was esteemed by contemporary and later theorists as second only to Dunstable and Dufay. A selection of his works is printed in *Denkmäler der Tonkunst in Oesterreich* (vols. vii. and xi.). Binchois died at Lille in 1460.

BINDWEED: *see* CONVOLVULACEAE.

BINET, ALFRED (1857–1911), French experimental psychologist, was born in Nice, on July 8, 1857. At an early age he went to Paris and entered the Lycée Saint-Louis from which he graduated in 1878. In 1890 he took a degree in natural science at the Sorbonne and received his D. Sc. in 1894. The laboratory of psychology and physiology was created at the Sorbonne in 1889, and three years later Binet was invited to join its staff as assistant to M. Beaunis. Upon the retirement of Beaunis in 1894, Binet became director. With Beaunis and Ribot he began in 1895 to publish the journal *L'Année psychologique*. This journal, under Binet's leadership, expressed the French movement in psychol-

ogy. His inclination for varied psychological problems drew him toward the study of hypnotism and he published with Fere, *Le magnétisme animal* and *Les altérations de la personalité*. His name, however, is generally connected with his researches on human intelligence and specifically with his scales and tests to measure intelligence. These tests, first published in connection with his *Étude Experimentale de l'intelligence* (1905–08), had wide usage. He made extensive investigations in other psychological fields and his publications include: *Introduction à la psychologie expérimentale,* with Philippe, Courtier and V. Henri (1894); *La fatigue intellectuelle,* with V. Henri (1898); *La suggestibilité* (1900); *L'âme et le corps* (1905); *Les enfants anormaux,* with Simon (1907). He died in Paris, Oct. 18, 1911. (For Binet Scale *see* EDUCATION.)

See R. Martin, *Alfred Binet* (Paris, 1925).

BINGEN (ancient VINCUM or BINGIUM), town in Germany, in the *Land* of Hesse, formerly called Hesse-Darmstadt, on the left bank of the Rhine, 15 mi. N.W. of Mainz. Population (1939) 16,987. The Romans erected a castellum here, and there remains a bridge of Roman origin over the Nahe. Bingen was a free town of the empire. A short way down the Rhine is the Bingerloch, a whirlpool whose fame helped the growth of the town. Many legends gathered about this portion of the Rhine valley. Bingen is a famous tourist centre. There is also an important pilgrimage in August. The parish church dates from the 15th century, but has an 11th century crypt. Commerce is in wine and spirits, and considerable transit trade is done by river.

BINGHAMTON, a city of New York, U.S.A., on the Susquehanna river, at the mouth of the Chenango, 125 mi. S.W. of Albany, near the Pennsylvania border; county seat of Broome county. It is on the Appalachian scenic highway, and is served by the Erie, the Delaware and Hudson and the Lackawanna railways. Area 10 sq.mi. Pop. (1940) 78,309.

Dairy farming is the agricultural specialty of the fertile river valleys, which contain some of the finest farms in the state. The farm bureau of Broome county, organized in Binghamton in 1911, is the oldest in the country. Easy access to large markets, sea and lake ports, coal, steel and raw materials favoured industrial development. Incoming and outgoing freight amounts to about 1,000,000 tons a year. The output in 1937 of the industries of Broome county, chiefly in Binghamton and its suburbs, Johnson City and Endicott ($2\frac{1}{2}$ mi. and 9 mi. distant), was valued at $148,914,603. The leading product is shoes, and the Endicott-Johnson Shoe corporation is one of the largest in the world, employing 17,000 men and women. Other important manufactures are patent medicine, aviation devices and equipment, pipe organs, cameras, furniture, valves, handbags, wire specialties, silk, motion-picture and other films, computing and tabulating machinery, office machines and various articles of iron and steel. East of the city is a state hospital for the insane.

The site of Binghamton was in Indian territory until 1779, when a decisive victory was won by General Clinton and General Sullivan at Newtown (now Elmira). An Iroquois village known as Ochenang was situated there, and the white settlement, dating from 1787, was first called Chenango Point. The greater part of the city stands on land originally included in the "Bingham Patent," a large tract on both sides of the Susquehanna, owned by William Bingham (1751–1804), a merchant of Philadelphia. A village was laid out by his agent in 1800. It was incorporated in 1834, and received a city charter in 1867. Weekly stage service to Newburgh and Owego was established in 1816; the first boat on the Chenango canal reached Binghamton in 1837; and the first passenger train from New York arrived over the Erie, Dec. 26, 1848.

BINGLEY, urban district, West Riding of Yorkshire, England, on the Aire, $5\frac{1}{2}$ mi. N.W. of Bradford, on the L.M.S. railway. Pop. (1938 est.) 21,722. Area 17.8 sq.mi. It is in the Yorkshire industrial region, but in spite of the many factories it retains much open land in the Aire valley, and agriculture is an important occupation. Textile working, especially spinning and weaving and worsted manufacture, is important, as well as metal working.

BINIOU or **BIGNOU,** a primitive bagpipe (*q.v.*) consisting of a leather bag inflated by means of a short valved insufflation tube or blowpipe. It is the traditional and popular instrument of the Breton peasants of Cornouailles and Morbihan.

BINMALEY, a municipality (with administrative centre and 18 barrios or districts), of the province of Pangasinan, Luzon, Philippine islands, on the delta of the Agno river, about 5 mi. W. of Dagupan which has railway connections with Manila. Pop. (1939) 20,455, of whom 9,893 were males and nine white. The chief agricultural products are palay (rice) and coconuts. Manufactures include products of the nipa palm such as thatch made of leaves and nipa wine. Fishing is an important industry. The gain in population after 1918 was 2,212, and of those between 6 and 19 (7,082), 43.1% were reported attending school. Of those aged 10 and over 49.7% were reported literate. The Pangasinan language is the vernacular. (C. S. L.)

BINNEY, EDWARD WILLIAM (1812–1881), English geologist, was born at Morton, Nottinghamshire. He was articled to a solicitor in Chesterfield, and in 1836 settled at Manchester. On the Coal Measures he became an acknowledged authority, and wrote *Observations on the Structure of Fossil Plants Found in the Carboniferous Strata* (1868–75). His collection of fossils was placed in Owen's college. He died at Manchester Dec. 19, 1881.

BINNEY, HORACE (1780–1875), U.S. lawyer, was born in Philadelphia, Pa., on Jan. 4, 1780. He graduated at Harvard college in 1797 and then studied law in the office of Jared Ingersoll (1749–1822), who was attorney-general of Pennsylvania. Binney was admitted to the bar in Philadelphia in 1800. He served in the Pennsylvania legislature from 1806–07. His most famous case, *Bidal* v. *Girard's Executors,* in which he was unsuccessfully opposed by Daniel Webster, greatly influenced the interpretation of the law of charities. During the Civil War he issued three pamphlets (1861, 1862 and 1865), justifying Abraham Lincoln in his suspension of the writ of *habeas corpus*.

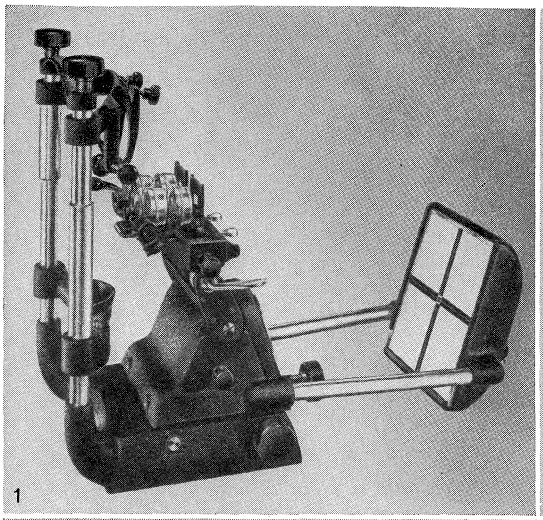
See the *Life of Horace Binney* (1903), by his grandson, C. C. Binney.

BINNEY, THOMAS (1798–1874), English Congregationalist divine, was born of Presbyterian parents at Newcastle-on-Tyne. He entered the theological school at Wymondley, Herts, now incorporated in New college, Hampstead. In 1829, after short pastorates at Bedford (New Meeting) and Newport, Isle of Wight, he accepted a call to the historic Weigh House chapel, London. Here he became very popular, and it was found necessary to build a much larger chapel on Fish street hill, to which the congregation removed in 1834. An address delivered on the occasion of the laying of the foundation stone was published, with an appendix containing a strong attack on the influence of the Church of England, which gave rise to a long and bitter controversy. In 1845 he visited Canada and the United States, and in 1857, the Australian colonies. He was twice chairman of the Congregational Union of England and Wales, and only resigned his pastorate in 1869 at the age of 72. He died on Feb. 24, 1874.

Binney gave a special impulse to congregational psalmody by the publication of a book entitled *The Service of Song in the House of the Lord.* He wrote much devotional verse, including the well-known hymn "Eternal Light! Eternal Light!"

BINOCULAR INSTRUMENT, an optical apparatus or instrument through which objects are viewed with both eyes. Such instruments can be conveniently dealt with as belonging to two classes: (1) Instruments for viewing solid objects or objects in space. (2) Instruments for the presentation of plane views to both eyes for the purpose of obtaining a stereoscopic view of the subject, *i.e.,* an impression of depth.

The natural vision is such that different central projections of the objects are communicated to both eyes, the difference of the two perspective representations arises from the fact that the projection centres are laterally displaced to an interval about equal to the distance between the eyes (the interpupillary distance). Binocular instruments should aid the natural vision with both eyes. If objects be so far distant that the two perspectives formed by the naked eye are no more distinguishable from each other, recourse may be had to binocular field glasses or telescopes, and if the objects be so small that in order to observe details on them the eyes must be brought so close to the objects that they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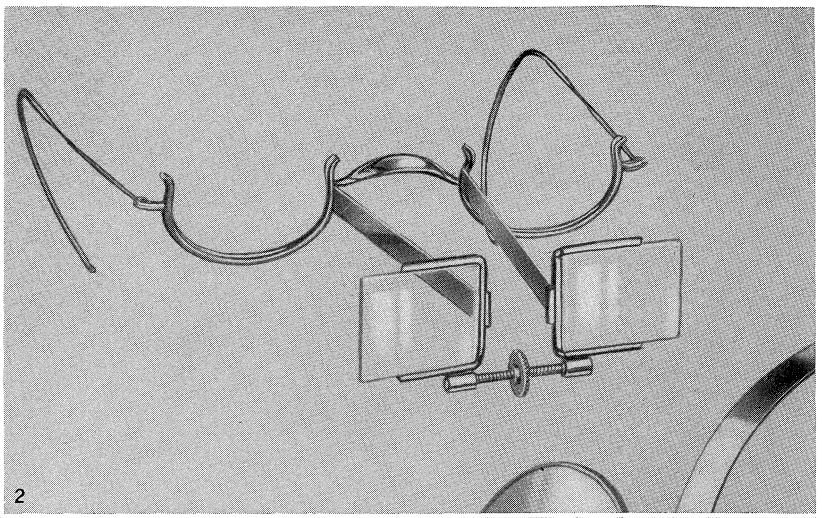
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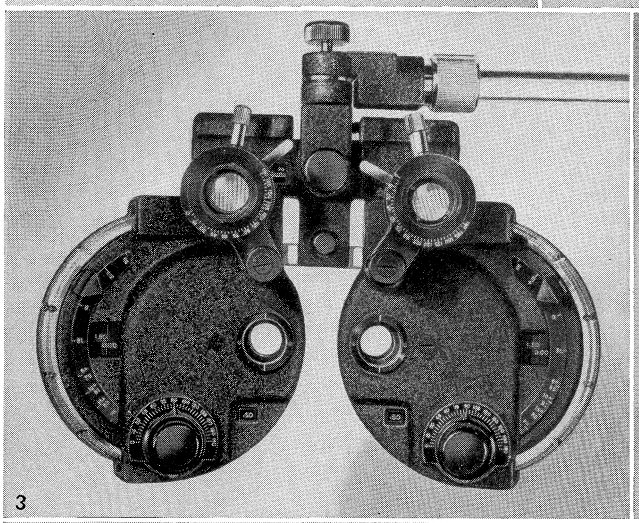
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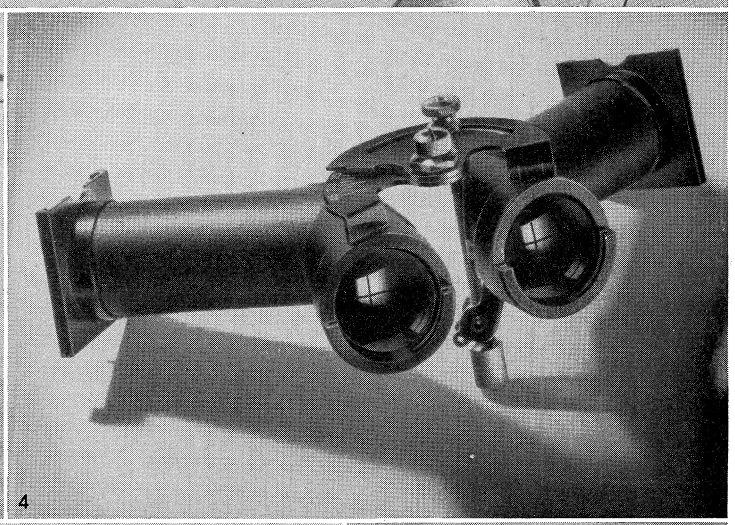
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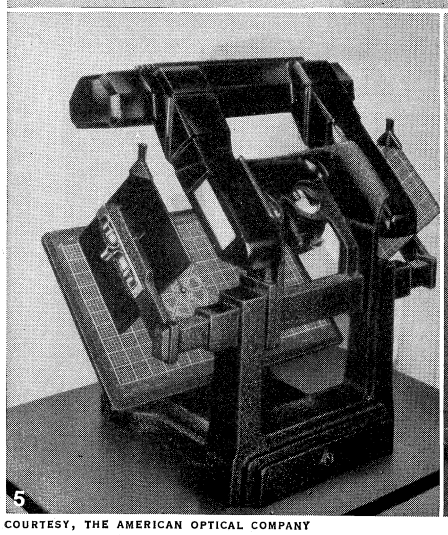
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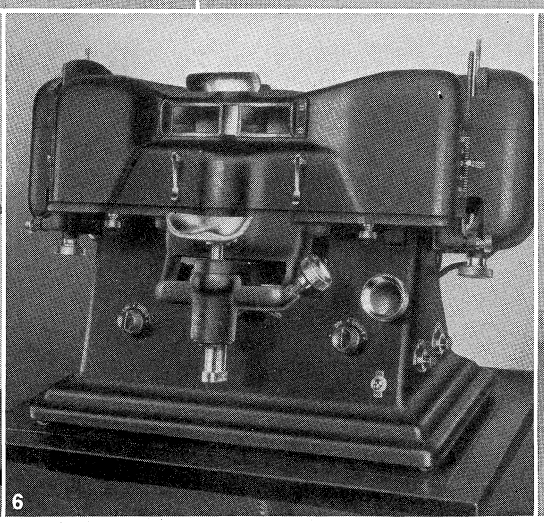
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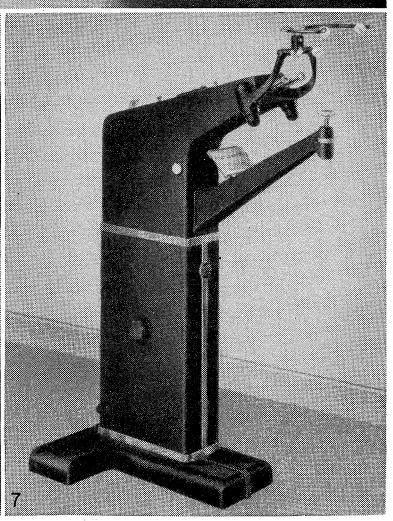
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COURTESY, THE AMERICAN OPTICAL COMPANY

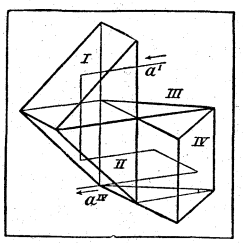
BINOCULAR INSTRUMENTS

1. Eikonometer. With this instrument measurement can be made of the difference in size and shape of the ocular images of the two eyes, such as exists in the condition known as Aniseikonia. The instrument also measures motor defects and refractive conditions of the eyes
2. Binocular Loupe. A magnifier for the stereoscopic examination of small, near objects. This instrument is attached to the head of the observer in the same manner as a pair of spectacles
3. Phoroptor. An instrument for determining refractive errors of the eyes and for the measurement of ocular muscular imbalance
4. Amblyoscope. For stimulating, exercising and developing the faculty of binocular single vision. The two eyes are used simultaneously and can be exercised by opening and closing the instrument about its hinged joint
5. Stereo Campimeter. For examining the visual field of view for the presence of pathological conditions. The fixation targets appear stereoscopically when fused by the eyes
6. Stereo Orthoptor. For exercising the external muscles of the eyes and for developing the known physiological and psychological processes relating to binocular efficiency. This instrument is basically a reflecting stereoscope with the angles of the mirrors controllable, and actuated by a small motor, compelling the desired movement of the eyes in following the movements of the target
7. Ophthalmograph. An instrument for recording photographically the movements of the eyes, in order to test binocular behaviour while reading. Pencils of light reflected from the eyes to a moving photographic film trace their movements

cannot accommodate to the images recourse may be had to binocular microscopes and magnifiers. The construction of binocular instruments dates back over several centuries and has now been brought to great perfection. The subject of their theory and history has been exhaustively treated by M. Von Rohr *Die binocularen Instrumente* (1907) the first publication to present a complete account of these instruments.

TELESCOPE

Early History.—The first binocular telescope, consisting of two telescopes placed side by side, was constructed in 1608 by Johann Lepperhey, the inventor of the ordinary Dutch telescope, *i.e.*, the combination of a collective lens as an objective and a dispersive lens as an eyepiece. The subject was next taken up by the monks. The Capuchin Antonius Maria Schyrlaeus de Rheita (A. M. Schyrl) (1597–1660) described in 1645 the construction of double terrestrial telescopes. Greater success attended the efforts of the Capuchin Cherubin d'Orleans who flourished a little later. He constructed large double telescopes of the Dutch type for use in war and small instruments of lower magnification. He introduced great improvements into these telescopes by providing them with adjustments to enable the interocular distance to be adapted to suit individual observers, and the object glass distance to suit far and near objects.



FROM GLEICHEN, "DIE THEORIE DER MODERNEN OPTISCHEN INSTRUMENTE" (ENKE)

FIG. 1.—PORRO'S REVERSING PRISM

After these discoveries the subject received no more attention until the 19th century. The reinvention of the Dutch binocular telescope apparently dates from 1823, and is to be assigned to the skilful Viennese optician Johann Voigtlaender. He received a kind of patent for an instrument having two Dutch telescopes so arranged that the axes of both were parallel and in line with the eye-centres. Both telescopes had independent focussing adjustments for both eyes. A year and a half later another Viennese optician B. Weidholt obtained a patent for an arrangement of two Dutch telescopes with their axes parallel but adjustable for interocular distance, but the credit of having placed these instruments on the market probably belongs to J. P. Lemière, in Paris, who in 1825 took out a French patent for an improvement of the Dutch double telescope. Lemière's instruments were furnished with a common central focussing adjustment and the adaptation to the interocular distance was effected by turning the two parallel bodies round their common axis. During the next few decades very few improvements in this type of instrument are recorded. The last improvement was apparently made by P. G. Bardout, who combined two terrestrial tubes using Lemière's method of mounting them parallel to a common axis with interocular adjustment and central focussing arrangement for both eyes. It was possible for him to achieve greater magnifications with his instruments.

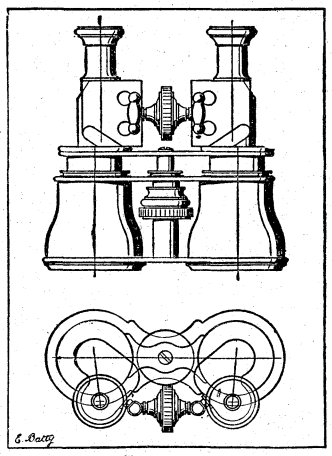
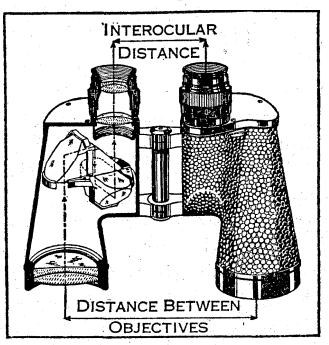


FIG. 2.—BOULANGER'S BINOCULAR TELESCOPE, 1859, THE FIRST IN WHICH THE PORRO PRISM COMBINATION WAS UTILIZED FOR THE PURPOSE OF ERECTING THE IMAGE

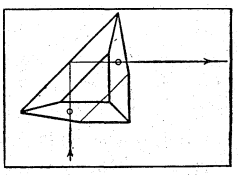
The Prism Combination.—Ignazio Porro (1795–1875) invented in 1851 a prism combination which was to play an important part in the future development of binocular instruments. The prism combination consists of two right-angle prisms placed with their hypotenuse faces adjacent, having the planes of total reflection at right-angles to one another (fig. 1). The complete reversal of the image accomplished by such a prism is necessary to neutralize the original reversal produced by the objective and eyepiece system, causing the image to appear to the eye as both erect and not suffering a reversal from right to left. A. A. Boulanger was the first to utilize the Porro prism combination in his binocular telescope (fig. 2) for which he obtained a patent in France in the year 1859. The prism combination was mounted above the objective of the telescope in such a manner that, by means of a right- and left-hand screw, the interocular distance could be adjusted to suit the observers. He overlooked, however, the possibility of mounting the Porro prisms in such a manner as to increase the distance between the objectives relatively to the eyepieces, thereby gaining enhanced stereoscopic effect. C. Nachet introduced this improvement in 1875.



BY COURTESY OF THE AMERICAN OPTICAL CO.

FIG. 3.—MODERN PRISM BINOCULAR

Ernst Abbe took the matter up *de novo* in 1893 when he designed prism binoculars and telescopes. His constructions were the forerunners of the modern prism binocular. If the Porro prism combination (fig. 1) is examined closely it will be seen that it contains two great advantages. Abbe made use of both by mounting them so that he obtained a greater distance between the objectives than between the eyepieces, and by separating the hypotenuse faces one from the other he shortened the telescope considerably in overall length. Abbe's binocular had an object-glass distance of $1\frac{3}{4}$ times to twice that of the eyepieces concurrently with great tube shortening, making the binocular very compact.



FROM GLEICHEN, "DIE THEORIE DER MODERNEN OPTISCHEN INSTRUMENTE" (ENKE)

FIG. 4.—AMICI'S REVERSING PRISM

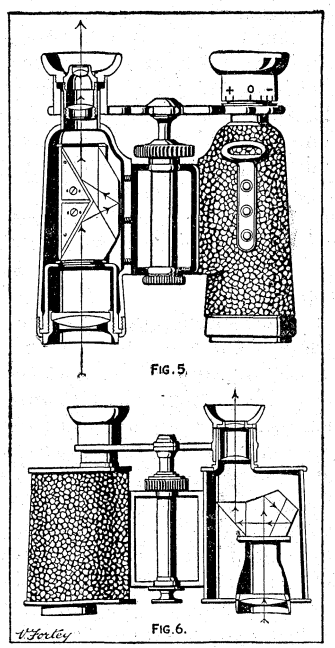


FIG. 5.

FIG. 6.

FROM GLEICHEN, "DER THEORIE DER MODERNEN OPTISCHEN INSTRUMENTE" (ENKE)

FIGS. 5 AND 6.—ABBE AND DAUBRESSE PRISM BINOCULARS

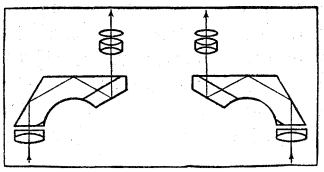
Fig. 5.—Prism binocular with Abbe's direct vision reversing prism

Fig. 6.—Prism binocular with a type of reversing prism designed by Daubresse

The binocular has undergone many improvements. The earlier instruments had small objectives and the eyepieces afforded a narrow angle of 36° at the eye. The field of view and illumination have been increased in the modern constructions, the former reaching a value of double the original, without destroying the compactness and handiness of the instrument (fig. 3). Numerous other reversing prism combinations have been utilized, being derived mostly from the form originally designed by Giovanni B. Amici (fig. 4). It is known that Amici used this prism in such a way that the incident and emergent bundles of rays after traversing the entrance and exit faces were reflected symmetrically from one roof face to the other, thereby undergoing two total reflections, and accordingly causing a reversal of the image from right to left. In addition, since the incident rays were reflected through an angle of 90° before emergence, a reversal in the vertical direction was accomplished. This type of prism commonly designated as the "roof prism," must be constructed with high accuracy; the two faces forming the roof must be at right angles to one another within the order of 2″ of arc to avoid doubling of the image, and the line forming the intersection of the roof faces has to be free

from imperfections which would cause undesirable scattering of the light. A number of roof prism combinations have been designed to obtain direct vision or at any rate parallelism of the entrance and exit beams, notably by Abbe, Sprenger, Daubresse and others (figs. 5, 6, 7 and 8). All these constructions have been used with more or less success in prism binoculars.

Fig. 5 shows a complete binocular with Abbe's direct vision reversing prism. This type does not increase the stereoscopic power beyond that due to the magnification, since eyepieces and object glasses are equal distance apart. Fig. 7 embodies two Sprenger prisms, the peculiar construction of which enables the object glasses to be separated widely, giving correspondingly increased stereoscopic effect. Fig. 6 shows a prism binocular with two modified Daubresse prisms, with very slightly increased object glass separations. Fig. 8 shows a binocular with two roof prisms, having six internal reflections, which for the sake of compactness have been so arranged that the distance between the objectives is less than that of the eyepieces, the stereoscopic effect in this case being less than that due to the magnification alone. The Porro reversing prism, shown in fig. 1 is capable of further modification in use if its compound parts are separated (fig. 9). If the object glass is placed in the entrance beam either in front or below the isolated upper prism, the distance between the eyepiece and objective can be increased at will. By combining two such instruments as a binocular (fig. 10) the stereoscopic effect will be increased in accordance with the ratio of interocular distance to object glass distance. These instruments are suitable for much higher magnifications than those previously described.



FROM GLEICHEN, "DIE THEORIE DER MODERNEN OPTISCHEN INSTRUMENTE" (ENKE)

FIG. 7.—OPTICAL ARRANGEMENT OF PRISM BINOCULAR WITH SPRENGER PRISMS

The Stereoscopic Effect.—A great many uses have been found for the type of telescope shown in fig. 10. On account of the greatly increased objective separation, up to 18 and more times the interocular distance, the stereoscopic effect of such instruments is very considerable, and gives the user a perception of depth, *i.e.*, enables him to distinguish objects in different planes at distances of many miles. For this reason it is used largely for artillery purposes at sea and on land. By making both telescopes move round an axis placed centrally to the eyepieces, the two objectives can be brought from a horizontal to a vertical position to enable the user to remain under cover and use the instrument in the manner of a periscope.

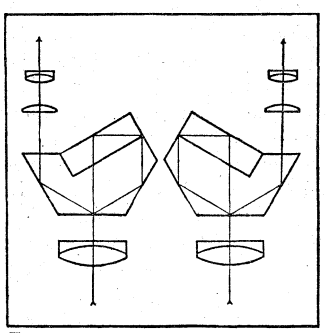
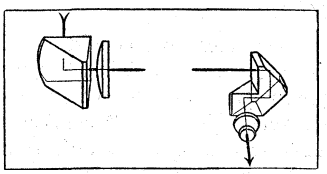


FIG. 8.—OPTICAL ARRANGEMENT OF PRISM BINOCULAR WITH REDUCED STEREOSCOPIC EFFECT

For measuring purposes instruments of the type shown in fig. 10 with a horizontal axis have been largely used. The measurement is effected by using in conjunction with the space or interval to be measured some means of measurement; *e.g.*, a movable pointer or a fixed scale. This instrument shows a transition to the stereoscope inasmuch as the scale or means of measurement is not directly observed but to each eye a plane representation is offered just as in the stereoscope; the space to be measured on the other hand is portrayed in exactly the same way as in a double telescope. The method of superposing the two spaces on one another was deduced by Sir David Brewster in 1856, but he does not appear to have dealt with the problem of measurements.

Hector de Grousillier in conjunction with Abbe and C. Pulfrich designed the first stereoscopic range finder suitable for practical use. The power of perception of depth, *i.e.*, the stereo-acuity of the human eye is most accurate, and is quite a different characteristic than is the visual acuity or keenness of vision of the single eye. The angle which serves as a measure of the visual acuity of the eye is that subtended by two neighbouring points of an object which are just seen by the eye as a double point; for smaller angles they merge into one. According to the experiments of Herman L. F. von Helmholtz this angle is about 60″, although more recent experiments show that the value lies between 60″ and 30″. Objects in space are observed as being at different distances because of the difference in angles at the object points subtended by the two eyes of the observer. The two eyes acting together are capable of distinguishing differences in these angles as small as 10″ and sometimes even less, as shown by Pulfrich in 1899. Observations made in connection with range finding indicate that values as low as 4″ are possible.



FROM GLEICHEN, "DIE THEORIE DER MODERNEN OPTISCHEN INSTRUMENTE" (ENKE)

FIG. 9.—MODIFIED PORRO PRISM

There are two methods of extending the limits of stereoscopic vision and of increasing the accuracy of the perception of depth, (1) by adding magnification of the image by the aid of a telescope or microscope, and (2) by increasing the interpupillary by several reflections after the plan shown by Helmholtz in 1857 (fig. 11) which shows his telestereoscope but without telescopic magnifying power. By combining telescopic magnification with increased interpupillary distance the type of instrument shown in fig. 10 is evolved. If there is a telescopic magnification of m times or a base magnification of n times, *i.e.*, the distance between the objectives is n times the interpupillary distance, then the radius of stereoscopic vision is increased m or n times with respect to that of the naked eye; and, if both are active, $m \times n$ times. The action of telescopic magnification m and base magnification n are however fundamentally different from one another. The first case is the optical equivalent of decreasing the distance between the observer and the objects in the ratio of $1/m$ of the true distance and thereby extending the radius of stereoscopic vision m times that of the unaided eye. In the second case the real dimensions remain unchanged but all objects appear to be brought nearer because of the increased binocular parallax introduced by optically increasing the interocular distance. The combined effects are present in all stereoscopic binoculars whose distance between objectives is equal to or greater than the interocular distance, and whose magnifications exceed unity.

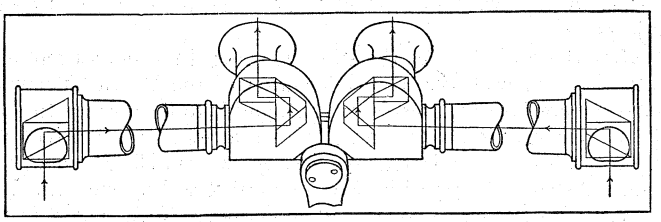
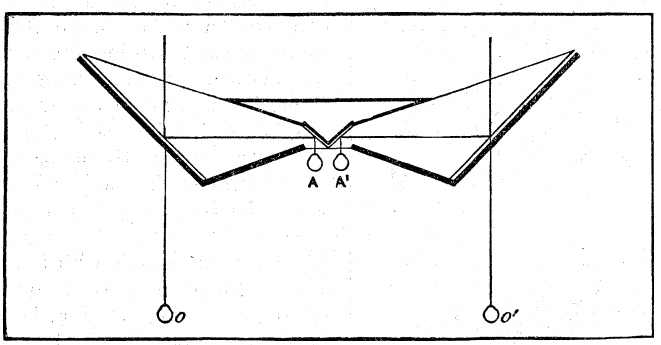


FIG. 10.—STEREOSCOPIC BINOCULAR TELESCOPE COMBINING TWO TELESCOPES WITH PORRO REVERSING PRISMS WITH SEPARATED ELEMENTS



FROM MÜLLER-POUILLET, "LEHRBUCH DER PHYSIK" (VIEWIG AND SON)

FIG. 11.—PLAN OF A TELESTEREOSCOPE BY HELMHOLTZ, 1857
Two reflections under 45° to the line of sight enable great stereoscopic effect to be obtained, as the eyes, which are at A A′, appear to be at O O′

MICROSCOPE

The first binocular microscope was invented by the previously

mentioned Father Cherubin, whose instrument consisted of two inverting systems and consequently gave a totally wrong impression of depth, *i.e.*, the depressions appeared as elevations and vice versa or, according to Charles Wheatstone's phrase, it presented a *pseudoscopic* impression. This quality was not recognized by the microscopists of the time. The instrument subsequently fell into complete neglect for nearly two centuries, to be revived in 1852 by Wheatstone. The publication of his views in his second great paper on "Binocular Vision" (*Phil. Trans.* 1852) undoubtedly stimulated the investigation of this instrument, which was carried on with zeal and success more especially in England and the United States of America. In 1853 the American J. L. Riddell published a description of his binocular microscope which contained the essentials of Wheatstone's pseudoscope. Wheatstone tried without success to interest Andrew Ross and Hugh Powell, the two most important microscope makers in London, in the binocular microscope.

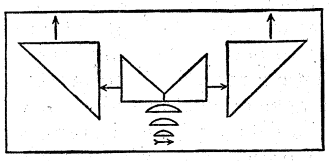
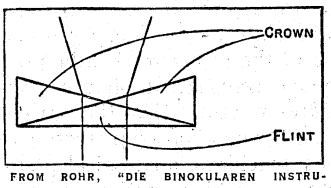


FIG. 12.—OPTICAL SYSTEM OF RIDDELL'S BINOCULAR MICROSCOPE

Some time later, however, F. H. Wenham became interested. He was not only a gifted amateur but also a technician having a particular interest in the advancement of the microscopes, and his theoretical insight in the subject was remarkable. His endeavours however bore fruit only in the next decade, but in a way which was decisive for the adoption of the binocular microscope in England at any rate. His first construction was almost identical with that of Riddell (fig. 12), but this type he only considered useful for binocular magnifying glasses. He tried to use Riddell's arrangement between the objectives and eyepieces and he could not avoid the pseudoscopic effect. The same defect adhered to his first achromatic refracting prism (fig. 13) interposed between the eyepieces and objectives of the microscope.

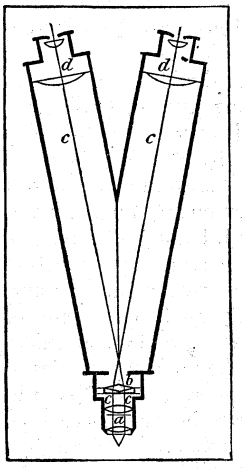
In the spring of 1860 he brought out his first binocular microscope (fig. 14) with *orthoscopic* representation thereby affording a true representation of depth, *i.e.*, elevations and depressions appearing respectively as such. He arranged the achromatic refracting prism so that the emergent rays crossed over on their way to the eyepieces so that the rays from the left side of the objective entered the right eyepiece and vice versa. This binocular microscope had the disadvantage of not being able to be used as a monocular microscope, and Wenham published in Dec. 1860 a description of his reflecting prism (fig. 15). When placed close behind the objective it directs the rays coming from the right half of the objective after two reflections into the left eyepiece of the microscope; those coming from the left half of the objective go straight into the right eyepiece (fig. 16). This form of binocular microscope construction was eminently suited to the English tube length of 10 in., but for continental microscopes with their shorter tube length ($6\frac{1}{2}$ in.) the required deviation in the reflecting prism became considerable and other constructions have been adopted in this case. Of other workers in this field mention may be made of Alfred Nachet, who in 1853 and subsequently in 1863 brought forward two forms of binocular microscopes.



FROM ROHR, "DIE BINOKULAREN INSTRUMENTE" (SPRINGER)

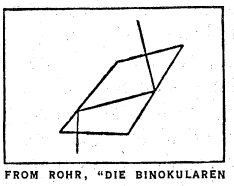
FIG. 13.—WENHAM'S ACHROMATIC PRISM FOR BINOCULAR MICROSCOPE. IT GAVE PSEUDOSCOPIC IMAGES

The earlier stages of the development of the binocular microscope had always been confined to those instruments with one objective in the immediate neighbourhood of which the systems for dividing the pencils were placed. At a later date, and particularly on the continent and in America, attempts were made to separate the image produced by the objective by modifying the eyepiece; this led to the construction of stereoscopic eyepieces introduced by R. B. Tolles, A. Prawsmosi and Abbe. The eyepiece designed by Abbe is of special importance, although, as he has stated, his methods accidentally led him to a construction given by Wenham in 1866. Wenham was then endeavouring to construct binocular microscopes for binocular vision as distinct from stereoscopic vision. He was of opinion that with objectives of a focal length of 5 mm. or less the image quality suffered considerably through the introduction of the stereoscopic arrangements, but that for such short foci the binocular vision was still of advantage although it offered no appreciation of depth. Wenham's prism form is shown in fig. 17. He split each beam from the objective into two portions, one going straight through the prism block, and the other being reflected on a prism surface bounded by a thin air-space, and then totally reflected on the further side of the prism to be directed into the other tube. Abbe's eyepiece construction followed these lines closely (fig. 18). A fundamentally different type of binocular microscope with orthoscopic representation of the image has been designed by H. S. Greenough by employing two separate tubes, each complete with objective and eyepiece, together with a Porro prism system to erect the images. By making these Porro prisms rotate round the tube axis the interocular distance could be adjusted to suit the observer. Subsequently, this instrument has been improved in performance by increasing the field of view, the result of eyepiece and prism design; and in some types of construction greater convenience and comfort in making observations have been obtained by inclining the eyepiece tubes (fig. 19).



FROM ROHR, "DIE BINOKULAREN INSTRUMENTE" (SPRINGER)

FIG. 14.—SYMMETRICAL BINOCULAR MICROSCOPE TUBES



FROM ROHR, "DIE BINOKULAREN INSTRUMENTE" (SPRINGER)

FIG. 15.—WENHAM'S REFLECTING PRISM FOR BINOCULAR MICROSCOPES

THE STEREOSCOPE

The fundamental property of stereoscopic vision, or simultaneous vision with both eyes, is the direct perception of relative distances of near objects. Even by the use of one eye it is possible to obtain an impression of depth or relative distance, but this is the result of experiences and other considerations. When using both eyes each eye is fixed and accommodated to one particular spot of the object. The angle made by the two lines connecting the right and left eye respectively with the spot chosen on the object varies with the distance of the object. For an object at the distance of 10 in. (normal vision) the angle would be about 15°, and it decreases as the object moves away from the observer, until it reaches zero when the object is at an infinite distance. The two images of a near object formed on the retina are dissimilar as is quite evident, and, as each eye transmits its respective picture to the brain, their dissimilarity creates the perception of depth or distance.

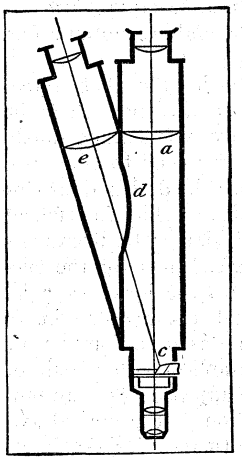
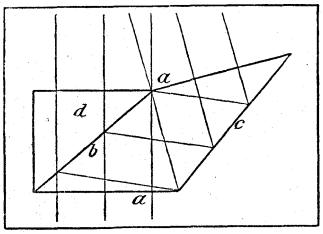


FIG. 16.—UNSYMMETRICAL BINOCULAR MICROSCOPE TUBES

The greater the distance of the object the less will be the dissimilarity between the two images. If we take an angle of 10″ as the threshold value of stereo-acuity of the two eyes acting simultaneously, it can be shown simply that stereoscopic vision is limited to a radius of 1,250 to 1,600 yd., according to the interpupillary distance of the observer. It is possible to convey the impression of depth by offering to both eyes plane representations of three dimensional objects, by, for instance, taking two photographs from the points of rotation of the eyes and by so arranging them in an instrument that each eye sees its respective picture without being able to see the other one. Such an instrument is called a stereoscope.

Construction of Various Types.—Wheatstone first observed the stereoscopic effect, in 1833, and was the first scientist to construct such an instrument, which he described in his paper in 1838. A principle of the instrument is shown in fig. 20. Other mirror stereoscopes were made by Heinrich W. Dove, Sir David Brewster and others. Brewster took up the stereoscope in 1849, and in a paper read in that year proposed his prism lens stereoscope in which he used eccentric portions of double convex lenses for viewing the half pictures. The first instrument of this type was made by Ross in the same year, but created no interest whatever among the public. It was only after J. Dubosq of Paris had taken up the regular manufacture that the instrument became very largely used. The causes of its success were its convenient form and the fact that a series of adjusted stereoscopic pictures (landscapes, machines, etc.) could be observed in rapid succession.



FROM ROHR, "DIE BINOKULAREN INSTRUMENTE" (SPRINGER)

FIG. 17.—WENHAM'S REFLECTING PRISM FOR MICROSCOPES WITH BINOCULAR VISION WITHOUT STEREOSCOPIC EFFECT

Brewster's stereoscope made an observation of stereoscopic pictures possible when the distance between identical points on both pictures was considerably greater than that between the observer's eyes. If the lenses shown in fig. 21 on the focal plane of which the image is formed are large enough, and the distance between the image points h_1 and h_2 is not greater than the distance between the centres of the two lenses (avoiding the divergence of the axes of the eyes), then the distance between the eyes is secondary and the observer sees the distant points with the axes of the eyes parallel. These apparent advantages however are counterbalanced by the fact that the picture seen through the lenses is eccentric and consequently an incorrect impression is obtained and an aberration in the three dimensional images occurs. Wheatstone showed later that this disadvantage in the lens stereoscope could be avoided by adjusting the lenses and distant points to the distance between the observer's eyes. This same condition was fulfilled in the "double verant," constructed by Rohr and Koehler (1905), in which the lenses in accordance with Allvar Gullstrand's rule are so arranged that the centre of rotation of the eye always coincides with the nodal point of the lens. If everyone had the same interpupillary distance there would be nothing more perfect than this stereoscope.

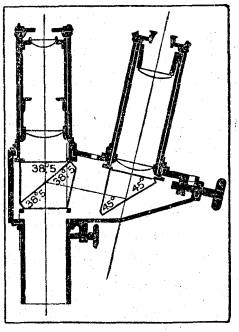
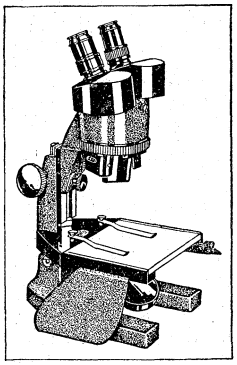


FIG. 18.—ABBE'S BINOCULAR EYEPIECE, A DERIVATION FROM WENHAM'S REFLECTING PRISM (FIG. 17)

Helmholtz showed in 1866 that stereoscopes should be so designed that the image of, for instance, a landscape should be shown in the stereoscope to appear to be at infinite distance; he designed his lens stereoscope accordingly. The instrument is shown in fig. 22, and consists of a box similar to Brewster's stereoscope, but it contains complete convex lenses for the eyepieces, the upper lens of about 5 in. focus, the lower of 7 in. focus. Combined these lenses gave a focal length of $2\frac{1}{2}$ in. to the eyepieces. The complete combination was used for viewing pictures on glass which had been photographed with a pair of lenses having a focal length of $2\frac{1}{2}$ in. Two adjustments were provided for the eyepieces—one in the direction of the optical axis for focusing, and another at right angles thereto for the interpupillary distance. If the stereoscope was to be used for viewing pictures which had been taken with 5 in. focus lenses, the upper lenses of the eyepieces alone were used, after the lower element in each eyepiece had been removed.

The problem of making one stereoscopic picture visible to several people simultaneously can be met in various ways, simply by portraying the two stereoscopic pictures in different colours one close to the other and giving each observer spectacles of different coloured glass or other transparent material with which it is only possible to see one picture with each eye. The latest development of this method has been the presentation of stereoscopic cinematograph films to large audiences. The film is printed in two colours and spectators are provided with suitably coloured spectacles.

In 1936 Edwin H. Land demonstrated a method of projecting and viewing stereoscopic still and motion pictures by utilizing modern light polarizing filters. Such filters have the property of transmitting light which is vibrating in one particular plane. The direction of this plane coincides with a definite direction with respect to the filter. On the other hand, light whose direction of vibration is perpendicular to this plane is absorbed. By projecting a stereoscopic pair of pictures through filters, the axes of which are mutually perpendicular, onto a metallized screen which does not alter the original directions of vibration of the light rays, and in turn, by viewing these projected pictures through a pair of spectacles, composed of polarizing filters so oriented that the right and left eyes receive their proper pictures only, the viewing can be accomplished by a large audience. With this method pictures in black and white, or in their original natural colours can be viewed.

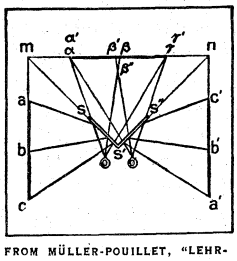


BY COURTESY OF AMERICAN OPTICAL CO.

FIG. 19.—A MODERN BINOCULAR MICROSCOPE BASED ON GREENOUGH'S DESIGN

Land, in 1940, described a method by which photographic prints or lantern slides of a special type can be viewed stereoscopically by many persons at the same time without equipment other than a pair of polarizing spectacles for each observer. The pictures to be viewed, instead of being composed of light absorbing elements as is the case of ordinary photographs, consist of light polarizing material itself, and the light and dark shades of the picture correspond to different amounts of polarization in the elements composing it. Land designated such pictures as vectographs. When such pictures are viewed through a polarizing filter the picture becomes visible. By superposing the right and left eye stereoscopic pictures whose polarizing elements have their axes of polarization at right angles to each other, and viewing them through a pair of polarizing spectacles, whose axes of polarization are appropriately at right angles to each other, the individual eye views only the corresponding picture and stereoscopy is achieved.

Stereoscopic Measurements.—The later developments of stereoscopy have been largely due to the work of Abbe and Pulfrich who succeeded in constructing apparatus which made it possible to measure three-dimensional objects. The earlier suggestions for making the stereoscope a measuring instrument were not realized, though decisive improvements were made. Brewster was unconsciously near the solution of the problem when he prepared ghosts of vistas by placing one transparent picture over another. More important than these trivial pictures are the superposed pictures (of cone sections, machines, anatomical preparations, etc.) in which sections of the same solid object are successively photographed on one plate, so that in a stereoscope one could see as it were through the opaque surface of the solid into the interior. To A. Rollett (1861) is due the merit of constructing the first stereoscopic measuring scale. It was a form of ladder, apparently extending into space, whose rungs gave the distances of the objects. J. Harmer (1881) used a scale of depth, consisting of a series of squares arranged one behind the other, in order to measure in the stereoscope a picture of the clouds taken with a large base line of about 15 metres. N. F. Stolze (1884 and 1892) placed gratings in front of the two half pictures of a mirror stereoscope, one of which could be moved by a micrometer. He thus discovered the device called the "travelling mark."



FROM MÜLLER-POUILLET, "LEHRBUCH DER PHYSIK" (VIEWIG AND SON)

FIG. 20.—WHEATSTONE'S STEREOSCOPE

Of the practical application of stereoscopy we may note the stereoscopic rangefinder already dealt with under the paragraph for telescopes, the *stereocomparator* devised in 1901 by Pulfrich, and the stereoscopic measuring machine, invented by H. G. Fourcade of Capetown, 1902, which is similar to the stereocomparator in many points. These instruments inaugurated the successful measurement of the distances of objects in space. Measurement is not made on the objects themselves but on photographic plates which are taken with special instruments, field and stand phototheodolites, at the extremities of a base line which is always selected according to the distance of the object and the exactitude of measurement needed. For measuring the pictures a binocular microscope adjusted to the dimensions and the distance between the two plates is used, and a fixed mark is placed in each image plane; these marks combine in binocular view to a virtual mark in the three dimensional images. If the plates are correctly adjusted the so-called travelling mark can be placed on any point of the landscape, and then used for the measurement of solidity of the objects or the production of plans and models, just as formerly, for example, the measuring staff was used for geodetic observations, with the difference that in the stereocomparator the mark is regulated by the observer only, and is not hindered in its movements by any undulations, etc., of the land.

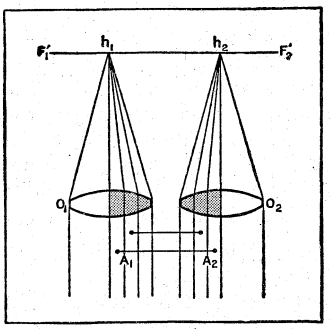
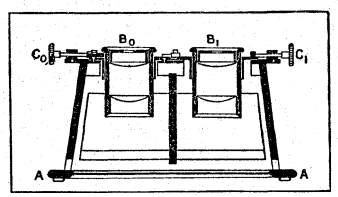


FIG. 21.—HALF LENSES OF BREWSTER'S STEREOSCOPE, ILLUSTRATING THEIR ACTION WHEN VIEWING PICTURES WHICH ARE LARGER THAN THE INTEROCULAR DISTANCE $A_1 A_2$

Applications.—The stereocomparator has a large number of applications; *e.g.*, in mountain photography, coastal measurements, photographing a battle from a ship, geodesy, the study of the waves, investigating the trajectory of a shot, and it is also utilized in railway building or on voyages of discovery, etc. A further advance has been made in the stereophotogrammetric method by providing the stereocomparator with a drawing apparatus (F. C. Thomson, E. Orel, Carl Zeiss and others) with which contours can be automatically drawn from the stereophotogrammetric photographs. As a further application of stereoscopy we may note the utilization of optical effects and disturbance of stereoscopic vision (agitation and lustrous appearances) in the discovery of differences and alterations in pictures. The method was first used by Brewster to recognize irregularities in carpet patterns, and later by Dove and others for distinguishing the original from a copy for testing coins, cheques, etc. Moreover, with the development of celestial photography, the stereoscope came to be applied to the discovery of planets, comets, variable stars, errors in plates, the proper motions and parallaxes of the fixed stars. Indeed a planetoid discovered by its aid was named Stereoscopia in recognition of this application.



FROM MÜLLER-POUILLET, "LEHRBUCH DER PHYSIK" (VIEWIG AND SON)

FIG. 22.—HELMHOLTZ'S STEREOSCOPE

The pictures placed at A are examined at B_0 and B_1 through eyepieces of different focal lengths, which must be adjusted in accordance with the focal length of the lens with which the pictures were taken

Since 1904 binocular observation of stellar plates to determine differences in the images of the objects reproduced has been gradually discarded for the method, derived by Pulfrich, which consists in the monocular observation of the two plates in the stereocomparator with the assistance of the so-called "blink" microscope (fig. 23). In this microscope the two pictures are seen simultaneously or individually by alternately opening the screens B_1 and B_2. All differences of the images are immediately distinguished by a sudden oscillation of the image point, or by a sudden appearance and disappearance of single points, as in the case of flashlights at sea or the modern illuminated sky lights in towns, and there is now no difficulty in discovering new planets, comets and variable stars by this method.

A useful and extensive application of stereoscopic methods is the making of topographic maps from photographs taken from aircraft. The distance between positions of the camera for successive photographs forms a stereoscopic base, sufficiently large that elevations and depressions of the terrain are depicted in strong

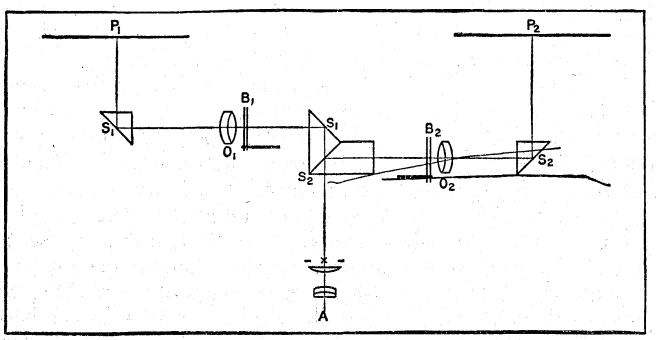
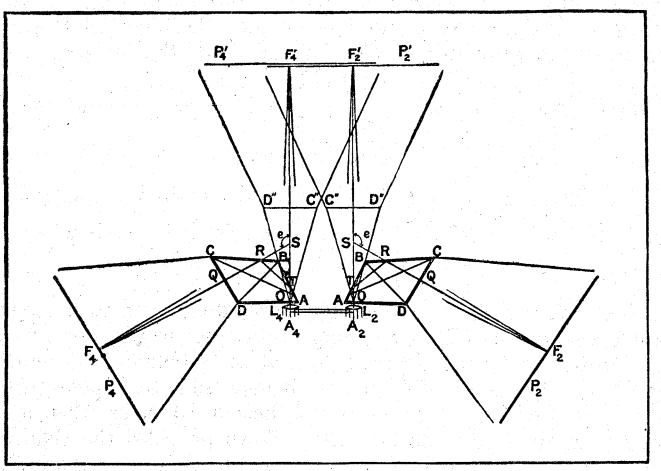


FIG. 23.—PULFRICH'S "BLINK" MICROSCOPE

The two pictures placed on P_1 and P_2 are seen at A either simultaneously or individually by alternately opening the shutters B_1 and B_2. Differences in the two pictures can be easily distinguished thereby

stereoscopic relief. Such stereograms lend themselves readily to accurate stereoscopic measurement. By means of a few ground control points whose vertical and horizontal positions have been determined by ground surveying methods, the vertical and horizontal scales of the stereoscopic photographs can be determined. The stereoscopic pictures are measured by either of two methods. The first utilizes a stereocomparator for drawing contours as mentioned above.

In the second method the negatives of the photographs, mentioned in the previous paragraph, are transformed to positive transparencies on glass. This transformation is accomplished by optically projecting the negative onto the positive plate, great care being taken that all the resulting positives have a definite scale size. A series of these positive pictures is then projected into space by a single projector for each picture. These projectors are set at such angles and distances from each other that the light rays emerging therefrom build up in space a small replica



FROM "ZEITSCHRIFT FUR INSTRUMENTEN KUNDE" (SPRINGER)

FIG. 24.—PULFRICH'S REFLECTING STEREOSCOPE

The two pictures placed at P_2 and P_4 are viewed through eyepieces at A_2 and A_4. By means of two total reflections in prisms ABCD they appear superposed at P_2' and P_4' giving correct impression of depth

of the terrain. This process may be thought of as the reverse of taking the original photographs. This spatial model is projected just above a plotting table on which is placed a small travelling screen capable of being adjusted both horizontally and vertically. In the centre of the screen is placed a small illuminated aperture used as a target. Each of a pair of the stereoscopic pictures is projected in a different colour and the observer wears coloured spectacles, each glass of which is capable of trans-

mitting only one coloured picture to the proper eye, thereby permitting each eye to view only its appropriate picture. The travelling screen is adjusted laterally and vertically so that its small target physically coincides with the spatial model. By setting the screen at a definite height above the plotting table a contour can be followed over the entire model. By means of a tracing pencil attached to the screen the outline of the contour is traced on a sheet of paper placed on top of the plotting table. By selecting various regular heights for the travelling screen a whole series of contours in regular steps of any desired size is produced.

Pulfrich (1912) describes a new form of reflecting stereoscope (fig. 24) in which the main object of the design was to provide stereoscopic apparatus for the examination of large pictures, notably those produced for stereophotogrammetric work and photographs taken by aircraft for the purposes of survey, etc. The instrument resembles the Wheatstone stereoscope (fig. 20), but with the simple reflecting mirror replaced by two mirrors, set at an angle in front of the observer's eyes, whereby the rays are reflected twice and deflected through an angle of 120°. The two mirrors in each half of the instrument have with advantage been replaced by a prism made from a solid block of glass. The instrument can be used for paper pictures or for plates, and is arranged with revolving plate holders for the orientation of photographs taken from aircraft.

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BINOCULAR VISION: *see* VISION.

BINOMIAL FORMULA. Binomial theorem is the name attached to an algebraic formula widely used for transforming and simplifying algebraic expressions and also in processes of approximation.

Positive integral exponents. If a and b stand for any real numbers, and n is a positive integer, then the binomial $(a+b)$, raised to the nth power, can be "expanded" by the formula,

$$(a+b)^n = a^n + na^{n-1}b + \frac{n(n-1)}{2!}a^{n-2}b^2 + \frac{n(n-1)(n-2)}{3!}a^{n-3}b^3 + \ldots + nab^{n-1} + b^n. \qquad (1)$$

By actual multiplication the expressions are easily obtained:—

$$(a+b)^2 = a^2 + 2ab + b^2, \qquad (a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3,$$
$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4.$$

The same results are obtained by substituting for n in Formula 1 successively the values 2, 3, and 4. In other words, Formula 1 is a generalization of the three special cases obtained by multiplication. By the aid of Formula 1 it is possible to dispense with the process of multiplication, which becomes tedious when n is large; the expansion can be written down provided the changes in the exponents and coefficients of the successive terms are observed. These changes are seen to be in accordance with the following laws: (1) the exponents of a are for the successive terms n, $n-1$, $n-2$, ...1, and finally 0 (not written, because $a^0=1$); that is, the exponent of a is n for the first term, and diminishes by unity in each successive term; (2) the exponent of b is 0 in the first term (not written, because $b^0=1$), and is 1, 2, 3, ...$n-1$, n for the terms following; (3) the coefficients are formed according to a slightly more complicated rule. The coefficient of the first term is 1, and that of the second term is n. The coefficient of the third term is obtained by multiplying the coefficient of the second term (n) by the exponent of a in that term ($n-1$), and dividing the product by 2, the number of that term in the series; thus one obtains $\frac{n(n-1)}{2}$. The coefficient of the fourth term is similarly obtained from the third term. Or, generally, the coefficient of the rth term is obtained by multiplying the coefficient of the $(r-1)$th term by the exponent of a in the $(r-1)$th term, and dividing the product thus obtained by $r-1$. In this manner there follows the general expression, for the rth term of the expansion, namely $\frac{n(n-1)\ldots(n-r+2)}{(r-1)!}a^{n-r+1}b^{r-1}$ by the aid of which any term may be written. Thus, if we desire the 4th term, we substitute 4 for r and obtain that term as given in Formula 1. Observing these three rules, it is possible to write down the expansion of a binomial for any power.

Fractional and negative exponents. When the exponent n is a positive fraction, a negative fraction, or a negative integer, the binomial formula retains the same *form* as above, except that there is no last term b^n. In other words, the series now has an unlimited number of terms and is an "infinite series." That there is no end to the series becomes evident from the fact that the coefficient for the rth term, $\frac{n(n-1)\ldots(n-r+2)}{(r-1)!}$, does not become zero when the exponent n is not a positive integer. For example, if $n=\frac{1}{2}$, none of the factors, $(n-1)$, $(n-2)$..., $(n-r+2)$, vanishes, and hence the rth term does not become zero, no matter how large a positive integral value r may represent. For the simpler case which we considered first, when n is a positive integer, say 5, it is easy to see that a term beyond the 5th, say the 7th term in the expansion, has in the numerator a factor $(5-7+2)$ which is zero; hence there really is no 7th term. The same factor zero occurs when r is taken to represent the 8th, 9th, or a term still higher. Thus, for $n=5$, there is a last term in the expansion, namely b^5. Thus far we have considered only rational values of the numbers a, b, and n, but the binomial formula is applicable to irrational values. Sometimes it is convenient to change the form of the binomial formula by letting $a=1$, and $b=x$, a variable. Since all the powers of 1 are 1, the expression becomes, if we also insert the rth term,

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \ldots + \frac{n(n-1)(n-2)\ldots(n-r+2)}{(r-1)!}x^{r-1} + \ldots \qquad (2)$$

When the expansion is an infinite series, the theory of the binomial formula becomes much more difficult. In fact, the expanded form on the right side of the equality sign can be said to be equal in arithmetical value to $(a+b)^n$ or to $(1+x)^n$, on the left side, only when the series is "convergent"; that is, when the sum obtained by adding more and more successive terms of the series approaches a definite finite value as a limit. When that sum does not approach a limit, the infinite series is not convergent, but "divergent," and the series is no longer equal in arithmetical value to $(a+b)^n$ or $(1+x)^n$. In other words, the sign of equality in the formula holds true only when the infinite series II is convergent. The series II is convergent when x is numerically less than 1; it is divergent when x is numerically greater than 1. The intermediate case when x is numerically equal to 1 is less important.

Exponents complex numbers. A still further generalization of the binomial formula is obtained by letting one or all of the letters a, b, x, n represent imaginary or complex numbers, of the type $c+id$, where c and d are real, and where $i \equiv \sqrt{-1}$. The expansion is an infinite series when n is a complex number. Tests of convergence have been found, similar to the ones given above.

History.—The history of the binomial theorem possesses points of interest. For values of a, b, and n, which may be integral or fractional, the formula was first given by Sir Isaac Newton in a letter of June 13, 1676, and explained further in a letter of Oct. 24, 1676, both addressed to H. Oldenburg, then secretary of the Royal Society of London. Newton's notation was somewhat different from that of to-day. The statement is frequently made that the binomial theorem is engraved on New-

ton's tomb in Westminster Abbey, but there is no such inscription. Newton gave no proof of the theorem, but verified it by actual multiplication and root extraction. The beginnings of the binomial theorem are found long before the time of Newton. The Indians and Arabs used the expansion of $(a+b)^2$ and $(a+b)^3$ for root extractions. Vieta knew the expansion of $(a+b)^4$. B. Pascal derived the binomial coefficients from the method of what is called the "arithmetical triangle," published posthumously in 1665, but the arithmetical triangle is found before Pascal as early as 1303 in a Chinese tract by Chu Shih-Chieh.

The first proof of the binomial formula for the case of positive integral exponents was given by Jakob (James) Bernoulli (1654–1705) in his posthumous work, the *Ars conjectandi,* 1713, p. 89. When the formula is an infinite series, rigorous proofs are much more difficult, because they necessarily involve considerations of convergence. The general proof given by Leonhard Euler (*Novi comment. Petrop.,* vol. xix for 1774, p. 103) and other writers of the 18th century dealt mainly with the form of the expansion and did not adequately consider the question of the equality of the arithmetical values on the two sides of the equation. The earliest one to give a rigorous proof of the general case was the Norwegian mathematician Niels Henrick Abel, in *Crelle's Journal,* vol. 1, 1826, p. 311. It is a remarkable article of 28 large quarto pages, and it establishes the theorem not only when the exponent n is integral, or fractional, or negative, but also when the exponent is a complex number, and when a and b may likewise be complex numbers. (F. CA.)

BINTURONG (*Arctictis binturong*), the single species of the genus, ranging from Nepal through the Malay Peninsula to Borneo and Java. This animal is allied to the palm civets, but differs from that family by its tufted ears and long, bushy, prehensile tail, which is thick at the root and almost equals in length the head and body together (from 28 to 33 in.). The fur is long, and coarse, of a dull black with a gray wash on the head and forelimbs. In habits the binturong is nocturnal, inhabiting forests, and living on small vertebrates, worms, insects and fruits.

BINYON, LAURENCE (1869–1943), English poet, art historian and civil servant, born at Lancaster on Aug. 10, 1869, was educated at St. Paul's school, London, and Trinity college, Oxford, where he won the Newdigate prize in 1890 for his *Persephone.* He entered the department of printed books at the British Museum in 1893, and was transferred to the department of prints and drawings in 1895. He was in charge of oriental prints and drawings (1913–32), and became one of the greatest living authorities on the subject. Among his principal contributions to the history of art, outside the great official catalogue of English drawings (4 vols. 1898 *seq.*), and that of Japanese woodcuts (1917) in the British Museum, are his various books on Chinese, Japanese and Indian art, and on the drawings and engravings of William Blake. Binyon was also famous as the author of a series of volumes of verse, and was a pioneer in an effort to restore blank verse drama to the modern English stage. The first of these to be staged was *Paris and Oenone* (1906); *Boadicea* was produced, 1925. His *Collected Poems* appeared, 1931. He was Keeper of Prints and Drawings, British Museum, 1932–33; created a Companion of Honour, 1932. During 1933–34, he taught poetry at Harvard. He died March 10, 1943.

BÍO-BÍO, an inland province of southern Chile which underwent several boundary changes. It is (1943) bounded N. by the provinces of Ñuble and Concepción, W. by Arauco, S. by Malleco, E. by Argentina. Area 4,343 sq.mi. of wooded and mountainous country. The climate is cool and rainy, and timber is a principal product of the region. Pop. (1940) 127,312. The Southern railway, which runs from Santiago to Puerto Montt, crosses the western part of the province and connects it with the port of Concepción. The capital, Los Angeles, is about 15½ mi. E. of this railway and is connected with it by a branch line.

BÍO-BÍO, a river of southern Chile, rising in the Pino Hachado pass across the Andes, 38° 45′ S. lat., and flowing in a general northwesterly direction to the Pacific at Concepción, where it is 2 mi. wide and forms an excellent harbour. It has a total length of about 225 mi., nearly one-half of which is navigable.

BIOCHEMISTRY. Biochemistry may be defined as the study of the chemical or physicochemical processes which play a part in the life phenomena of plants and animals. The subdivision of the science of chemistry into a number of special branches, physical, inorganic, organic, biological, etc., has been the natural consequence of the rapid advances in knowledge which have been made since about 1870. Although the study of the chemical aspect of the physiology of living organisms has only been generally termed biochemistry since 1900, it is actually one of the oldest branches of chemical science.

Lavoisier.—Disregarding events which occurred before the birth of modern chemistry at the end of the 18th century, we find that Antoine L. Lavoisier, the creator of the new science, spent no small portion of his time in prosecuting biochemical research. He showed clearly for the first time that the life-processes of the animal body can be investigated by chemical means, for he proved by quantitative methods that the body temperature is maintained by the combustion of foodstuffs just as the heat generated in the burning of wood or a candle is produced by the oxidation of organic matter. The first half of the next century produced three outstanding figures, whose united labour extended widely the foundations on which the modern study of biochemistry is based. In the first place Justus von Liebig, carrying back with him from Paris to Germany the inspiration gained by contact with those who had been students or colleagues of the great Lavoisier, not only established the study of organic chemistry, on which biochemistry is dependent, but opened up wide avenues of research on problems of plant and animal chemistry.

Liebig.—In 1837, at the request of the British Association for the Advancement of Science, he undertook to prepare a report on the state of knowledge in organic chemistry. This led to the publication in 1840 of his memorable work *Die Chemie in ihrer Anwendung auf Agrikultur und Physiologie,* followed in 1842 by *Die Thierchemie, oder die organische Chemie in ihrer Anwendung auf Physiologie und Pathologie.* These two classics mark clearly the point at which the study of plant and agricultural chemistry on the one hand, and that of animal chemistry on the other, first attracted wide interest among scientists in general and chemists in particular. August W. von Hofmann, speaking of this great chemist said, "In the study of biology, vegetal and animal, Liebig was the first to disentangle intricacies that had before seemed problems beyond the grasp of human intellect to solve; and it was one of the grandest results of his philosophical and experimental investigations that he traced, amid the multitudinous and apparently ever-varying manifestations of life, in its countless modifications of kind and degree, the operation of a few simple laws, physical and chemical, affording, by their determinate combination, the precise and proved conditions of vital development, nutrition, growth, and perpetuation from generation to generation, in unaltered individuality."

Claude Bernard and Pasteur.—At this time progress in this field of thought was still hampered by the persistence of ideas favouring the existence of a *vital force.* The first blow to shatter these theories was dealt by Friedrich Wohler in 1828 when he announced the synthesis from inorganic materials of urea, a typical animal product for the formation of which some influence exerted by the vitality of the organism had, until then, been considered essential. The belief in a *vital force* or *vital principle* would have died slowly had it not been for the brilliant series of researches in experimental physiology that have made the work of Claude Bernard immortal. The third figure is the illustrious Louis Pasteur, whose researches on fermentation, putrefaction and disease revealed not only the organisms that gave rise to these conditions, but also, in many cases, the chemical or physicochemical changes that occurred.

During the second half of the 19th century researches in plant and animal chemistry were prosecuted with increasing vigour. Unfortunately, however, there was a tendency for the studies in each field to be kept apart from the other, and there were comparatively few investigators of that period who were sufficiently broad in their outlook to attempt to view the problems from the standpoint of the cell rather than from that of the animal or plant.

Much progress was made in both animal chemistry or, as it was usually termed, physiological chemistry, and in plant and agricultural chemistry, but there were few attempts at correlation.

The 20th Century.—The more general appreciation of the need of a wider outlook seems to have become apparent at the opening of the 20th century, when the term biological chemistry or biochemistry began to displace the older terms. In Great Britain the Biochemical Club, now the Biochemical Society, was founded in 1912, six years after the appearance of the first volume of *The Biochemical Journal.* The corresponding scientific journals in the United States and Germany, *The Journal of Biological Chemistry* and *Biochemische Zeitschrift,* also appeared for the first time in that year. The rapid advance of the new branch of chemistry can be illustrated by the growth of *The Biochemical Journal,* of which the first volume (1906) contained 32 papers, amounting in all to 495 pages of printed matter, whereas the volume for 1926 contained 171 papers and a total of 1,376 pages.

Chemical Processes in the Cell.—The study of the chemical processes occurring in living cells or brought about in the external medium by their action has all along been dependent to a very large extent on the rate of advance in our knowledge of organic and physical chemistry. The contents of the cell, known generally as protoplasm, represent to the chemist a mixture of such complexity that despair of ever gaining any clear conception of its actual composition might well be pardoned. Not only is the task one of great difficulty by reason of the wide variety of substances which are to be found present in cells, but also because a large proportion of those compounds exist in the cell in the condition known as the colloidal state. (*See* COLLOIDS.)

Conditions of Progress.—Progress in biochemistry has, therefore, been dependent to a large extent on the rate of advance of knowledge in the neighbouring fields of organic and physical chemistry. One example may make this clear. A large proportion of the solid material of cellular contents is composed of complex nitrogenous substances termed collectively the proteins. No satisfactory theory regarding their significance in living cells could be advanced until information concerning both the molecular structure of the proteins and their physical properties as colloids had been obtained. The former was provided by the classic researches of the great German chemist Emil Fischer, who revealed, by his analytical studies, that the proteins are large, complex molecules formed by the intercombination of a number of amino-acids by virtue of the basic and acidic groupings. Although it is still uncertain whether the only form of linkage between the constituent amino-acids in the protein molecule is that described by Fischer, it is apparent that it is by far the most common and a very important one. His work has given us a general picture of the internal structure of the protein molecule that is in agreement with the vast majority of known facts concerning its chemical properties.

Parallel with these researches in the field of organic chemistry on the constitution of the proteins, extensive investigations were being made in many quarters on the colloidal properties of these remarkable substances. As a result of this work it has at last been possible to attack with reasonable chances of success the major question concerning the rôle of the proteins in the living cell.

In general, it can be seen that advance in biochemistry has followed much the same path that has been traced by the growth of other branches of experimental science. Broadly speaking, the development can be divided into two phases, the descriptive phase and the quantitative phase. In the former period the efforts of investigators were devoted mainly to the isolation of the substances present in living tissues and to the investigation of their nature and properties, whilst in the later phase attention has been more and more given to elucidating their significance in the organism and to the quantitative examination of the dynamics of the reactions in which they are concerned.

The study of biochemistry may be regarded as having very definitely entered the second phase about 1910, for in almost any journal devoted to this branch of science the great proportion of the papers published at the present time are devoted to the study of the dynamics of cellular reactions. The importance of pursuing this line of study must be apparent when it is borne in mind that it is particularly by reason of the extraordinary complexity and variety of the energy exchanges that occur in even the simplest cell that living matter is best differentiated from non-living.

Definition of Life.—From the earliest time philosophers have attempted to define life, without one wholly satisfactory definition having been advanced. To-day the difficulties of their task can be appreciated because it becomes increasingly evident that there is no clear line of demarcation between the living and the non-living. Nevertheless, as Claude Bernard indicated in his striking essay on the "Phenomena of Life," there are a number of properties of living matter which, taken collectively, serve as a rough and ready means of differentiating it from systems relatively inert. These are: (1) Assimilation and respiration; (2) reproduction; (3) growth and development; (4) movement; (5) secretion and excretion.

Considered singly, it is obvious that no one of these is in itself characteristic of living matter alone, but as yet no system that could be considered in the light of present opinion a non-living one has been found to exhibit all together. It may serve to show the scope of modern biochemistry if examples be given of the application of the new branch of science to the study of the chemical aspect of these phenomena of life.

Assimilation Processes.—The biochemical study of assimilation has somewhat naturally fallen into two sections, depending upon whether plants or animals are being considered. The power possessed by green plants to synthesize complex organic substances from carbon dioxide, water and simple inorganic salts, such as nitrates, sulphates and phosphates, places them in a class apart from other beings and calls for particular study. The essential difference is, of course, that for the synthesis of organic matter from carbon dioxide a supply of energy is necessary—the reaction being an endothermic one. Comparatively long ago it was recognized that the source of this supply of energy is the sun, but only recently has the knowledge of the nature of the pigments in the leaf, of the absorption of energy in the form of light by these pigments, of the mechanism of absorption of carbon dioxide by the leaf and of the nature of the substances formed during assimilation, enabled biochemists to construct reasonable theories as to the process of photosynthesis in green plants. In this field much remains to be done. In spite of many strong indications that the first step in carbon assimilation is the photochemical reduction of carbon dioxide to formaldehyde, precise confirmation is lacking. The efficiency of the process is also undetermined. Early investigators believed it to be of the order of 3–5%, but Warburg has recently recorded that the value may be much higher under optimum conditions.

Chlorophyll.—There is also the question of the origin of the chlorophyll pigments in relation to their rôle as energy absorbers and transformers. Obviously so complex a molecule as Willstätter's researches revealed chlorophyll to be must have an exceedingly long evolutionary history. From what type of substance is it descended? At a very early period in the history of living organisms it is probable that supplies of energy for assimilation of carbon dioxide and formation of organic substances were derived not from the absorption of solar radiation by suitable pigments, but from simple exothermic chemical reactions of the type exhibited by the existing species of autotrophic bacteria. (*See* BACTERIOLOGY.) These remarkable organisms, amongst which are grouped certain of the sulphur bacteria, the nitrite bacteria and the hydrogen bacteria, possess the power to carry out simple reactions, such as the oxidation of sulphur to sulphates, ammonia to nitrites, and hydrogen to water, and to use the energy liberated by these reactions to effect the conversion of carbon dioxide into organic matter. It is also interesting to note that certain of the sulphur bacteria contain a pigment, bacterio-purpurin, which appears to function somewhat in the manner of chlorophyll in higher plants, when the bacteria are exposed to the light, whereas in the dark these organisms satisfy their energy requirements by the oxidations referred to above. Possibly these species represent the transitional forms that ultimately led to the evolution of the assimilatory system of the green plant. Little as is our knowledge of the synthesis of carbon compounds in green plants, it is pro-

found when compared with that concerning the formation of substances containing other elements, in particular nitrogen. We are, to all intents and purposes, entirely ignorant of the mode of formation in the plant of the great groups of the proteins, alkaloids and plant bases.

Animal Assimilation.—The outstanding fact that the animal organism is essentially analytic and not synthetic as is the green plant, has, of course, been recognized for many years. The study of assimilation by the animal becomes, therefore, to a large extent, the study of the breakdown, or metabolism, as it is termed, of the foodstuffs that are ingested by the organism to supply, on the one hand, the energy for heat production or work and, on the other, the molecular units required to construct or maintain its tissues.

Biochemical investigations of assimilation in the animal world have made rather more rapid progress than corresponding efforts in the field of plant chemistry. To a large degree this is due to the fact that, in the higher animals at least, it is to some extent possible to follow the fate of substances by examining the body fluids, the individual organs, or, more particularly, the excretions.

Food Metabolism and Enzymes.—The study of the metabolism of foodstuffs in the animal body represents a large and important branch of biological chemistry. It entails in the first place an examination of the mode of action of the remarkable catalytic agents possessed by the living cell and termed enzymes (*see* ENZYMES), by means of which the complex molecules of the proteins, polysaccharides, and fats are broken down so that the simpler molecules of amino-acids and sugars can pass through the absorbing membranes of the alimentary canal.

Mechanism of Absorption.—The actual mechanism of absorption of substances into the tissue fluids must then be studied, after which we must enquire into the fate of the molecules that have been assimilated. Some of these go to form tissues that are being constructed, especially during the period of growth; of the others, the great majority are in due course oxidized so that the energy liberated by their oxidative degradation may be available for maintaining body temperature, or for the performance of work. A whole field of biochemistry is concerned with the mechanisms by which organic molecules are oxidized in the living cell to carbon dioxide and water, for a large proportion of the substances that are rapidly and fully oxidized in the tissues at temperatures below 40° C are oxidized only by drastic treatment with chemical reagents and by the employment of high temperatures when subjected to experiment in the test tube.

Respiration Processes.—It was discovered by the researches of Mayow, Priestley and Lavoisier that living creatures support life by the process of respiration, in which oxygen is taken into the system, and the product of oxidation of organic matter, carbon dioxide, is given off. To-day it is recognized that respiration is in no way peculiar to living tissues, for many non-living systems can be constructed that will absorb oxygen and eliminate carbon dioxide under conditions more or less comparable with those under which the living cells respire. The very striking experiment described in recent years by the distinguished German chemist Otto Warburg may be taken as an illustration. The oxidation of certain substances which are oxidized in the body, *e.g.*, certain amino-acids, will take place along apparently similar paths, at any rate leading to the formation of carbon dioxide and ammonia, when their aqueous solutions are shaken with carefully prepared charcoal in a fine state of division. A measure of the oxygen absorbed and of the carbon dioxide evolved in such cases is as truly a measure of the respiration of the charcoal as a determination of the respiratory quotient is an indication of the oxidative activity of a living tissue. The parallel becomes even more remarkable when it is learned that the respiration of the charcoal particles can be depressed by the addition of narcotics or poisons in a manner entirely comparable with the influence of these substances on the respiration of living cells.

Origin of Circulatory System.—The biochemical study of respiration is, however, a problem presenting many aspects. Primarily it is necessary to investigate the means by which the oxygen is brought to the cells, a task that widens on every hand and takes us into many fields. The cells of the simpler forms of life draw their supplies of oxygen direct from solution in the surrounding fluid, but for more complex organisms this would not suffice, and methods of distributing the oxygen to tissues more remote from the external medium have evolved. Thus arose the circulatory system of animals. Simple air-breathing species dependent on the diffusion into the tissue spaces of oxygen from a more or less complicated system of tracheal tubes, gave rise to more complex organisms requiring the evolution of the lung with its enormous diffusion surface. Even this would have been insufficient to supply the oxygen requirements of the majority of animals if oxygen carriers of the type of haemoglobin had not been evolved to enable the circulating fluid to carry round to the tissues ample oxygen for their needs.

Haemoglobin and Respiratory Pigments.—A field of biochemical research that attracts wide attention at the present time concerns the respiratory pigments, of which the haemoglobins are the best known examples. These substances may serve a dual rôle by acting as oxygen carriers and as catalysts of oxidation reactions. The latter seems particularly true of a remarkable pigment that has been found present in every form of life yet examined. Discovered in 1884 by MacMunn and exhaustively studied by him, its significance, as a substance related to haemoglobin and as an important factor in the oxidation reactions in the cell, which he emphasized, escaped notice until attention was again drawn to it by the recent studies of Keilin. The occurrence of cytochrome, as Keilin has renamed this pigment, in plant as well as animal cells indicates that its significance is probably fundamental; it seems likely that it occupies an important position in the evolutionary history of the haemoglobins. But the interest of the biochemist cannot stop with the study of the mechanisms by which oxygen is brought to the cells or held there; he must enquire how the oxygen is made available in the cell for oxidations.

Action of Oxygen.—Atmospheric oxygen, whether obtained direct from solution in the surrounding medium, or by the dissociation of such a pigment as oxyhaemoglobin, is relatively inert as an oxidizing agent. Of the foodstuffs oxidized in living cells only very few are appreciably attacked by oxygen in the molecular form O_2; the unsaturated fatty acids present in such oils as cod liver oil and linseed oil are examples of compounds that take up molecular oxygen, but the extent to which they are oxidized is very small when compared with the complete degradation to carbon dioxide and water that occurs with ease in the animal body. Early in the 19th century Schönbein, in his studies of ozone, pointed out that oxygen must in some manner be activated before it is able to effect the majority of oxidations, and this view, in one form or another, has formed the basis of the many theories of oxidation that have been advanced since his time. We are still without clear ideas regarding the mechanism of activation of molecular oxygen which the living cell possesses, but the studies of Warburg on tissues and on the charcoal model to which reference has been made suggest that minute traces of iron and possibly of other heavy metals such as copper play an important part in the process.

Oxidative Mechanisms.—This brings us in a natural sequence to refer to the oxidative mechanisms which the living organism possesses. In the first place, there are the oxidizing enzymes, the oxidases, a group of catalysts, many of them of a highly specific character, capable of oxidizing with great rapidity under suitable conditions a wide variety of substances. The biochemical examination of the oxidases has been extensive, and has, particularly in recent years, given us considerable information how molecules such as those of tyrosine, xanthine and uric acid are oxidized. According to the recent work of Thunberg, Battelli and Stern the cell possesses, in addition to the recognized type of oxidase, other types of oxidative catalysts of a thermolabile nature. It would appear, however, from the results of the researches of Sir Gowland Hopkins and of Meyerhof that there are also present in the cells of plants and animals oxidative reductive systems which are thermostable. The remarkable substance glutathione, discovered by Hopkins, probably plays an important part in these last-mentioned systems.

Reproduction.—Turning now to the second characteristic of life in our list, namely, reproduction, we find we are considering a phenomenon which might well, at first sight, appear to be outside the scope of experimental attack by biochemists. Surely in the processes underlying reproduction, if anywhere in the realm of biology, might be traced the "vital force" or "entelechy" that would at almost every turn frustrate experimental attack. The clear demonstration that such is not the case, and that the problems of fertilization and reproduction are no less open to experimental biochemical investigation than those of digestion or respiration, we owe to the remarkable work of the great experimental biologist Jacques Loeb. His investigations on the influence of the composition of the surrounding medium on the reproductive cells of certain marine animals dispel any doubt that many of the problems of fertilization, of specificity and of inheritance will in time be solved, and to a large extent by biochemical methods. (*See* CYTOLOGY; EXPERIMENTAL EMBRYOLOGY.)

Can this be doubted when we recall that the migration of the sperm to the egg has been shown to be directed by the physico-chemical action of certain substances derived from the latter; that the penetration of the ovum by the sperm can be controlled by altering the composition of the surrounding fluid, even to the extent of permitting the admission of a sperm cell foreign to the egg; that the mechanical act of penetration performed by the sperm, and resulting in the almost explosive outburst of oxidative activity that marks the initiation of fertilization, can be reproduced by perforation with needles so successfully that numbers of male frogs have been reared to adult size from eggs so fertilized? Considering these striking facts, and at the same time bearing in mind the mass of evidence that is accumulating on every side to show how the development of the reproductive cells is under chemical control in the body and how these tissues themselves exert by chemical means a far-reaching control on the development and functions of other tissues, no reasonable doubt can be entertained that the phenomena associated with reproduction are open to biochemical investigation.

Genetic Problems.—Many of the closely associated problems of genetics are also well within the biochemist's purview, as can readily be judged by giving one or two examples. The inheritance of colours, whether we are thinking of the blue, red or purple colours of flowers or the black and brown markings of animals, has been shown to depend on the inheritance of a physico-chemical system capable, under ordinary conditions, of producing the colour. Some of these systems and the mechanism of their action are fairly well understood. The systems may be more or less complex in character, but unless they are complete the mechanism for the production of the colour cannot function normally. Thus, for example, two white flowers from different plants of the same species may lack colour because one component of the colour-producing system is absent. If the missing factor is the same in both cases, crossing will not result in the production of coloured flowers, but if their deficiencies are complementary, the seeds produced on cross fertilization will yield plants with coloured flowers. The mechanisms concerned in the production of both animal and plant colours have been extensively studied *in vitro*, and are to some extent understood.

Growth and Development.—The biochemical study of growth and development has been followed along many paths. The influence of the composition of the soil on plant growth has attracted wide attention ever since the classic researches of Liebig were published. To-day the agricultural biochemist not only studies the significance of the more obviously essential constituents of the soil, such as nitrates, phosphates, etc., but is concerned to no little extent with the influence which apparently insignificant amounts of other substances may have. The curious fact that the broad-bean plant will not grow to full maturity without a minute amount of the element boron being present in the soil is an example of what has already resulted.

Chemical Control.—The biochemical study of the growth and development of animals provides many examples of both these aspects of the chemical control of growth. On the one hand the energy requirements of animals during the period of growth have been investigated in great detail, whilst on the other, it has been ascertained that a normal development is dependent on the satisfaction of a number of clearly defined requirements.

Growth Factors.—A small but definite amount of the amino-acid tryptophane, a constituent of some, but not all, proteins, is necessary for growth of young animals, and the provision of any amount of a protein deficient in that particular building stone will fail to induce growth unless the missing unit is provided from some other source. Many biochemists at the present time are engaged in investigating the remarkable influence which the substances known as the vitamins have on the growth and nutrition of animals. The number of these substances that are generally accepted as being clearly differentiated is already five and probably more exist as yet undiscovered. Their chemical nature remains unknown, and we are also ignorant as to the actual part they play in the economy of the organism. (*See* VITAMINS.)

Lastly, there is a chemical aspect of growth in the investigation of the influence of inorganic elements on animal development. Problems such as the rôle of traces of iodine in inducing normal development of the thyroid gland, and the manner in which lime salts are deposited in growing bone illustrate the type of question in this field that calls for an answer from biochemists.

Movements.—Study of the chemical or physico-chemical factors inducing the movements of plants and animals covers a wide field of experimental research, ranging from control of the movements of free-swimming unicellular organisms to the unravelling of the complex series of events that occur during a muscle twitch in higher animals.

Little is known, at the present time, of the factors determining the growth movements of plants beyond Loeb's having shown by his researches on regeneration in *Bryophyllum* that chemical factors probably play a part in the directional growth of shoots and roots. The movements of many forms of simple animals can be to a certain extent controlled by making alterations in the composition of the medium in which they exist, as, for example, when the water flea, *Daphnia,* which normally swims away from the light moves in the reverse direction when carbon dioxide is bubbled through the water. Another remarkable example also described by Loeb is that of the larvae of *Porthesia,* which in the starving condition are attracted toward light and climb high up the stems of the plant on which they customarily feed, but which, having fed on the leaves, become negatively heliotropic and at once descend again to the darker regions. By starving them or by feeding on the leaves of the plant they can in the laboratory be made at will to move toward or away from a source of light.

Mechanism of Muscular Movement.—Turning to what we may regard as the other corner of this field, namely, the biochemical investigation of the mechanism of muscular movement in animals we find one of the most complete chapters of modern biochemistry. The long series of researches of outstanding merit by Hopkins and Fletcher, Meyerhof and A. V. Hill have taught us how the glycogen of muscle is broken down to sugar; how the sugar, passing through the intermediate stage of being combined with phosphoric acid, gives rise to the lactic acid that initiates the contraction, and how these anaerobic changes are followed by an oxidative phase of recovery during which part of the lactic acid passes back into its precursor, whilst the remainder is oxidized to carbon dioxide and water. These changes have been followed with such precision by chemical and physical methods that the heat production of the muscle during the whole cycle has been accounted for with considerable exactitude by a knowledge of the heat exchanges of the chemical reactions which are believed to occur. In spite of these carefully compiled results, we are as yet ignorant of the actual processes involved when the muscle fibre shortens in contraction.

Hormones.—The processes of secretion and excretion have been the subject of extensive biochemical research, although mainly on animal tissues. The discovery by Starling and Bayliss of the agents known as hormones (*q.v.*) showed for the first time how important a part such chemical messengers play in the co-ordinating mechanisms of the higher animals. Their discovery of secretin, the substance of, as yet, undetermined nature which is

produced in the mucosa of the upper part of the small intestine under the stimulus of the entry of acid food-material from the stomach, and which, passing into the blood stream, invokes, in a very short space of time, the secretion of the digestive juice of the pancreas, has paved the way for the discovery by Banting and Best of the internal secretion of the pancreas itself, and more recently of that of the internal secretion of the parathyroid gland by Collip. Few more striking examples of the service of chemistry to the study of biological problems concerning human welfare could be given than the discovery of the nature of adrenalin and its synthesis by Takamine, and the isolation of a specific substance of the thyroid gland (thyroxin) by Kendall and the more recent demonstration of the chemical constitution of this remarkable substance and its synthesis by Harington. Viewed as a whole, the regulatory action (*see* ENDOCRINOLOGY) exerted by the secretions of the various glands and tissues of the higher animals is seen to be one of the most delicately balanced nature, but it is one that is quite definitely open to chemical investigation.

Excretory Processes.—The processes of excretion by which living organisms rid their tissues of waste products have, as yet, been scarcely investigated at all in plants. In animals, more particularly in the mammals, they have been extensively examined from the biochemical standpoint. The secretion of urine, the work done by the kidney in this process, the chemical and physico-chemical principles underlying the concentrations of waste products that appear in the excreted fluid, all these have been the subject of prolonged and fruitful investigation.

Secretory Processes.—Of no less interest are problems concerning the secretion by living cells, such as the gastric mucosa of animals, of fluids containing appreciable concentrations of free mineral acids. These questions are intimately bound up with the very general one concerning the mechanisms by which the reaction of the body fluids is maintained within narrow limits. The study of the system of amphoteric colloids and simple electrolytes that constitute the tissue fluids of animal or plant tissues has, from the standpoint of physical chemistry, been almost exhaustive, and the analysis, step by step, of the influence of the many factors playing a rôle in the cycle of changes that occurs in blood during its circulation in the bodies of animals stands as one of the most impressive tributes to the application of the rigid, quantitative methods of modern physical chemistry to problems of outstanding biological importance. Many other spheres of extensive biochemical work might be mentioned, but it will be sufficient if brief reference be made to the chemical investigations of fermentation and bacterial changes.

Fermentation Processes.—To-day, as a result of the researches of Harden and Young in Great Britain, of Fernbach in Paris, and of C. Neuberg in Germany, we are in possession of a reasonably clear idea of the stages by which the sugar molecule is broken down to yield alcohol and carbon dioxide when fermented by yeast. Most of the intermediate products have actually been isolated and their part in the process proven. Of particular interest is the fact that the most recent work on the fermentation of sugar by yeast and on its degradation in the cells of the animal body points to the essential steps in the breakdown of the carbohydrate molecule being the same in both cases.

Probably in no other field of research in biochemistry have so many striking examples been found as in that of fermentation chemistry, of the course of a reaction being changed by alterations in the conditions of the experiment. Certain of these diversions of the normal course of events have proved of considerable economic value, as, for example, when, during the World War, German scientists were able to prepare considerable quantities of glycerol from sugar by causing inhibition of the fermentation at a certain stage by the addition of sulphites.

Apart from the alcoholic fermentations there are numerous other processes, many of them of considerable technical importance, in which the action of the bacteria (*see* BACTERIOLOGY) or other micro-organisms is the subject of biochemical research.

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(J. C. D.)

BIOGENESIS, a biological term for the theory according to which each living organism, however simple, arises by a process of budding, fission, spore-formation or sexual reproduction from a parent organism. Under the heading of ABIOGENESIS (*q.v.*) is discussed the series of steps by which the modern acceptance of biogenesis and rejection of abiogenesis has been brought about. No biological generalization rests on a wider series of observations, or has been subjected to a more critical scrutiny than that every living organism has come into existence from a living portion or portions of a pre-existing organism. In the articles REPRODUCTION and HEREDITY the details of the relations between parent and offspring are discussed. There remains for treatment here a curious collateral issue of the theory. It is within common observation that parent and offspring are alike: that the new organism resembles that from which it has come into existence: in fine, biogenesis is homogenesis. Every organism takes origin from a parent organism of the same kind. The conception of homogenesis, however, does not imply an absolute similarity between parent and organism. In the first place, the normal life-cycle of plants and animals exhibits what is known as alternation of generations, so that any individual in the chain may resemble its grand-parent and its grand-child, and differ markedly from its parent and child. Next, any organism may pass through a series of free-living larval stages, so that the new organism at first resembles its parent only very remotely, corresponding to an early stage in the life-history of that parent. (*See* EMBRYOLOGY; LARVA and REPRODUCTION.) Finally, the conception of homogenesis does not exclude the differences between parent and offspring that continually occur, forming the material for the slow alteration of stocks in the course of evolution (*see* VARIATION and SELECTION). Homogenesis means simply that such organism comes into existence directly from a parent organism of the same race, and hence of the same species, sub-species, genus and so forth.

From time to time there have been observers who have maintained a belief in the opposite theory, to which the name heterogenesis has been given. According to the latter theory, the offspring of a given organism may be utterly different from itself, so that a known animal may give rise to another known animal of a different race, species, genus, or even family, or to a plant, or *vice versa*. The most extreme cases of this belief is the well-known fable of the "barnacle-geese," an illustrated account of which was printed in an early volume of the Royal Society of London. Buds of a particular tree growing near the sea were described as producing barnacles, and these, falling into the water, were supposed to develop into geese. The whole story was an imaginary embroidery of the facts that barnacles attach themselves to submerged timber and that a species of goose is known as the barnacle goose. In modern times the exponents of heterogenesis have limited themselves to cases of microscopic animals and plants, and in most cases the observations that they have brought forward have been explained by minuter observation as cases of parasitism. No serious observer, acquainted with modern microscopic technical methods, has been able to confirm the explanation of their observations given by the few modern believers in heterogenesis. (P. C. M.)

BIOGRAPHY, that form of history which is applied, not to races or masses of men, but to an individual. The idea of the distinction between biography and history is a modern thing; we speak of "antique biography," but it is doubtful whether any writer of antiquity, even Plutarch, clearly perceived its possible

existence as an independent branch of literature. All of them, and Plutarch certainly, considered the writing of a man's life as an opportunity for celebrating, in his person, certain definite moral qualities. It was in these, and not in the individual characteristics of the man, that his interest as a subject of biography resided.

The true conception of biography, therefore, as the faithful portrait of a soul in its adventures through life, is very modern. We may question whether it existed, save in rare and accidental instances, until the 17th century. The personage described was, in earlier times, treated either from the philosophical or from the historical point of view. In the former case, rhetoric inevitably clouded the definiteness of the picture; the object was to produce a grandiose moral effect, to clothe the subject with all the virtues or with all the vices; to make his career a splendid example or else a solemn warning. The consequence is that we have to piece together unconsidered incidents and the accidental record of features in order to obtain an approximate estimate. We may believe, for instance, that a faithful and unprejudiced study of the emperor Julian, from the life, would be a very different thing from the impression left upon us by the passions of Cyril or of Theodoret. In considering what biography, in its pure sense, ought to be, we must insist on what it is not. It is not a philosophical treatise nor a polemical pamphlet. It is not, even, a portion of the human contemporary chronicle. Broad views are entirely out of place in biography, and there is perhaps no greater literary mistake than to attempt what is called the "Life and Times" of a man. In an adequate record of the "times," the man is bound to sink into insignificance; even a "Life and Times" of Napoleon I. would be an impossible task. It fills its canvas with one figure, and other personages, however great in themselves, must always be subsidiary to the central hero. The only remnant of the old rhetorical purpose of "lives" which clearer modern purpose can afford to retain is the relative light thrown on military or intellectual or social genius by the achievements of the selected subject. Even this must be watched with great care, lest the desire to illuminate that genius, and make it consistent, should lead the biographer to gloss over frailties or obscure irregularities. In the old "lives" of great men, this is precisely what was done. If the facts did not lend themselves to the great initial thesis, so much the worse for them. They must be ignored or falsified, since the whole object of the work was to "teach a lesson," to magnify a certain tendency of conduct. It was very difficult to persuade the literary world that, whatever biography is, it is not an opportunity for panegyric or invective, and the lack of this perception destroys our faith in most of the records of personal life in ancient and mediaeval times. It is impossible to avoid suspecting that Suetonius loaded his canvas with black in order to excite hatred against the Roman emperors; it is still more difficult to accept more than one page in three of the stories of the professional hagiographers. As long as it was a pious merit to deform the truth, biography could not hope to flourish.

Among the ancients, biography was not specifically cultivated until comparatively later times. The lost "Lives" of Critias were probably political pamphlets. We meet first with deliberate biography in Xenophon's memoirs of Socrates, a work of epoch-making value. Towards the close of the 1st century, Plutarch wrote one of the most fascinating books in the world's literature, his *Parallel Lives* of 46 Greeks and Romans. In later Greek, the *Life of Apollonius of Tyana* was written by Philostratus, who also produced *Lives of the Sophists*. In the 3rd century, Diogenes Laertius compiled a *Lives of the Philosophers,* which is of greater interest than a *Lives of the Sophists* composed 100 years later by Eunapius. Finally in the 10th century, Suidas added a biographical section to his celebrated *Lexicon*. In Latin literature, the earliest biography we meet with is the fragment of the *Illustrious Men* of Cornelius Nepos. Memoirs began to be largely written at the close of the Augustan age, but these, like the *Life of Alexander the Great,* by Q. Curtius Rufus, were rather historical than biographical. Tacitus composed a life of his father-in-law, Agricola; this is a work of the most elegant and stately beauty. Suetonius was the author of several biographical compilations, of which the *Lives of the Caesars* is the best known; this was produced in the year 120. Marius Maximus, in the 4th century, continued the series of emperors down to Heliogabalus, but his work has not been preserved. The *Augustan History,* finished under Constantine, takes its place, and was concluded and edited by Flavius Vopiscus.

English Biographies.—Biography hardly begins to exist in English literature until the close of the reign of Henry VIII. William Roper (1496–1578) wrote a touching life of his father-in-law, Sir Thomas More, and George Cavendish (1500–61?), a memoir of Cardinal Wolsey which is a masterpiece of liveliness and grace. It is with these two works, both of which remained in manuscript until the 17th century, that biography in England begins. The lives of English writers compiled by John Bale (1495–1563) are much more primitive and slight. John Leland (d. 1552) and John Pits (1560–1616) were antiquaries who affected a species of biography. In the early part of the 17th century, the absence of the habit of memoir writing extremely impoverishes our knowledge of the illustrious authors of the age, of none of whom are there preserved such records as our curiosity would delight in. The absence of any such chronicle was felt, and two writers, Thomas Heywood and Sir Aston Cokayne, proposed to write lives of the poets of their time. Unfortunately they never carried their plans into execution. The pioneer of deliberate English biography was Izaak Walton, who in 1640, published a *Life of Donne,* followed in 1651 by that of *Sir Henry Wotton,* in 1665 by that of *Richard Hooker,* in 1670 by that of *George Herbert,* and in 1678 by that of *Dr. Robert Saunderson.* These five reprinted, under the title of *Walton's Lives,* were not only charming in themselves, but the forerunners of a whole class of English literature. Meanwhile, Fuller was preparing his *History of the Worthies of England,* which appeared after his death, in 1662, and John Aubrey (1626–97) was compiling his *Minutes of Lives,* which show such a perfect comprehension of the personal element that should underlie biography; these have only in our own days been completely given to the public. Edward, Lord Herbert of Cherbury (1583–1648), wrote a brilliant autobiography, first printed in 1764; that of Anne Harrison, Lady Fanshawe (1625–1680), remained unknown until 1829. A very curious essay in biography is the memoir of Colonel John Hutchinson, written by his widow, Lucy, between 1664 and 1671. Margaret Lucas, duchess of Newcastle (1624?–74), wrote her own life (1656) and that of her duke (1667). The *Athenae Oxonienses* of Anthony à Wood (1632–95) was a complicated celebration of the wit, wisdom and learning of Oxford notabilities since the Reformation. In 1668 Thomas Sprat (1635–1713) wrote a *Life of Cowley,* which was very much admired and which exercised for many years a baneful influence on British biography. Sprat considered that all familiar anecdote and picturesque detail should be omitted in the composition of a memoir, and that moral effect and a solemn vagueness should be aimed at. The celebrated funeral orations of Jeremy Taylor were of the same order of eloquence, and the wind of those grandiose compositions destroyed the young shoot of genuine and simple biography which had budded in Walton and Aubrey.

From this time forth, for more than half a century, English biography became a highly artificial and rhetorical thing, lacking all the salient features of honest portraiture. William Oldys (1696–1761) was the first to speak out boldly; in 1747, in the preface to the *Biographia Britannica,* he pointed out "the cruelty, we might even say the impiety, of sacrificing the glory of great characters to trivial circumstances and mere conveniency," and attacked the timid and scrupulous superficiality of those who undertook to write lives of eminent men, while omitting everything which gave definition to the portrait. In 1753 the *Lives of the Poets,* which bore the name of Theophilus Cibber (1703–58), but was mainly written by Robert Shiels (d. 1753), gave a great deal of valuable information with regard to the personal adventures of our writers. Dr. Johnson's *Life of Savage* (1744), though containing some passages of extreme interest, was a work of imperfect form, but Mason's *Life and Letters of Gray* (1774) marks a great advance in the art of biography. This was the earliest

memoir in which correspondence of a familiar kind was used to illustrate and to expand the narrative, and Mason's *Gray* is really the pioneer of almost all modern English biography. For the first time it was now admitted that letters to intimate friends, not written with a view to publication, might be used with advantage to illustrate the real character of the writer. Boswell, it is certain, availed himself of Mason's example, while improving upon it, and in 1791 he published his *Life of Dr. Samuel Johnson,* which is the most interesting example of biography existing in English or perhaps in any language.

As soon as the model of Boswell became familiar to biographers it could no longer be said that any secret in the art was left unknown to them, and the biographies of the 19th century are all more or less founded upon the magnificent type of the *Life of Johnson.* But few have even approached it in courage, picturesqueness or mastery of portraiture. In the next generation Southey's lives of *Nelson* (1813) and *John Wesley* (1820) at once became classics; but the pre-eminent specimen of early 19th century biography is Lockhart's superb *Life of Sir Walter Scott* (1837–38). The biographies of the 19th century are far too numerous to be mentioned here in detail; in the various articles dedicated to particular men and women in this Encyclopædia, the date and authorship of the authoritative life of each person will in most cases to be found appended.

Other Countries.—To Switzerland appears due the honour of having given birth to the earliest biographical dictionary ever compiled, the *Bibliotheca Universalis* of Konrad Gesner (1516–65), published at Zürich in Latin, Greek and Hebrew, from 1545 to 1549. A very rare work, by a writer of the greatest obscurity, the *Prosopographia* of Verdier de Vauprivas, published at Lyons in 1573, professed to deal with the lives of all illustrious persons who had flourished since the beginning of the world.

In mediaeval and Renaissance France there existed numerous memoirs and histories, such as those of Brantôme, into which the lives of great men were inserted, and in which a biographical character was given to studies of virtue and valour, or of the reverse. But the honour of being the earliest deliberate contribution to biography is generally given to the *Acta Sanctorum,* compiled by the Bollandists, the first volume of which appeared in 1653. It was confined to the lives of saints and martyrs, but in 1674 Louis Moréri, in his *Grand Dictionnaire,* included a biographical section of a general character. But the earliest biographical dictionary which had anything of a modern form was the celebrated *Dictionnaire historique et critique* of Pierre Bayle, in 1696; the lives in this great work, however, are too often used as mere excuses for developing the philosophical and controversial views of the author; they are nevertheless the result of genuine research and have a true biographical view.

In Italian literature, biography does not take a prominent place until the 15th century. The *Lives of Illustrious Florentines,* in which a valuable memoir of Dante occurs, was written in Latin by Filippo Villani. Vespasiano da Bisticci (1421–98) compiled a set of biographies of his contemporaries, which are excellent of their kind. The so-called *Life of Castruccio Castracani,* by Machiavelli, is hardly a biography, but a brilliant essay on the ideals of statecraft. Paolo Giovio (1483–1552) wrote the lives of poets and soldiers whom he had known. All these attempts, however, seem insignificant by the side of the autobiography of Benvenuto Cellini (1500–71), confessedly one of the most entertaining works of the world's literature. A great deal of biography is scattered throughout the historical compilations of the Italian Renaissance, and the *Lives of the Artists,* by Giorgio Vasari (1512–74), is a storehouse of anecdotes admirably told. We find nothing else that requires special mention till we reach the memoir-writers of the 18th century, with the autobiographies of Count Carlo Gozzi and Alfieri; and on the whole, Italy, although adopting in the 19th century the habit of biography, has rarely excelled in it.

In Spanish literature Fernán Pérez de Guzmán (1378–1460), with great originality, enshrined, in his *Generations and Likenesses,* a series of admirable literary portraits; he has been called the Plutarch of Spain. But, in spite of numerous lives of saints, poets and soldiers, Spanish literature has not excelled in biography, nor has it produced a single work of this class which is universally read. In Germany there is little to record before the close of the 18th century.

In the course of the 19th century a new thing in biography was invented, in the shape of dictionaries of national biography. Of these, the first which was carried to a successful conclusion was the Swedish (1835–57), which occupied 23 volumes. This dictionary was followed by the Dutch (1852–78), in 24 volumes; the Austrian (1856–91), in 35 volumes; the Belgian (which was begun in 1866); the German (1875–1900), in 45 volumes; and others, representing nearly all the countries of Europe. England was behind the competitors named above, but when she joined the ranks a work was produced the value of which can hardly be exaggerated. The project was started in 1882 by the publisher George Smith (1824–1901), who consulted Leslie Stephen. The first volume of the English *Dictionary of National Biography* was published on Jan. 1, 1885, under Stephen's editorship. A volume was published quarterly, with complete punctuality until midsummer 1900, when vol. 63 closed the work, which was presently extended by the issue of supplementary volumes. In May 1891 Leslie Stephen resigned the editorship and was succeeded by Sidney Lee, who edited the work with its supplementary volumes till 1916, when it was transferred to the Oxford University Press. A further supplementary volume containing the biographies of those who had died between 1912 and 1921 was published in 1927 under the editorship of H. W. C. Davis and J. R. H. Weaver. The *Dictionary of National Biography* contains the lives of between 30,000 and 40,000 persons. (E. G.)

MODERN DEVELOPMENTS

Biography is a branch of literature; that is to say, it is an art, not a science. The biographies that succeed are those that people are always ready to read for the kind of pleasure given by literary art. The biographies that fail are those that do not give that pleasure. It is necessary to affirm these elementary truths, because the present age, weak in creative energy, tends to exalt the merely explanatory or sceptical activities, and shows a desire to claim that biography is a branch of science or a department of morbid psychology. That an art is promoted by being called a science is a superstition of persons, often very learned, who possess apparatus, but lack creative vigour.

We must beware, therefore, of those who confuse a plain case by the introduction of misleading qualifications. No biographer can claim merit by urging that his work is in some special sense "new" or "modern." A "new" or "modern" biography can only mean a "recent" biography. If a youthful iconoclast writes a hostile life of Scott as a counterblast to Lockhart, the *differentia* of his book will be hostility, not novity or modernity. Nor will the hostility be necessarily a merit or a defect. A hostile biography, like any other, must justify itself by success, that is, by giving pleasure to generations of readers. Actually, a perverse biography that tries to belittle some large figure (*e.g.,* Dickens) is as unlikely to succeed as the inverse biography that tries to magnify a minor figure (*e.g.,* George IV.).

The Descent from Johnson.—The publication in 1918 of *Eminent Victorians* by Giles Lytton Strachey gave some encouragement to those who fail to distinguish between malice and veracity. Though generally labelled "new" and "modern," it descends in a direct line from the work of the greatest of English biographers. himself, by singular coincidence, the subject of the greatest of English biographies (*see* JOHNSON, SAMUEL; BOSWELL, JAMES). The opening lines of Johnson's *Life of Cowley* are so cogent that no excuse need be made for quoting them:

> The Life of Cowley, notwithstanding the penury of English biography, has been written by Dr. Sprat; . . . but his zeal of friendship, or ambition of eloquence, has produced a funeral oration rather than a history: he has given the character, not the life of Cowley; for he writes with so little detail, that scarcely anything is distinctly known, but all is shown confused and enlarged through the mist of panegyrick.

The first sentences of the actual *Life* read thus:

> Abraham Cowley was born in the year one thousand six hundred and eighteen. His father was a grocer, whose condition Dr. Sprat conceals under the general appellation of a citizen.

By "character" Johnson means something like the Theophrastian "character" (*see* THEOPHRASTUS) which was vastly popular in England during the 17th century—the description of supposed types, such as the abstract "just man," "avaricious man," and so forth, instead of real individuals. The "character" always tends to become a model or vehicle of insincerity or hypocrisy, that is, of suppression and pretence. The father of a "character" is never a grocer, but a citizen. Hypocrisy was the moral and intellectual habit of so many vigorously respectable people during the Victorian and Albertine age that the "character" biography became a natural expectation. The admission of human weakness or natural frailty was resented as if it were a malicious perversion of the truth. Thus, the *Memoirs* (1851) of his famous uncle, by Bishop Christopher Wordsworth (*q.v.*), suppressed certain vital incidents of the poet's early life as being out of the "character." Thus, too, the terribly competent and imperious Florence Nightingale, the rightly unscrupulous organizer of victory in a sacrificed region of warfare, had to be presented to sentimental complacency as the exquisite "Lady with the Lamp," the scarcely earthly ministering angel. Now any representation of Florence Nightingale as a delicate, docile lady in the dove-like raiment of "the Nurse," is not only a misrepresentation of the facts, but a positive insult to her remarkable achievement. It is the Theophrastian "character" run mad.

Lytton Strachey's Method.—When Strachey rejected the type and regarded the person, he invented nothing new in method; he went back to Johnson, who biographically allowed a person to have a human grocer, instead of a Theophrastian "citizen," as father. Strachey took four Victorian figures, whom the methods of the funeral oration or its later substitute, journalistic panegyric, had turned into images of impeccable eminence and he described them, not as "characters," but as human beings. His types were Dr. Arnold (Public School Tradition), General Gordon (the Christian Soldier), Florence Nightingale (the Angel of Mercy) and Cardinal Manning (the Saintly Prelate). These eminent Victorians he treated as frankly as Johnson had treated his eminent Carolines and Jacobeans. The images came alive under the process. In *Queen Victoria* (1921) Strachey applied the same methods to an august figure so grossly magnified into inhuman dimensions that William Nicholson's excellent woodcut of her as a little but firmly posed old lady in a bonnet had, a few years before, been hotly resented as an insult to majesty. The ideal of royal portraiture—the Winterhalter tradition brought down to date—was Stuart-Wortley's representation of Edward VII. as an immensely tall and magnificently overpowering figure in Court dress. It bore no resemblance whatever to that popular and public monarch. It was a Theophrastian "king"; and any footman from Buckingham Palace might have been the model. Biographers were expected to conform to this tradition of distortion. It is the special merit of Strachey that he did not conform, but went back to the nobler example of Johnson. There are other famous Victorians, George Eliot for instance, who would clearly gain by frankly human treatment. Those who think that by turning "characters" into human beings Strachey has diminished his subjects understand neither life nor letters. For them the practice of successful "modern" biography consists in finding eminent persons to belittle or little persons to magnify. It is now possible to find studies in biography, specifically described as "new" or "modern," which contain nothing but the impertinence of youth to maturity or the obtuseness of stupidity to achievement.

Partial Portraits.—There is no formula for the biographer. Like the poet and the novelist, like the painter and the sculptor, he must be true to his medium, but he is as free as they to seek individual form and expression. It would be intolerable if all biographies were written to the model of Boswell's *Johnson* or Lockhart's *Scott*. A chapter of a life may be better than the whole! A special episode, treated artistically, may reveal more than a protracted narrative. Two excellent examples of such "partial portraits" are *Father and Son* (1907), by Sir Edmund Gosse (*q.v.*), and *Byron, the Last Journey* (1924), by Harold Nicolson. The first, originally published anonymously, is the story not merely of the clash between two temperaments, but of the strife between two generations. A long story could tell no more and might even tell less. Nicolson's unexcited account of one year, and that the last in Byron's life, presents a figure which is not only more real and intelligible, but actually more romantic than the romances. It views Byron from the latter end and is a fully successful essay in retrospective biography.

The frank casting of biographical material into the form of a novel may be felicitous when the subject is Shelley and the writer André Maurois (*Ariel,* 1923). On the other hand, the sedulous denigration of Dickens in a novel *This Side Idolatry* by C. Bechhofer Roberts (1928) is offensive, not for moral reasons, but because the representation, however supported by evidence, is irrelevant. There is no law in the matter. Biographical fiction can hardly be forbidden when historical fiction is allowed. A novelist has at least as much right as a dramatist to the life of Abraham Lincoln. In *Venetia* Disraeli succeeded in transmitting much of Byron, but failed to transmit anything of Shelley, as Peacock had failed before him, in the caricature of *Nightmare Abbey*. Some of Disraeli's other "real" characters in fiction are admirable, *e.g.*, the sketch of Palmerston as Lord Roehampton in *Endymion*. The life of Disraeli himself by André Maurois (1927) tells a story as fascinating as a novel, without departing from the normal frame-work of a biography. Other successful examples of what may be called essential biography are the *Parnell* of St. John Ervine (1925) and the *Palmerston* of Philip Guedalla (1926). Brilliant and personal as the latter is, it rests upon a solid foundation of research. To say that the *Kaiser Wilhelm II.*, the *Napoleon* and the *Bismarck* of Emil Ludwig are "film-biographies" is not in the least to disparage them, for there are excellent as well as execrable films. Of these three the *Bismarck* is the most satisfying, but not the most attractive; for though the author triumphs over his material, the subject itself lacks spectacular appeal. The qualities that made Emil Ludwig successful as the biographer of Napoleon or the Kaiser disable him utterly when he attempts a life of Jesus.

The Chronicle-biography.—In the realm of biography there is always place for the work that is not so much a creation as a chronicle; that is to say, for the work that is a careful assembly of material by someone in possession of the facts. Many recent political and official biographies belong to the category of chronicle and do not need discussion as works of biographical art. A rather special case of the chronicle-biography is the *Life of Samuel Butler* (1919), by Henry Festing Jones, who had already proved his biographical skill in the compilation of a short, vivid sketch of the strange person with whom he had been closely associated. It is idle to say that no one wants such a long biography of such a minor literary figure; for the answer is first, that people who like Butler like him enough to want to know as much as possible about him, and next, that the sole possessor of information is fulfilling a very proper duty in recording it.

An even more remarkable instance of the devotion which is expended upon the collection and recording of personal detail is the *Life of Beethoven,* by Alexander Wheelock Thayer, for here the biographer pursues the man so earnestly that he overlooks the musician, who, after all, is what matters most.

There is, as we have said, no formula for biography; there is only the pragmatic test of success. Even the standard "life" in two volumes need not be, though it often has been, an expanded epitaph in the lapidary style of the monumental mason. What the best biographical writing of recent times can truthfully claim is that it has turned wholesomely away from the falsified "character" and the exaggerated "funeral oration," and has tried to depict human beings instead of frigid types "shown confused and enlarged through the mist of panegyrick." As examples of modern biographical activity we may mention that the *Dictionary of National Biography* continues its career of plain usefulness and that the classic series called *English Men of Letters* has entered upon a third and less classic phase of its welcome existence.

(G. SN.)

The United States.—In the United States biography apart from history was comparatively late in developing although chroniclers such as John Smith founded certain long-lived indi-

vidual legends, for example the Pocahontas story, or gave vivid thumb-nail sketches of their more prominent contemporaries as did Capt. Edward Johnson (1599–1672) in his *Wonder-Working Providence of Zion's Saviour in New England* (1654).

We do find extended biographical work, however, in that curious jumble of fact, tradition and personal prejudice—Cotton Mather's *Magnalia Christi Americana* (1702), in which are sections devoted to the lives of the governors and names of the magistrates "that have been shields to the churches of New England," to famous ministers and to the history of Harvard college and of "some eminent persons therein educated." Nevertheless in spite of such spirited bits of narrative as Sir William Phips' finding of long buried Spanish treasure under the sea, the pompous style and moralizing treatment have on the whole won deserved oblivion. Almost complete oblivion has also overtaken the other biographies produced in the colonial epoch as *Parentator* (1724), a quaint tribute to Increase Mather by his more famous son; *The Life and Character of the Reverend Benjamin Colman, D.D.* (1749) by his son-in-law, Ebenezer Turell; Jonathan Edwards' life of David Brainerd (1749), a young missionary; and Jeremy Belknap's *American Biography* (2 vol., 1794–98).

During the Revolution writers and thinkers were too occupied with waging war on live questions to extol the virtues and accomplishments of dead dignitaries. What few semi-biographical notes were struck were satirical—thinly veiled allusions to prominent members of the opposite party such as are found in Mercy Otis Warren's farce *The Group* (1775)—or incidental—the acrid sketches in her *History of the American Revolution* (1805). After the Revolution, however, emphasis shifted from the divines who had absorbed the attention of writers to the great patriotic figures who were already assuming heroic proportions. *The Life of Washington* (1800) by Parson Weems, a versatile and somewhat unscrupulous man, although it was regarded askance even by contemporary scholars, proved one of the best-selling biographies ever written in America and imbedded in the popular mind fictions like the hatchet story which have not yet been wholly uprooted. Also inaccurate was the *Life of Patrick Henry* (1817) by William Wirt (1772–1834), lawyer and essayist, whose polished style makes the book more readable, however, than the *Life of James Otis* (1823) by William Tudor (1779–1830) or the ponderous *Life of Washington* (1804–07) by Chief Justice John Marshall.

One of the first tributes to American writers was the somewhat stilted and inaccurate *Life of Charles Brockden Brown* (1815) by William Dunlap (1766–1839), playwright, manager, so-called "Father of the American Theatre." Edgar Allan Poe indulged in literary chit-chat in his *Literati of New York City* (1846), and his own literary executor, Rufus Griswold (1815–57) by his distorted memoir of the poet (1849) gave one of the most prominent examples of the satisfaction of personal grudges which for a period blackened American biography. The best biographical work which came out of New York at that time (and probably the best biographical work in America to date) was the Spanish series of Irving and his last work *The Life of Washington* (1855–59). The opportunities he had to examine Spanish source materials and to imbibe the atmosphere of the places about which he wrote as well as the suavity of his style and the general picturesqueness of his theme and treatment caused his *History of the Life and Voyages of Christopher Columbus* (1828), according to Southey, to place him "in the front rank of modern biographers" and to secure him, according to Edward Everett, the position "of founder of the American school of polite learning."

Although Cooper took time off from his fiction to write *Lives of Distinguished American Naval Officers* (1842–45) and *Ned Myers* (1843), the life of a common sailor who had been with him on the "Sterling," and although his Leatherstocking series wielded an extraordinary influence on most of the later scout biographies, for work of a sort to compare with Irving we must turn to the New England school. There Jared Sparks, for a time editor of the *North American Review,* professor of history and later president of Harvard, not only wrote numerous biographies himself but edited the most extensive work of its nature to date, *American Biography,* which appeared in two series (25 vol., 1834–38 and 1844–47) and which still has value. The literary contacts of Boston, Cambridge and Concord through the latter part of the 19th century brought forth numerous biographies on a comparatively high level. Emerson's tribute to Thoreau (1862), Charles Eliot Norton's biographies and editions of the literary remains of his various friends, the work of Thomas Wentworth Higginson, O. W. Holmes' biographies of Emerson (1885) and Motley (1879), the memoirs of the Transcendentalists, although they have their blemishes, are generally satisfactory. About the same time in the South John Pendleton Kennedy (1795–1870), lawyer, politician, essayist and novelist in his *Memoirs of the Life of William Wirt* (1849) carried on the biographical tradition; and the prolific Simms turned off lives of Francis Marion (1844), John Smith (1846) and Nathanael Greene (1849). In the West Timothy Flint by his biography of Boone (1833) and Benjamin Drake by that of Black Hawk (1838) established the biographical tradition of the Frontier.

By the third quarter of the 19th century, then, biography had become well established as a popular form in the United States, and works of this nature issued from the publishers in ever-increasing volume. It is possible only to indicate the chief of the lines of development, many of the outstanding biographies being named in the bibliographies of the individuals whom they concern. One rather common type was the so-called "family biography" in which the children or near relatives of an individual, having free access to his or her papers and intimate knowledge, present their impressions. Of such a nature were biographies of Harriet Beecher Stowe, of Hawthorne, of Julia Ward Howe, of Emily Dickinson and many others. Horace Traubel's devotion to Whitman resulting in *With Walt Whitman in Camden* (1906 *et seq.*) furnishes perhaps the best example of the Boswell type of biography. The secretaries of Lincoln, John Hay (1838–1905) and John G. Nicolay (1832–1901) produced in their life of the president (1890) what is not only one of the most comprehensive of American biographies but a book which serves as a history of an epoch. This same use of history on a smaller scale to serve as the background of a central figure is found in W. P. Trent's biography of William Gilmore Simms (1892). A specialized type of biography, the campaign biography written to serve an immediate end—exalting a candidate—has numbered in its ranks no lesser figures than Nathaniel Hawthorne and William Dean Howells.

At the end of the 19th and beginning of the 20th centuries, with the exception of accounts based on personal association, biography fell largely to the lot of the professional editor, the studious minister, the college professor and the aspirants for doctoral honours.

Their work had the merit of being almost without exception more accurate than that of the earlier annalists, and while at its worst it was dry and over-pedantic, it was as a rule well written and thorough.

Among the best examples of this type of work are the American Men of Letters series edited by Charles Dudley Warner and biographies by M. A. De Wolfe Howe (1864–), William Roscoe Thayer (1859–1923), Wilbur Cross (1862–), A. B. Paine (1861–1937), J. Q. Adams (1881–).

In the 20th century the broad and even path that the American biographer was complacently treading, however, suddenly branched off at strange tangents.

The scholar, the dignified editor of the old school, was jostled by novelists, poets, short-story writers, psychoanalysts, bent on probing the dark recesses of the soul. Lucky were the buried notables who escaped without being proved victims of one complex or phobia, and lucky were the descendants who need fear the revelation of no family skeletons. For the so-called "new biography" like the realism of the Zola school did not believe in reticences; sometimes it seemed almost to glory in pillorying the past. The chatty, personal, vivid note popularized in biography by Strachey in England, Ludwig in Germany, André Maurois in France, and Gamaliel Bradford (1863–1932) in America, commendable in itself, gave rise to serious abuses, now mainly past.

Spice was sought to the neglect of truth; a biographer, intent on dragging from his pedestal an over-idealized hero or on playing up a side of his subject that had been neglected or glossed over, was likely to forget his sense of proportion, to stress that side to the exclusion of all others, and sometimes, unconsciously perhaps, to twist the evidence.

At the present (1940) we are reaping the benefits of the "new biography." Written with a sense of climax and an admirable dramatic quality, these books have made more vital and interesting the people they portray; they have done good service in insisting on the truth without fear or favour. No one need now approach as a task the reading of such biographies as Carl Sandburg's *Abraham Lincoln,* 6 vols. (1926, 1939).

Moreover, American biography is now justly recognized as an important and popular genre. The annual Pulitzer prize award offers special distinction to the more outstanding of the many volumes meritorious both for content and style. The interest in social history has drawn attention to many representative figures and types hitherto neglected; the state historical societies are preserving records of significant local personages; and the *Dictionary of American Biography* (20 vol., 1928–37), financed by Adolph Ochs of *The New York Times* and edited by Allen Johnson (1870–1931) and Dumas Malone (1892–), is an invaluable tool.

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BIOLOGICAL AND ZOOLOGICAL ARTICLES. The main branches of biological science are dealt with in special articles such as ZOOLOGY, EMBRYOLOGY and PALAEONTOLOGY. BIOLOGY itself is treated in an article outlining the scope and applications and history of the science. In addition to the article on EVOLUTION, ORGANIC, there are articles on such branches as SELECTION: *Natural; Artificial;* and *Sexual;* EVOLUTION AND MIND and ACCLIMATIZATION; further, the evolutionary aspect has been stressed in many of the articles dealing with the various groups of animals, *e.g.,* MAMMALIA and AMPHIBIA, and in other general articles such as ZOOLOGICAL REGIONS, DISTRIBUTION OF ANIMALS, MIMICRY and so on. HEREDITY is the central article of another group which includes such subjects as LAMARCKISM, CYTOLOGY, SEX, REPRODUCTION and VARIATION. Each of the large groups of animals has an article devoted to it, *e.g.,* CRUSTACEA, PROTOZOA, MOLLUSCA, INSECTS and REPTILES; in mammals, besides a comprehensive account of the class as a whole in the article MAMMALIA, each order has an article devoted to it, among which PRIMATES, CETACEA, CARNIVORA and PROBOSCIDEA may be mentioned as examples, and the principal animals are fully covered by a series of shorter articles devoted more especially to their natural history—DEER, ANTELOPE, DOG, FOX, LION, CHIMPANZEE, ELEPHANT, HORSE, KANGAROO, etc. Birds are treated in the general articles BIRDS and ORNITHOLOGY, the latter article including a section on the economic status of birds; there are, in addition, numerous shorter articles on individual birds, *e.g.,* DODO, CUCKOO, EAGLE, FALCON, HERON, HUMMING-BIRD, BIRDS OF PARADISE, THRUSH, SPARROW, etc. Insects are covered by comprehensive articles on INSECTS and ENTOMOLOGY, in the latter of which is an account of the economic bearings of this important class; the better known and economically important insects are dealt with in greater detail in separate articles, such as GYPSY MOTH, APHIDES, MANTIS, GRASSHOPPER, MAY-FLY and PHYLLOXERA, as well as in articles on the more important orders:—LEPIDOPTERA, DIPTERA, ORTHOPTERA, etc. Ants, bees and wasps, in addition to treatment under these headings and in the article HYMENOPTERA, are considered at length, with the termites, in their social aspects in the article SOCIAL INSECTS. The other groups of animals are similarly covered: thus there is a general article REPTILES, with shorter articles such as SNAKES, CROCODILIAN, DINOSAURIA, LIZARD, GECKO, etc.; a general article FISHES, with subsidiaries such as FISHERIES, HERRING, COD, SALMON AND SALMONIDAE, EEL, SHARK, etc.; a general article CRUSTACEA, with supplementary articles on the important subdivisions, COPEPODA, MALACOSTRACA, etc., and on such important forms as CRAB, LOBSTER, SHRIMP, WOOD LOUSE and others. The better known fossil animals are also given separate articles, *e.g.,* DINOSAURIA, TRILOBITA, ICHTHYOSAURIA, GRAPTOLITES, ARCHAEOPTERYX, TITANOTHERE, PERISSODACTYLA. The various methods of protecting animals and preserving wild life are covered by such articles as BIRDS, PROTECTION OF, NATURE RESERVES, BIRD SANCTUARIES and GAME RESERVES; on this aspect, too, the article BIOLOGICAL SURVEY has an important section, while ZOOLOGICAL GARDENS, AQUARIUM, AVIARY and AVICULTURE deal with animals in captivity. The great advance in the more detailed knowledge of the cells and tissues of the animal body of recent years is summarized in CYTOLOGY, REGENERATION IN ANIMALS, TISSUE CULTURE, EXPERIMENTAL EMBRYOLOGY and COMPARATIVE PHYSIOLOGY and kindred articles. Animal psychology and behaviour, which has also received much attention recently, is covered by the general articles COMPARATIVE PSYCHOLOGY and ANIMAL BEHAVIOUR, while COURTSHIP OF ANIMALS, PLAY IN ANIMALS, EDUCATION IN ANIMALS and other articles deal with special points. Such important groups as PROTOZOA and TAPEWORMS are treated at length and their relations to man clearly brought out, while much of the information is summarized and its main bearings pointed out in the articles PARASITOLOGY and PARASITISM. Finally the application of biological knowledge to man's problems is considered in such articles as MARINE BIOLOGY, ENTOMOLOGY and EUGENICS.

BIOLOGICAL SURVEY. The Biological Survey is one of the eleven bureaus among which are distributed the various lines of research and most of the allied activities of the United States Department of Agriculture. Its functions are investigations for the classification, conservation, utilization, and control of the wild life of the country, the administration of Federal laws for the protection of migratory birds and the prevention of illegal interstate commerce in game and furs, and foreign importations of harmful wild birds and mammals. Federal bird and large-game reservations distributed from the Atlantic to the Pacific and in Alaska, Porto Rico, and the Hawaiian islands are under its administration. The term "wild life" as used here comprises all the vertebrates, except the fishes.

The research work of the bureau includes the technical study of the thousands of species making up the wild life of the United States and adjacent regions, with investigations of their habits, distribution, and economic relations. The responsibilities of the bureau require also its active participation in the conservation and increase of the useful and harmless species and the control or destruction of those economically injurious. These present many difficult problems, which involve the interest of the people of the entire country to an extent not commonly realized.

On July 1, 1886, wild-life research was first established as a distinct unit in the Department of Agriculture, with three employees and an annual appropriation from Congress of $5,000. At that time the work undertaken was the study of the migration of American birds and the distribution and food habits of the birds and mammals. On July 1, 1927, the number of employees in the Biological Survey exceeded 1,300, and the appropriation made available by Congress for its operations during the year amounted to $1,346,955. In addition, co-operative funds, mainly to be expended in field work for the control of injurious mammals under the direction of the bureau, amounting to more than $1,000,000, were contributed by the various States.

Owing to the numbers of birds—estimated to exceed 4,000,000,000 in the United States—their importance to man as game and as destroyers of noxious insects on a gigantic scale, and because of their attractiveness in form, colour and notes, they may be listed as of first importance in our wild life resources. The mammals, however, including both game and fur-bearers, make a close second. What has been accomplished in building up wild-life resources in certain States proves that with a nation-wide exercise of wise conservation, these resources might be increased.

As against the benefits derived from the useful species, man suffers heavy annual losses from various destructive forms of wild life. The pests fall into two groups: firstly, the predatory animals, such as the wolf, coyote, puma, lynx, and a few others, which kill domestic animals; and secondly, the rodents, of which the house rat, prairie dog, various species of ground squirrel,

pocket gopher, hare, and rabbit, which destroy the farmers' products in field and granary, are the most harmful. Both the predatory animals, and the rodents are most numerous in the more thinly populated parts of the country west of the Mississippi. The house rat, however, the most destructive of all, is practically everywhere. The losses through predatory animals in the United States have been estimated to be more than $20,000,000 annually. Investigations by the Biological Survey indicate an approximated annual loss by house rats of $200,000,000. The annual losses from all other rodent pests have been estimated as about $300,000,000. Nearly half the total appropriations for the bureau and all the co-operative funds made available by the States for its operations are for the purpose of controlling these losses.

Control Methods.—Until the survey began the work, sporadic, costly, ineffective efforts were made to subdue the wild bird and mammal pests. The usual method was through the payment of a fixed bounty for the scalp or other part of the offender. Many millions of dollars were thus wasted, and no general relief was obtained. The depredations of animal pests continued and had become so serious by 1916 that, coupled with a great outbreak of rabies carried into five States by coyotes and other predatory animals, the Biological Survey was given the task of controlling the situation, especially in the States west of the Mississippi river, where much of the land still belongs to the Federal Government.

The methods of control of the pests developed by the Biological Survey were soon found to be effective. As a result, States throughout the country have joined forces and are making the campaigns of control joint efforts by the Federal and State governments. Under unified direction by the Biological Survey, these losses have been practically eliminated over considerable areas.

Since 1916, when the control of wild animal pests became the major single activity of the bureau, the kill among the larger predatory animals has been as follows: Wolves, 6,233; coyotes (prairie wolves), more than 500,000; pumas, 1,877. To accomplish this requires the directed efforts of from 250 to nearly 600 hunters each year, the number varying with the season. They use poison, traps, and the rifle.

In the control of the rodent pests, which exist in great numbers over a vast territory, the usual method is to poison them. With the co-operation of farmers and other landowners, poison has been placed over many millions of acres of farming and grazing land and a great reduction made in the abundance of these pests. In considerable areas the prairie dog has been exterminated.

Since 1926 the Biological Survey has been charged with the investigation of the reindeer industry in Alaska, and the development of scientific methods for its improvement and up-building. Between 1892 and 1902 a total of 1,280 reindeer were brought to Alaska by the Bureau of Education from eastern Siberia, and in 1927 they had increased to more than 500,000 in addition to over 150,000 that had been killed for their meat and hides.

Enforcement of Federal game laws has also become part of the work of the bureau. Most far-reaching of these is the Act to enforce the provisions of the Migratory Bird Treaty with Great Britain for the protection of the migratory birds that live part of their lives in the United States and part in Canada. Another law is the Lacey Act to prevent the illegal interstate traffic in game and furs, and controlling the importation of living wild birds and mammals, to prevent the introduction of injurious species. The Survey co-operates with the Alaska Game Commission in the enforcement of the Alaska game and fur laws, and its chief representative in Alaska serves as executive officer of the commission.

All the varied activities of the Biological Survey are based on the scientific research of its staff of naturalists and other trained men. Their field investigations during many years have accumulated a great store of information concerning the distribution and habits of the wild mammals and birds of North America, and have amassed a study collection containing about 60,000 birds and 137,000 mammals.

A continual effort is made through the press and by popular articles to inform the public in regard to the value of useful wild life, the conditions affecting it, and the needs of conservation, in order that it may be maintained. The contributions by the bureau to these subjects are published in the departmental series of bulletins and circulars and in a technical series known as "North American Fauna," the latest of which is numbered 50. These technical reports consist of monographic revisions of groups of mammals, reports on the results of life-zone surveys of State and other major areas, and other technical matter relating to the wild life of the continent.

These publications, the data in the files, and the reference collections constitute the largest store of information available on the wild life of any continent, and make the Biological Survey, with its staff of scientific naturalists, the main centre of information concerning the conservation, utilization, and control of the wild life of North America. The information amassed is being increasingly consulted by wild-life administrators and naturalists in the U.S.A. and abroad, and is of especial use to State game commissions and other organizations in problems constantly arising locally, but requiring for their solution the nation-wide experience of the Biological Survey.

To conduct its work effectively the bureau is directed by a chief directly responsible to the secretary of agriculture. Under his immediate supervision are the general administrative officers, and the heads of six technical divisions, as follows:

1. Division of Biological Investigations.—Under this head are grouped most of the fundamental scientific investigations of the bureau. The scientific staff is made up of experienced mammalogists, ornithologists, herpetologists, and botanists. They make taxonomic studies especially of groups of mammals and birds and identify specimens sent in by field parties as well as great numbers sent by individuals and institutions throughout the country. Some of the results of these studies have appeared as monographic revisions of genera of birds and mammals and the descriptions of hundreds of species and geographic subspecies of mammals, birds, reptiles, amphibians, and plants new to science.

The members of this scientific staff also are leaders of the field expeditions sent out to determine the distribution and habits of wild-life species. During the entire history of the bureau, biological field explorations have been among its major undertakings. Parties of trained field naturalists have done intensive work over a large part of the United States, and in Alaska, Canada, Mexico, Guatemala, and Panama. Many of these expeditions have gained a definite knowledge of the faunas and to a minor extent the native floras, of great areas, which up to that time had been almost unknown. Among the most notable of these have been expeditions to the Hudson's bay region and the Mackenzie river in Canada, to remote parts of Panama, and explorations covering every part of Mexico during a period of 14 years.

Early in the history of the Biological Survey the then chief, Dr. C. Hart Merriam, developed the idea defining transcontinental life zones dependent on the distribution of life as determined basically by temperatures, mainly during the breeding, growing, and fruiting seasons, modified by humidity and other factors. One of the principal objects of the field work of the bureau has been to determine the characteristic species of mammals, birds, reptiles, amphibians, and plants of the different zones. The information so obtained with that available from other sources has supplied the data from which a life zone map of North America has been produced. A systematic series of life-zone surveys of several States is in progress and for some it has been completed and the results published with zone maps. To complete a life zone survey of a State requires intensive field work in every part of its territory to cover all the varying contours and elevations, since the distribution of life is often dependent on special local conditions.

The study of the migration of North American birds throughout the United States is another project that has been carried on from the beginning. Several hundred co-operating volunteer observers have for years kept track of and reported upon the movements of birds during the spring and fall migrations at stations

in many parts of U.S.A. and Canada. The information gathered from these and other sources has supplied valuable data.

With the enforcement of the terms of the Migratory Bird Treaty with Great Britain was developed the need of having more exact knowledge of the migratory travels of individual birds. To obtain this the bureau took over in 1920, from the private organization that had it in hand, the banding (or ringing) of birds and developed this method of research into an international programme through the co-operation of Canada. By the end of 1927 the voluntary co-operators banding birds numbered more than 1,200, and had become organized into four regional associations covering all parts of the United States and Canada; more than 384,000 birds, mainly migratory species, had been banded; and about 16,000 had been retaken, thus supplying invaluable information concerning their travels. The information thus obtained in regard to ducks, geese, and other migratory wild fowl is of very practical value in connection with the administration of the Migratory Bird Treaty Act.

To gain a more definite knowledge of the bird population of the country, a system of censuses or counts of breeding birds is being made on definite areas during successive breeding seasons. More than 100 censuses of this character have been made by volunteer enumerators through a term of years, with such closely corresponding results at widely separated localities as to indicate their approximate accuracy. These counts show averages of about 2·5 breeding birds to each acre of farming land, of one breeding bird to from 1·5 to three acres of open prairie land, and one breeding bird to from one to two acres of forest.

By 1920, the amazing increase of the reindeer herds in Alaska demanded attention as a new form of animal husbandry. To meet the situation an accomplished veterinarian and parasitologist and two grazing experts were placed in the field to try to overcome some of the troubles that had arisen in handling the herds. The results of this work, which is still continuing, have been of the greatest practical value. Many of the troubles with parasites have been much lessened and the methods of herd management have been greatly improved.

Experiments are being made to breed up the reindeer by crossing them with the larger wild caribou bulls from the interior of Alaska. The first crosses as yearlings are much larger than the pure-blooded reindeer in the same herd.

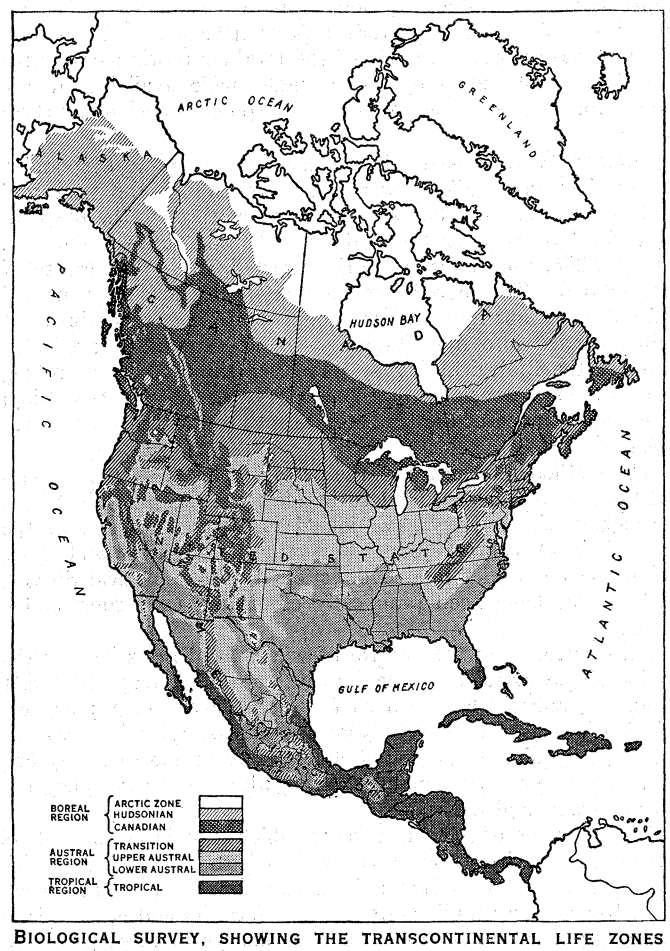
Through co-operation of the Biological Survey with the Department of Interior of Canada, two young Canadians familiar with the northern flora spent the greater part of a year in the field with the experts of this bureau among the reindeer herds in Alaska for the purpose of learning the methods of herd management, with a view to establishing the reindeer industry in northern Canada. This is now being undertaken.

A reindeer experiment station has been established by the survey at Fairbanks in co-operation with the Alaska Agricultural college. Breeding experiments will be continued there with a view to improving the reindeer by developing larger and more hardy stock and also experiments to develop beyond its present abilities the reindeer as a winter draught animal in the north.

2. Division of Food Habits Research.—The major work of this division is the study of the food habits of birds through field observation and by the detailed laboratory examination of the bird stomach contents, usually under the microscope. This requires skilled entomologists, who must also have a thorough knowledge of plants and their seeds. The stomach contents of more than 95,000 birds have thus been investigated. The contents of many other stomachs also have been examined to determine accurately the food of big game, carnivores, rodents, reptiles and amphibians.

The analyses of stomach contents have supplied much of the information on which are based the laws protecting insectivorous birds throughout the country. At the same time current problems are constantly arising as to the destructiveness of vast flocks of blackbirds, hordes of crows, and fruit-eating birds, and methods are being developed for the control or destruction of offenders.

A study of the wild-fowl food resources of large sections of the country is being made by a survey of the vegetation of water and marsh areas. The knowledge thus gained is being used by owners of water areas who obtain the co-operation of the bureau in studying conditions in their waters and in recommending the planting of additional food plants suitable to such localities. Other investigations of a practical nature in relation to the maintenance and production of upland game birds have been in progress for years. During the past five years, in co-operation with sportsmen having large estates in Georgia and Florida, a detailed and comprehensive study has been made of the "bobwhite" quail



BIOLOGICAL SURVEY, SHOWING THE TRANSCONTINENTAL LIFE ZONES INTO WHICH NORTH AMERICA MAY BE DIVIDED. THESE ZONES ARE DETERMINED BY THE CHARACTERISTIC BREEDING SPECIES OF MAMMALS, BIRDS, REPTILES, AMPHIBIANS AND INVERTEBRATES, ALSO PLANTS, WHICH ARE INDIGENOUS TO THEM. THE DISTRIBUTION IS DEPENDENT, BASICALLY, ON TEMPERATURE. THE IRREGULARITY OF THE ZONES IS CAUSED BY VARIATIONS IN TEMPERATURE DUE TO DIFFERENCES IN ALTITUDE AND HUMIDITY

with a view to the control of its enemies and the better maintenance of its numbers. One startling result of this work was the determination of the fact that over a large area of typical "bobwhite" country more than 80% of the nests were destroyed each season by enemies.

Investigations on a considerable scale have continued through many years to learn the effective methods of attracting useful birds and increasing their numbers about towns, on farms, and in forests. From the examination of their stomachs, the favourite food plants of many species have been learned and bulletins have been issued giving information concerning the more desirable kinds of plants to introduce or to encourage in different sections of the country.

The breeding of ducks, geese, and other wild fowl in captivity is being thoroughly studied, in order that this utilization of wild life may be developed and thus provide game for the market now that the supply of wild birds has diminished until their sale is no longer permitted.

All the studies named are essential to the building up of American wild life resources, and supply economic information needed in connection with the control of the harmful species.

3. Division of Fur Resources.—The decrease of certain fur bearers and the increasing numbers of furs being brought to market to meet the growing demands of increasing population are danger signals of a possible world shortage of furs. From the beginning of fur farming (*q.v.*) the Biological Survey became active in helping build up the industry along conservative lines as one means of possibly easing the situation for the wild fur bearers. The bureau established an experiment station in northern New York State. There in June, 1927, were held 75 foxes, 6 martens, and 128 rabbits. This station has been the source of much practical service to fur farmers. The use of rabbit skins for fur has developed rapidly within a few years, and the Biological Survey in co-operation with the rabbit growers of southern California in 1927 established a rabbit experiment station in that region.

4. Division of Economic Investigations.—This section of the bureau deals with the problems arising from the depredations of injurious mammals, both the predatory species and rodents, and their control. The predatory-animal problems lie mainly in the grazing States west of the Mississippi, where millions of sheep and cattle occupy the open ranges on the national forests and neighbouring open plains. The habits of the stock-killing animals are studied and extensive experiments made in methods of trapping and in the use of various deadly poisons. Of recent years poisoning methods have been developed that are proving very effective.

The destruction of noxious rodents is carried on mainly by the use of poisoned grain or pieces of vegetables coated with strychnine or other poison. To deal effectively with rodents requires an intimate knowledge of their food habits. Hundreds of millions of acres, including the best farming lands in their territory, are infested with one or more species of injurious rodents, which, uncontrolled, in some districts render agriculture unprofitable. In each of the Rocky Mountain and other Western States, where the injury is greatest, the bureau has headquarters at the capital or other central point. There the leaders of the predatory animal and rodent work have offices and guide the work of their forces and of the co-operating farmers or stockmen in the districts in which operations are being conducted. The field work is planned to cover certain areas under the direction of experienced men, and great numbers of traps, poisoned grain and other supplies are furnished from headquarters. The capture of certain cunning wolves or other notorious stock-killers at times requires a long persistent hunt, sometimes extending over weeks or even months.

The house rat has to be combated mainly in towns and about other habitations of men. While millions of the pests have been poisoned, the most effective and far-reaching work against them has been in bringing about the cleaning up of trash piles and other shelter, the rat-proofing of new and old buildings, and the isolation of food in rat-proof storage and other containers.

In order to continue the production of the best poison combinations for rodents and baits for predatory animals, a well-equipped laboratory is maintained in Denver (Colo.). There during the year 1927, 127,000 ounces of strychnine were used for the purposes mentioned.

The Biological Survey has had two striking problems of national significance to solve in relation to wild animals. First, the control of rabies among coyotes and other wild animals, which had spread from California over four neighbouring States and was threatening to extend with appalling results over all the remaining Western States. In 1916, when the task of stopping this was given the bureau, the disease spread from Nevada into Utah before the organization to control it had been completed. The loss in all kinds of livestock for the preceding year in Nevada was estimated by the stock-owners to exceed $500,000. During the first year of operations the spread of the malady was stopped by a campaign to destroy predatory animals in great numbers over six States, and within the next two seasons it was completely under control. Since then outbreaks of rabies have occurred repeatedly in widely distributed areas in the Western States, but all have been promptly suppressed by concentrating about them strong forces of hunters, who have cleaned up the wild and domestic predatory animals serving as carriers.

The second great problem was concerned with the suppression of the foot-and-mouth disease among the deer on the western slope of the Sierra Nevada in Stanislaus County, California. This disease had been imported into the State and before all the infected livestock had been killed the infection had been spread on the range along a part of the mountain slope among the mule deer, which were abundant all along these and neighbouring mountains for hundreds of miles. The general spread of the disease among the deer along the ranges would have infected many thousands of cattle and sheep and would have meant a quarantine against California by all the other States. The result would have been losses running into vast sums and the temporary wrecking of the States' agriculture and commerce. A large corps of the best hunters, numbering more than 200 at one time, was employed and a series of camps established encompassing the lower border of the territory towards which approaching winter would force the deer as snow came higher up. By the use of rifles and other methods more than 23,000 mule deer were killed in this infected area. About 10% showed signs of the disease. In the spring, men were stationed in the mountain passes and no deer were permitted to make their accustomed way across for fear of infecting the far slope. This campaign proved to be an absolute success and not an infected deer was taken outside the "iron ring" of hunters. No trace of the disease has since appeared in this area. It is now being restocked with deer, and grazing there by livestock has been resumed.

In the various phases of this economic work the bureau has had hearty co-operation from several Federal bureaus, State officials, farmers, sportsmen and others interested.

5. Division of Game and Bird Reservations.—Five big-game reservations under game-proof fence in the western United States and 73 bird reservations located in all parts of the United States and its outlying territory, including Alaska, Porto Rico, and the Hawaiian islands, form a series of sanctuaries where wild life is maintained under special guardianship. The National Bison Range, the largest of the fenced big-game areas, has more than 18,000ac. in western Montana. It contains about 652 bison, 69 mountain sheep, 328 wapiti ("elk") and more than 180 white-tailed and mule deer. It has been demonstrated there, as well as on other reservations, that all these kinds of big game thrive and increase in captivity under proper conditions. In connection with the maintenance of the big game on the reservations and also on the national forests, studies are now being made of the forage plants utilized by game. The occupation of the game country by man and his flocks and herds throughout the West has given rise to difficult problems related to the up-keep of the game supply. These the Biological Survey is helping to solve.

The largest wild life refuge in the United States is on the upper Mississippi, and includes much of the river bottoms for about 300m. on both sides of the river. The Aleutian reservation includes all of the Aleutian chain of islands, extending in a line from the mainland of Alaska westward between Bering sea and the Pacific ocean for a distance of about 1,000 miles. On some of these islands blue fox farming and sheep grazing are now being conducted without detriment to the reservation.

6. Division of Protection of Migratory Birds.—In 1916 a treaty was negotiated with Great Britain to protect the hosts of wild fowl and insectivorous birds that migrate through the United States and Canada each spring and fall. The protective laws and regulations are administered through a division of the bureau organized for the purpose. Federal game wardens widely distributed throughout the country patrol the main hunting areas in co-operation with the game wardens of the States. Owing to the growing scarcity of game and the enormous increase in the number of hunters, the hunting of migratory wild fowl after Jan. 31 each winter and the sale of this game at any time is forbidden. Since this law and its regulations have been in force many of the States have changed their laws affecting migratory birds to conform with the Federal provisions, and this greatly increases the effectiveness of the protection given the birds.

Federal reservations covering a great area in the aggregate have been established, and efforts are being made to increase their number to offset the effects of the drainage of the great water areas required by the birds. The need of vigorous protection of migratory wild fowl is shown by the fact that for the hunting seasons of 1925 and 1926 approximately 5,500,000 hunters went afield in the United States, a large percentage of whom hunted migratory wild fowl. The collection of migratory birds for scientific or propagating purposes in the United States may be done only under special permits issued through this bureau.

This division also enforces the Lacey Act, which in regulating interstate commerce in game and furs prohibits traffic in them contrary to State laws. Thousands of violations of State and Federal laws are detected each year and valuable assistance is thus given the States in conserving their game and fur resources.

The importation of wild mammals and birds is required by law to be under permit. Agents of the bureau at the principal ports of entry inspect each shipment on arrival. Permits for the harmless kinds are recommended and promptly issued. Harmful species, such as the mongoose and the fruit bat, are denied entry.

(E. W. N.)

BIOLOGY, the science of organisms, an inquiry into the nature, continuance and evolution of life. The term may also be used comprehensively to include botany, zoology, bacteriology (*qq.v.*), protistology and the other special sciences that have to do with particular kinds of living creatures. Thus in Herbert Spencer's classification of the general concrete sciences, biology occupies a central place, with its foundations in chemistry and physics, and leading on to psychology and sociology. This is a convenient classification, particularly useful in emphasizing the central position of biology; but there is something to be said in favour of a classification simpler still. It is practically impossible to separate chemistry and physics, and it is inviting fallacy to separate biology and psychology. Thus it may be simpler to recognize three great orders of facts:—(1) *the domain of things,* entirely describable (in their present occurrence) in terms of matter and energy, *i.e.,* in terms of protons, electrons and radiations or ether-waves; (2) *the realm of organisms,* from microbes to mammals, whose activities require for their description certain concepts or categories, which transcend those of mechanism; and (3) *the kingdom of man,* in which the units are not individuals, but societary forms with a continued tradition. For these three orders of facts, the terms cosmosphere, biosphere and sociosphere have been suggested, with the corresponding sciences—chemophysics, biology (or bio-psychology) and sociology. In any case, there is value in the elementary, yet fundamental, idea, that the domain of things encloses and interpenetrates the realm of organisms, and that the kingdom of man is within the larger rubric of organism. Within the immense ellipse of the cosmosphere is the minute ellipse of the known biosphere, and within that again the still more minute sociosphere. When man domesticates animals he is taking part of the biosphere into his kingdom; and similarly he acts on the cosmosphere in gigantic operations such as a Panama Canal. When earthworms make soil, or green plants make oxygen, the biosphere cuts into the cosmosphere; and into the sociosphere when bacilli cause plagues or the forest closes in on the village. So the cosmosphere irradiates both the realm of organisms and the kingdom of man, it may be killing in the lightning flash or invigorating in the sunshine. It is impossible to read either human history or the ascent of life without the assistance of the climatologist.

Biology may be used, then, in a comprehensive way to include all the special sciences that deal with different parts of the biosphere; but the stricter usage, which began with Treviranus and Lamarck, is in reference to the study of the larger or deeper questions that apply to all sorts of living creatures. In this sense the biologist inquires into the nature of the particular kind of activity that we call "life" (*q.v.*). A third usage, common in Germany, is as an equivalent for bionomics or ecology or ethology. This is indefensible and should be discontinued.

Subdivisions of Biology.—In regard to organisms there are eight main biological questions that may be asked, and the answers to these form the sub-sciences of biology. (1). The question may have to do with form and structure, with organic architecture and internal arrangements; with the statical aspects of the living creature. When the instruments are scalpel and forceps, the answer is anatomy. When the microscope is used, and an analytical method such as section-cutting, the answer is histology. The general principles of organic architecture, as contrasted with the anatomical and histological details, constitute morphology; and the history of this inquiry has been a gradually deepening analysis, of the intact organism, with its shape and symmetry, of the component organs with their homologies, and thence of the tissues, the cells and the stereochemistry of the living material itself. For it is a morphological problem to find out what kind of spicule is characteristic of a particular kind of sponge or what crystalline form is taken by the haemoglobin of this or that mammal when the blood is artificially dried. The first question is: What is this, in itself and in all its parts; what is its structure, macroscopically and microscopically? The answer is: *Morphology.*

(2). But the study of structure leads to the grouping together of organisms that resemble one another in their fundamental architecture. Morphology points the way to *Taxonomy* or classification, and that in different grades—species, genus, family, order, class and phylum. This is not merely for the sake of convenience, it is based on the discovery of deep-seated resemblances in structure and development,—homologies. Classification aims at being an expression of actual relationships or affiliations between the different types. In most cases, this end is still remote.

(3). The obverse of morphology is *Physiology* (*q.v.*), the study of activity or function. The morphologist is concerned with statical relations, the physiologist with dynamical, but the two aspects are obviously complementary. Symmetry, *e.g.* radial or bilateral symmetry, has to be correlated with the animal's manner of living; the structure of the heart must be studied in the light of its function; and, on the other side, physiology has to analyse a resultant into the components that are contributed by the individual parts. And as the history of morphology has been a persistently deepening analysis, so physiology has passed from the study of the intact organism's activities, to inquire into the working of the organs, the tissues, the cells and even of the particles in the living matter itself.

(4). Conventional physiology restricts itself in the main to the activities of the individual, especially the everyday animal functions of contractility, irritability, nutrition, respiration and excretion, and the corresponding functions in plants. But in the study of the reproductive function it is necessary to pass beyond the individual, and thus there arises what has been called "the higher physiology," the study of habits and inter-relations. This corresponds to a large extent to the old Natural History, now called *Ecology* (*q.v.*). What are the dynamic relations between parents and offspring, between the members of a family, a herd, a community or an association? What linkages bind one kind of organism to another, it may be in the quest for food, or in the avoidance of enemies, or in the continuance of the race, as in the part insects play in pollinating flowers, or the part birds play in distributing seeds? In ordinary respiration there is a give and take between the individual organism and the immediate environment; and this is obviously a question of ordinary physiology. But the swaying balance between the insects and the flowers of a given district, or between the rodents and the vegetation, or between the vegetarian and the carnivorous animals, is a problem of ecology.

So far then four sub-sciences have been recognized,—morphology and taxonomy, physiology and ecology; and these may be arranged (after Patrick Geddes) as tables on the following page[1].

(5). A fifth clear-cut question inquiries into the individual development, and the answer is *Embryology* (*q.v.*). In so far as this consists in describing the structure of successive stages in the individual Becoming, it is a morphological study, and might well be called embryography. But of recent years the inquiry has

[1]This scheme applies to multicellular organisms and needs modification for others.

Taxonomy	Ecology
Class	Fauna and Flora
Order	Association
Genus	Community
Species	Species
Variety	Family
Organism	Organism
Organs	Organs
Tissues	Tissues
Cells	Cells
Protoplasm	Protoplasm
Morphology	Physiology

become more and more physiological, seeking to analyse the conditions of growth, the play of stimuli, the influence of one part on another, and so forth. This study is often called Developmental Mechanics (*Entwicklungsmechanik*) or Developmental Physiology; and some would separate it off from embryography, just as physiology is separated from anatomy or morphology. The term embryology, which would unite the morphological with the physiological analysis of development, must not be taken too literally; for the word "embryo" refers strictly to the stages before the developing organism gets free from the egg-shell or egg-envelope, whereas the science has also to do with the later stages such as larva and young creature. Indeed it may be suggested that the science of development should logically include the biological study of adolescence and maturity, of the reproductive period and of senescence. It is a study of the organism in its time-relations. It is an analysis of the course or trajectory of the individual life, though for practical purposes it is restricted to the period before the "finished form" is attained. Embryology may be subdivided like anatomy and physiology. Thus organogenesis is concerned with the development of organs, and histogenesis with the development of tissues. Even deeper is the difficult problem of the division of labour which gives rise to different types of cells—nervous, contractile, glandular, skeletal and so forth. The central problem is how the inherited organization of living matter comes to be differentiated yet integrated.

(6). When the biologist asks how the tadpole becomes a frog, he is an embryologist; but to the question whence came the race of amphibians, the answer is *Palaeontology* (*q.v.*). In other words, embryology has to do with individual development (ontogeny), palaeontology, with racial evolution (phylogeny). The main material of the palaeontologist is of course to be found in the fossils in the rocks, but in his task of reconstructing the past and disclosing the advance of life through the geological ages, he may be able to utilize hints afforded by the comparative anatomist's study of the extant, and by the embryologist's disclosure of the individual development. Palaeontology should be more than palaeontography,—an anatomy of fossils; it fails of its ambition unless it also does something to reveal the great events in the historical advancement of life. Palaeontology describes as far as possible the gradations from one species to another, the connecting links between distinct types, the presumed affiliation of a class, and even the origin of a particular association of organisms. Thus there may be distinguished a palaeontology of species, of types, of classes, of phyla and of associations. With the last may be included an inquiry into geographical distribution, *i.e.*, as to how different regions have come to possess similar or dissimilar faunas and floras. In essence palaeontology is a description of the stages by which organisms have come to be as they are.

If embryology and palaeontology are linked under the rubric *historical,* since both describe processes of Becoming or Genesis, individual and racial, the following schema may be useful.

Palaeontology	Fauna and Flora
	Phylum
	Class
	Type
	Species
Embryology	Fully-formed Organism
	Organogenesis
	Histogenesis
	Cytogenesis
	Differentiation in general

(7 and 8). Huxley applied the useful term *Aetiology* to the study of the factors that have operated in the process of organic evolution. It is one thing to state that birds evolved from an extinct stock of reptiles; it is another thing to be able to indicate, by analogy from the present day, what factors were at work in this notable emergence. Here is included much of the study, in part experimental, of variation and heredity (*qq.v.*), selection and isolation. Aetiology is the study of the causes of phylogeny; it might be pardonable to call it a scientific philosophy of the history of organisms. P. Geddes has suggested that it may be useful to make a separate division for the study of the causes of ontogeny, an inquiry into the factors operative in individual development, not racial evolution. This would include the general part of physiological embryology, the whole question of the plastic influence of the environment on the individual, and much of what is now called genetics, a term suggested by W. Bateson for the science of heredity and variation. The whole diagram may now be put together.

	Palaeontology	Taxonomy	Ecology	Aetiology	
Palaeontology	Fauna and Flora	Class	Fauna and Flora	Racial Evolution	Theory of Phylogeny
	Phylum	Order	Association		
	Class	Genus	Community		↑ Aetiology ↓
	Type	Species	Species		
	Species	Variety	The Family		
Embryology	Fully-formed Organism	Organism	Organism	Individual Development	Theory of Ontogeny
	Organogenesis	Organs	Organs		
	Histogenesis	Tissues	Tissues		
	Cytogenesis	Cells	Cells		
	Differentiation in general	Protoplasm	Protoplasm		
	Embryology	Morphology	Physiology	Aetiology	

Illustrations of Modern Biology. *Morphological.*—New types continue to be discovered, both extant and extinct, which have to be anatomically described. One thinks of the giraffe-like okapi from west African forests and the tiny antenna-less *Acerentomon,* an elusive precursor of winged insects. The "Challenger" Expedition brought home such prizes as *Cephalodiscus,* a distant relative of *Balanoglossus* (*q.v.*), amongst the pioneer Chordate animals, and this kind of connecting link continues to be discovered. The sea continues to be a well of surprises like the Indian Ocean Alcyonarian *Studeriotes,* whose polyparium of hundreds of individuals can be retracted into a densely spiculose cup, sometimes the size of an orange. Not only are new types still forthcoming, but the old ones are analysed more intimately than before. The modern knowledge of *Amphioxus,* which lends itself so readily to exhaustive sectioning, is far more thorough than the best anatomy of Cuvier's days. Yet many keen eyes had examined it before Boveri discovered its 90 pairs of kidney-tubes. The same might be said of the not less interesting *Peripatus,* which seems to unite the Annelid and the Tracheate lines of evolution. Improvements in microscopic and microtomic technique have made morphological analysis more searching and thorough than it used to be. This is particularly true in regard to the cell, which is disclosed as a microcosm with unexpected complications—centrosomes and chromidia, Golgi's apparatus and mitochondria, and within the cytoplasm the nucleus which is another little world in itself (*see* CYTOLOGY).

Taxonomic.—The ambition of many a post-Darwinian taxonomist was to make a genealogical tree, showing the relationships of the phyla, classes and orders—an entirely legitimate ambition when there are sufficient data. But most genealogical trees have crumbled in parts; and it must be admitted that we know very little that is certain in regard to the origins of the chief phyla, such as Vertebrata, Mollusca, Arthropoda or Annelida. More is known in regard to classes, but while all zoologists are agreed, since Huxley's day, that birds are affiliated to some extinct reptilian stock, there is no certainty in regard to the precise pedigree. Yet in regard to more detailed questions, such as the classification of birds and fishes, insects and spiders, Echinoderma and Coelenterata, much progress has been made. It seems, at first sight, strange that the taxonomists should be puzzling still over the old question: What is a species? But the inquiry has deepened (*see* SPECIES). Thus there has been a disclosure of specificity—*i.e.,* of the cytological, biochemical, even habitudinal individuality or idiosyncrasy of any species worthy of the name. Probably every "good species" has its own protein. Then there is the discovery, for plants in particular, that a series of species believed to be nearly related on account of macroscopic resemblances, may show a regular progression in the number of their chromosomes, *e.g.,* in a series of four species of rose, the chromosomes are 14, 28, 42 and 56 respectively. Thirdly there is the experimental attack on the species-problem, which is throwing some light on the puzzling inter-specific discontinuity and frequent sterility. It is becoming clear, however, that in many cases at least, the term species is only a convenient label, and that species are usually not sharply marked off in time and often not in space.

Physiological.—The aspect of the science has been profoundly changed by a series of modern discoveries. Thus, as has been pointed out already, to the integration effected by the nervous system and by the common medium of the blood, there has to be added the specific biochemical integration due to the regulatory hormones. Similarly the modern account of the movement of the sap in a tree has become, on the one hand, simpler, because of a clearer understanding of the rôle of the water-columns in the wood-cells and wood-vessels, and, on the other hand, subtler, through a recognition of the probable influence of hormones in the vessels of the bast. Modern biology has been profoundly affected by some understanding of the significance of the colloidal state, of semi-permeable membranes, of substances in the form of films. Some progress has been made towards a better understanding of ferments or enzymes, which play an important part in vital processes. In short, biochemistry is exerting a transforming influence in biology, as is illustrated in the article COLOURS OF ANIMALS.

Since the contraction of muscle fibres enables most animals to move about, and also secures in the majority the circulation of the blood and the passage of the food down the alimentary canal, it is one of the most important processes in the animal body. It is not yet more than partially understood, but it has become much more intelligible within recent years. The researches of Fletcher and Hopkins have shown that the stimulation of the muscle fibre is associated with the liberation of lactic acid which in some way or other induces a physical change in the fibre, namely contraction. Thus we can understand better why there must be a reinstatement of the lactic acid or its chemical precursor into the fibre if it is to continue effective; and there are interesting theories which suggest how the restitution of lactic acid may be effected. Part of it seems to be burnt up to supply the energy to reinstate the remainder. We cannot do more than touch the subject, but it is a good illustration of the way in which chemistry and physics are being applied to the elucidation of an everyday function. One cannot expect an understanding of the whole process to be easy; for, as Sir Charles Sherrington has put it, "The engineer would find it difficult to make a motive machine out of white of egg, some dissolved salts and a thin membrane, which is practically what nature has done in the exquisite artifice of the muscle fibre!"

The physiology of reproduction (*q.v.*) in animals has been much influenced by the modern study of hormones (*q.v.*). From glandular tissue entangled within the reproductive organs or gonads, essentially germ-cell-producing, hormones pass into the blood and are distributed throughout the body, activating adolescent changes in their manifold expression. The male frog's swollen first finger, the courting adornment of many cock-birds, and the antlers of stags are familiar instances of masculine peculiarities, instigated by the reproductive hormones. In many cases the female includes in her inheritance the factors of masculine characters, but these lie latent, because the liberating stimulus is absent, or because they are inhibited by an antagonistic female hormone with an opposite influence. This explains how a duck from which the ovary has been removed may at the next moult put on the brighter livery of the drake, and assume some of his ways as well. Crowing hens and egg-laying cocks are no longer hopeless puzzles. Not less important are the hormones associated with the female reproductive organs in mammals, for they prepare the mother for the development of the offspring in the uterus and for its demands for milk after it is born. Very interesting lights are being shed on the intimacy of the ante-natal partnership between the mother and the unborn offspring. For it has been discovered that there is a passage of regulatory hormones from the mother to the developing offspring, and also a passage of hormones from the offspring to the mother, which contribute to her health. Thus there is a literal symbiosis, correcting the old ugly idea of "the foetal parasite."

The male organism is essentially a sperm-producer, the female an egg-producer; and there are some animals, such as sea-urchins in which the sexes are so closely alike that they cannot be distinguished without a microscopic or a very experienced inspection of the reproductive organs. What lies behind this essential difference between males and females remains obscure (*see* SEX); it finds expression in two microscopically indistinguishable threads of a mould, as well as in the staring contrast between peacock and pea-hen. There are, as we have mentioned, differences in the sex-hormones, but may there not be some deep constitutional dichotomy leading to this difference? Again, there may be a difference in the chromosomes, as when the female has in every cell of the body one more chromosome than the male (woman having 48 and man 47), but what is there in the presence of an extra chromosome to account for all the contrasts between the sexes? Thus some biologists have sought to discover physiological differences between the sexes, and we take this as an instance of a modern inquiry. It has long been known that males and females may differ in constitutional details, as in the number of red blood-corpuscles and the proportionate amount of haemoglobin. Here, for instance, man is numerically superior to woman. The developing grub of a worker hive-bee has, as regards fat and glyco-

gen, a chemical composition markedly different from that of a grub that is developing into a drone. In many cases the blood of a caterpillar that is developing into a female butterfly is greenish, while that of its neighbour that is developing into a male is light yellow or colourless. This points to a difference in the chemical routine or metabolism of the body.

In 1889 P. Geddes and J. A. Thomson suggested in *The Evolution of Sex* that the fundamental sex-difference behind all the minor contrasts was in the ratio of anabolic to katabolic biochemical processes, A/K in the female being always greater than a/k in the male; and of this theory there has been some experimental and much observational confirmation. A germ-cell whose rate and rhythm of metabolism (measured, for instance, in pigeon's eggs by Oscar Riddle) inclines to a large A/K ratio, will tend to develop into an egg-producing female, with the expression of feminine characters. Conversely, a germ-cell whose a/k ratio tends to be much smaller, will tend to develop into a sperm-producing male, with the expression of masculine characters. And if it should be asked why there should be these alternatives in the A/K ratio, the answer is that this is a universal variational dichotomy, comparable to low gear and high gear. It finds expression in the contrast between ovum and spermatozoon as cell-types; between plants and animals as sub-kingdoms; between Sporozoa and Infusorians as sub-phyla; between reptiles and birds, as classes; between hydroid and medusoid as phases in one life-history, and so with thousands of bifurcations on the path of life. It is often illustrated by variations, of lizards for instance, within a species. It may also be recalled that one and the same organism may in the course of its life change normally from one sex to another, as is illustrated by the hagfish, *Myxine glutinosa.*

In 1923 Manoiloff described a chemical test that enabled him with notable success to tell whether a sample of blood had been taken from a male or from a female animal. To a diluted half-transparent emulsion of blood in salt solution he added, drop by drop, a succession of reagents. After the treatment the emulsion of blood from a male was colourless; that from a female was coloured. Out of 530 tests Manoiloff had about 96% right answers, and two of his students had 97 and 92% of successes. Many others, however, have been much less fortunate, and the discrepancies are puzzling. As the chlorophyll-green of plants and the haemoglobin of animals are regarded by many biochemists as nearly allied pigments, Manoiloff turned his attention to some of the dioecious plants, such as willow, poplar and dog's mercury. In Manoiloff's hands the sex-test worked almost as well for the plants as for the animals, but some other investigators have not had this experience.

Distinctive of this generation has been the study of reflex actions (*see* PSYCHOLOGY, COMPARATIVE). In the familiar knee-jerk, when a sharp tap below the joint of a crossed leg sends the foot up into the air, the mechanical stimulus leads to a thrill along sensory nerve-fibres to the spinal cord; the nervous impulse—still so much of a puzzle—passes to connecting or associative cells and thence to motor nerve-cells, both in the spinal cord. Thence, along motor nerve-fibres, orders come to the muscles, commanding them, as we say, to contract. The brain is not required at all. A pre-arranged linkage of sensory, associative, and motor spinal neurons is sufficient in itself, with, of course, the muscle-cells to give effect to the motor orders. What occurs is called by the physiologists an "unconditioned reflex," and it is one of the commonest occurrences, both in man and beast. When we shut our eyes at the approach of a missile, or when we swallow what touches the back of our mouth, we are illustrating various forms of the unconditioned reflex, some more complicated than others. So is it when a sea-anemone closes its tentacles on a piece of food, when a crab amputates a badly damaged leg, when an earthworm jerks itself into its hole if the ground vibrates under a blackbird's footsteps, when a plaice puts on the colour of sand on which it has come to rest, when a nestling opens its mouth at the touch of food in its mother's bill—these are illustrations of unconditioned reflexes; and the animal world is full of them. It is characteristic of unconditioned reflexes that they are inborn, that they do not require to be learned, that they are shared by all members of the species, and that they are often quite independent of the brain for their performance. It should be noted, however, that even in the case of a very simple unconditioned reflex like the knee-jerk, a message goes to the brain to report the occurrence. Moreover, the brain is sometimes able to suppress the normal reaction, as in the case of criminals tried by Oriental ordeals, such as the swallowing of dry rice, which is almost impossible if fear inhibits the flow of saliva.

But the modern development of this line of inquiry which we wish to take as an illustration of physiological progress is I. Pavlov's study of "conditioned reflexes." If a dog is shown a piece of flesh its mouth waters. If a whistle is always sounded when the flesh is shown to the dog, an association is gradually formed between the sound and the prospect of a meal. This association or enregistration may become so strong that the dog's mouth will water when the animal hears the whistle, although there is no flesh in sight. The flow of saliva in the dog's mouth illustrates a "conditioned reflex," and the strength of the reaction can be measured by the amount of saliva secreted. It seems likely that in the everyday early life of animals many of these conditioned reflexes are established, and this is to the naturalist the particular interest of Pavlov's experiments. The established associations work rapidly and are probably life-saving as well as time-saving. A wild animal, such as a lion, will react rapidly to a sound or sight in connection with which a reflex has been established, whereas it may not be in the least perturbed by a much more obvious, but unfamiliar, source of danger, such as the arrival of a motor-car against the wind. The conditioned reflex, though usually based on some much older unconditioned reflex, is always built up in the experience of the individual; and, as in mankind, so among the higher animals, there may be some appreciation of the meaning of the connection.

Ecological.—Ecology (*q.v.*) is the study of life as it is lived in nature, where the circle of each individual's interests is intersected by many other circles—such as kindred, members of the same species, competitors, deadly enemies, parasites, symbions, and so forth. Ecology is concerned with inter-relations and linkages, with ways of living, with adjustments to space and time. Thus it includes the study of numbers and dispersal, of migration and other seasonal reactions. Ordinary physiology is concerned with the internal economy of the individual body, but ecology has to do with external relations. The transition from individual physiology to ecology is in the study of reproduction, for that leads from organism to organisms. A few illustrations may be given of the lines of modern ecological investigation.

The leaf-cutter ants cut off segments of leaf from certain trees and carry them to their underground nest, where they are chewed into a green paste, used as the culture-medium for a particular kind of mould not found anywhere else. This mould forms the exclusive food of the leaf-cutters in their subterranean life. When the queen leaves the nest on her nuptial flight, thereafter to start a new community, she takes with her in a little depression beneath her mouth a sample of the mould, which she plants out as soon as her brood of workers have collected leaves and made a soil of green paste. Naturalists have been long admiringly familiar with the parental care exhibited by many insects, but did anyone suspect the extraordinary nutritive exchange common among social wasps between the nurses and the grubs, and also illustrated among ants and termites? Sometimes the mother-wasps, but oftener the step-mothers or workers, feed the grubs in their cells with the chewed flesh of insects, the jaw-apparatus of the larvae being poorly developed. But when the meal is supplied, and sometimes in defect of it, the larva exudes from its mouth a drop of sweet elixir which is greedily licked off. The demand for this luxury may be somewhat coercive, and the elixir is appreciated and may be obtained by the drones, as well as by the queen and the workers (*see* SOCIAL INSECTS). As the sweet juice is secreted only by the young larval wasps, the exchange or "trophallaxis" tends towards the establishment of a *ménage* in which throughout the season there are continual relays of young ones. The luxury seems to have become almost a necessity.

Instances of symbiosis have multiplied greatly within recent years, plant within plant, plant within animal, animal within animal. The last is best illustrated by the highly specialized Infusorians whose sole habitat is the intestine of wood-eating termites, where they do something that is indispensable to the food. By raising the temperature it is possible to kill off the Infusorians without harming the termites, whereupon the insects die, being unable to make anything of the wood. But they can be rescued by introducing a fresh supply of Infusorians. Another remarkable symbiosis is illustrated by some luminous cuttlefishes that shine with a light produced by nests of harmless luminous bacteria, like those familiar on drying fish.

The disclosures of the ecologists are warnings against taking simple views of things. Some beetles that bore in growing wood have no symbionts in their food-canal, but on the walls of their tunnels they grow a mould that yields what is called "ambrosia." The fungus collects, concentrates and prepares the sap, and in some cases it has been proved that the beetles do not eat the wood or sap as such, but depend entirely on the ambrosia. The fungus does not seem to form spores or other elements specialized for propagation, so it is probable that the beetles infect a new tree with surplus vegetative ambrosia cells which have passed out undigested from the food-canal. Ecology makes life more complex. Thus the much-studied life of the hive-bee has been complicated by the disclosure of the nectar-dance and pollen-dance on the honeycomb, in which a worker-bee gives her sisters a clue to treasure-trove. Similarly there is the discovery of the graduated quasi-apprenticeship of the worker through a succession of instinctively discharged duties, and there is the punctilious study of homing. To take the last, Wolf has shown that the homing depends partly on visible landmarks that have been learned, partly on the odour of the hive, and partly on a "sense of direction," which has its seat on the antennae, and is remotely comparable to the sense associated with man's semicircular canals. By the antennae the bee is able to record movements until it begins to "lose count." When bees are fed for the nonce at a point 150 yards due north of the hive, a captured one released from its box flies at once southwards. But if the captive is carried in the box 150 yards due east of the hive and then released, it flies again due south. When it has covered 150 yards (judging the distance to ten yards!) it begins to hesitate, apparently made aware that it is quite wrong. It then proceeds to circle around until it finds the hive by sight and scent. Our illustrations have perhaps been within too narrow a range, for ecology has to do with associations and communities, families and pairs, thrust and parry with the environment and with the seasons, trading with time and trafficking with circumstance, migrations and trekkings, outgoings and incomings, and, of course, with plants as much as with animals.

Embryological.—The old-fashioned morphological embryography has largely given place to experimental and physiological studies of development; but the description of the stages in a life-history can never cease to be an integral part of biology. Johann Schmidt's masterly elucidation of the larval development of the common eel has much interest even for the general biologist, and Leiper's discovery of the story of *Bilharzia* is notable in itself as well as in its practical applications. Of recent years there has been no more striking achievement than Isabella Gordon's description of the building up of the sea-urchin's test, from a few sclerites in the early free-swimming larva to the elaborate edifice of the adult. Notable advances have rewarded the applications of physiological methods and ideas to embryology (*q.v.*). There has been a fruitful study of the regulative and "organizing" influence of one part on another during development, of the rôle of hormones in controlling the rate and rhythm of developmental changes, of the significance of certain environmental factors and of chemical substances in the food. The studies of Julian Huxley and others on dedifferentiation and regeneration (*qq.v.*) well illustrate the modern movement, and the experiments of Spemann are outstanding. A few particular discoveries may be mentioned to give more concreteness to the picture. (*a*) In many cases (even in frogs), it is possible to induce the normal development of eggs without there being any fertilization (*see* FERTILIZATION). (*b*) Many experiments show that a part of an egg may be as good as the whole. A larva may be reared from a fertilized fragment of an Echinoid egg, or from one of the first four cells into which the ovum of *Amphioxus* divides. (*c*) In certain cases, as in Ctenophores and Tunicates, it is possible to prove that there are specific organ-forming substances in an egg, whose removal is followed by some particular defect in the developing organism. (*d*) A portion of the optic vesicle of a tadpole grafted under the skin of the larva in an entirely irrelevant place, such as the side, will induce in the cells of the epidermis the formation of a lens, which is the normal function of the optic vesicle in its proper place. (*e*) If the newly fertilized eggs of the American minnow (*Fundulus*) are exposed for a few hours to a temperature a little above freezing point, a percentage will develop into blind larvae. This experiment shows that the blindness of certain cave fishes need not necessarily be ascribed to the darkness. (*f*) If the developing eggs of the same fish are subjected to various reagents, such as butyric acid, there result numerous strange monstrosities in eyes and ears, nostrils and mouth, even in heart and fins. The chemical intrusion seems to dislocate and partially dissolve the germinal material, especially towards the head end. This may throw some light even on mammalian monstrosities, for butyric acid sometimes appears in higher animals as the result of some disturbance in the carbohydrate metabolism. A consequent poisoning of the mammalian mother's constitution might result, through the placenta, in monstrosities in the early embryo. (*g*) If the larva of the blind newt *Proteus* be reared in the laboratory under red light, the developing eye, which is normally arrested in the darkness of the caves, increases in size, reaches the surface of the head, and may continue its development even to the extent of becoming functional. The reason for the red light is that in white light the skin of the larva becomes darkly pigmented, and shuts off the stimulus from the developing eye. (*h*) According to Baltzer's account of the development of the green worm *Bonellia,* notable for its extraordinary sexual dimorphism, those free-swimming larvae that settle down on the floor of the sea develop into large females with a body an inch or two in length and a flexible food-capturing proboscis which may be a foot long. But those that settle down on the proboscis of a full-grown female, and proceed to absorb the skin-secretion, have their development inhibited, and become pigmy males! Those larvae that Baltzer helped to attach themselves to the proboscis of a full-grown female, but left attached for a very short time, subsequently developed into almost perfect females. Those that he left attached for a long time became the ordinary pygmy males with much simplified structure, which live parasitically in the female. But those left for intermediate intervals of time showed various stages of inter-sex.

There is more than verbal progress in the recognition that embryology cannot be limited to the study of the very young animal. It is plain that the larval, as well as the embryonic, stages must be included, and all the difficult phenomena of metamorphosis. But one cannot logically exclude such strange dis-organizations and re-differentiations as are involved, for instance, in the "brown body" of many Polyzoa. The changes of adolescence cannot be separated off from their antecedents, and thus the broader view of embryology will include the study of the whole organism in its time-relations, even those of senescence. The work of Child on *Senescence and Rejuvenescence* is significant of the broadened modern outlook. It is biologically interesting to compare the life-histories of different types, for they sometimes differ from one another in the relative length of the various arcs on the life-curve. Thus some, like *Peripatus* and the elephant, have a prolonged embryonic period; others, like the lamprey, show a lengthened out larval phase; others have a long adolescence, like the elephant again; and so on. Some, like eels, die abruptly after reproduction, while others continue parental for many years, like Golden Eagles. Some, like Mound Birds, practically telescope the whole youthful period; others, *e.g.,* many fishes, continue steadily growing throughout life. These elongations and telescopings of arcs on the life-curve are undoubtedly adaptive in many cases to particular conditions of environment and seasons. They suggest the

occurrence of what may be called "temporal variations"; and these in higher animals may be correlated with endocrinal peculiarities.

Palaeontological.—The modern advance in palaeontology may be dated from the work of Waldemar Kowalevsky (1874) who devoted himself to a reconstruction of the life of fossil ungulates. He sought to relate his fossils not only to their extinct ancestors and extant descendants, but to their own habits and to their particular environments, both climatic and animate. The distinctive note in the outstanding palaeontological studies of recent years is the reconstruction of the life of the past. The palaeobotanist joins with his zoological colleague, and both take counsel with the geologist and with the climatologist. A further aspect of modern palaeontology is the way in which it has filled in gaps and given us continuous series of fossils.

Aetiological.—The origin of the new remains one of the central problems of biology, but some steps of essential importance have been made since Darwin's day. (1). There is evidence of the frequency of discontinuous variations or mutations, and these illustrate Mendelian inheritance. (2). There is no doubt that many—some would say *all*—visible and somatic variations are due to germinal permutations, combinations and changes. (3). In some cases it is certain that the germinal "factors" or "genes," corresponding to particular mutations, and to all or many of the discrete non-blending "unit characters" of the organism, lie in longitudinal order in the chromosomes of the nuclei of the germ-cell. In the fruit-fly *Drosophila* there are known to be about 7,500 of these "factors"; and their topography has been provisionally mapped out. In the history of the germ-cells there are ample opportunities for their shuffling, which might, and no doubt does result in new patterns. (4). Some experiments show that deeply saturating environmental, nutritional and functional peculiarities —including X-ray radiations—may incite germinal changes. (5). Just as a periodic scrapping and re-organization (endomixis) occurs normally in some species of slipper animalcule, so there may be re-arrangements and re-organizations in the complex nucleus of a germ-cell, which, after all, must be intensely alive. (6). There is strong palaeontological and a little experimental evidence that variations are sometimes definite or orthogenic, *i.e.*, occurring consistently in a particular direction. In other words, a variation may be congruent with what has been already enregistered in the organization of the creature. As a particular illustration we may refer to Erwin Baur's study of mutations in snapdragons, *Antirrhinum majus* and its relatives. The garden races are continually exhibiting mutations, small in amount, but crisp and brusque in character, and transmissible in their entirety in Mendelian fashion. There seems no doubt that they are expressions of slight germinal changes in the hereditary factors.

Various evolutionists who admit the reality of mutations have been inclined to depreciate their importance on the ground that they tend towards monstrosities and represent a weakening of germinal vigour. This may be true in some cases, *e.g.* in fancy goldfishes or waltzing mice, but it is certainly not true of Baur's small mutations in snapdragons, for these are generally well within the limits of healthy normality. They find expression not only in the flower and its colour, but in many parts and characters of the plants. Sometimes the new departures suggest an enhancement of vigour, as in a deeper green in the leaves. In any case, there is rarely any hint of the pathological. In most cases the mutants seem to have taken a small step further along the direction which marks the parental race. After 20 years of investigation of the garden races and wild species of snapdragon, Baur has come to the conclusion that in many cases their distinguishing characteristics are due to the summation of small mutations such as are of everyday occurrence in the garden. In natural conditions the summation may be put to the credit of natural selection, which sifted the new tentatives in reference to the diverse and changeful conditions of locality and climate. This is a characteristically Darwinian conclusion, for Darwin thought much more of the creeping than of the leaping of the eternal Proteus of life. But whereas Darwin was vague in regard to his raw material of "small variations," Baur is very precise in regard to his "small mutations," except as regards their cause. While Baur confirms Darwin's belief in the cumulative importance of small changes, which might be called evolution-jerks or quanta, he is far from saying that these furnish the whole of the raw material of progress. On the contrary, while he lays chief emphasis on minute changes in the hereditary factors or genes,—*changes which occur abundantly even in "pure lines"* (all descended from one parent),—he admits that new departures may arise from the crossing of different strains with different sets of factors. But the existence of these different strains depends in snapdragons on the previous summing up of small mutations. The large transilient variations or freaks, which attract the gardener's eye, can be continued by careful cultivation, but they tend to be eliminated by natural selection as too extreme. The small mutations count for most. It may be noted that, in contrast to roses and some other organisms, the number of chromosomes does not change, being eight in all the species studied.

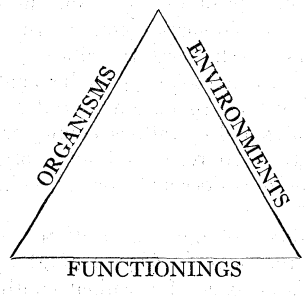
As regards heredity, the modern position has been profoundly altered (1) by the re-discovery (1900) of Mendelian inheritance, (2) by Weismann's concept of germinal continuity, and (3) by the use of statistical methods. While there are some puzzling phenomena, there is at present no conclusiveness in the evidence adduced in support of the transmission of individually acquired somatic modifications, even to a slight degree. But there is a clearer recognition of the fact that the expression of a character in the course of development is always the resultant of two components—the hereditary "nature" and the environmental, nutritional, and functional "nurture." There have been several violent reactions from the characteristically Darwinian theory of natural selection, but they do not appear to be well-informed. Darwin anticipated the criticism that natural selection does not account for the material to be sifted; he was careful to distinguish other forms of selection besides the immediate lethal elimination of the relatively less fit; he laid stress on the survival value of such non-competitive endeavours as parental care and mutual aid; he laid emphasis on the correlation of variations, as explaining how an incipient new departure, too minute to be of appreciable value, might be carried in the wake of a large and important variation with which it is correlated. Since Darwin's day it has become clearer that natural selection operates in relation to a system of inter-relations—the web of life—already established, a fact which explains how the difference between Shibboleth and Sibboleth may have survival value. It has also become clearer that organisms sometimes take part in their own evolution by playing the hand of hereditary cards with which they have been endowed. It is true that the environment often selects organisms, but it is also true that the organism sometimes selects its environment. Since Darwin's day there have been a few actual proofs of natural selection at work, as in the case of Weldon's crabs and Cesnola's mantises.

Increased attention has been paid to the effect of isolation in its varied forms—geographical, habitudinal, temporal and temperamental—for isolation tends to inbreeding or endogamy, which stabilizes a stock or species, whereas outbreeding or exogamy promotes variability, sometimes almost like an epidemic. There can be little doubt that alternations of inbreeding and outbreeding have meant much in evolution. Careful experiments have shown that inbreeding may be long continued in a vigorous stock without any deterioration, the prejudice against it being due to the mistake of supposing that the not infrequent disclosure of recessive defects in the course of inbreeding is due to the consanguinity as such.

Reconsideration of Sub-divisions.—After this illustration of the scope of biology it may be useful to return to the sub-divisions of the science:—Palaeontology: Taxonomy: Ecology: Aetiological phylogeny. Embryology: Morphology: Physiology: Aetiological Ontogeny. Is there no alternative grouping, for it has been objected (1) that aetiology is not a separate sub-science, but rather the raising of a question that is relevant all through; (2) that the causal investigation of development (ontogeny) is very different from the study of racial evolution (phylogeny), and should not be separated from embryology; (3) that the relation of

embryology to palaeontology is not comparable to that between physiology and ecology, or morphology and classification.

As an alternative grouping it may be suggested that the biologist has to do with Organisms, Functionings and Environments, using each term in the plural, and "functionings" rather than "functions," on the ground that the everyday functions that secure the continuance of the living creature cannot be separated from the organism without leaving a false abstraction.



Organisms may be studied statically (anatomy, etc.) or dynamically (physiology, etc.), and in their time-relations (from embryonic development to senescence). Functionings include all the ongoings and operations of the organisms (ecology). The study of environments includes the whole staging of life, animate as well as inanimate, and that is also to be studied in its time-relations, both seasonal and secular. At every point the evolutionary question may be raised, in regard to each of the three sides: By what steps and by what factors did these organisms, functionings and environments come to be as they are? This removes the awkwardness of having aetiology as a separate sub-section, and of separating the anatomy and physiology of the embryo or larva from the anatomy and physiology of the adult. If the sides of the triangle, a cross-section of "the biological prism," be pictured as convex, the inner surface may represent the psychical, mental or subjective aspect (clearly present in many organisms and functionings and in at least the higher reaches of the animal part of the environment), while the outer surface may represent the protoplasmic, bodily or objective aspect. The correspondence of the biological co-ordinates, Organisms, Functionings and Environments, with the sociological analogues, Folk, Work and Place, is obvious.

APPLICATIONS OF BIOLOGY

It is useful, theoretically at least, to distinguish applied biology from applied zoology and applied botany. When means are taken to check the spread of injurious insects, or the dissemination of malaria by mosquitoes and of sleeping sickness by tse-tse flies, or the damage done by parasites such as the hook-worm in man or the Isle-of-Wight mite (*Acarapis*) in hive-bees, there is an application of zoology to a practical problem. The success of the check often depends on a knowledge of the life-history and inter-relations of the animals involved. Similarly, there is an application of botany in the effort to check the diffusion of plant-diseases and plant-enemies. As regards man himself, as well as his domesticated animals and cultivated plants, great results have rewarded applied botany and applied zoology. But applied biology is somewhat different; it implies the application of general biological ideas, not the specialist's knowledge of this or that animal. Thus Mendelism (*q.v.*) applied to plants and animals is applied biology, and so is the general policy of hygiene and eugenics. An appreciation of the general biological idea of the web of life might have saved man from some of his short-sighted introductions and eliminations, and may assist him in his policy of more economically exploiting the life of land and sea. In coping with the bilharzia parasite in detail there is co-operation between medicine and zoology, but the idea of acting on a knowledge of the linkage between the man and his worm, on the one hand, and between water-lilies and aquatic birds on the other, comes as a suggestion from biology.

Unsolved Problems.—It is not to be supposed for a moment that the science of biology is so far advanced that a list can be made of its unsolved problems! Yet there are many vital phenomena which are well on the way towards being described in terms of relatively simple or generalized concepts, such as the metabolism or the irritability of protoplasm, while others remain defiantly beyond our present analysis. Some qualitative advance, such as the discovery of hormones, must be made before they become relatively clear; no mere quantitative addition of data will supply the required illumination. Thus biology is still far from understanding the factors operative in cell-division, or what is the most essential event when an egg is fertilized, or how enzymes continue unwearyingly to exert their extraordinary transforming power. There are some very puzzling phenomena, *e.g.*, the case in which a living organ, such as the growing root of a plant, influences a similar organ of another kind of individual, without there being any contact between them.

While the biologist has come to understand how certain kinds of variations or new departures may arise, *e.g.*, by a shuffling of the hereditary cards contained in the chromosomes, or by the interpenetration of some potent environmental influence, it is not possible at present to give any clear account of the origin of a large mutation of a distinctly novel character, though H. G. Muller and others have succeeded in producing large mutations by X-ray irradiation. Yet the origin of the new is the central and inevitable problem of biology. Similarly, while the secure data of Mendelian inheritance have grown in volume with remarkable rapidity, it does not appear to be possible at present to give any reason why one of two contrasted characters should be dominant and the other recessive. On another line, it may be said that some biologists who regard the evidence in favour of Lamarckism as altogether unconvincing, are willing to admit the reality of certain puzzling phenomena which demand further inquiry and some fresh discovery. But the whole subject of organic evolution bristles with unsolved problems!

Returning to the concrete, we may illustrate the kind of unsolved problem to which we specially refer by mentioning the way-finding capacities exhibited by migratory birds. Prolonged experiments with ants and bees seem to have proved that in the majority of cases at this level there is an individual learning of the topography around the hill or hive. But this does not apply to cases like the sooty and noddy terns of the Tortugas which are able in some cases to return to their nests after being transported in closed baskets for a thousand miles and liberated in seas previously unknown.

Major Problems of Biology.—The biologist begins with simple forms of life, like some of the simplest Protista of to-day, and supposes that from these, by a continuous sequence of natural processes, all other organisms have been evolved, in the course of some hundreds of millions of years. But the first question is: how the postulated simplest organisms began to be upon the earth. To suppose, with Kelvin and others, that germs of life reached the earth from elsewhere, in the crevices of a meteorite or in cosmic dust, is not an easy hypothesis; and in any case it only shifts the problem. It must be kept in mind that the existence of protoplasmic organisms is not possible except in a relatively cool corner of the cosmos, where water is available in a liquid phase. The only other scientific suggestion is that simple living creatures may have arisen from non-living materials by processes of natural synthesis. This synthesis may have been due to the prolonged action of light on water containing carbon-dioxide and nitrite of ammonia, or the like, brought down by rain after a thunderstorm. It is interesting to recall the achievements of the synthetic chemist in building up such complex substances as amino-acids, but the difficulty is to suggest the natural conditions that would play the chemist's part. In this connection the experiments of Baly and his collaborators are of much interest. For he was able to produce first formaldehyde and then sugar by prolonged illumination of water containing carbon dioxide. Furthermore it was found possible to induce the formaldehyde to unite with nitrites, thus forming nitrogenous carbon-compounds, by the use of ordinary sunlight in the presence of a "metallic photocatalyst," *i.e.*, a metallic substance which makes the energy of light more available. This is probably the function of chlorophyll.

Life is a particular kind of activity exhibited by living creatures. It includes many chemical and physical processes which become more clearly known every year. But these processes of oxidation and fermentation, of surface tension and osmosis, of heat-production and electric discharge, and so forth, are correlated, regulated, controlled and integrated; and it is this unification, leading to effective behaviour, which seems at present to be indescribable in terms of chemical and physical concepts. These have been for the most part developed in reference to changes of matter and energy in circumstances not including life, and it is not to be expected that they should apply to the totality of reactions exhibited in another order of facts, namely those of organisms. It is not behaviour alone that stands by itself, but the capacity for growth, multiplication, development and enregistration. As W. K. Clifford said: "It is the peculiarity of living things not merely that they change under the influence of surrounding circumstances, but that any change in them is not lost, but retained, and, as it were, built into the organism to serve as a foundation for future actions." Since the living organism appears to be a new synthesis, as compared with a stone or a star or a drop of colloidal matter, since it exhibits qualities that cannot be adequately described in terms of matter and energy, it seems good sense to claim some autonomy for biology. The organism is a new synthesis in which certain aspects of reality, previously unexpressed, find expression, and these cannot be adequately described without the use of special biological concepts, such as irritability and enregistration, growth and development, and effective behaviour.

Among birds and mammals there is abundant evidence of the intelligent control of behaviour in reference to a perceived purpose. There is often more than a hint of judgment; endeavour is undeniable; feeling is often strong. The biologist must recognize that he is dealing with psycho-biosis. A Robot theory of the higher animal does not work, and recent well-criticized observations and experiments on the highest apes show that the level of intelligence is higher than the most generous had supposed. On the other hand, there is not less abundant evidence that no small part of animal activity depends on automatic reactions, tropisms, enregistrations and reflexes, both unconditioned and conditioned. It may be said, indeed, that animal behaviour has evolved along two main lines. On the one hand, there is the evolution of the power of fresh adjustment, of making little experiments or tentatives. This is the line of individual initiative and it has its climax in sheer intelligence. On the other hand, there is the evolution of the capacity for the neural enregistration of profitable modes of behaviour, so that they become parts of the inheritance, requiring no more than a liberating stimulus for their activation. In both cases there is inherited capacity, but among "big-brained types," as Sir Ray Lankester has called them, the inheritance is mainly a nimble, plastic, educable intelligence, while among "little-brained types" the inheritance is mainly a stereotyped series of reactions. Now it is one of the major problems of biology to do justice to these two lines, a problem which is the more difficult since they sometimes intersect.

But the attempt to do this is likely to bring the biologist face to face with the still more difficult problem of the relation between body and mind. On the one hand, there is the bodily, the nervous, the physiological, the objective. On the other hand, correlated yet incommensurable, there is the mental, the psychical, the psychological, the subjective. How are these two aspects of reality to be thought of in relation to one another? When are we warranted in stressing the one, and when the other? It remains a difficult problem for the biologist to trace the expressions of mentality backwards to their slender beginnings, both in the individual higher form and in the animal kingdom as a whole; and to probe further back still to what may have corresponded to mind in the non-living materials out of which organisms may have evolved. It seems necessary to assume that a certain degree of organismal intricacy is necessary, both in ontogeny and in phylogeny, before emergence is possible for that aspect of reality which we call "mind," an aspect which is of such predominant importance in the development of The Sociosphere.

Inter-relations with Other Sciences.—In Spencer's scheme biology is the central science based on chemistry and physics, leading on to psychology and sociology. Saying the same thing somewhat differently, we have ranked the study of the realm of organisms (the biosphere) as intermediate between the study of the domain of things (the cosmosphere) and the study of the kingdom of man (the sociosphere).

In the living body there are diverse processes of oxidation and reduction, hydration and dehydration, solution and fermentation and so forth, which can be taken separately and studied by the bio-chemist. Similarly there are phenomena of surface tension, capillarity, osmosis, leverage, hydrodynamics, thermodynamics, electricity and so forth, which can be taken *seriatim* and studied by the bio-physicist. Biophysical and biochemical methods have helped greatly towards a better understanding of the life of the body. They illustrate what Comte called a legitimate and necessary materialism. Biology cannot dispense with the assistance of the more exact sciences. But, even if we had a complete ledger of all the biochemical and biophysical processes that occur when a swallow returns from the Gold Coast to the place of its birth in a Scotch farm-stead, we should not understand the bird's remarkable homing. For that requires distinctively biological concepts. The concepts of chemistry and physics are indispensable in biology, but biology transcends them and requires concepts of its own. The organism transcends mechanism and is a "historic being."

The inter-relation of "body" and "mind" is such as to justify the saying: *nemo psychologus nisi physiologus;* but we sometimes forget to transpose this. An emotional storm stimulates the production and distribution of adrenalin; dyspepsia warps the judgment and dulls good feeling. A blot in the brain may mean a darkening of the eyes of the mind; and the clinical biographies tell us how an eye-trouble may ruin a man's temper. Yet a merry heart is the life of the flesh and good news promotes digestion. Mental and bodily, psychical and neural, subjective and objective are so closely intertwined that it seems to many biologists that their science is really psycho-biology. Similarly, but more distantly, in regard to sociology, the biological foundations cannot be ignored without loss. The units in sociology are societary groups of some sort, but these consist of individuals with all the appetencies and limitations of organisms. There is a social aspect of heredity, of sex, of multiplication and of nutrition. Just as there can be no sound biology that does not keep continually in view the three sides of the prism, Organism, Functioning and Environment, so there can be no sound sociology that does not keep continually in view the social analogues of these: Leplay's *"Famille, Travail, Lieu."* Here the biologist and the sociologist join hands.

(*See* ZOOLOGY; BOTANY; PHYSIOLOGY; PALAEONTOLOGY; PALAEOBOTANY; EVOLUTION, ORGANIC; SPECIES, etc.)

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HISTORY

Biology, in the widest acceptance of the word, is used to cover all those studies which deal with the structure, nature and behaviour of living beings. It is thus in contrast to the word physics which is similarly used to cover the study of the structure, nature and properties of such matter as is neither living nor a necessary product of the activity of living things. It happens that certain of the studies classed as "biological" are intimately bound up with the study of medicine. Such are, for example, human

anatomy, the physiology of the warm-blooded animals, bacteriology and the like. The linking of these departments with medical study has had certain historical and practical results and they are sometimes tacitly excluded from what is called biology in certain narrowed academic uses of that term. As a matter of practical convenience these departments have been considered in the article MEDICINE, HISTORY OF. Here we shall only consider them incidentally.

The word biology was introduced by S. T. Treviranus (1776–1837) in his *Biologie oder die Philosophie der lebenden Natur* (Göttingen, 1802–22). It was adopted and popularized by J. B. de Lamarck (*q.v.*) (1744–1829) in his *Hydrogéologie* (Paris, 1802). It is probable that the first English use of the word in its modern sense was by Sir William Lawrence (1783–1867) in his work *On the Physiology, Zoology and Natural History of Man* (London, 1819). There are, indeed, earlier uses of the word in English but they are in relation to biography.

Biology, like other sciences, can be traced to the Greeks. At a very early date, and particularly at the hands of Alcmaeon of Croton (*c.* 500 B.C.), we hear of independent investigations of the structure and habits of animals. Thus Alcmaeon described the optic nerves and tubes that lead from the nose to the ear (Eustachian tubes), and he made a beginning of the study of the development of the embryo. Moreover, the Hippocratic collection (*see* MEDICINE, HISTORY OF and HIPPOCRATES) provides evidence, imbedded in a work on diet, of the existence of attempts to make a classification of animals as early as the 5th century B.C. All the early records of biological science before the 4th century B.C. are, however, either completely lost or too fragmentary to permit of adequate reconstruction. Not until we get to Aristotle (384–322 B.C.) do we encounter any complete biological works. Moreover, as our knowledge of Greek biological science begins with Aristotle, so it may almost be said to end with him. The only surviving ancient works on living things, besides those of Aristotle, that were prepared without consideration of the application of the knowledge they set forth, are by his pupil, Theophrastus. A full account of the biological achievements of Aristotle and of Theophrastus would thus contain an almost complete account of our knowledge of pure biological science as it existed in antiquity.

Aristotle as a Biologist.—Of the biological works of Aristotle a considerable number have survived. Among them, four stand out pre-eminent. They are: (*a*) On Psyche, *i.e.*, on the soul or living principle, usually known as *De Anima.* (*b*) Histories about animals, usually known as the *Historia animalium.* (*c*) On the generation of animals, usually known as *De generatione animalium.* (*d*) On the parts of animals, usually known as *De partibus animalium.*

There are matters in these works which come rather in the department of philosophy than in that of biology (*see* ARISTOTLE) but which must nevertheless of necessity be considered in any account of the history of biological thought which they have influenced throughout its course. Among these matters is Aristotle's conception of the nature of the living principle or psyche.

The oldest use of the word "psyche" is in the sense of breath, and breathing is the most obvious sign of life. It was, therefore, natural that from breath the word psyche came to mean life, then the soul and again the mind. Aristotle used this term for the principle that differentiates living from not-living substance When he began to examine different living things he reached the conclusion that there were different kinds or orders of psyche or soul. In the course of this investigation he came to distinguish between (*a*) the vegetative soul, (*b*) the animal soul, (*c*) the rational soul.

The first or lowest of these was the vegetative soul. Aristotle regarded plants as the lowest living forms and the qualities of life that he distinguished in plants he regarded as the only qualities essential for this lowest form of soul. These qualities seemed to him to be nutrition, growth and the power of reproduction.

Aristotle considered that while animals had these qualities of the vegetative soul, they also had, of their nature, the power of movement, and the movements that they made seemed to him to correspond to what they felt. The animal soul thus possessed, as he thought, not only the qualities of the vegetative soul but also a second order of qualities which were responsible for the sensitive and motive powers of animals.

Lastly, man had all these qualities exhibited in the lowest creation, both plants and animals, but he had also certain others. He could reason and his movements and actions were dictated by his thoughts. His soul was, therefore, equipped, in Aristotle's view, not only with the qualities of the vegetative and animal souls, but also with rational or intellectual powers.

It will thus be seen that Aristotle was, in the fullest and most definite sense, a "vitalist." Apart from the classification of kinds of soul Aristotle held certain definite views as to the relationship of this soul or psyche to the living body. This relationship was determined by the existence of an *Entelechy,* a term which may perhaps be translated for biological purposes as "an indwelling purposiveness."

The nature of this Entelechy is perhaps best brought out by quotation from his work *De Anima,* from which it will be gathered that he held that the soul is neither independent of, nor is it identical with, the body.

"They are right," says Aristotle, "who hold the soul as not independent of the body and yet as not in itself anything of the nature of the body. It is not body, but something belonging to body. It, therefore, resides in body, and moreover, a particular soul to a particular body. They were wrong who sought to fit the soul into the body without regard to the nature and qualities of that body. For the Entelechy of each thing comes naturally to be developed in the potentiality of each thing, and it is manifest that soul is a certain Entelechy and notional form of that which has the capacity to be endowed with soul."

This, then, is the basic thought in Aristotle's biological work, and in this sense Aristotle is a modern biologist, for it is the basic thought in much biological work at the present day. But besides Aristotle's finely wrought out biological theories, of which this is one, there is much in his biological writing that does not involve these high topics, but is restricted to the ordinary investigations of the working biologist as we know him in our own time. Foremost among these investigations on the phenomenological level we may note Aristotle's magnificent observations on the habits of fishes, some of which, doubted for centuries, have been verified in our own time. No less remarkable are his observations on the breeding and development of the octopuses and their allies. His discourses on whales, porpoises and dolphins, on the development of dog-fish, and on the habits of bees are also very noteworthy. There is much in his writings to justify us in classing Aristotle as one of the best observing naturalists of all time.

The whole course of biology may be represented as the history of ideas on the classification of living things. Something must be said on this subject in relationship to Aristotle.

At first, Aristotle entirely separated man from the lower creatures, distinguishing him among living things by the possession of a rational soul. As Aristotle's knowledge increased, he seems to have become less inclined to make this absolute distinction and he came to admit that animals in their degree share rationality with man. His final position seems to have been that the distinction between the animal and the rational soul cannot be consistently maintained and that there is no fundamental distinction between life or soul and mind. This is precisely the attitude of an important school of modern biologists.

In ascribing reason to animals Aristotle seems to have been influenced by his advance towards something that we should nowadays call a belief in "Evolution." It cannot justly be said that he ever attained to a clear view of organic evolution. Nevertheless, it is evident that he was moving in that direction, that he was not far from reaching it and that had he lived a few years more it might well have been that he would have reached it. But whether we call him an evolutionist or whether we withhold that title from him, it is certainly easy to read an evolutionary meaning into much of his biological writings. Moreover, we see him groping at some natural manner of arranging the orders of animals. He is, in fact, striving towards what we should call a

"classification." The mechanism that he actually adopted was to arrange living things in a sort of scale. This *Scala Naturae* of Aristotle is a subject of great interest and is worthy of all possible respect. He describes a particular part of this as follows:

"Nature proceeds little by little from things lifeless to animal life in such a way that it is impossible to determine the exact line of demarcation, nor on which side thereof an intermediate form should lie. Thus next after lifeless things in the upward scale comes the plant. . . . Of plants one differs from another as to its amount of apparent vitality. In fact, the whole of plant kind, while devoid of life as compared with animals, is endowed with life as compared with other forms of matter. Therefore, there is in plants a continuous scale of ascent towards the animal, and of some, one is at a loss to say whether they be animal or plant. . . . Thus nature passes from lifeless objects to animals in unbroken sequence, so that scarcely any difference seems to exist between two neighbouring groups by reason of their close proximity."

As a working naturalist Aristotle excelled chiefly in his observations on the habits and lives of animals. He was less fortunate in his investigations of their structure, and less fortunate still in his consideration of the functions of parts. He was, in fact, far less an experimenter than an observer. This is not surprising since he had no exact body of knowledge of experimental physics and chemistry on which to build. Some of his successors among the Greeks, *e.g.*, Galen, far excelled him in their experimental skill and ingenuity.

Ancient Biology After Aristotle.—Aristotle's botanical researches are, unfortunately, lost. We have, however, very full botanical works of Theophrastus of Eresus (380–287 B.C.), his heir, his favourite pupil and his successor as head of the Lyceum. Theophrastus, like other ancient men of science, seems to have felt acutely the need for a technical terminology. He made some attempts to establish one, and at least one technical botanical term, pericarp, comes to us from him.

Theophrastus understood the value of developmental study, a conception derived from his master. "A plant," he says, "has the power of germination in all its parts for it has life in them all, wherefore we should regard them, not for what they are, but for what they are becoming." He lays much stress on the different modes of reproduction of plants. He distinguishes between the monocotyledons and the dicotyledons, and he has some interesting passages in which sex is discerned in plants, notably in the palms.

The works of Theophrastus are extremely valuable as perhaps the most complete biological treatises that have come down to us from antiquity. They contain many excellent observations, but are on the whole distinctly inferior in depth, range and insight to the biological works of Aristotle.

Pure biological investigation virtually came to an end with the death of Theophrastus. Biology was studied at the Alexandrian school, but chiefly in connection with medicine and has been considered elsewhere (*see* MEDICINE, HISTORY OF). There was one important development, however, in Alexandrian times to which we may refer. This was the practice of portraying the forms of plants exactly and artistically. It seems probable that science owes this most important accessory art to one Crateuas, a herbalist who practised in the 1st century B.C. There are reasons for believing that we have accurate copies of some of the drawings of this artist, and these copies are therefore of the utmost interest to biologists.

The Hellenistic investigator, whose writings have had most influence on the course of botany, and in particular on botanical terminology, is the physician Dioscorides of Anazarba in Asia Minor. Dioscorides served in the army of the emperor Nero, and a work by him on plants useful in medicine has come down to us in great completeness and in a very large number of manuscripts. Nevertheless, this work is ill arranged, almost devoid of general ideas and steeped in the errors that must always pursue those who follow purely practical ends without regard to theoretical considerations. The work of Dioscorides is essentially a drug collector's manual, and represents a very great deterioration from the Aristotelian standard.

Even lower in quality than the *De materia medica* of Dioscorides is the *Natural History* of his contemporary, Pliny the elder (died A.D. 79). It is immensely interesting as a storehouse of folk-lore and as a mirror of the follies and superstitions of his age. It cannot be passed over in silence since it was perhaps more read during the middle ages than any work of antiquity except the Bible. From the point of view of a rational development of biological thought, however, Pliny's work is beneath contempt.

The only other important later figure in the biological thought of antiquity is Galen. The magnificent apparatus and achievements of this man have been considered elsewhere (*see* GALEN and MEDICINE, HISTORY OF). Though his interests were mainly medical, the vigour and independence with which he pursued his researches give him a very important place in the history of biology.

After Galen, the history of biological thought is a dismal record of steady deterioration for many centuries. Even with the great scholastic and artistic revival of the 13th century, there is little evidence of any systematic firsthand observation. Still less is there any trace of independent biological thought. We do no grave injustice to any writer in passing direct to the revival of learning.

Biology at the Revival of Learning.—Although the scholastic period was barren in biological achievement, there were yet certain elements in its more characteristic developments which became ultimately factors in the revival of biological science. Among these we must give a leading place to the passage towards naturalism in art. This movement first made itself felt in the 13th century, though it did not develop fully until the 15th. Moreover, from the end of the 13th century a certain amount of natural curiosity was satisfied by the process of dissection which, however, was not practised with any frequency until the very end of the mediaeval period. These movements, naturalistic and anatomic, were fertilized, so far as biology was concerned, by the artistic discovery of antiquity. Thus the renaissance of art became also a renaissance of science.

The great artists of the Renaissance period, Botticelli, Leonardo da Vinci, Dürer, Michelangelo and others, exhibited an interest in the exact portrayal of animal and plant forms as well as curiosity as to the structure of the human body. As well as being artists these great Renaissance figures were all of them curious as to the ways of nature, and it is not misusing words to speak of these artists as men of science, botanists, anatomists, physiologists and the like. The group of movements which came to flower with the beginning of the 16th century placed the student of nature in a peculiarly favourable position. He had the works of science of antiquity on which to start. The craft of printing was at his disposal. He had the scientific studies of the great artists before him. He had learnt to represent details of nature effectively. At last, also, the art of the wood-cutter was perfected, so that the figures of the artist could be transferred to the printed page.

It was in this happy collocation of circumstances that the first effective biological textbooks of modern times were produced. The movement began in Germany and it began with the botanists. It is the distinction of Otto Brunfels (1464–1534) that he produced the first printed work on plants which relied solely on observation. The drawings are firm and faithful and it is very interesting to compare them with those of a good modern textbook. As Brunfels was the first, so Leonhard Fuchs (1501–66) was the greatest, of the German "fathers of botany." His work appeared in 1542 and is the landmark in the history of natural knowledge.

A part of the same movement illustrated by the "fathers of botany" is the new scientific interest in anatomy. Protagonists of that movement (*see* MEDICINE, HISTORY OF) are Andreas Vesalius and Bartolomeo Eustachio. More in the class of pure "naturalists" in the modern acceptance of that word were the two French observers, Belon and Rondelet.

Pierre Belon (1517–64) of Le Mans spent some years wandering in the Near East. He kept careful notes of the natural history of the countries that he traversed, basing his observations on his reading of Aristotle. Later he produced two books on fishes and another on birds, which, though borrowing much from Aristotle,

show also much original observation. It is interesting to note the clearness with which Belon grasps the general principles of comparative anatomy, especially as applied to the skeleton. These principles had already been elucidated by Vesalius. More accurate as an observer, though less imbued with comparative principles was Guillaume Rondelet (1507–66) of Montpellier, a friend of Rabelais. Rondelet's great work is a painstaking investigation of the fishes of the Mediterranean.

The learning of the time was liable to express itself in the form of encyclopaedias. These were mostly little but compilation. An exception must be made, however, for that of Konrad von Gesner (1516–65), the great Swiss naturalist. His history of animals in five folio volumes covers the topics of quadrupeds, birds, fishes and snakes. Most of the matter is borrowed, but much also is original, notably the section on fishes which contains also figures of a large number of invertebrates. The work of Gesner is regarded by many as the starting point of modern zoology. To his contemporaries, Gesner was best known as a botanist, but his most important botanical works were not published until 200 years after his death.

Towards the end of the 16th century, following on the stimulus of the revival of art, of the new interest in natural history and of the re-institution of scientific anatomical studies, all the important departments of biology—anatomy, physiology, botany, zoology—were becoming differentiated and making considerable progress. These subjects were being taught especially in the universities of northern Italy. Nowhere were they prosecuted with greater energy and ability than at Padua, the old school of Vesalius. Of all the teachers of that school, Jerome Fabricius (1537–1619) of Aquapendente exercised most influence. Fabricius made extensive embryological investigations, and his works on the subject are the first to be illustrated with figures drawn from the object. He made many physiological researches. Thus he described the valves of the veins and was one of the first to give an accurate account of the structure of the eye. Other important Paduan teachers of the time were Realdo, Colombo, Sanctorio, Cesalpino and Casserio.

The Rebirth of the Physiological Study of Animals and Plants.—A remarkable pupil of Fabricius was the Englishman, William Harvey (1578–1657), the discoverer of the circulation of the blood. His work on that subject, published in 1628, gave the first rational explanation of the workings of the animal body. (*See* MEDICINE, HISTORY OF, and HARVEY, WILLIAM.) While Harvey was at work on the special researches which are associated with his name, optical instruments were being constructed which made it possible to examine the structure of animals more minutely. In 1610 the compound microscope was described by Galileo and through him passed into modern use. The first systematic investigation of living things with the new instrument was made by a group of young men who formed themselves into the first scientific society, under the name of the "Academy of the Lynx," which usually met at Rome. The small company was accustomed to assemble at the house of its president, Prince Federigo Cesi, duke of Aquasparta. His early death in 1628 brought the academy to an end, and many of its works perished. We have, however, records of a few of its observations which are peculiarly interesting as the earliest for which the microscope was systematically employed. Prince Cesi himself worked on botanical topics and described and portrayed the spores of the fern. Other members of the academy applied themselves to animal forms and fine enlarged representations of the parts of the bee have come down to us from them.

With the collapse of the "Academy of the Lynx" systematic microscopical observation ceased for a generation. The microscopic work between 1628 and 1660 was desultory and of no great consequence. After that date, however, there arose a series of great microscopical observers who among them revolutionized the conception of the nature of living things. Of these "classical microscopists" two, Hooke and Grew, were English, two, Leeuwenhoek and Swammerdam, were Dutch, and one, Malpighi, was Italian. It is interesting to observe that the more important work of all of them, except Swammerdam, was published in England.

Marcello Malpighi (1628–94) supplemented Harvey's work by describing the capillary circulation which Harvey had not seen. Malpighi demonstrated it in the lung of the frog. He extended greatly the work of Fabricius and he especially investigated the early stages of the development of the embryo of the chick. He gave very accurate representations of the early stages, and notably he showed that in the embryo there are paired branches of the aorta which reunite. These correspond, as we now know, to the vessels in the gills of a fish. Malpighi, who had no evolutionary leanings, had no conception of the nature of these vessels, but his description of them is very good. The bulkiest of Malpighi's contributions are his writings on the anatomy of plants. He gave excellent representations of the cell walls of plants, and he established the broad outlines of the microscopic anatomy of the roots and stems of the higher plants.

In botanical anatomy even more accurate and systematic observations were made by Nehemiah Grew (1641–1712, *q.v.*). Grew placed the study of the anatomy of plants on a firm foundation. He is also remarkable for his statement as to the sexual character of flowers—an observation which he himself ascribes to Sir Thomas Milligan, Savilian professor of geometry at Oxford.

Jan Swammerdam (1637–80, *q.v.*) was perhaps the most accurate and remarkable as he was the most mentally unstable and shortlived of the "classical microscopists." His first work, *A General History of Insects,* deals chiefly with the modes of transformation of insects and brings out well the different modes of development of the major groups of insects. The text and figures are equally good, and the book itself obtained popular recognition. The early onset of a state of mind not far from insanity prevented much further publication. His magnificent *Bible of Nature,* which is probably the finest collection of microscopical observations ever published, did not appear till long after his death. It is still in current use by naturalists.

Anthony van Leeuwenhoek (1632–1723, *q.v.*) made the most impression on his contemporaries of all the "classical microscopists." He published an immense number of observations of a desultory kind, nearly all of them in the *Philosophical Transactions of the Royal Society.* These observations contain many shrewd judgments. Leeuwenhoek's portrayal of Bacteria in 1683 and of spermatozoa in 1677 are triumphs of observation with the optical means at his disposal. On several occasions he drew and described the structure of striated muscle. He investigated in his own peculiar fashion almost every department of animal and plant life. No one was more influential than Leeuwenhoek in drawing the attention of observers to the minute complexity and beauty of the structure of the animal body.

Of all the "classical microscopists" the most gifted was Robert Hooke (1635–1703). He was, however, only to a very limited extent a biologist. His important work, *Micrographia,* appeared in London in 1665. In it he has a figure of the microscopic structure of cork showing the boundaries of the cell walls. He refers to these as *cellulae,* and the word "cell" in our modern biological nomenclature is probably derived from him. He shows also the cells on the surface of the stinging nettle, and he has a good account of its stinging apparatus. An important botanical observation by him is on leaf fungus, the development of which is well shown. He also gives accounts of the development of a mould and of the structure of moss, and of experiments on the sensitive plant. He gives the first figures of a polyzoan, and remarkable delineations of the compound eye of an insect, and of the larvae of a gnat, besides two gigantic figures of a flea and of a louse.

The work of the "classical microscopists" stands somewhat apart from that of other investigators and forms a peculiarly isolated chapter in the history of biology.

Early Attempts to Classify Living Things.—In the work of the early naturalists, whether they were botanists or zoologists, or microscopists or anatomists or encyclopaedists, there was seldom any sustained attempt at systematic arrangement. The encyclopaedic naturalists, such as Gesner, arranged their material according to the obvious divisions of the animal kingdom, fishes, birds, reptiles and the like. Botany and zoology were still in a state of great disorder.

The first trace of any systematic arrangement of descriptions of plants in accordance with their structure is in the work of Matthias de l'Obel (1538–1616), a Dutchman who came to England in his youth and dedicated his first book (1570) to Queen Elizabeth. He was keeper of a botanic garden of an English peer and, later, botanist to James I. L'Obel attempted to group plants according to the form of their leaves. He succeeded fairly well with the grasses, less well with the monocotyledons and failed with the dicotyledons, with which he confused the ferns.

More promising was the suggestion of the botanist Andrea Cesalpino (1519–1603) of Padua and Pisa, who attempted to class plants according to their flowers and fruits. The scheme formed on this basis was by far the best of the kind that had yet appeared. A small part of it was absorbed into the influential work of Gaspard Bauhin (1550–1624 *q.v.*) of Basle. For the most part, however, it fell on sterile ground and was little noticed till the time of Linnaeus.

So far as general arrangement is concerned Bauhin was distinctly inferior to Cesalpino. He gives, however, descriptions of about 6,000 plants. The great merit of his book is that in it for the first time the species of plants are placed together in small definite groups or *genera*. The modern conception of genus and species is in fact Bauhin's more than that of anybody else, and he and not Linnaeus is the true introducer of the binomial nomenclature which since Linnaeus has been in universal use.

Important steps in the direction of a systematic arrangement of living things were made by the two friends John Ray (1627–1705) and Francis Willughby (1635–72). They formed a scheme for a systematic description of the whole organic world. Willughby was to undertake the animals, Ray the plants. Willughby died early and in the event Ray became the chief founder of the science of systematic biology. His early attempts on the flora of Cambridge and his treatise on birds were followed in 1682 by his important *New System of Plants*. In this he demonstrated the true nature of buds and used the divisions of flowering plants into dicotyledons and monocotyledons. He based his system largely upon the fruit, but also upon the leaf and other characteristics and especially, following Cesalpino, upon the flowers. In doing this he succeeded in disentangling a number of the larger groupings of plants now known as families. His work in botany was completed by his *Synopsis of British Plants* and followed up by a *Synopsis of Quadrupeds and Serpents* (1693). This contains the first truly systematic arrangement of animals. It is based upon the fingers and toes and teeth of the animals concerned.

The systematic study of living things begun by Bauhin and Ray was continued by the Swede, Linnaeus (1707–78), the greatest of the systematists. Linnaeus brought to bear upon his life-work an enormous acquaintance with living things, especially plants, gained in the field. His prodigious industry and power of systematic arrangement would alone have given him a high place among naturalists. He profited from all the best teachers of the day, visiting many parts of Europe, including Holland, France and England. He was a most inspiring teacher and had numerous pupils, one of whom accompanied the English explorer, Captain Cook, and was for many years resident in London. Linnaeus became a sort of biological dictator, and for a century after his time most of the biological work that was done in every country was in his spirit.

Linnaeus had a perfect passion for classification and succeeded in assigning to every known animal and plant a position in his system. This involved placing any specimen first in a class, then in an order, then in a genus, then in a species. The broad outline of his system of classification has remained, though its rigid framework has long ago been abandoned.

The chief service of Linnaeus to biology is his method—derived from Bauhin, and impressed upon his contemporaries—of arranging living things into genera and species, with his development of the "binomial" system. His system extended even to man, and he distinguished *Homo sapiens* from *Homo troglodytes*. His *Systema Naturae* went into many editions, the most highly prized being the tenth, to which naturalists still refer when they speak of Linnaean genera and species.

Linnaeus held that species are constant and invariable, a view in which he differed from John Ray. He assumed that all the members of a species were descended from a single pair that had been originally created. He afterwards modified this view and came to hold that it was the genera, not the species, which had issued from the Godhead.

The Beginning of the Study of Comparative Anatomy and Physiology.—The first animal whose naked eye structure was adequately explored was man himself. The anatomy of man was placed upon a sound basis by Vesalius in his wonderful monograph of 1543. For certain organs of the body Vesalius had not any adequate access to human material. Thus his account of the eye and of the organ of voice are taken from the dog. He was aware of differences in structure between man and animals and he chose several opportunities in his work to adopt a comparative method. A similar device is invoked by Pierre Belon. During the 16th century several other observers made dissections of animals and compared them to man. None was more exact than Ruini, a lawyer of Bologna, who published his monograph on the horse in 1598.

As the 17th century advanced there were a number of workers who further extended comparative studies. Of these the classical microscopists were by far the most important; for the most part they worked upon invertebrates. Monographs on various vertebrates were also prepared, as for instance that on the chameleon by the Italian Francesco Redi, and that on the chimpanzee or "pygmy" by the Englishman Edward Tyson. Monographs on invertebrates were prepared by Malpighi on the silkworm, by Swammerdam on the may-fly, the bee and the snail, and by Leeuwenhoek on the development of the flea.

With the great movement initiated by the work of Harvey, something in the nature of comparative physiology became possible. Harvey's masterpiece is in fact in large part a comparative study of the circulation. Of comparative physiology there has never been a greater exponent than the English country parson, the Rev. Stephen Hales (1677–1761). Hales practically began the study of the functional activity of plants and his work was the most important in that department until the 19th century. He measured the amount of water taken in by the roots and given off by the leaves, comparing this with the amount of moisture in the earth and showing the relationship of the one to the other. He made calculations of the rate at which water rises in the stems, and he showed that this has a relation with the rate at which it enters by the roots and transpires through the leaves. He measured also the force of suction in wood and roots, that is to say, "root pressure." He sought to show that these actions of living plants might be explained as the result of their structure. His most important contribution for botanical physiology was perhaps his demonstration that the air contributes something to the building up of the substance of plants, and in this respect he may be said to have been the discoverer of carbon dioxide. Following this up, he showed that air enters the plant not only through leaves but also through the rind. His experiments and conclusions in the physiology of animals were as important as in that of plants. Here he showed that there is a pressure of the blood within the vessels which can be measured, and that it varies in different circumstances and differs in the arteries and the veins. He even estimated the rate of flow in the capillaries. It is specially characteristic of his work that in all his experiments he sought to give a quantitative expression to his results. In this sense Hales was among the first to adopt exact methods in biology.

The comparative attitude in combination with exact experiment in biology was peculiarly characteristic of the investigators of the 18th century and separates them from those of the previous period. None pursued the method with greater enthusiasm than that great surgeon, John Hunter (1728–1793, *q.v.*; *see* also MEDICINE, HISTORY OF). At the time of his death Hunter had anatomized over 500 species of animals, many of them a great many times, as well as a great number of species of plants. The general object of his work might be described as a systematic attempt to trace the different phases of life as exhibited in the structure of animals and plants. Both in precept and example Hunter was the

greatest influence in connection with the establishment of natural history museums, the subsequent development of which has followed lines very similar to those which he suggested.

Hitherto comparative studies had been the preoccupation of individual workers. Georges Cuvier (1769–1832), by means of his immensely powerful position, was able to establish a complete and organized school of comparative investigators which may be said to have continued to our own time. His influence was very stimulating to research, but it cannot be said that he invariably exerted his power with the greatest wisdom. He believed strongly in the fixity of species and thus opposed the views of Lamarck (1744–1829, *q.v.*) and of Etienne Geoffroy Saint-Hilaire (1772–1844). Nevertheless by the palaeontological school which he founded and which extended into every country, he did perhaps more than any other man to collect material on which the doctrine of the impermanence of species became formally founded in later times.

Cuvier's great work, *Le Règne Animale,* has formed one of the main foundations for comparative studies even to our own time. Among the specific achievements of Cuvier was firstly the creation of the science of palaeontology, secondly the exploration of the anatomy of the group Mollusca, and thirdly his systematic treatment of the vast class of fishes. The tradition of Cuvier was carried to England by Richard Owen (1804–92), who afterwards became director of the British Museum of Natural History.

While Cuvier and his school led in the comparative study of structure, the comparative study of function which had been expounded by Hales was established on a firmer basis by the great German physiologist, Johannes Müller (1801–58). (*See* MÜLLER, JOHANNES PETER, and MEDICINE, HISTORY OF.) The latter part of Müller's life was given mainly to zoological research, and there is hardly a group in the animal kingdom on the knowledge of which he has not left his mark. As a microscopist he worked out the anatomy of the glandular and cartilaginous tissues, and grouped the connective tissues. He thus prepared the way for the work of his pupil Schwann. Müller was a convinced vitalist and his "Doctrine of Specific Nerve Energy" remains one of the corner-stones of vitalistic theory.

The study of the palaeontology of plants came later than that of animals. A few fossil plants had been described by earlier naturalists. Toward the end of Cuvier's time several figures of plants from the coal measures had been published with the generic and specific names that they still bear. Not until 1831 was the technique of their examination sufficiently advanced for microscopic study.

The study of fossil botany began to be systematic in 1858 with the work of W. C. Williamson (1816–95) who demonstrated that in coal are to be found gigantic forms similar to the higher flowerless plants such as horse-tails, ferns and club moss. His results were long treated with neglect, but have at last earned more recognition. During the last 50 years the palaeontology of plants has come near to be on the same footing as that of animals.

Effects of Geographical Exploration in the Course of Biological Development.—From the end of the 15th century the western nations of Europe were sending forth expeditions east and west, and these brought home knowledge of the natural products of lands newly explored. Thus the idea that each region has its characteristic living things, implicit in ancient biology but forgotten during the middle ages, became gradually explicit. In the 18th century exploratory expeditions began the practice of carrying specially-trained naturalists and thus they enter the history of biology. The three voyages of Captain Cook (*q.v.*) form an era, not only in the history of geographic discovery, but also in the study of living things. Among the naturalists that Cook took with him were Joseph Banks (1743–1800, *q.v.*), D. C. Solander (1736–82) and the pupil of Linnaeus, Robert Brown (1773–1858, *q.v.*). These three were instrumental in exploring the flora and fauna in the Pacific.

An important voyage which covered the western as well as the eastern hemisphere was that of the "Beagle," which sailed in 1831 and carried the naturalist Charles Darwin (1809–82, *q.v.*) with it. Quite apart from the investigations and theories with which Darwin's name is especially associated, the voyage was important as making accessible a whole multitude of new forms and as establishing the doctrine of zoo-geographical and phyto-geographical regions.

By the middle of the 19th century exploration and survey had become recognized as an important duty of the British Admiralty. Many scientific expeditions were sent out by that body. Of these the most important was that of the "Challenger" which sailed in 1872. The features of this expedition were, firstly, the very careful examination of the depth and character of the seas and sea water whereby oceanography was established as a separate science; secondly, the large number of very inaccessible places visited, and thirdly, the magnificent scale on which the scientific results of the journey were published. The reports of the "Challenger" expedition are still in current use by naturalists. The influence of this expedition, coming as a culmination of a series of previous voyages of exploration, was to modify considerably the general view of the range and variety of living things, and to enable naturalists to form a picture of life in the ocean where the geographical regions are distributed vertically rather than horizontally.

Reproduction of Plants and Its Comparison to That of Animals.—One of the main gaps in biological thought was the great difference between the nature of animals and that of plants. Especially the mode of reproduction of plants seemed to separate them very widely from animal forms. Theophrastus, for instance, gives a list of the modes of plant reproduction without hinting at the essential nature of fertilization. It is on this account, perhaps, that there have arisen so many legends concerning the "loves of the plants" and vague ideas ascribing sex to these beings. We have already seen how the idea was adumbrated in antiquity, by Theophrastus, among others, and how in the 17th century Millington, through the mouth of Grew, actually suggested sexual characters in the parts of the flowers. The conception of sex in plants was, however, lucidly, consistently and accurately set forth, though in elementary fashion, towards the end of the 17th century by R. J. Camerarius (1665–1721). This remarkable observer pointed out that the sex theory could not be made to apply to flowerless plants. The doctrine of the sex of flowers was accepted by Linnaeus and incorporated in a mechanical way into his system. Linnaeus found the sexual parts of plants convenient for establishing his classification.

During the course of the 18th century several botanists succeeded in using the pollen of one species to fertilize the flowers of another species of plant. The existence of hybridization was recognized, and one writer, J. G. Koelreuter (1733–1806) of Carlsruhe, held that the main agent in the fertilization of flowers was the wind, but that some flowers fertilized themselves, and that in others insects played a part. With great acumen, moreover, he pointed out that in some plants, *e.g.,* the mistletoe, which did not lend themselves to pollination by the wind, and in which the flowers were of different sexes, the only way of pollination was by insects. Moreover, for this same plant he called attention to a matter that was later very successfully investigated by Charles Darwin, namely, the question of the distribution of seeds by birds. Thus, as he pointed out, the mistletoe depends upon two groups of animals, birds and insects, for its existence. The subject was taken up by several German workers, notably, by C. C. Sprengel (1750–1816) who, in his work *The Newly Revealed Mystery of Nature in the Structure and Fertilization of Flowers,* paid special attention to cases in which the sexual parts occurring on a single blossom matured at different periods (dichogamy).

Sprengel reached the conclusion that some flowers can only be fertilized by insects, that some are so constructed as to injure and even kill insects that serve them, and that yet other flowers are fertilized by wind. He observed that flowers belonging to the last class always produced large quantities of light pollen, whereas in the flowers of the other types pollen is relatively heavy. He demonstrated the relation of the nectary to the process of fertilization, and in general he sought to show that his principles explained all the course of flowers—position, size, smell, colour, form, date of flowering and the like.

The actual process of fertilization was first observed by the extremely acute and versatile Italian microscopist, G. B. Amici (1784–1860). In 1823 this remarkable naturalist, whose work has not been adequately noticed, working with the microscope which he had himself improved, saw the tube given off by the pollen grain and its contents perform streaming movements. In 1830 he actually followed the pollen tubes into the ovary and observed one find its way to the micropyle of each ovule. These observations were confirmed by Robert Brown and Schleiden, and finally in 1846 the process of fertilization in flowering plants was placed upon a firm and recognized basis by Amici himself. Thus the general character of the vital processes of plants was brought into relation with that of animals.

Metamorphoses and Alternation of Generations in Animals and Plants.—An obstacle to the conception of living things obeying general laws has always been the observation of the extreme changes that some forms undergo. Such "metamorphoses" were observed by the ancients and were the subject of exact study during the 17th century by Swammerdam and other naturalists. These observations were extended by many observers during the 18th century and notably by John Turberville Needham (1713–81).

In the early 1840s Johannes Steenstrup (1813–97) of Copenhagen, described how certain animals, notably jellyfish and parasitic worms, produce offspring which at no time resemble their parents, but which, on the other hand, bring forth progeny similar to the grandparents. Instances of the alternation of generations, as this process was called, were rapidly accumulated by naturalists from a number of organisms belonging to different groups in the animal kingdom. The well-known and easily observed instance of such a curious cycle is in the common aphis of roses in which there is an alternation of parthenogenetic and sexual generations.

In 1851, a short time after the appearance of Steenstrup's volume, Charles Darwin published his first important monograph on a living group. In this work on the barnacle and allied organisms, he demonstrated that these creatures go through a very remarkable metamorphosis, being born as free-swimming forms similar to other Crustacea and subsequently settling down to fixed life in which they sometimes resemble the Mollusca, with which Cuvier had classed them.

Darwin, moreover, demonstrated the curious feature that while individuals of this group were normally hermaphrodite, yet from time to time forms appeared that were male only, and there was at such times true sexual generation.

The interpretation of these phenomena was, however, unsatisfactory and vague. The botanist, Karl Nägeli (1817–91) in the '40s made some advance in examining the prothallia of ferns, and observed their free-swimming spermatozoa. At last in 1850 Wilhelm Hofmeister (1824–77, *q.v.*) gave a consecutive account of the actual process of generation in the fern, having observed the whole process of development from a single cell into the prothallus. He saw how the prothallus matured specialized cells, which, after conjugation, gave rise to the more conspicuous and well known asexual form. In other words, he had demonstrated the process of alternation of generations in the fern. He went on to show that the mode of production of the embryo in the pines and their allies was in certain cases intermediate between that of flowering plants and that of the higher flowerless plants such as ferns. Thus, by the sixth decade of the 19th century, it was established that fertilization in flowerless plants consists in the blending together of the spermatozoid and the egg-cell, and that in certain flowerless plants, *e.g.*, the ferns, there is a definite alternation of generations.

Observations on the sexual character of plants, on the alternation of generations and on metamorphoses gave absorbing interest to the investigation of generation in general, and stimulated the study of embryology both of animals and plants. Indirectly, these studies led to the firmer establishment and wider application of the cell theory, and to the accumulation of data which were used by the founders of the evolutionary school.

The Establishment of the Cellular Nature of Animals and Plants.—The appearance of cell walls is to be seen in many microscopic drawings of plant tissues made in the 17th century by the great classical microscopists. In the careful analysis made by these men there is distinction between the various tissues of the higher plants, although in making this distinction they knew nothing of the cell substance dwelling within the cell wall. Not until the 19th century was the actual living substance of the cell first observed, a feat achieved by Amici.

In some of the accounts of the microscopic appearance of the tissues of animals by the classical microscopists, cells had been vaguely distinguished, though much less definitely than in plants. During the 18th century little important microscopic work was done. At the beginning of the 19th century a brilliant French investigator, M. F. X. Bichat (1771–1802), perceiving that the different parts of the body such as bones, muscle, nerves, blood-vessels, cartilages, etc., had a different microscopic appearance, succeeded in analysing the microscopical appearance into 21 "tissues." Out of this discovery arose the study of histology, a word introduced by Richard Owen, and still in current use.

Between the 17th and early 19th centuries advances were made in the knowledge of uni-cellular organisms. *Vorticella* had been described in 1667, Bacteria in 1683, *Paramecium* in 1702 and *Amoeba* in 1755. Several monographs dealing with uni-cellular plants and animals had appeared, but no advance had been made in the proper appreciation of the real nature of these organisms. In 1833 Robert Brown in his investigations on plant fertilization had discussed the nucleus and found it a normal accompaniment of the cell, but had no clear idea of the nature either of cell or of nucleus. The modern doctrine of the cell theory was placed upon a secure footing in the work of M. J. Schleiden of Jena (1804–81) in 1838, and of Theodor Schwann (1810–82) in the years 1838–39. Schleiden observed the process of protoplasmic streaming in many cells, and he recognized the nucleus as an essential element. He made a curious blunder in holding that cells originated by budding from the surges of the nucleus.

The work of Schwann, who was a pupil of Johannes Müller, has a more modern appearance than that of Schleiden. He gives admirable figures of animal cells, and especially of those of cartilage. He traces the cells of these and of other tissues from their undifferentiated origins, and he shows how the ovum is itself a cell. Finally, he passes to a general statement as to the cellular origin of animals and plants. We may note that he introduced the word "metabolic." He did not, however, shake himself free from Schleiden's theory of the cell originating from the nucleus. The investigator who was instrumental in destroying this theory was Karl Nägeli (1817–91). The word "protoplasm" was introduced by Hugo von Mohl (1805–72) of Tübingen, in 1846, and the conception of this substance as the physical basis of life was the work of Max Schultze (1822–74).

With the final establishment of the cell theory, histology became a special science and was admirably developed by the Swiss Albrecht von Kölliker (1817–1905), a pupil of Johannes Müller. The subject of histology was extended into the department of disease by yet another pupil of Johannes Müller, Rudolf Virchow (1821–1902, *q.v.*).

Organic Evolution. The Origin of Species.—By most older writers, species are treated as fixed and definite—as though their characteristics had been made once and for all, and have never altered. Thus in the opinion of Linnaeus there are "as many species as issued in pairs from the hands of the Creator." Even Linnaeus, despite his systematic obsession, began to see that it is often very difficult to separate species one from another. He did not like to move from his original position of the fixity of species, and therefore he simply substituted the genus for the species as the original creation. He thus reached the conclusion that "all the species of one genus constituted at first one species."

There are a great many early naturalists who adumbrated more or less clearly the doctrine of the evolution of organic forms. Many antiquarian writers have applied themselves to excavating this conception from writings of antiquity, of the middle ages and of modern times. The first naturalist, however, who clearly set forth the idea of evolution as applied to existing living things was Buffon (1707–78).

Buffon's great scientific work, *Natural History, General and Particular,* appeared in 45 volumes, and its publication occupied 55 years, 1749 to 1804, being completed after his death by one of his assistants. It aimed at containing all scientific knowledge and was the first modern attempt of the kind. In various parts of his great work and in other works Buffon expressed himself differently on the subject of organic evolution; nevertheless, we can see that he was moving farther and farther from the position occupied by Linnaeus. He finally accepted definitely the conception that species alter in type from time to time, but that at each alteration they retain some marks of their previous type, as the pig, for instance, retains fingers now in disuse but formerly used. He thus came to the conclusion that many species are degenerate forms of others; that the ape, for instance, is a degraded man, and that the ass is a degraded horse.

Similar views were set forth even more clearly by Erasmus Darwin (1731–1802), the grandfather of Charles Darwin. Erasmus Darwin held that species change in course of time, and that these changes are due to influences that bear upon the individual from without. These changes he held to be passed on to the offspring, so that he was a believer in the inheritance of acquired characteristics, a conception which was further developed by his younger contemporary J. B. de M. Lamarck (1744–1829, *q.v.*), whose *Zoological Philosophy* appeared in 1809. Lamarck held that for living organisms there existed a "natural order." He thought that if all the species that exist were known, they would be found to form a long ladder or scale in which each would differ but little from the next. This linear view of the arrangement of species Lamarck inherited ultimately from Aristotle. The gaps that he could discern in the existing series he ascribed to the destruction of the intermediate links. These gaps he hoped would be filled in by palaeontological discovery.

Over and above such value as Lamarck gave to the conception of the evolution of species we owe to him one important step of permanent value. It was part of his scheme that the animal and the plant world must be continuous with each other at some stage or stages. He set in sharp contrast the study of living things against that of non-living things. For the scientific study of the former, he adopted from Treviranus the word biology (1802). We thus owe this word biology largely to Lamarck, but still more we owe to Lamarck the conception of biology as a comprehensive study. Since according to Lamarck species shade into each other, it seemed to him improbable that they were permanently fixed. In reaching this conclusion, he laid much stress, as did Charles Darwin after him, on the peculiar development of domesticated animals. There must, he thought, be some agent acting to produce variations from the original type. This agent Lamarck believed to be environment. He thus reached the conclusions, firstly, that species vary under changing external influences; secondly, that there is a fundamental unity underlying the diversity of many things and thirdly, that the diversity of living things is subject to a progressive development. The mechanism of that development Lamarck held to be use and disuse of acquired characters.

Discussion of the conception of the progressive development of living things with its corollary, the inconstancy of species, was raised by many writers in the first half of the 19th century, among them the French naturalist Étienne Geoffroy Saint-Hilaire (1772–1844), and the German poet Goethe (1749–1832). In England the writer who attracted the most attention was the Rev. T. R. Malthus (1766–1834), whose important *Essay on Population* was first published anonymously in 1798. That work appeared during the French Revolution, and its tone and argument are not unrelated to the social views of the time—views which had their influence upon Darwin. Indeed, it is not too much to say that the *Origin of Species* is one of the secondary products of the utilitarian philosophy of which the chief exponent was Jeremy Bentham.

The treatise on the *Origin of Species* by Charles Darwin appeared early in 1859. For the detailed nature of the views there expressed, the reader is referred elsewhere (*see* DARWIN, CHARLES). It created a revolution in thought in England, and to a less extent in France and Germany. The cause of that change in opinion was not so much the doctrine of the impermanence of species, which had been voiced by many before Darwin, as the fact that Darwin displayed to his readers the details of a process which could be seen in daily operation. Moreover, in setting forth his hypothesis of the action of natural selection he placed before his public a mechanism which he believed, and they believed, was sufficient to account for the process in question. His theory appealed specially to the practical minds of the English naturalists, who required an explanation of the process before they would altogether accept it. The theory naturally had less effect upon certain more philosophic thinkers, whom the actual evidence for the existence of evolution had already convinced.

In 1852, seven years before the publication of the *Origin of Species,* the philosopher Herbert Spencer (1820–1902) had set forth doctrines of evolution in which that word was probably used for the first time in literature to describe the idea of a general process of production of higher from lower forms. Sir Charles Lyell, of whom Darwin professed himself a disciple, and who deeply influenced his whole thought and work, used the word some 20 years earlier in a similar, though less general, sense. The word evolution was seldom used by Darwin himself, but the particular application that had been given to it by Spencer rapidly caught on, and Darwinism and Evolution were often treated as synonymous terms. The doctrines of Darwin, however, only applied and were only meant to apply to the world of life, nor even there can we regard the words Darwinism and Evolution as truly synonymous, for it is quite possible to conceive of organic evolution that is independent of such "Darwinian" factors as natural selection or sexual selection. The phrase "survival of the fittest" was also coined by Spencer, and caught on in the same way as did evolution. Evolutionary doctrines were diffused by a host of expert biologists who were rapidly converted to the Darwinian point of view. Among them T. H. Huxley (1825–95, *q.v.*) in England and Ernst Haeckel (1834–1919, *q.v.*) in Germany are worthy of special commemoration.

Since Darwin's time, and especially in the 20th century, a great deal of doubt has been cast on the evolutionary efficacy of those factors on which Darwin himself laid most stress. The conclusion that species do in fact give rise to other species has earned almost universal acceptance, and on the general relation of living things within the larger groups there is no wide divergence of opinion. Here Darwin may be regarded as victorious all along the line. It cannot be said, however, that any general agreement has been reached as to the process by which the great variation in living things has been produced, nor can it be claimed that there is any consensus of opinion as to the relationship of the main groups of living things with each other.

Despite these reservations it cannot be gainsaid that the history of biology since the days of Darwin may be treated as in large part a commentary on his work. The stimulus which he gave to comparative morphology has given rise to an almost incredible mass of literature dealing with plant and animal forms. His work has acted as a less stimulating influence on those departments which deal with function, and comparative physiology remains in a rudimentary state. The study of inheritance and of genetic characters, however, may be traced back directly to his example. A large part of the work of the last half century in this direction has been done in confirmation or refutation of the views which he expressed.

Biogenesis Versus Abiogenesis. The Origin of Life.—All the older naturalists, following Aristotle and his pupil Theophrastus, were willing to accept spontaneous generation at least of the lower forms of life. According to them, spontaneous generation was the normal mode of production of certain organisms. These views were universally accepted until the middle of the 17th century, and the advent of microscopic research.

The exploration of microscopic life soon revealed that many cases of apparent spontaneous generation had been falsely interpreted. Thus, for instance, Malpighi showed that galls were not spontaneously generated, but were associated with the larvae of the insect, the egg of which was placed within the plant by the parent insect. On the other hand, the increasing power of the microscope revealed the existence of more and more minute organ-

isms which seemed to appear out of nothing. Thus Leeuwenhoek saw such organisms in infusions of broth and other substances. Such infusions, at first perfectly clear, became in a few days turbid with these minute actively moving bodies, which were for this reason called Infusoria.

The first scientific treatment of the question of spontaneous generation was made by the Italian Francesco Redi (1626–97). This remarkable naturalist's experiments were most admirably designed, and his conclusions were lucidly set forth. He exposed fresh meat in jars covered with fine gauze, using as controls meat in other jars not so covered. Soon in the open jars larvae of flies developed, while eggs corresponding to such larvae were deposited on the surface of the gauze above the closed jars, but no larvae ever developed within the closed jar itself. Redi traced the larvae to their parents and showed conclusively that the generation of these insects could only be through parent forms.

With the extension of microscopic observation, however, the problem was thrown farther and farther back, and during the 18th century the battle on the subject of spontaneous generation raged back and forth. On the one hand it was shown that by boiling or chemically treating a medium, organisms appeared in it slowly or not at all. On the other hand, cases were always being adduced in which microscopic organisms did so appear, despite all precautions. About the middle of the 18th century the controversy reached an important stage in a discussion between John Turberville Needham (1713–81) and the versatile Abbé Spallanzani (1729–99). This discussion is interesting since it was practically repeated about 100 years later between Pasteur and his opponents. In 1748 Needham published what was in effect a repetition—made in conjunction with Buffon—of the experiments of Redi of the previous century. His experiments were, however, more refined than those of Redi, since he aimed at excluding even the most microscopic organisms. He came to the opposite conclusions to those of Redi, and inferred that microscopic organisms are generated spontaneously in organic substances. His apparatus consisted in effect of a phial filled with broth, the mouth of which was closed with mastic after the broth had been boiled. Needham's observations were good, but his deductions obscure, often verging on the mystical. He was effectively answered by Spallanzani, an investigator and writer of very great ability, who made important contributions to several branches of biological science. Some of Spallanzani's experiments to test the truth of spontaneous generation were so exactly like those of Pasteur in the last century that the figures of Pasteur might be used to illustrate the memoirs of his predecessor.

The controversy concerning spontaneous generation continued in much the same state until 1859. During the previous years Pasteur had shown that putrefactive and fermentative changes in organic substances and especially in fluids were due to organisms. The question was as to the origin of the organisms. He was well aware of the controversy between Needham and Spallanzani, but took the side of Spallanzani. By 1859, the year of the publication of *The Origin of Species,* Pasteur was engaged in acute controversy as to the origin of life. The matter was brought finally to a head by a very fine series of studies on the subject of spontaneous generation, the results of which Pasteur published in 1861.

Spallanzani, in his experiments, had heated phials, and he showed them containing putrescible substances. He was able to show that the contents of such phials remained indefinitely without any sign of putrefaction or fermentation. These processes did not take place unless or until the phial was opened. The only effective criticism made on the experiments of Spallanzani was that by the process of heating he had altered not only the infusions themselves but also the air contained within the phial. To this Pasteur had his answer, and it was the most triumphant of his experiments. He introduced into a flask an infusion of fermentable fluid. The neck was then drawn out into a long S shape, narrowed, but left open. The flask and its contents were then raised to boiling point repeatedly, and finally left at rest. The flask was left for days, weeks, months, undisturbed, and no fermentation took place. Finally, the neck was severed, thus exposing the fluid to the fall of atmospheric dust. In a few hours the liquid began to ferment, and organisms could be demonstrated under the microscope.

This is the critical experiment in a demonstration that there is no such thing, under present terrestrial conditions, as biogenesis. The issue has been raised in various forms at various times and by various observers, but experiments comparable to those of Pasteur have always been devised in rebuttal. So far as any biological doctrine can be said to be firmly established, it is the doctrine that all living things are the product of living things. It is manifest that this doctrine does not prejudge the question as to the first origin of life, nor does it prejudge the question as to whether life may have arisen at more than one date and in more than one place. It does, however, give to the biologist a conception of the nature of life comparable in its value as a standard of scientific research to the doctrine of the conservation of matter and of energy in the hands of the physicist. By a chance, the movements which led to this demonstration on the origin of life were almost exactly contemporaneous with the movement which led to the establishment of the doctrine of organic evolution. Thus the modern period of biology may be said to open in our era about the year 1860.

Change in the Biological Outlook to the Modern Stage.—The whole outlook on the nature of living things underwent a complete and profound change in the period of about 20 years following 1860. This change may be ascribed to a variety of causes, some of which we have been able to discuss. These we may now review categorically.

(*a*) The discovery of the essential identity in the mode of reproduction of animals and of plants.

(*b*) The discovery of the essential identity in the living substance of animals and of plants, and the emergence of the conception of protoplasm.

(*c*) The examination of methods of nutrition and of respiration, and the realization that these too are fundamentally the same for all living things.

(*d*) At first the differences of the food supply of animals and of plants seemed an insuperable barrier to this last step. Gradually, however, there emerged the conception of the chlorophyll apparatus concerned with the manufacture of organic substance for nutrition of both animal and plant. The elaboration within the plant body, from atmospheric gases, of material for absorption into tissue came to be recognized as part of the mechanism of living nature as a whole. The view of the "balance of life" and of organic nature as one huge mechanism came to the fore.

(*e*) The reduction of all living processes to terms of the cell.

(*f*) An evolutionary view of life gave a new conception of what may perhaps be called the "economics of nature." Thus there arose the tendency to examine the manner of life and habits of living things involving also their relations to other forms of living things.

(*g*) The conviction that, so far as scientific experience extends, all living things are derived from living things and are not generated from not-living things.

The combination of these conclusions and tendencies has introduced so much alteration in the approach of biologists to the material with which they deal that we may speak of entering an entirely new era. During this new era much attention has been concentrated on genetics and the process of heredity. For long, under evolutionary influence, the subject of variation in animals and plants was intensively studied. It is, however, apparent that the real problem to be solved is why the offspring resembles, not why it differs from its parent. This is perhaps the main modern biological problem. It may be observed that Aristotle, the first biologist, most clearly visualized this very problem. In this connection we may ascribe to Aristotle a most remarkable insight in his contention that the male contributes form only to the offspring and that nothing material need pass from male to female.

The study of Aristotle's expression of his views on this and allied topics will convince the investigator that throughout his writings he is in the presence of something far different from one of those cases of lucky prevision that are of frequent occurrence in the course of scientific development. A careful study of the

texts of Aristotle and of the history of biology reveals him as one of the very greatest and most profound of all biologists. From his writings and from the thoughts enshrined therein, biologists will ever return with refreshment and stimulus. Biological science in its most modern dress has indeed begun to tread again the Aristotelian path. The different fragments into which biology has been rent, morphology, physiology, genetics, embryology, ecology, cannot concern themselves with living things as they are but only with abstractions and ideas of what parts of them are or might be. The great master of those who know sought in antiquity to set forth a science of life as a whole. The greatest of his modern disciples had still the same objective when he wrote *The Origin of Species* 2,200 years later. It may be that this aspiration toward a unified biology, a true science of life, is the real legacy of Aristotle and Darwin.

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BIOLOGY, ECONOMIC, the application of biological science to the control and improvement of man's practical interrelations with plants and animals. Man's circle of practical interests intersects the life-circles of many other creatures. There are, first, those wild animals that are captured for food, and it is the business of economic zoology to make the most of such creatures as deer and antelopes, rabbits and hares, pigeons and partridges, frogs and food-fishes, squids and snails, cockles and mussels, oysters and clams, crabs and lobsters, shrimps and prawns, palolo-worms and sea-cucumbers. Second, there are those animals captured, not for the food furnished directly by their flesh, but for other products, which are sometimes edible. Here are included baleen whales, elephants, beavers, birds of fine plumage, crocodiles for leather and turtles for combs, inedible fishes for glue and manure, oysters for pearls and beetles for blisters. Third, there are the animals that man has domesticated because of their direct or indirect utility—such as dog and horse, sheep and cattle, goats and reindeer, pigeons and poultry, ostriches and pheasants, silk-moths and honey-bees. Here the modern biologist has to advise about the improvement of breeds.

Fourth, there are the animals that favour man's operations, like the earthworms that have made the fertile soil, and the flower-visiting insects that secure cross-pollination. Here the main service of the economic biologist is to disclose and appreciate vital linkages that bind living creatures into an intricate system. Fifth, there are man's animal enemies, reduced in modern times both in numbers and size. Most of the beasts of prey have ceased to be important, but the poisonous serpent still bites man's heel. Of greater moment are man's parasites, such as hookworm and bilharzia, and the vehicles of parasites such as the malaria-carrying mosquito and the sleeping-sickness-carrying tsetse fly. The biologist has to unravel life-histories and discover checks and how best they may be put into practice.

The sixth group is composed of animals which injure man indirectly by attacking organisms that are useful to him, notably his animal stock and his crops. The list includes voles, wood-pigeons, worm-parasites, locusts, cockchafers and boll-weevils, wheat-midges and warble-flies. It is part of the task of the economic zoologist to combat these injurious animals, both directly and by encouraging natural checks. He has also to advise against operations that upset the balance of Nature and against careless importations and transportations. Seventh, there are animal enemies which injure man neither directly, nor through his stock and crops, but by getting at his stores or permanent products. Termites are very destructive in warm countries; rats and mice spoil much more than they eat; weevils and their relatives destroy stored corn; boring beetles eat away the rafters; ship-worms and boring crustaceans do much harm to wooden piers.

An eighth group consists of animals that are man's indirect friends, by keeping a check on the fifth, sixth and seventh groups, and must therefore be conserved and encouraged. The birds of prey keep down the voles; the hedgehogs devour slugs; lapwings feed on wireworms and leather-jackets; ichneumon-flies lay their eggs in caterpillars; spiders catch scale-insects; lady-birds levy toll on the green-flies; water-wagtails are fond of the small water-snails that harbour the larval stages of the liver-fluke; and so on.

Similarly for plants, there are wild species directly used for food and drink; those that furnish valuable products like textiles and drugs; those that have been cultivated; those that help man, as forests do in improving the climate. On the other hand, there are inimical plants like the "poison-ivy" and many bacteria; the weeds that become pests and the moulds that attack crops; the fungi that destroy stores and dry-rot wood.

The central idea of economic biology is that the circle of human life intersects many other circles; and these intersections, which are often changing, have to be controlled in man's interests —generously and far-sightedly interpreted. Man is part of a web of life in the weaving of which he increasingly shares, and the success of his weaving depends on his understanding, which in this particular case is expressed in economic biology. (*See* FISHERIES; AGRICULTURE: A GENERAL SURVEY; FORESTS AND FORESTRY; ORNITHOLOGY: *Economic Ornithology;* ENTOMOLOGY: *Economic* and *Medical;* INSECTS; PARASITOLOGY; BOTANY.)

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BIOLUMINESCENCE. Any light with a negligible amount of accompanying heat is spoken of as a luminescence or a cold light. It is to be contrasted with an incandescence, where the heat production is large and the light is directly associated with the high temperature. Luminescences may result from various procedures and the word is usually accompanied by such prefixes as radio-, electro-, crystallo-, tribo-, chemi-, etc. These prefixes indicate, respectively, luminescence from previous exposure to radiation of various kinds, or from electrical excitation, from crystallization, from rubbing materials together, or during a chemical reaction. Fluorescence is a type of radioluminescence in which materials emit light while they are being irradiated, whereas in phosphorescence the light continues after the irradiation.

The word phosphorescence, then, strictly applies only to this light production at low temperatures by certain substances called phosphors, after previous exposure to light or radiation of other kinds. However, common usage has made it applicable to the glow of phosphorus, or of the firefly, the sea, dead fish or meat, or wood, the so-called fox fire of forests. Light of the sea, or of fish, flesh or wood, is always due to living organisms of various kinds and should more properly be called bioluminescence or

biophotogenesis. Such light is the result of a slow oxidation of material manufactured by the organism and hence is an example of chemiluminescence.

Luminous Organisms.—At least 40 different orders of animals contain luminous species, and two groups of plants, the bacteria, responsible for the luminescence of flesh, and the fungi, responsible for the luminescence of wood. Either the fine strands of *fungus mycelium,* which penetrate the wood, or the fruiting body, the mushroom, or both, may be luminous.

Luminous bacteria are so small that individuals cannot be seen by their own light, whereas natural colonies are easily visible. They may be cultured on artificial media, and form excellent material for the experimental study of bioluminescence. They are not pathogenic to man but are known to infect living animals, giving rise to a natural luminescent disease of sand fleas, shrimp and probably midges, which is eventually fatal. Luminous bacteria may also live symbiotically in definite light organs of fish. It is believed by some that the luminescence of all luminous animals, even the firefly, is due to symbiotic luminous bacteria, but this view is very far from proven.

The characteristic of the light of bacteria and fungi, which distinguishes them from all other luminous organisms, is its uniform intensity, shining night and day, independent of stimulation. Other organisms light only when disturbed or stimulated in some way. Hence the glow in the wake of a ship, or as waves break on a shore, or when a school of mackerel swims thru a mass of luminous organisms and makes their presence visible to fishermen.

Phosphorescence of the sea is largely due to protozoa, of which the radiolaria, dinoflagellata and cystoflagellata (including *Noctiluca*) are luminous. The latter two groups may develop in such enormous numbers that the sea is a pink or red by day and a vivid sheet of flame by night. Larger patches of light in the ocean are mainly due to coelenterates, jellyfish, siphonophores, or ctenophores (comb jellies). The latter are often very abundant and show the interesting phenomenon of loss of luminescence in sunlight or on bright illumination by electric light. The luminescence again appears on stimulation after about one-half hour in the dark. The ctenophores and coelenterates probably contain more luminous species than any other group, the sea pens or pennatulids showing especially brilliant luminescence, which travels over the colony of polyps in the form of a wave. Nerves carry the impulse which sets off luminescence of each polyp, giving rise to the wave of light. The scintillating light which appears when the marine growth on old piles or rocks is gently stroked, frequently comes from colonies of hydroids, some species of which are luminous.

One nemertean worm (*Emplectonema*) is luminous. It lives coiled on an ascidian at depths of 120 ft. in bays along the coast of Japan. Among the true worms or annelids, some earthworms and many marine forms (*Chaetopterus, Polynoë, Tomopteris, Polycirrus* and *Odontosyllis*) are luminous. *Odontosyllis* is the well known fire worm of Bermuda, which swarms in great numbers during certain months of the year, a few days after full moon. The worms rise to the surface of the sea from coral rock, 55 minutes after sunset, and shed their eggs and sperm with an accompanying brilliant display of luminescence. The swarming lasts 15 to 30 minutes.

Although the worm, *Chaetopterus,* lives in a parchmentlike tube, buried in the sand, and never comes out in the open, its body is covered with gland cells that secrete a bright luminous slime when the animal is disturbed. *Tomopteris* is pelagic, but *Polynoë* and *Polycirrus* live among other marine animals, shells and sponges. The luminescence of sponges may be due to luminous animals living on them, but at least one species appears to be self-luminous.

Luminous molluscs are represented by *Pholas dactylus* (a bivalve) and *Phyllirrhoë bucephala* (a nudibranch), together with the cephalopods, of which many members produce light. The cephalopods and deep sea fish possess the most complex lantern-like luminous organs. Among the echinoderms, only the brittle stars (ophiuroids) possess luminous members.

Among the crustacea, copepods and ostracods (*Cypridina*) contain many luminous forms, while the schizopod and decapod shrimps possess members with true luminous organs or photophores, often consisting of lens, reflector and pigment screens—veritable lanterns on a microscopic scale. These light organs had earlier been mistaken for eyes. The ostracods and some shrimp eject into the sea an abundant luminous secretion from large glands, thus surrounding themselves with a liquid fire.

Some centipedes are luminous, as well as the springtails; also the larvae of the fly, *Bolitophila,* which live in New Zealand caves, and beetles (firefly, glowworm and the elaterid, *Pyrophorous,* of the West Indies). All stages of metamorphosis, including the egg, of some fireflies are luminous. The word glowworm is applied to the larva of the firefly, or to some adult fireflies which are wingless and hence look like a worm.

The most remarkable luminous insects are beetles of the family, *Phengodidae,* related to fireflies. The males are like any other beetle in appearance, while the fertile females are grublike and larviform, often 2 in. long. In the North American genus, *Phengodes,* the female and larvae possess a row of 11 bright greenish luminescent spots on each side of the body, while the South American form, *Phryxothrix,* has in addition a red light on the head, hence its local name of *ferrocarril* or "railroad worm." The red light is the colour of a glowing cigarette.

Balanoglossus and *Pyrosoma,* primitive chordates, are also luminous. The latter forms large colonies of minute animals floating on the surface of the sea, each individual possessing two luminous spots.

Finally, mention should be made of the fish, both elasmobranchs and teleosts, containing luminous members. The deep sea forms are often bizarre in appearance and sometimes contain the luminous organ on the end of a long process dangled before the animal, a Diogenes of the deep in search of an honest meal. Others have rows of lights like portholes along the sides of the body. Most fish are self luminous, but some forms, such as *Photoblepharon, Anomolops, Monocentris, Equula,* and possibly *Physiculus,* light by virtue of symbiotic luminous bacteria. They possess luminous organs especially designed to nourish the bacteria. In *Photoblepharon* and *Anomalops* from the Banda Islands in the Dutch East Indies, the large oval light organs are situated just under the eye and contain rows of long tubular cells full of bacteria. A copious network of blood capillaries supplies oxygen. The light is constantly emitted, as with other luminous bacteria, but the fish can turn off the lights and, as they swim, the lights blink on and off in a regular rhythm. This is accomplished in *Photoblepharon* by a black fold of skin drawn over the light spots like an eyelid. In the closely related *Anomolops* the whole light organ is hinged at one end and turned inward toward a groove or pocket to obscure the light.

The sponges, alcyonaria, bryozoa, mayflies, termites, spiders and salpids contain forms reported to be luminous but whose light production is still doubtful.

It is rather surprising that only land or marine animals are luminous. No phosphorescence is to be noted in great inland bodies of fresh water, no matter how ancient geologically, and despite the fact that they contain organisms (dinoflagellates) closely related to marine species which are luminous. In Lake Suwa, Japan, there is found a luminous shrimp, but luminescence in this case has been shown to be due to infection with luminous bacteria, not to self-luminosity. The nearest approach to a fresh-water luminous animal is the larva of a firefly which lives in tropical pools and streams, breathing by tracheal gills.

In general, luminous organs or regions are glandular, and the luminous material may be ejected (extracellular luminescence) as a slime or a secretion, which in the squid, *Heteroteuthis dispar,* surrounds the animal in the sea water as does the black ink of the common squid. On the other hand, the luminous material may react within the photogenic cells (intracellular luminescence) as in the firefly and organisms possessing photophores. There is always a mechanism for supplying the organ with abundant oxygen, a rich blood supply or tracheae, a fact which indicates—and of which there is no doubt—that the light production is an

oxidation.

Chemistry of Bioluminescence.—Knowledge of the chemical nature of bioluminescence has proceeded in four steps:

(1) R. Boyle (1667) showed that fungi and bacteria required air (oxygen) for luminescence, becoming dark under an air pump and luminescing again when air was readmitted. He drew an interesting comparison between a glowing coal and phosphorescent wood, although oxygen was not known and combustion was not understood at that time.

(2) R. de Réaumur (1733) and L. Spallanzani (1794) showed that water was necessary, that luminous cells could be dried and preserved, producing light when moistened. This proves also that bioluminescence is not a process involving definite structural peculiarities of the cell, as is the contraction of a muscle or the conduction of a nerve impulse, which will not occur after drying and moistening. The best material for chemical studies is the dried ostracod, *Cypridina,* which gives a bright luminescence in water after 30 years in the dry state.

(3) R. Dubois, in 1887, found that the photogenic material of *Pyrophorus* and of *Pholas* could be separated into two constituents, luciferin and luciferase, due to marked difference in chemical behaviour. The latter is destroyed on boiling, and behaves like an enzyme or catalyst; the former is heatresisting and an oxidizable body. These substances can be treated like any other chemical compound, precipitated by certain reagents and redissolved in appropriate solvents. They have been partially purified and their complete isolation and synthesis is merely a matter of time and material.

(4) E. N. Harvey (1918), working with extracts of dried *Cypridina,* showed that after the luminescence had disappeared, due to the oxidation of luciferin in the presence of oxygen, addition of various reducing agents that can add hydrogen to the molecule would reform luciferin. Reversibility of the reaction was established, since light again appeared if the newly formed luciferin were reoxidized by luciferase and oxygen. Actually, two kinds of oxidation are proceeding simultaneously. Luciferin undergoes a spontaneous oxidation in absence of luciferase without luminescence, and a luminescent oxidation in presence of luciferase. Anderson (1936) found that only the spontaneous oxidation was easily reversible, the luminescent oxidation resulting in compounds that are not reduced by simple methods.

The mechanism of oxidation is much more complicated than might at first appear and proceeds in steps, one of which is probably the combination of luciferin and luciferase to form a complex. The oxidation of luciferin may occur at two regions of the molecule, and the term oxidized luciferin should be restricted to the reversible oxidation product formed by removal of two hydrogens and analogous to the change of a leucodye to the dye itself, also a dehydrogenation. In some respects the luciferin-luciferase system is analogous to a coenzyme-enzyme complex.

The solubility of *Cypridina* luciferin in various solvents is known, as well as many other properties, including the absorption spectrum. Reduced *Cypridina* luciferin is greenish yellow, changing to reddish yellow on oxidation and finally becoming colourless. It contains carbon, hydrogen, oxygen and phosphorous but no sulphur, halogen, or ash, and probably no nitrogen. The absorption spectrum leads to the view that it may be a napthalene or anthracene derivative and a relatively simple compound. Luciferase has all the properties of a protein.

In luminescence some molecules must absorb energy, thereby attaining the excited or energy-rich state. On return to normal this excess energy appears as a light quantum. The luminescence intensity is determined by the number of quanta emitted per unit of time. In a fluorescent lamp, molecules of fluorescent powder on the glass walls of the tube are excited by the energy of incident radiation; with many organic substances the energy of chemical reaction may lead to excitation of molecules, giving such a brilliant bluish chemiluminescence as that of aminophthalichydrazid (luminol) or the yellow chemiluminescence of dimethyldiacrylidium nitrate (lucigenin). Many other organic compounds capable of oxidation emit light, such as pyrogallol, lophin, esculin, and various essential oils. In fact, the whole process of light production by luminous organisms can be so perfectly imitated by such purely chemical reactions that bioluminescence can no longer be considered a mysterious or unusual phenomenon.

Efficiency of Light Production.—Bioluminescence is often spoken of as "cold light." This does not mean that no heat is produced but only that very little appears as compared with the ordinary methods of illumination, which depend on the incandescence of carbon particles in flames or of wires through which a current is passing. The rise of temperature in some luminous animals is less than 0.001° C.

The luminescence spectra of luminous animals consist of bands of different widths and in different positions in the visible region of the spectrum; hence the variation of colour of different luminous animals, which may be reddish, yellow, green, blue, or violet. The light is no different, physically, from any other kind of light—will affect a photographic plate, can induce chemical reactions, and can be polarized, although it is never polarized as produced by the animal. There are no infra-red or ultra-violet radiations and no penetrating radiations produced. Hence the luminous efficiency, *i.e.,* the percentage of the radiant energy which is visible, is very high, nearly 100%. This does not tell, however, what the radiant efficiency is, *i.e.,* the percentage of the energy (chemical) of the oxidation process which appears as a radiant energy; nor does it tell the over-all efficiency, *i.e.,* the energy (chemical) in the food of the animal which appears as visible radiant energy. This is the efficiency in which an illuminating engineer is interested, and studies on luminous bacteria have shown that the over-all efficiency of these forms is at least slightly and probably considerably greater than that of a nitrogen-filled incandescent lamp, when calculated from the energy of the coal necessary to run the dynamo that supplies current to the lamp. Neither the radiant efficiency nor the over-all efficiency of the firefly is known.

It has often been suggested that firefly light, or living light, might someday be used in house lighting. The intensity is sufficiently great, provided large enough areas are covered. In fact, the modern trend in lighting has been toward indirect illumination, where the high intrinsic brilliancy of an incandescent filament is diffused by reflection from a white background. Although no chemiluminescence has yet been used in commercial lighting, the fluorescent tube, perfected around 1938, is destined to replace the electric filament because of higher efficiency, little heat, and diffuse illumination. By this change mankind has adopted the principle if not the actual light of the firefly.

Use of Animal Light.—Regarding the use of luminescence to the animal, very little can be said with certainty. In deep sea forms, living in perpetual darkness, it would seem that the organs must be lanterns for seeing or recognition. Many luminous forms live where light penetrates, and it has been suggested that the luminescence may be used at night as a warning to scare away predaceous animals which might molest the luminous forms, or as a lure to attract creatures upon which the luminous animal feeds. These suggestions remain to be proven; but we do know that in the firefly the light acts as a signal or attraction to bring the sexes together, and that one who is an expert can go into the field and point out the different species of fireflies by the length of the flash and the interval between the flashes. On the other hand, who can suggest the use of light to a luminous bacterium, an organism one twenty-five thousandth of an inch in diameter with no nervous reactions of a higher form, or the use to a protozoan, living at the surface of the sea, blown hither and thither by the wind? One is forced to the conclusion that in their case the light is merely fortuitous, a chance phenomenon, merely accompanying some of the necessary organic chemical changes proceeding in the organism. (*See* also FLUORESCENCE AND PHOSPHORESCENCE.)

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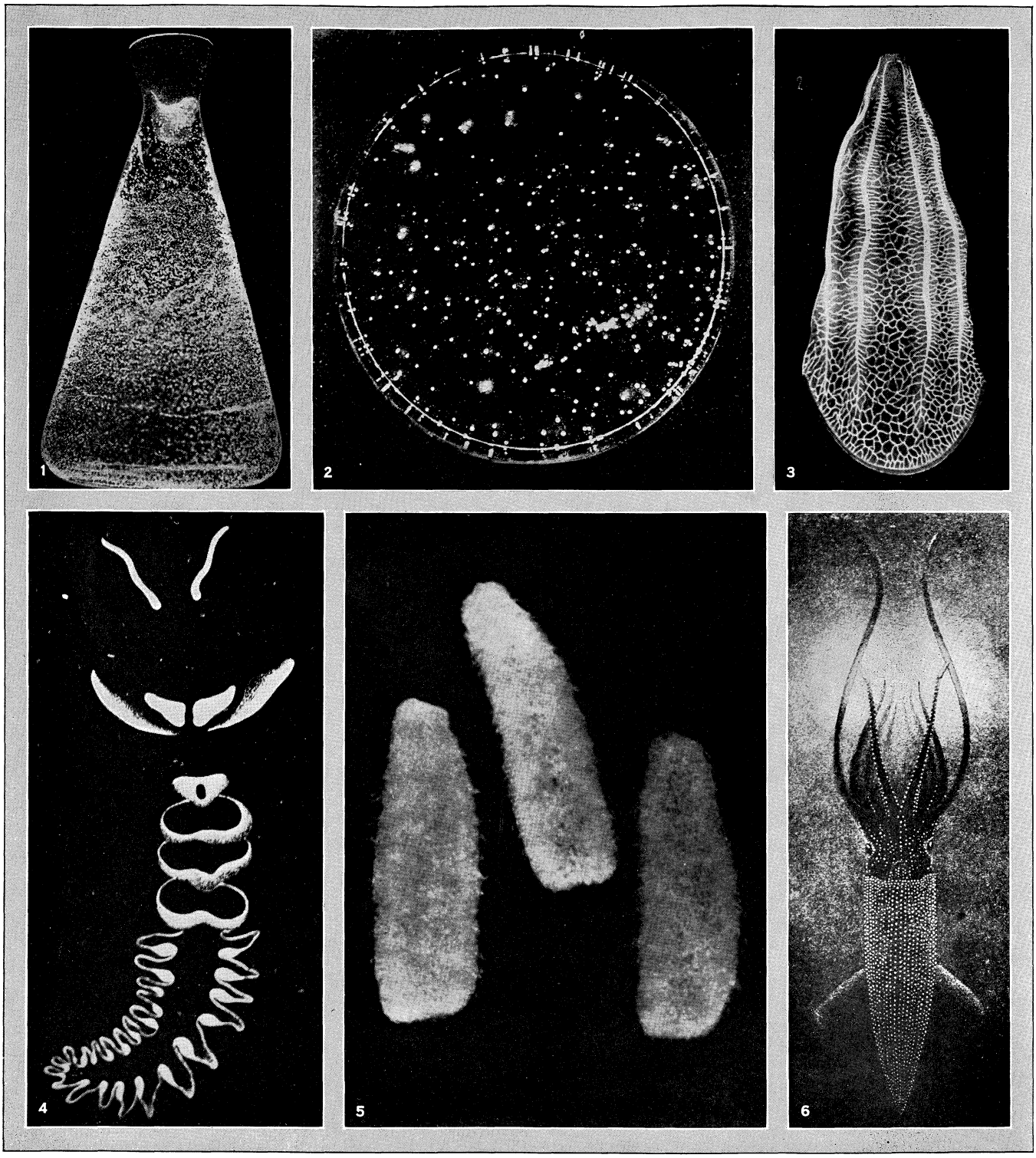


BY COURTESY OF (5) E. NEWTON HARVEY, (1, 2) HANS MOLISCH FROM "LEUCHTENDE PFLANZEN" (GUSTAV FISHER), (4) E. N. HARVEY FROM "THE NATURE OF ANIMAL LIGHT" (J. B. LIPPINCOTT CO.)

LUMINOUS ORGANISMS

1, 2. Colonies of luminous bacteria growing on culture media
3. "Comb" jellyfish or Ctenophore
4. A marine worm (*Chaetopterus*)
5. A sea-squirt (*Pyrosoma*)
6. A luminous squid (*Watasenia*)

of Animal Light, with bibl. (Philadelphia, 1920); A. Pratje, *Ergebnisse der Physiologie,* vol. xxi with bibl. (1923); E. N. Harvey, *Living Light,* with bibl. (Princeton, 1940). (E. N. H.)

BIOMETRY, a word to which three somewhat different meanings may be given.

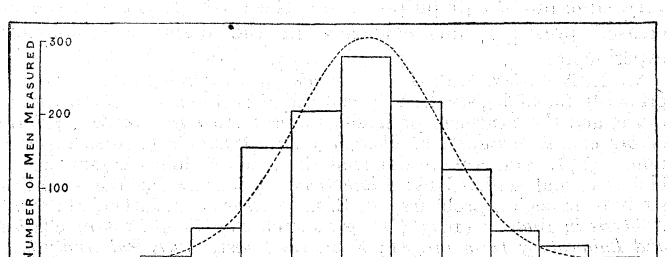
(*a*) Just as the word geometry, originally denoting land-measurement, has come to refer strictly to the mathematical study of the properties of space, so biometry may be taken to mean the mathematical study of the properties of populations, a subject otherwise designated as mathematical, or theoretical, statistics. This meaning, though too limited, gains in appropriateness from the fact that many of the great modern advances in statistical theory have in fact been developed in the study of biological material.

(*b*) A more comprehensive meaning would include not only the mathematical theory but the experimental technique of, and the results obtained by, the application of quantitative methods in biology. This meaning will be adopted with the reservation that, since biological researches of all kinds, as they become more exact and detailed, must also become quantitative in character, we may ignore the large class of researches into living or organic materials, by quantitative physical or chemical methods, which do not involve the peculiar characteristics of populations, as opposed to individuals, or require statistical methods in their interpretation.

(*c*) The third meaning is of historical interest only. In the early years of the 20th century the term was applied to the work of a group of investigators who held that heredity could better be studied by mass observations and correlation coefficients than by Mendelian analysis, by means of the frequency ratios obtained by experimental breeding. The progress of research has cleared away the causes of this controversy, and Mendel is now recognized as a pioneer in the introduction of statistical methods in biology.

In treating so large a subject in a limited space it will be necessary to omit on the one hand the advanced mathematical development of statistical theory, and on the other the description of the innumerable practical applications of the systematic measurement of living things, ranging as these do from the mass production of clothing to the practical improvement of live-stock. Attention will therefore be concentrated upon illustrating the fundamental arguments and methods of procedure by which progress has actually been achieved.

The primary purpose of biometrical methods is to overcome the obstacles to exact reasoning which arise from the variability of biological material. This is invariably accomplished by studying the frequency of occurrence of the different possible forms, or of the different possible types of response to treatment, etc. This method is at its simplest when there are only a few or even two possibilities to be enumerated, as when live births are classified as those of male or female children. The statement that 51% of such births are of males is thus of the biometrical type at its simplest, in that it expresses the frequency ratio of one possibility of a variable event. Mendel's discovery of the laws of inheritance was due to the fact that in matings from which the offspring could be of two or more distinct kinds, he took the revolutionary step of ascertaining from a sufficiently large count just what the frequency ratios actually were. In this way he found the simple ratios 1:1 and 3:1 characteristic of differences dependent upon only a single factor, in addition to the more complex ratios appropriate to two or more independent factors. The Mendelian method of studying heredity lay in the experimental determination and interpretation of frequency ratios, and it is noticeable that each great advance from Mendel's position has been achieved by the same method.



HISTOGRAM INDICATING DISTRIBUTION OF 1,126 ARMY RECRUITS IN CHEST GIRTH

The actual frequencies in 11 classes are shown in the histogram, which shows at a glance the nature and extent of the variation observed. Most recruits fall in the three central classes, while observations of four or five inches in excess or defect are very rare. The normal curve superimposed on the histogram gives a better idea of the true variation in the population from which the sample observed was drawn at random

Chest girth (inches)	28	29	30	31	32	33	34	35	36	37	38	39	1,126
Frequency	1	2	9	47	159	207	280	219	127	49	22	4	Total

More often the biological variation observed cannot be described in terms of a few distinct classes. A quantity (technically a *variate*) such as human stature can take any exact quantitative value in a considerable range of variation. Such measurements may be grouped in artificial classes; *e.g.,* all statures from 65½ to 66½ in. may be considered as one class. The frequency of occurrence in each such class may be observed, and the *frequency distribution* so obtained affords an adequate description of the particular variate in question. For example, the table below gives the measurement of chest girth for 1,126 British recruits aged 18, obtained at Liverpool:—

The recognition of the value of such frequency distributions was principally due to Francis Galton. They are now invariably employed as a first step in the study of any biological phenomenon showing so-called continuous variation. The kind of information they provide may be seen at once by constructing a *frequency histogram,* in which the different measurements in the range of variation are indicated on a horizontal scale, and the classes are represented by rectangles, the areas of which are proportional to the number of individuals in each class.

The histogram illustrates graphically the high frequency with which measurements are recorded in the central classes of 33 to 35 in., and the increasing rarity with which the more extreme measurements occur, whether of very large or of very narrow chests. It is easy to see that the most frequently occurring chest girth (the *mode*) will be nearly the average or *mean* girth, and that these will both be near a third value, the *median,* which divides the population into two equal portions, half being larger than the median and half smaller. Further, the form of the histogram evidently gives a good idea of how variable the population is, for the same area might have been more concentrated than it is in the central values, and spaced over a smaller number of classes, representing a less variable population. Or, on the contrary, it might have had a lower central hump, and be spaced over a wider range, if the population had been more variable.

The statistical treatment of frequency distributions is much facilitated by the fact that, in a large number of cases, the observed distributions conform, at least, to a good approximation to a definite mathematical form known as the normal distribution. This is specified by the law that the logarithm of the frequency in an infinitesimal range of the variate is a quadratic function of the variate itself. The variable part of this function may be written as $-\frac{(x-m)^2}{2\sigma^2}$ in which m designates the central point, or mean, of the symmetrical distribution, and σ^2 designates the *variance* of the distribution, and provides a quantitative measure of the amount of variation present; its square root, σ is called the standard deviation of the distribution.

From any sample of observations it is important, therefore, to obtain estimates of the two *parameters* m and σ which specify the population sampled; such an estimate has been termed a *statistic.* It has been demonstrated that the best obtainable estimate of the quantity m is found by calculating the arithmetic mean of the observations, written $\mathrm{n}=S(\mathrm{n})/N$ where N is the number of observations in the sample and S denotes summation over all the observations. The best estimate of the variance may then be written $s^2=S(x-\bar{x})^2/(N-1)^2$.

When these two statistics have been calculated, the corresponding curve of frequency distribution may be constructed, as is shown in the figure by the dotted curve superimposed on the histogram. It will be seen that this process has removed the two arbitrary and fortuitous elements in the original representations; (*a*) the discontinuities, introduced by our arbitrary choice of units of measurement and grouping, are replaced by a curve showing continuous variation of frequency; (*b*) variations, due to the chances of random sampling, of the numbers in the different classes, are obliterated except in so far as the estimates of m and σ have been influenced by these errors of random sampling.

The errors to which statistical estimates are liable form the branch of the subject to which the greatest amount of attention has been given in recent years. For samples from the normal distribution it is known that the error distribution of the mean, $\bar{x}$, is itself normal, with variance equal to σ^2/N; the distribution of s (the standard deviation estimated from the sample) is not normal, but is known with exactitude, and for large samples it approximates to the normal form with variance equal to $\sigma^2/2N$. Using our estimate s for the value of σ, these variances and the corresponding standard errors may be regarded as known; thus having a mean chest girth of 34″.009, with an estimated standard error 0″.0443, we have reason for some confidence that the mean girth of the population sampled lies between the limits 33″.920 and 34″.198.

The result may be expressed otherwise by saying that the mean chest girth is *significantly* greater than 33″.92, *i.e.*, it exceeds this quantity by an amount which cannot readily be ascribed to chance.

It will be noted that although the measurements are actually taken only to the nearest inch it is improbable that the estimate of the mean will be in error by as much as $\frac{1}{10}$ of an inch, and its standard error may be diminished without limit by taking larger samples. This important fact depends on the positive and negative errors of measurement neutralizing each other more and more exactly as the number in the sample is increased; it would not be true if the graduations of the tape measure used were in error. Similarly, in estimating the variance of the population, an allowance (Sheppard's correction) is usually made for the variance introduced by taking the measurements only to the nearest inch; if, however, owing to careless measuring a proportion of cases are not measured truly to the nearest inch, this proportion being greatest when the true measurement is near a class boundary, a part of the variation observed will be really due to these additional errors of measurement. In order to be sure that these errors are sufficiently rare the precaution should be taken of obtaining duplicate measurements, on different occasions, of a number of individuals.

The methods outlined above find a very wide application in the study of the *correlation* or *covariation* of two or more variates. For this purpose a two-way frequency distribution is used which expresses, as the result of direct enumeration, how frequently both of the variates shall simultaneously have values between assigned limits. The utility of this method lies in the great choice which exists in the pair of variates chosen. Thus, if we have the height and weight of each of a number of individuals, a two-way distribution will show how frequently an individual chosen at random will have any given combination of height and weight; how frequently an individual of given weight will have an assigned height; and how frequently an individual of given height will have an assigned weight. Definite mathematical relations (regression equations) will be found to express the average weight of persons of a given height in terms of that height, or the average height of persons of a given weight in terms of that weight. Finally, it is sometimes useful to evaluate an abstract number, the correlation coefficient, which measures on an arbitrary quantitative scale the closeness of the interrelation between the two varieties.

Again, the two variates may be similar measurements of related persons, such as are the heights of parent and child. The regression equation, which expresses the average height of the child in terms of the height of the chosen parent, is then of great importance, for it provides a direct measure of the efficacy of selection, natural or artificial, in modifying the average character of the population. For human physical measurements the simple rule is found to hold that, if one parent only is selected to be one unit above the average, then the next generation will have advanced by half a unit; but if both parents are selected the advance is approximately $\frac{4}{5}$ of a unit. Similar biometrical studies are increasingly important in the improvement of livestock. In cases of inheritance the correlation coefficient may be used as a measure of the heritability of the character in question, as when it is found that certain mental and moral qualities are associated in near relatives to just the same extent as are physical measurements. Alternatively it may be taken to measure the closeness of relationship, as when it is shown that twins of like sex are more closely alike than are ordinary brothers or sisters.

The study of simultaneous distributions has opened out an immense field of research by providing a precise and objective method of studying vague and ill-understood influences—for example, meterological and sociological. It is essentially a pioneer method, and is usually replaced as soon as exact knowledge is available of the causes at work. Pairs of values may be associated for innumerable reasons, but the first step, which the two-way table provides, is to find if they are or are not in fact associated.

In most cases there is a wide choice in the statistics which might be calculated as estimates of the parameters characteristic of the population. These will differ greatly in the efficiency with which they utilize the information supplied by the data. Methods are, however, available for obtaining in any particular case statistics which shall be efficient in this respect.

As further exact solutions are obtained of the error distribution of different statistics, so accurate tests of significance appropriate to the different problems which arise in practice are being developed. For a single normally distributed variate it is possible to test accurately whether the mean and variance do or do not differ significantly from given hypothetical values, as also whether two means or two variances obtained from observations are or are not in agreement. For the simultaneous distributions of two or more variates the theory of the regression coefficients and of the coefficient of correlation, in terms of which the dependence of one variate upon another may be expressed, is now almost equally complete. In addition, tests of *goodness of fit* are available for comparing the frequency of occurrence of the different classes with the frequencies expected by hypothesis, and for testing the adequacy of regression formulae, linear or non-linear, involving one or more independent variates. These tests may all be developed in the form known as the *analysis of variance*. Although much further mathematical research is required before the practical needs of biologists in this field will be fully met, the methods already established are adequate for a very large number of purposes, not the least of which is the increased precision and efficiency in the design of biological experiments.

See R. A. Fisher, *Statistical Methods for Research Workers* (1925), primarily for biologists, with special attention to exact tests of significance, and the treatment of small samples; *Recommendations for the taking and presentation of biological measurements* (British Association, 1927), practical recommendations of a joint committee of biologists and statisticians; *Biometrika,* a journal for the statistical study of biological problems, ed. E. S. Pearson; K. Mather, *Statistical Analysis in Biology* (1943); D. Mainland, *The Treatment of Clinical and Laboratory Data* (1938); E. F. Lindquist, *Statistical Analysis in Educational Research* (1940). (R. A. F.)

BION, Greek bucolic poet, was born at Phlossa, near Smyrna, and flourished somewhere about 100 B.C. Nothing is known of him, except that he probably lived in Sicily. The story that he died of poison is probably only an invention of the author of the *Epitaphios Bionos*. Although his poems are called *Bucolics* the remains show little of the vigour and truthfulness to nature characteristic of Theocritus. They are over-sentimental, and show the over-strained reflection which characterizes late pastoral poetry. The longest and best of them is the *Lament for Adonis* (Ἐπιτάφιος Ἀδώνιδος) which refers to the first day of the festival, when the death of Adonis was lamented. Fragments of his other pieces are

preserved in Stobaeus; the epithalamium of Achilles and Deidameia is not his.

Bion and Moschus have been edited separately by G. Hermann (1849) and C. Ziegler (Tübingen, 1869), the *Epitaphios Adonidos* by H. L. Ahrens (1854) and E. Hiller in *Beiträge zur Textegeschichte der griechischen Bukoliker* (1888). Bion's poems are generally included in the editions of Theocritus. English transl.: J. Banks (1853) in Bohn's *Classical Library;* Andrew Lang (1889), with Theocritus and Moschus (prose); A. S. Way (1913) (verse); edition by U. Wilamowitz-Möllendorff in the Oxford *Scriptorum Classicorum Bibliotheca* (1905). On the date of Bion *see* F. Bücheler in *Rheinisches Museum,* xxx, pp. 33–41 (1875); W. Stein, *De Moschi et Bionis Aetate* (Tübingen, 1893); also G. Knaack in Pauly-Wissowa's *Realencyklopädie, s.v.;* and F. Susemihl, *Geschichte der griechischen Literatur in der Alexandrinerzeit,* i, p. 233 (1891).

BION, of Borysthenes (Olbia), in Sarmatia, Greek moralist and philosopher, flourished in the first half of the 3rd century B.C. He was of low origin and was sold as slave to a rhetorician, who gave him his freedom and made him his heir. After the death of his patron, Bion went to Athens to study philosophy. He was admitted to the literary circle at the court of Antigonus Gonatas. He subsequently taught philosophy at Rhodes and died at Chalcis in Euboea. His life was written by Diogenes Laërtius. Bion's *Diatribae* was a satire of a popular character; while praising poverty and philosophy, he attacked the gods, musicians, geometricians, astrologers, and the wealthy. His influence is distinctly traceable in succeeding writers, *e.g.,* in the satires of Menippus. Horace (*Epistles,* ii, 2, 60) alludes to his satires (*sal nigrum*). An idea of his writings can be gained from the fragments of Teles, a cynic philosopher of the 3rd century, who made great use of them. Specimens of his apophthegms are found in Diogenes Laërtius and Stobaeus. There are traces of his influence in Seneca.

See Hoogvliet, *De Vita, Doctrina, et Scriptis Bionis* (1821); Rossignol, *Fragmenta Bionis Borysthenitae* (1830); Heinze, *De Horatio Bionis Imitatore* (1889); von Arnim's article in Pauly-Wissowa's *Realencyklopadie.*

BIONOMICS, the study of an organism in relation to its environment. *See* Zoology; Ecology; Animal; Plants and Plant Science: *Plant Ecology.*

BIOT, JEAN BAPTISTE (1774–1862), French physicist, was born in Paris on April 21, 1774. In 1800 he became professor of physics at the Collège de France, through the influence of Laplace, from whom he had sought and obtained the favour of reading the proof sheets of the *Mécanique céleste.* In 1804 he accompanied Gay Lussac on the first balloon ascent undertaken for scientific purposes. In 1806 he was associated with F. J. D. Arago, with whom he had already carried out investigations on the refractive properties of different gases, in the measurement of an arc of the meridian in Spain, and in subsequent years he was engaged in various other geodetic determinations. He died in Paris on Feb. 3, 1862. He was especially interested in questions relating to the polarization of light, and his observations in this field, which gained him the Rumford medal of the Royal Society in 1840, laid the foundations of the polarimetric analysis of sugar.

His very numerous published works include: *Analyse de la mécanique céleste de M. Laplace* (1801); *Traité analytique des courbes et des surfaces du second degré* (1802); *Recherches sur l'intégration des équations différentielles partielles et sur les vibrations des surfaces* (1803); *Traité de physique* (1816); *Recueil d'observations géodésiques, astronomiques et physiques exécutées en Espagne et Écosse,* with Arago (1821); *Mémoire sur la vraie constitution de l'atmosphère terrestre* (1841); *Recherches sur plusieurs points de l'astronomie égyptienne* (1823); *Recherches sur l'ancienne astronomie chinoise* (1840); *Études sur l'astronomie indienne et sur l'astronomie chinoise* (1862).

His son, Edouard Constant Biot (1803–1850), after amassing a competence from railway engineering, turned to the study of Chinese subjects, and published *Causes de l'abolition de l'esclavage ancien en occident* (1840); *Dictionnaire des noms anciens et modernes des villes et des arrondissements compris dans l'empire chinois* (1842); *Essai sur l'histoire de l'instruction publique en Chine et de la corporation des lettres* (1847); *Mémoire sur les colonies militaires et agricoles des chinois* (1850).

BIOTITE, an important rock-forming mineral belonging to the group of micas (*q.v.*). The name was given in honour of the French physicist, J. B. Biot, who in 1816 found the magnesia-micas to be optically uniaxial or nearly so. The magnesia-micas are now referred to the species biotite and phlogopite, which differ in that the former contains a considerable but widely varying amount of iron. Biotite is an orthosilicate of aluminium, magnesium, ferrous and ferric iron, potassium and basic hydrogen, containing small amounts of calcium, sodium, lithium, fluorine, titanium, etc., and ranges in composition between $(H,K)_2(Mg,Fe)_4(Al,Fe)_2(SiO_4)_4$ and $(H,K)_2(Mg,Fe)_2Al_2(SiO_4)_3$.

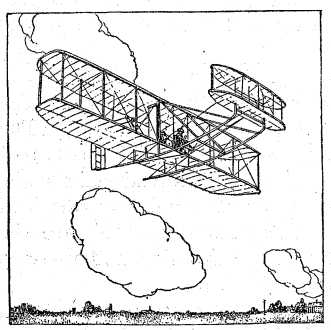
Like the other micas, it is monoclinic with pseudo-hexagonal symmetry, and possesses a perfect cleavage in one direction. Biotite is, however, readily distinguished by its darker colour, strong pleochroism, and small optic axial angle. The colour is usually brown or dark green; thick crystals are often deep-black and opaque. The absorption of light rays vibrating parallel to the cleavage is much greater than of rays vibrating in a direction perpendicular thereto, and in dark-coloured crystals the former are almost completely absorbed. The specific gravity of biotite is, as a rule, higher than that of other micas, varying from 2.7 to 3.1 according to the amount of iron present. The hardness is $2\frac{1}{2}$ to 3.

Several varieties of biotite are distinguished. By G. Tschermak it is divided into two classes, *meroxene* and *anomite;* in the former the plane of the optic axes coincides with the plane of symmetry, whilst in the latter it is perpendicular thereto. Haughtonite and siderophyllite are black varieties rich in ferrous iron, and lepidomelane is a variety rich in ferric iron. Rubellane, hydrobiotite, pseudobiotite and others are altered forms of biotite.

Biotite is a common constituent of igneous and crystalline rocks: in granite, gneiss, and mica-schist it is often associated with muscovite (white mica), the two kinds having sometimes grown in parallel position. In volcanic rocks, and in nearly all other kinds of igneous rocks with the exception of granite, biotite occurs to the exclusion of the muscovite. In the dyke rocks known as mica traps or mica lamprophyres biotite is especially abundant. It is also one of the most characteristic products of contact metamorphism, being developed in sedimentary and other rocks at their contact with granite masses.

Although biotite (black mica) is much more common and widely distributed than white mica, yet it is of far less economic importance. The small size of the sheets, their brittleness and want of transparency render the material of little value. Large, cleavable masses yielding fine smoky-black and green sheets, sufficiently elastic for industrial purposes, are, however, found in Renfrew county, Ontario.

(L. J. S.)



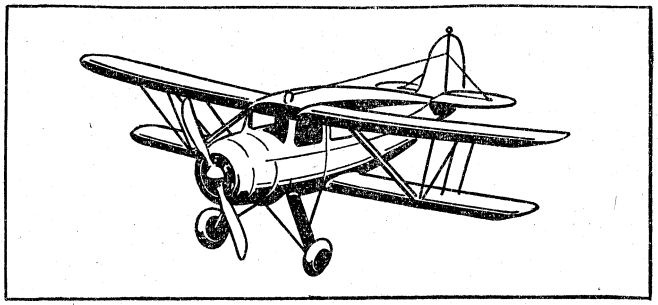
BY COURTESY OF THE WRIGHT MFG. CO.

THE FORE-RUNNER 1904, THE MACHINE IN WHICH THE WRIGHT BROTHERS MADE THEIR EARLIEST PRACTICAL FLIGHTS. HAVING NO WHEELS, IT HAD TO BE LAUNCHED FROM A SLIPWAY

BIPLANE, a form of aeroplane (*q.v.*) in which the main supporting surfaces are arranged in two planes, one above the other. Until 1930 biplanes were far more common than any other type, but since that time designers have come to adopt the monoplane for the majority of their models. The chief advantage of a biplane is that it can be built to carry the same weight as a monoplane with less wing span, and thus requires less storage in hangars. Its long priority over the monoplane is explained by the fact that its interplane bracing, struts, and wires permitted the use of comparatively thin wings which at first were the only ones to possess aerodynamic efficiency.

The chief disadvantage of the biplane arises from the resistance caused by the interplane struts and wires. Substantial progress was made in reducing this resistance by giving both struts and wires a streamlined cross section, but even in the most advanced

types this resistance remains a serious source of aerodynamic "drag."



A MODERN BIPLANE; ITS CABIN AFFORDS THE PASSENGERS ALL THE COMFORTS OF A SEDAN AUTOMOBILE

Other things which have worked against the popularity of the biplane have been its comparative complexity of manufacture, assembly and maintenance with attendant high costs of operation.

(D. Se.)

BIPONT EDITIONS, the name of a famous series of editions, in 50 volumes, of Greek and Latin classical authors, so called from Bipontium, the modern Latin name of Zweibrücken or Deux-Ponts in Bavaria, where they were first issued in 1779. Their place of publication was afterward transferred to Strasbourg.

BIPRISM, FRESNEL'S, an obtuse angled prism used for the production of interference fringes. The prism is set up so that the line joining the obtuse angle to the source of light (in the form of a slit) is normal to the base, and the edge of the obtuse angle is parallel to the slit, this angle lying between the source and the base. Two virtual images of the source, very close together, are formed, and the biprism is thus equivalent to two mirrors inclined so that they produce interference. (*See* Light.)

BIQUADRATIC, an adjective used in mathematics to refer to the fourth power of a quantity; that is, to the square of a square. It is used in connection with equations or algebraic functions. The equation $ax^4+bx^3+cx^2+dx+e=o$ is a biquadratic equation, since the highest power of the unknown quantity (x) is the fourth; that is, x^4 is the square of x^2, or the square of the square of x (the *bi,* two + *quadratus,* square). The general biquadratic equation was first solved by Lodovico Ferrari (1522–*c.* 1560) and was published by Cardan in his *Ars Magna* (1545). Excepting in the above cases and in connection with a few geometric figures the word "quartic" is used instead of "biquadratic." (*See* Equations, Theory of.)

BIRBHUM, a district of British India in the Burdwan division of Bengal, bounded on the south by the river Ajai. The administrative headquarters are at Suri (pop. [1941] 15,867). The district has an area of 1,743 sq.mi. and a population (1941) of 1,048,317. The eastern portion is the ordinary alluvial plain of the Gangetic delta; the western part consists of undulating ridges of laterite. The Ajai, Bakheswar and Mor or Maurakshi, are the principal rivers. The chief industry is the spinning and weaving of silk, chiefly from tussur or jungle silk-worms.

Birbhum in the early part of the 13th century constituted a Hindu State, with its capital at Rajnagar or Nagar which was conquered by the Mohammedans. At the beginning of the 18th century it appears as a kind of military fief held under the nawab of Bengal by one Asadullah Khan. It passed into British possession in 1765, suffered terribly from the famine of 1770, and between 1785 and 1790 was a prey to armed bands of dacoits who found a refuge in the great jungle on the western border. Since that time (except during the Santal rising of 1855) the district has been peaceful and prosperous.

BIRCH, SAMUEL (1813–1885), English Egyptologist and antiquary. At first employed in the Record Office, he was appointed to the British Museum staff in 1836, as he knew Chinese. He then began to study Egyptian and Assyrian, and on the reorganization of the museum he was in charge of the department of that name. He wrote a grammar of Egyptian hieroglyphs and compiled a dictionary, as well as making a translation of the *Book of the Dead.* He wrote a standard history of pottery and many philological papers.

BIRCH, THOMAS (1705–1766), English historian, son of Joseph Birch, was born at Clerkenwell on Nov. 23, 1705. He was ordained deacon in the Church of England in 1730 and priest in 1731. He held successively a number of benefices in different counties, and finally in London. Birch was killed on Jan. 9, 1766, by a fall from his horse. He left his books and manuscripts to the British Museum, and a sum of about £500 to increase the salaries of the three assistant librarians.

Birch had an enormous capacity for work. In spite of their dullness many of his works are of considerable value, although Horace Walpole questioned his "parts, taste and judgment." Many of his letters appear in *Literary Anecdotes of the 18th Century* (London, 1812–15) and *Illustrations of the Literary History of the 18th Century* (London, 1817–58) by J. Nichols; in the *Bibliotheca Topographica Britannica,* vol. iii. (London, 1780–90); and in Boswell's *Life of Johnson.*

For a list of his works *see* W. P. Courtney in the *Dictionary of National Biography,* vol. v. (1886). A. Kippis, *Biographia Britannica* (1778–93); Horace Walpole, *Letters* (1891).

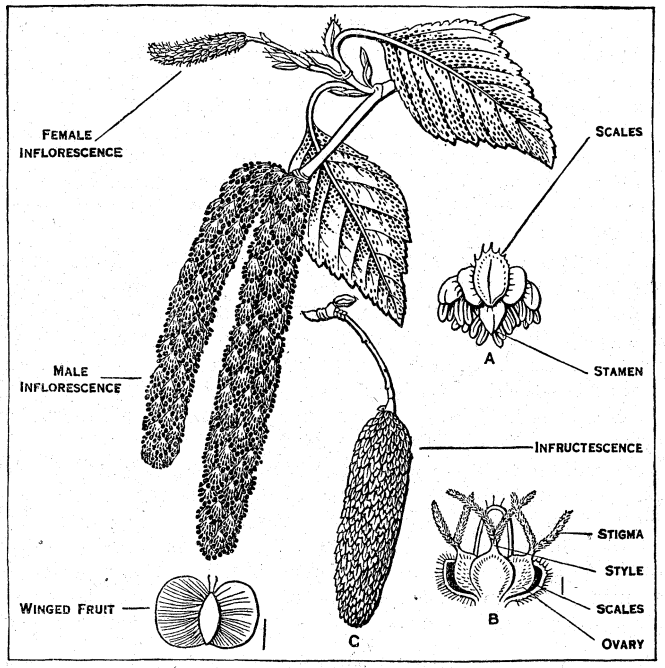
BIRCH (*Betula*), a genus of plants allied to the alder (*Alnus*), and like it a member of the family Betulaceae. The various species of birch are mostly trees of medium size, but several of them are merely shrubs. They are of a hardy character, thriving best in northern latitudes. The trees have round, slender branches, and serrate, deciduous leaves, with male and female catkins on the same tree, and tiny winged fruits, erroneously called seeds. The bark occurs in fine soft membranous layers, the outer cuticle of which peels off in thin, papery sheets.

The white or silver birch (*B. alba*) (*see* fig.) grows throughout the greater part of Europe, and also in Asia Minor, and Siberia, reaching in the north to the extreme limits of forest vegetation and stretching southward on the European continent as a forest tree to 45° N. The male and female flowers are borne on separate catkins in April and May. It is a short-lived tree, generally from 40–50 ft. high with a trunk seldom more than 1 ft. in diameter. It flourishes in light soils and is one of the few trees that will grow with heather; owing to the large number of "winged seeds" which are readily scattered by the wind, it spreads rapidly, springing up where the soil is dry and covering clearings or waste places.

This birch is one of the most widespread and generally useful of Russian trees, occurring in vast forests, either in pure stands or mixed with pines, poplars and other species. The wood is highly valued by upholsterers and turners on account of its toughness and tenacity, and in Russia it is prized as firewood and a source of charcoal. Its pliant and flexible branches are made into brooms; and in ancient Rome the fasces of the lictors, with which they cleared the way for the magistrates, were made up of birch rods. A similar use of birch rods has continued among pedagogues to times so recent that the birch is yet, literally or metaphorically, the instrument of schoolroom discipline. The bark of the white birch is much more durable, and industrially of greater value, than the wood. It is impermeable to water, and is used in northern countries for roofing, for domestic utensils, for boxes and jars to contain both solid and liquid substances, and for a kind of bark shoes worn by the Russian peasantry. By dry distillation the bark yields an empyreumatic oil, called *diogott* in Russia; it is used in the preparation of Russian leather; to this oil the peculiar, pleasant odour of the leather is due. The bark itself is used in tanning; and by the Samoiedes and Kamchatkans it is ground up and eaten on account of the starchy matter it contains. A sugary sap is drawn from the trunk in the spring before the opening of the leaf buds, and is fermented into a kind of beer and vinegar.

Of some 10 species which belong peculiarly to North America, the most important economically are the yellow birch (*B. lutea*), the sweet, black or cherry birch (*B. lenta*), the red or river birch (*B. nigra*), and the paper or canoe birch (*B. papyrifera*). The yellow birch, one of the largest deciduous trees of north-eastern America, with a trunk 3 ft. to 4 ft. in diameter and occasionally

100 ft. high, grows from Newfoundland to extreme western Ontario, and southward to central Iowa and North Carolina. It is cut for lumber chiefly in the lake states and New York. The hard, close-grained wood, as heavy as that of red oak, is extensively used for furniture and interior finishings. The sweet, black or cherry birch, which sometimes grows to a height of 80 ft. with a trunk diameter of 2 ft. to 5 ft., has smooth, red-brown, cherry-



FROM STRASBURGER, "LEHRBUCH DER BOTANIK" (GUSTAV FISCHER)

THE WHITE BIRCH (BETULA ALBA), A USEFUL TREE OF NORTHERN LATITUDES. IT IS EMPLOYED IN MAKING CANOES, BROOMS, FOR ROOFING HOUSES, ETC., AND IN RUSSIA THE BARK IS SOMETIMES EATEN

Branch with male and female catkins
A. Bract with three male flowers (enlarged)
B. Bract with three female flowers (enlarged)
C. Inflorescence in the fruiting condition

like aromatic bark from which an oil very similar to the oil of wintergreen is extracted. It grows from Newfoundland to Iowa and southward to Florida, attaining its greatest size in the Appalachian mountains. West Virginia and Pennsylvania yield the largest cut of sweet birch lumber. The strong, hard, yellowish-brown wood, as heavy as that of white oak, is highly valued for making furniture, agricultural implements and woodenware. The semiaquatic red or river birch, 80 ft. to 90 ft. high and sometimes 5 ft. in diameter, with dark red branches, grows from Massachusetts to Nebraska and south to Florida and Texas. It attains its greatest size in warm, wet lowlands along the Gulf coast. The strong, light brown wood, which is cut for lumber in the south, is used sparingly for furniture and in turnery.

The paper or canoe birch, very similar to the European white birch, is found from Newfoundland and Labrador to Alaska as far as 70° N., and southward to New York, Nebraska and Washington. It grows usually from 60 ft. to 70 ft. high with a trunk from 2 ft. to 3 ft. in diameter. Its creamy white, tough, durable bark, easily separable into layers, is used by the northern Indians for making canoes, drinking cups, dishes and baskets. The bark has also a limited use as a substitute for paper. The light, strong, close-grained wood is extensively utilized in turnery, especially for spools, shoe-lasts and shoe pegs, and also for wood pulp and fuel.

From 1900 to 1920 the total birch lumber cut in the U.S. at times exceeded 400,000,000 bd. ft. annually, of which Wisconsin and Michigan usually contributed more than half; in 1940 it was 351,320,000 bd. ft. (E. S. Hr.)

BIRCH-PFEIFFER, CHARLOTTE (1800–1868), German actress and dramatic writer, was born at Stuttgart. She was trained at the Munich court theatre, and in 1818 began to play leading tragic roles at various theatres. In 1825 she married the historian Christian Birch of Copenhagen, Denmark. From 1837 to 1843 she managed the theatre at Zürich, Switzerland. In 1844 she accepted an engagement at the Royal theatre in Berlin, to which she remained attached until her death. She dramatized many popular novels, and her plays, adapted and original, made 23 volumes, *Gesammelte dramatische Werke* (1863–80). Her novels and tales, *Gesammelte Novellen und Erzählungen*, were collected in three volumes 1863–65).

BIRD BANDING or Bird ringing, is a method of ornithological study based upon information resulting from the recovery of birds marked with registered, numbered bands.

HISTORY

European (Pioneer Period).—Scattered through the natural history literature of the 18th and 19th centuries are casual notes relative to the marking of a bird or of a brood of young for the elucidation of some pertinent question. Such notes indicate that the possibilities of this means of research were not totally unappreciated by the early naturalists although the methods generally employed were too crude to produce important results. Flight or tail feathers were marked with indelible ink or paint; thin metal disks were cemented to these feathers; parchment memoranda were tied to some part with silk thread; or the feet, bill or plumage were mutilated in a distinctive fashion. Obviously none of these practices was satisfactory, and in many cases the marking device could, at best, last only until the succeeding moult.

The first known record of a wild bird marked by a metal ring attached to the tarsus is that of a great gray heron (*Ardea cinerea*) captured in Germany in 1710. This bird carried a ring that had been attached in Turkey several years previously. Full details are not known but it has been assumed that the band probably was made of silver.

In 1804 the Dutch naturalist Brugmann marked a number of white storks (*Ciconia alba*) in an announced effort to learn whether these birds habitually returned to the place of their birth. The manner of marking is not known, but since none of the birds was subsequently retaken, the experiment must be classed as a failure that is of interest only because in the latter part of the same century the white stork again figured in one of the most important of modern European investigations in bird migration.

Hans Christian Cornelius Mortensen of Viborg, Denmark, usually is considered the pioneer in scientific bird banding, but his work, started in 1899, was antedated by that of Percy on the estate of the Duke of Northumberland at Alnwick, England, who in 1890 and in many subsequent summers, marked numbers of young woodcock (*Scolopax rusticola*), using bands inscribed with the year and the letter "N." The operations of Mortensen were, however, more ambitious and were extended to include the white stork, great gray heron, pintail (*Dafila acuta*), teal (*Nettion crecca*), starling (*Sturnus vulgaris*) and two or three birds of prey. His bands were inscribed "Adresse: Mortensen Viborg Danmark Europa."

Stimulated by the success of the Danish ornithologist, bird banding in Europe came rapidly into prominence, and at the outbreak of World War I in 1914 nearly every country in Europe had one or more projects in various degree of activity. At the German Ornithological Society's bird observatory at Rossitten on the Baltic sea, banding was started in 1903 under the direction of Prof. Dr. J. Thienemann. A similar station was inaugurated the following year at the naval base of Helgoland under Herman Weigold, while Dr. Erwin Stresemann extended the work to Bavaria. A banding project also was started in 1908 by Jakob Schenk of the Royal Hungarian Institute for Ornithology at Budapest.

At Berne, Switzerland, in 1911, Dr. Albert Hess established a central bureau for bird ringing, using bands marked "Bern Helvetia" or, on the smaller sizes, "Bern H." The year 1912 witnessed inauguration of banding projects in Belgium and Finland, the first by the Ornithological Society of Belgium with bands marked "Ornis Louvain," and the second by Dr. J. A. Palmen, whose bands carried the legend "J. A. Palmen, Helsingfors,

Finland," or more simply, "Palmen Helsingfors." Dr. Paul Tratz began banding at the ornithological station at Salzburg, Austria, in 1913, using bands with the legend "Ornith. Station Salzburg," and in that same year a "Russian Ornithological Committee" marked a number of birds with bands inscribed "Moskwa Ornith. Komite."

During this pioneer period several other banding schemes were inaugurated in different countries of continental Europe. Among them were projects by the Natural History Society of Riga, Latvia, the Bavarian Ornithological Society, the Kroatian Natural History Society, the Biological Society of Gothenburg, Sweden (subsequently taken over by the Royal Natural History museum at Stockholm), the Leyden (Holland) museum, the Imperial Russian Acclimatization Society for Plants and Animals and the French League for the Protection of Birds.

In the British Isles, during the period from 1904 to 1916, several private or semiprivate ringing projects were pressed with more or less persistence. The most important of these by Dr. A. Landsborough Thomson, under the auspices of Aberdeen university, and by Harry F. Witherby of *British Birds* magazine, were started independently and almost simultaneously in 1909. After some intensive work Dr. Thomson concluded his efforts and published the results in 1921. The *British Birds* marking scheme began operation June 1, 1937, under the British Trust for Ornithology and is easily the most important of all European investigations using the banding method.

From available figures the various European individuals and agencies were responsible for the marking of approximately 170,000 birds until about 1914, when war in Europe caused total or partial suspension of the work.

American.—In the new world, the banding of birds dates back at least to 1803 when the artist-naturalist, John James Audubon, attached silver wire rings to the legs of a brood of phoebes (*Sayornis phoebe*) at Mill Grove farm in eastern Pennsylvania. The following spring he found two of these birds in the same locality. The first important scientific banding work in the United States, however, was the study made by Dr. Paul Bartsch of the National museum, who during 1902 and 1903 banded 101 juvenile black-crowned night herons (*Nycticorax n. hoactli*), at two colonies in the District of Columbia. The bands used carried the legend "Return to Smithsonian," the year and a serial number. Dr. Bartsch published the results of his work in Dec. 1903.

About this same time (1902), Dr. Leon J. Cole published his *Suggestions for a Method of Studying the Migrations of Birds*, and the following year, in a letter to the editor of the bulletin of the Michigan Ornithological club, he called attention to the banding work of the German Ornithological Society at Rossitten, in East Prussia. A year later as a result of Dr. Cole's suggestions, P. A. Taverner, then of Detroit, Mich., made public announcement that he was using bands to mark such birds as he could obtain. The legend carried by his home-made bands was "Notify The Auk, N.Y." *The Auk* is the quarterly journal of the American Ornithologists' union which, from the beginning of scientific bird banding in America, was thus associated with this method of research.

While some of these bands were used, operations were not extensive and, after an attempt in 1908 by the New Haven (Conn.) Bird club to do some local banding, Dr. Cole appeared before the American Ornithologists' union at its annual meeting in 1909 and proposed the formation of a national organization to conduct investigations by means of numbered bands. The American Bird Banding association was organized in November of that year with Dr. Cole as its first president. To provide financial aid, the Linnaean Society of New York assumed certain responsibilities in the spring of 1911, and increased funds also were obtained through the efforts of the association secretary, Howard H. Cleaves.

At that time there was no U.S. manufacturer of bands of the type required, so they had to be purchased in England. Despite many difficulties, banding was actively practised for a few years by several U.S. and Canadian ornithologists. During the World War I period (1914–1918), however, the work lagged and finally the association existed chiefly in name, as only a few bird students had the necessary time and they were almost always hampered by band shortages.

From its inception, the marking of birds as an aid to studies of distribution and migration had been carefully watched by the biological survey (later merged in the fish and wildlife service, U.S. department of the interior.) Incident to other investigations in the Bear river marshes, at the northern end of Great Salt lake, Utah, from 1914 to 1916, Dr. Alexander Wetmore of its staff, had banded more than 1,200 birds of 23 species, chiefly migratory waterfowl. Bands of two patterns were used. One was stamped with the legend "Notify U.S. Dept. Agt., [Agriculture] Wash., D.C.," while the other was inscribed "Notify Biological Survey, Washington, D.C." Recoveries numbered 182, amply demonstrating the value of the method in studying the migration of waterfowl.

A few years later, on Nov. 11, 1919, at the annual meeting of the American Ornithologists' union, S. Prentiss Baldwin, of Cleveland, Ohio, presented a paper that demonstrated how the usable data, particularly for the smaller nongame species, could be materially increased through the systematic trapping of adult birds. While both Cole and Taverner had suggested the use of traps, it remained for Baldwin to point the way for an extensive development of bird banding through this means.

As a result of the possibilities thus disclosed, Edward W. Nelson, chief of the bureau of biological survey, offered to take over the work of the American Bird Banding association and on Dec. 9, 1919, the offer was accepted. Co-operative arrangements were made with the national parks bureau of Canada, and under the auspices of the two governments the work was expanded to the point where nearly 500,000 birds were being banded each year.

PRODUCTION PERIOD

At the conclusion of World War I in 1918, the only active ringing schemes were those in England and the Scandinavian countries, although during the war period some work had been done at the German stations of Rossitten and Helgoland. With the return of more normal conditions several of the pioneer projects were revived and, in addition, new ones were started, including, as outlined above, the work under government auspices in North America. As a result, the period from 1920 to 1938 was one of great activity in this field, both in Europe and America. A banding project was even started in India under the auspices of the Bombay Natural History Society, while the Japanese copied in intense detail the system employed in North America. The accompanying table shows by countries the sponsoring agencies, years of inception, band inscriptions and medium of publication of the principal European and American projects that were in operation, chiefly during the period 1920 to 1938. Strictly private ventures are not listed, although the work of Jack Miner of Kingsville, Ontario, in banding Canada geese (*Branta canadensis*) attracted to his sanctuary, achieved world-wide attention in the public press.

The importance of this activity to ornithological science cannot be evaluated by mere statement of the gross results, although these have been extensive. By the end of 1944, the *British Birds* marking scheme had a grand total of well over 700,000 banded birds, while the files of the U.S. fish and wildlife service carried banding data for nearly 5,000,000 birds. It is, however, to the detailed studies made possible by this mode of research that banding must claim attention.

The underlying reason for all banding work has been the growing need for more precise knowledge concerning the migrations of birds. Study of the voluminous literature on the subject, for the period 1920 to 1938, clearly shows this intent, since important contributions have been published in nearly all the ornithological journals of the world. The return or recovery record of a banded bird indicates that there were at least two times in its life when its whereabouts could be stated with precision. By the co-ordination of many such cases the routes followed by the members of a species passing through a given point, may be traced with

Country	Year of Inception	Sponsoring Agency	Inscription on Bands	Medium of Publication[1]
America	1920	U. S. biological survey (=fish and wildlife service), dept. of the interior, Washington, D.C., and national parks bureau, dept. of mines & resources, Ottawa, Ont.	Notify Biological Survey Washington, D. C. Notify Biol. Surv. Wash. D.C. Notify F. and Wildlife Service Washington, D.C. Notify F. & W. Service Wash. D.C.	Chiefly in government reports, *The Auk, Bird Banding, The Wilson Bulletin, The Condor,* and *The Canadian Field Naturalist.*
Belgium	1927	Royal Museum of Natural History, Brussels	Musee Hist. Nat. Bruxelles	*Le Gerfaut,* and *Bull. du Musee Royal d'Historie Nat. de Belgique*
Bulgaria	1930	Royal Museum of Natural History, Sofia	Avertir Musee Royal Sofia, Bulgaria Retur Palais Sofia Bulgarie	*Mitteilungen aus den königlichen naturwissenschaftlichen Instituten,* and *Bull. Inst. Royal d'Hist. Nat.*
Czechoslovakia	1914	Ornithological Station of "Lotos," Liboch, Bohemia	Lotos-Prag, Austria Lotos-Prag, Bohemia	*Sylvia*
Denmark	1914	Danish Ornithological society (work started by Mortensen in 1899), Viborg	Adresse P. Skovgaard, Viborg, Danmark, Europa	*Dansk. Orn. For. Tidsskr. Danske Fugle*
	1921	Roskildefjord Ring Marking station, Frederikssund	H. Pedersen Fr-sund Danmark	
	1926	Zoological museum, Copenhagen	Zoological Museum Kobnhavn Danmark	*Meddelelsen om Groenland*
Estonia	1922	Ornithological section of the Natural History society, Tartu (Dorpat)	Tartu Estonia Universitas Estonia Tartu Orn.	? [2]
Finland	1924	Museum of Zoology, University of Helsinki	Mus. Zool. Helsingfors Finland Mus. Helsingfors Mus. Z. Hki Finland	*Ornis Fennica, Mem. Soc. Fauna et Flora Fennica, Der Vogelzug, Ornithologische Monatsberichte*
France	1912	National Museum of Natural History, Paris	Oiseaux Museum Paris Ois. Museum Paris Museum Paris	*Bull. des Stations Francaises de Baguage, L'Oiseau, et la Revue Francaise d'Ornithologie, Annales des Epiphyties, Alauda*
	1924	French National Society of Acclimatation, Paris	Protegoiseau, Paris	
	1924	Institute for Research in Agronomy, Versailles	I. R. A. Versailles France	*Revue d'Histoire Naturelle, Station Ornithologique de Versailles*
Germany	1903	Rossitten Bird Observatory of the Kaiser Wilhelm Society for the Advancement of Knowledge, Rossitten	Vogelwarte Rossitten Germania	*Der Vogelzug, Journal fur Ornithologie, Ornithologische Monatsberichte, Schriften der Physikökonom. Gesellschaft zu Königsberg, Märkische Tierwelt, Der Biologe, Vogelring*
	1909	Bird Observatory of the State Biological Society, Helgoland	retour Zoolog Station Helgoland Retur Zool. Stat Helgoland Biolog. Helgoland	
Great Britain	1909	University of Aberdeen, Aberdeen, Scotland	Aberdeen University	*Scottish Naturalist*
	1909	British Birds Magazine, London	Witherby High Holborn, London British Museum Nat. Hist. London	*British Birds*
Holland	1911	Royal Museum of Natural History, Leyden	Museum Nat. Hist. Leiden-Holland Museum National de Holland	*Ardea* (Nederlandsche Ornithologische Vereeniging), *Zoologische Mededeelingen* (Mus. Leiden), *Limosa*
Hungary	1908	Royal Hungarian Institute for Ornithology, Budapest	M. Kir. Ornith. Központ Budapest Hungaria Budapest Ornithologia Hungaria Madartani Intezet	*Aquila, Kocsag*
Iceland	1931	Museum of Natural History, Reykjavik	Mus. Nat. Reykjavik Iceland	Special museum reports in Icelandic and English
Italy	1928	Civic Museum of Natural History, Milan	Museo Nat. Milano	Riv. Sci. Nat. *Natura, Recherche di zoologia applicata alla Caccia, Rassegna Faunistica*
Latvia	1925	Ornithological bureau, Riga	Ornithol. Centrale Riga	? [2]
Norway	1914	Zoological museum, Oslo	Zool. Museum Kristiania	*Norsk Jaeger & Fiskerforening Tidsskrift*
	1922	Stavanger museum, Stavanger	Stavanger Museum	*Norsk Ornithologisk Tidsskrift, Stavanger Museum Arshifte*
Poland	1931	Polish National Zoological museum, Warsaw	Retour Mus. Zool. Polon. Polonia Varsovia Polonia Varsovia	? [2]
Rumania	1926	National museum, Brasov (Kronstadt)	B.s.Museum Brasov Romania	? [2]
	1941	Central Bureau for Ornithology, Bucharest	Centr. Ornitolog. Bucuresti Romania	
Russia	1924	Central Agrobiostation, Moscow	Moskwa b. 1-o.H	Special reports issued by the presidium of the All-Russian Central Executive committee; Committee for Game Preserves; Central Bureau for Bird Ringing
	1925	Forest Institute, Leningrad	Leningrad Lesnoy Institut	
Spain	1928(?)	Ornithological Service of the Forest Institute of Investigations and Experiences, Madrid	Instituto Forestal España Madrid	*Boletin de la Real Sociedad Española de Historia Natural;* special bulletins of the Forest Institute
Sweden	1911	Gothenburg Biological society, Gothenburg	Museum Göteborg Sweden	*Göteborgs Biologiska Förenings, Göteborgs Museo Årstryck*
	1913	Royal Museum of Natural History, Stockholm	Return Riksmuseum Stockholm	*Svenska Vetenskapsakademiens Skrifter i. Naturskyddsärenden*
Switzerland	1911	Central Bureau for Bird Ringing, Berne	Bern Helvetia Bern H.	*Archives suisses d'Ornithologie*
	1924	Swiss Bird Observatory, Sempach	Vogelwarte Sempach Helvetia	*Der Ornithologische Beobachter*
Yugoslavia	1910	Ornithological division of the Zoological Institute, Zagreb (Agram)	Ornit. Zentr. Zagreb Croatia	? [2]
	1927	Laibach Bird observatory, Ljubljana	Ornith. Observ. Ljubljana S.H.S.	

[1]Only the chief media of publication are noted since papers dealing with bird banding have been printed in virtually all regional and national ornithological periodicals.
[2]No published results are known.

accuracy. This has been done for many species, and as the work continues to progress it seems reasonable to believe that ultimately the flight lines of all migrants will be faithfully charted.

In addition to the delineation of routes of travel, there are other migration topics on which banding data are throwing new light. Among them is the unanswered question as to whether those members of a species that breed farthest north, winter farthest south; in other words, whether they "jump over" those members breeding in the intermediate zone which would accordingly either make a much shorter migration or else would not migrate at all. These data also are showing the speed of migration as differentiated from the speed of flight, the amount of time spent by individual birds on their breeding and wintering grounds, and at favoured feeding and resting areas while en route between them. Strength of the homing instinct, that strange power that brings birds back to the site of their nest of the previous year or to the precise area where they spent the preceding winter, can be accurately determined only by the records of the banded individuals and this also is true for many other migration problems that have long been mysteries of science.

Systematic trapping at regularly established stations makes it possible to determine other facts about the lives of birds that could not be discovered in any other way. Through the use of supplementary coloured bands of celluloid, individuals, pairs and family groups have been kept under almost continuous observation, resulting in important studies of the extent of their local movements or territories. The sex ratio and the probability of future rematings of a pair of birds have been studied for several species, while much new and important information has been obtained regarding the development of plumage and the nature and incidence of avian diseases. Detailed and highly technical investigations have been made concerning the temperature control and tolerance of young birds, as well as their dispersal from the area where they were hatched. Many other interesting and important lines of life history investigation are engaging the attention of ornithological students working with the banding method and the individual living bird.

PROCEDURE

While several of the pioneer workers, back to and including Mortensen, employed traps to capture some of the birds they banded, it is also true that until 1920 chief reliance was placed on the banding of nestlings. For data of certain kinds the banding of young birds in the nest is essential, but there are valid reasons why this should be held to a minimum. First, the mortality rate of fledglings is notoriously high, so that great numbers must be marked to produce only a few recoveries. This procedure results in a considerable waste of bands, but even more serious is the fact that the destruction of young is increased, not by injury during the banding operation or through desertion by the parents, but by small predatory animals such as house cats and weasels that will follow (apparently from curiosity) human scent trails.

Accordingly, in the development of the method in the United States under government supervision, organized nest hunting, to obtain birds for banding, has not been permitted. Instead, co-operators of the fish and wildlife service must indicate their intent to operate a trapping station before being granted a federal banding permit. On the grounds of such a station the banding of nestlings is authorized because there natural enemies are kept under control. The banding of the young of colonial species also is approved when undertaken by operators who are familiar with such special work.

Permits, issued under the enabling act that implements the migratory bird treaties between the U.S. and Great Britain and between the U.S. and Mexico, are issued to qualified persons by the fish and wildlife service (in Canada by the national parks bureau). Usually these must be supplemented by state or provincial permits or by endorsement of the federal authority. In the U.S. these permits are not issued to persons under 18 years of age. So far as was known banding permits were not required at the end of World War II in any of the European countries.

The development of traps and other banding equipment received a ready response from persons possessed of an inventive and mechanical turn of mind. In Europe the art of bird catching, chiefly for the cagebird traffic, is an old one, and many ingenious devices have been perfected. These have usually taken the form of nets, either spread horizontally on the ground and manipulated by the operator, or vertically in such a way that birds flying into them are entangled in the meshes. The Italians have been particularly adept in the use of nets and for the capture of certain species, as the migratory quail (*Coturnix coturnix*), elaborate "sets" have been constructed.

Equipment of this type has been extensively employed to capture birds for banding, principally in Europe, but also, to a limited extent in the U.S. In North America, however, chief reliance has been placed upon cage traps, most of which are of simple construction. Specifications of those approved for the work are furnished to each co-operator, most of whom make their own equipment. As was to be expected, the birds banded in largest numbers have been the common frequenters of the dooryards and those that are readily attracted by simple traps and cereal baits, *i.e.*, the ground feeders. The ready capture of other groups, particularly the insect feeders, has presented more difficult problems. While it never may be practicable to attempt the capture in large numbers of some groups, such as the pelagic, or oceanic species, the only birds that have been definitely excluded from the field are the hummingbirds. For these the greatest handicap is the mechanical difficulty in producing bands small enough to fit their diminutive tarsi.

Regional Associations.—In order that the work of individual stations might be better co-ordinated, both with the fish and wildlife service and with each other, banding co-operators in North America have been organized into four regional associations. These are the Northeastern Bird Banding association, with the territory covered by the New England states, Quebec and the maritime provinces of Canada; the Eastern Bird Banding association, with the Atlantic coast states, exclusive of New England, but including New York and the province of Ontario; the Inland Bird Banding association, with the territory between the Allegheny and the Rocky mountains, and the Canadian provinces of Manitoba, Saskatchewan and Alberta; and the Western Bird Banding association with the Pacific coast and Rocky Mountain states and provinces.

By 1941 the number of co-operators had grown to about 2,000, but so great was the interest that U.S. bird students had shown in this form of ornithological research, that an objective of 5,000 stations was set. Most co-operators are members of the association serving their region, all of which contribute to the advancement of the work by publication at regular intervals of news bulletins. Three of these , *EBBA Nus, Inland Bird Banding News* and *News from the Bird Banders,* are processed documents; but one, *Bird Banding,* is a regularly printed quarterly. This last, issued first in Jan. 1925, as the *Bulletin of the Northeastern Bird Banding Association,* went through five annual volumes under this name, and then (Jan. 1930), under the sponsorship of the Northeastern, Eastern, and Inland associations was renamed and began publication anew with volume one. At this time the ornithological stations of Helgoland and Rossitten, Germany began publication of the quarterly, *Der Vogelzug.* Results of British research in this field were published consistently in *British Birds* magazine. (F. C. L.)

BIRD-LOUSE, a common name for small parasitic insects of the order Mallophaga. They resemble the sucking lice in life histories and general shape but are distinguished from them by having strong toothlike mandibles adapted for feeding on feathers, hair or scales in contrast to the delicate piercing and sucking mouth parts of the Anoplura. The term biting louse is more appropriate for insects of this group as some mammal parasites as well as about 1,400 species of bird parasites are included.

Mallophaga parasitic on birds show considerable host specificity, that is, certain species are found only on small groups of related hosts and many genera are restricted to a single family of hosts.

One species of bird, however, may be parasitized by six to ten species of lice. Seven species are commonly found on domestic chickens. Heavy infestations of lice on domestic fowls are deleterious but there is little evidence that they cause serious injury to wild birds as their food consists largely of the dead tissues of the host. In rare instances fresh blood, which is obtained from superficial wounds or from blood vessels in the shafts of young feathers, is found in the intestinal tract of Mallophaga. No large order of birds is free of biting lice.

Biting lice of mammals constitute fewer genera and species and appear to be restricted to the marsupials, rodents, carnivores, ungulates and dassies. The elephant louse, *Haematomyzus,* is questionably referred to this order of insects. Extremely heavy infestations of biting lice occur at times on horses and dogs to the great annoyance of the hosts. Dogs in temperate and tropical climates are frequently infested with a louse, *Heterodoxus longitarsus,* which is a characteristic parasite of the kangaroo. This is one of the few instances where a louse has been able to establish itself on a host of a different order. A dog tapeworm passes part of its life cycle in the common dog louse, *Trichodectes canis.* Biting lice have not been incriminated as carriers of any infectious diseases of birds or mammals.

Large museum collections of biting lice for study have been accumulated at Stanford university, Cornell university, United States National museum and British museum. (W. L. J.)

BIRD-NESTING: *see* BIRDS.

BIRDS, a class (*Aves*) of animals so conspicuously different from all other classes that they can be separated by the two words "feathered bipeds." In addition they are warm-blooded, oviparous vertebrates with many structural adaptations based on the requirements of flight.

FLIGHT OF BIRDS

It is probable that birds were given to swift running before they were able to fly, and that the beginnings of flight were long flying leaps. It is likely that they practised parachuting from tree to tree, as some reptiles, like *Draco volans,* still do, before there was true flight. It is likely that there was a prolonged arboreal apprenticeship, which is pointed to, for instance, by the gripping arrangements of the toes of birds, and also by the active climbing of the young of the primitive hoatzin (*Opisthocomus*) which uses its clawed hands as well as its feet in moving from branch to branch.

Mechanism of Flight.—In ordinary flight the wings combine the functions of propellers and planes. From a raised position, sometimes vertically above the back, they are pulled forward, downward and backward by the contraction of the largest pectoral muscle, and then raised again by the *pectoralis minor,* whose tendon works through a pulley at the shoulder joint. The tip of the wing describes a curve somewhat like an asymmetrical figure-eight. The downward component of the wing stroke, displacing a mass of air, keeps the bird up or raises it; the backward component gives it horizontal velocity; but the resistance of the air, which tends to retard the forward movement, has an important lifting function, for it works upward against the ventral surface of the body and the slightly concave under surface of the wings. Between successive strokes there is bound to be some loss of altitude and momentum, but this is almost inappreciable. It is lessened by economizing energy in raising the wing. This is effected by an automatic reduction in the size of the wing when it is not pressing down against the air, by a movement of the individual feathers so that air passes between them, and by the convex upper surface which allows the air to glide off easily. For physical reasons an increase in the rapidity of flight up to a certain limit lessens the proportion of energy required; it is relatively more economical to fly quickly. Marey calculated that the energy expended by a pigeon when first taking flight is five times as great as when it has acquired its average. Among the most important adaptations to flight are—the shape of the body and the external reduction of frictional resistance; the light build of the skeleton which affords large surface for the insertion of muscles and feathers without great increase of weight; the insertion of the wings high up on the thorax and the ballasting of the body with the heavier organs, such as liver and gizzard, below, so that the centre of gravity lies below the centre of suspension; the strong development of the pectoral muscles and of the keel on which they are ventrally inserted; the possibility of increasing "sail-area," by lengthening the feathers, without involving much corresponding increase in weight or size of skeleton.

The secondary feathers, attached to the ulna, are of major importance in the wing stroke; the longer primary feathers, attached to the hand, are of great use in lateral steering, hence their prominence in the insect-catching swallows and swifts. Steering is effected mainly by the differential action of the wings, but also by altering the tilt and pose of the body and by moving the tail feathers, which likewise serve for balancing and as a brake. A quickly flying insect like a bee may have 200–300 strokes per second; in its ordinary flight a sparrow has per second 13 strokes, a wild duck 9, a carrion-crow 3 to 4, a stork 2, and a pelican $1\frac{1}{6}$.

Gliding.—Besides ordinary flight, there is gliding, when the bird having attained to a certain velocity rests on its oars for a while; or having attained a certain height descends to the ground without any stroke of its wings. It is probably the most primitive mode of aerial locomotion, parachuting rather than flying. A gull or a heron or any bird with a large sail area, having attained a certain velocity, planes with motionless wings, "like an aeroplane with its engines shut off," getting the necessary "lift" from the air resistance to its forward movement; but this cannot continue long without loss of position, unless there is a strong up-current of air, as from the face of a sea cliff. Guidance during gliding may be effected by movements of the tail, head and neck, and by tilting the outstretched wings. It would be convenient to use the term "gliding" for everyday exhibitions such as gulls illustrate. Then the term "sailing" might be conveniently retained for extraordinary exhibitions such as the circling of the albatross around a ship. The peculiarity in this case is that the bird sails with and against the wind without visible wing strokes for perhaps half an hour at a time. It takes advantage of currents of air of unequal velocity at different heights. It glides down the wind, with increasing velocity but sinking a little; it wheels and rises into a less rapid current, with reduced flight velocity, changing part of its energy of motion into energy of position. The term "spiral sailing" might be substituted for the "soaring" of the vultures and storks when they rise without upstrokes in slow spirals to a great height. It implies a steady, strong up-current of air, and is most frequently seen in warm countries. It seems unfortunate that the term soaring should be indissolubly associated with the lark climbing the sky. In this case there are very rapid wing strokes, with the downward component predominating. The soaring of the lark comes close to the hovering of the kestrel or hummingbird, in which the rapid wing beat is devoted to keeping up the bird.

Velocity of Flight.—In thinking of the velocity of flight it is obviously necessary to distinguish between air-speed and ground-speed. A bird that seems to the observer to be stationary may be flying hard against the wind. "A bird flying at 30 mi. per hour in a 20 mi. wind will seem from the ground to be making either 50 mi. or 10 mi. per hour according to whether it flies with or against the wind." The most accurate measurements are those made from aeroplanes on birds keeping level with the machine and flying in the same direction. Thus measured by Meinertzhagen, small song birds show an average rate of 20–37 mi. per hour, crows 31–45, ducks 44–59, plovers 40–51; but these may be increased in exceptional circumstances, and an occasional rate of 100 mi. an hour is quite credible. "Swifts of our common species, feeding 6,000 ft. above Mosul, were noted as easily passing and recircling about an aeroplane which was registering 68 mi. an hour."

The value of flight is obvious, but it may be useful to recall some of the different ways in which it has justified itself in the struggle for existence. It gave its possessors a new safety and independence; it enabled them to follow food and to seek water over long distances; it helped them to secure the well-being of

their offspring by building nests in places often inaccessible except to enemies able to fly or climb. The power of flight in its high development also gave birds a unique power of annihilating distance, of evading the winter, of having two summers in the year, of having two homes, of changing their season in a night. In seeking out suitable feeding places and breeding places neither space nor time present obstacles to the flying bird.

FEATHERS AND PLUMAGE

While there is no known connecting link between a feather (*q.v.*) and an epidermic scale, the development of the two structures is not very different. Both arise from expanded papillae of the epidermis, with the cells transformed into horn; and both are fed, as long as they grow, by pulplike upgrowths of the underskin or dermis, containing minute blood vessels. There can be no hesitation in comparing the scales on a bird's toes and instep region, as also on the bill, with the typical scales of reptiles; but it should be noted that what is moulted in reptiles is the outermost dead layer of the epidermis covering the scales, whereas in birds the whole feather is thrown off. Feathers are unique structures whose evolution is obscure.

The Parts of the Feather.—An ordinary feather shows the following parts: (1) the cylindrical hollow barrel or calamus, whose base is embedded in a follicle of the skin; (2) the main shaft or rhachis, filled with white pith, and somewhat quadrangular in cross-section, but convex externally and concave internally; (3) the vane, consisting of a bilateral web, which in the case of the pinions serves to strike the air, and is built up of biserial barbs united by barbules and microscopic barbicels; and (4), it may be, an aftershaft or hyporhachis, which arises to the inner side at a little pit marking the junction of calamus and rhachis, and usually consists of a tuft of barbs, often with barbules. In a few cases, such as the cassowary, the aftershaft is as long as the shaft, and the feather looks as if it were double. The most important structural fact is the webbing of the vane, so that it forms in the pinions an efficient instrument for striking the air. In feathers not used in flight the coherence of the parts of the vane helps to keep air imprisoned below, to lessen the loss of heat and to protect the skin from being wetted. A bird's feathers occasionally occur all over the skin (in penguins), but they are usually disposed in regular rows (feather tracts or pterylae), which show particular patterns in different families.

Preen Gland (oil gland).—Apart from the occasional presence of glands near the ear opening, the bird's skin has only the preen gland; and even that may be absent, as in ostrich, bustard and some parrots. It is best developed in aquatic birds, and this is popularly associated with the need for water-proofing the plumage. Some mammals lick and brush their skin, but in the main the fur is kept in good order automatically. Birds, on the other hand, attend to the feathers individually, and they may be sometimes seen reaching back with their bill to the preen gland, which produces an oily secretion. But some birds, like the skimmer (*Rhynchops*) and the pelican could not readily compress their preen glands, and in many cases the secretion is very small in amount compared with the extent of the plumage. Moreover, some birds without a preen gland keep their feathers in good order. It has been suggested by W. P. Pycraft that the preen gland may be a scent gland, helping in the recognition of kin. But most birds have a poorly developed sense of smell. It is possible that a drop or two of the oil stimulates the secretion of the salivary juice, which helps in preening. According to Paris the removal of the preen gland makes no difference to the bird. The structure of this organ resembles that of the odoriferous glands of some reptiles; it is a bilobed subcutaneous mass of glandular tubes, supplied by blood vessels and nerves, surrounded by a capsule of connective tissue, but without muscle fibres except at the opening.

Moulting.—After a feather is fully formed the component cells begin to die away, and the pulp retreats into the skin, leaving little partitions or "caps" across the interior of the calamus. It follows that there can be no repair of worn feathers, and it is therefore advantageous that there should be "moulting." A complete "post-nuptial moult" usually occurs after the breeding season and before the autumnal migration, but in some birds, *e.g.*, swallows and hawks the change of the wing feathers may be delayed until midwinter. Moulting usually requires about six weeks and the feathers are replaced in a regular sequence except that geese, ducks and rails lose all their pinions at once, and are for a time unable to fly.

All birds moult completely once a year and some moult twice, but the spring moult, when the males put on their nuptial plumage may be incomplete as to wing and tail feathers. The ptarmigan has three moults in the year. There are many other exceptional features; thus the penguins moult their feathers in patches, not individually, and birds that are not in good health may pass up a moult partially or completely.

Feathers often illustrate an unsurpassed combination of pigmentary and structural colouration (*see* COLOURS OF ANIMALS).

Chief Uses of Feathers.—In connection with the variety of plumage, it is useful to bring together the chief uses of feathers, which must have been subjected to selection with reference to many different advantages: (1) the primary use was probably to form a relatively nonconducting robe which tends to retain the animal heat. This may be aided by layers of air included between and below the feathers; (2) the plumage may also save the skin from being wetted. This prevention of wetting varies in different birds; (3) the feathers made flight possible, and here may be noted the light elastic build, the resistance to wear and tear, the almost air-tight linkage seen in the vanes of the pinions, and the possibility of attaining great length without much weight; (4) the plumage often renders the bird inconspicuous in its habitual surroundings. Thus the brooding woodcock among the fallen leaves and withered herbage has a very effective cloak of invisibility. Very common is the obliterative "countershading" seen in a bird like a curlew or a sandpiper, whose plumage is lighter below and slightly darker above, the two shades blending on the sides. Another type is the "ruptive marks" or dazzle pattern, where variety in different parts breaks up the shape of the body, a good example being the wood duck. This type of protective colouration has the advantage of being effective against diverse backgrounds; (5) conveniently separable, perhaps, from protective colouration is that which masks aggressive birds in the eyes of their victims, as may be the case with the Greenland falcon and the snowy owl. Here might be included other qualities of the plumage useful in the chase, such as the softness that makes the flight of owls so noiseless; (6) when there is a profitable resemblance to other birds, the term "mimicry" may be legitimately used. A weak species may profit by being like a strong one, a predatory bird by being like a peaceful one. A. R. Wallace pointed out that the friar birds of the Malay Archipelago, large, strong, gregarious, assertive honey eaters, holding their own against birds of prey, are "mimicked" by the weaker orioles, and that the particular species of friar bird on each island has its corresponding mimetic oriole! The term is also used for birds that simulate their environment in form as well as colour. The screech owl mimics a piece of bark, the bittern a snag in the marsh, the night hawk a broken branch; (7) feathers are often auxiliary to the appeals made in courtship. They may enhance the brilliance of the male bird; they may be exaggerated into extraordinary decorations, as in birds of paradise; they may form tufts and crests erectile in excitement; they may be used to produce arresting sounds, as in the drumming snipe; (8) in many cases, reaching a climax in eider duck, feathers are used in nest making, conserving the heat around the nestlings, and making brooding more comfortable; (9) finally, there are various minor uses, such as helping in recognition of kin by kin.

SKELETAL ADAPTATIONS

The bird's skeleton affords numerous instances of adaptations, as might be expected since there are in most cases two different kinds of locomotion, flying and running, and sometimes swimming as well. The term "adaptation" is here used to express not a process but a result, a particular adjustment of structure well suited to discharge certain functions.

Lightness of Skeleton.—The lightly built skeleton is adapted for flight. This implies that the medullary cavities of the long bones are large, that they are often without marrow in adult life, that many contain air sacs continuous with the lungs, and that they frequently show spongy bony tissue below the hard and compact cortex. Thus the skeleton is built on the hollow girder principle, with a relatively large surface for the insertion of muscles, yet without the corresponding increase of weight that would be involved if the bones were as substantial as those of reptiles and mammals. Long bones with large cavities also occur in bats and in Pterodactyls. In some birds, such as the albatross, practically every bone is "pneumatic" except the scapula and the hyoid.

The Fusion of Bones.—A second general character of the bird's skeleton is the tendency of adjacent bones to fuse together while still in the making. This occurs in many parts of the body. Thus, except in running birds, most of the bones of the skull coalesce early, which may be in some cases adaptive when the skull as a whole is used as an instrument; *e.g.*, as a hammer in woodpeckers, or for tearing up a victim in birds of prey. The fusion of most of the thoracic vertebrae in ordinary flying birds affords a firm fulcrum for the downstroke of the wings. This interpretation is confirmed by the absence of fusion in running birds and by the tendency to coalescence in the thoracic vertebrae of bats. The fusion of several vertebrae (thoracic, lumbar and caudal) with the true sacrals, to form a synsacrum, and the fusion of this with the entire length of the iliac portion of the pelvic girdle, must be interpreted in adaptation to bipedal progression. So much of the bird's body is usually in front of a perpendicular dropped from the acetabulum, with which the head of the femur articulates, that it is necessary for balancing purposes that the hip girdle should take a long and strong grip of the backbone. The point is emphasized if the bird's hip girdle be contrasted with that of the jumping and swimming frog, which cannot stand on its hind legs, and has only a single sacral vertebra with which the thigh bone has merely a ligamentar attachment. In all modern flying birds (Neognathae), though not in running birds (Palaeognathae), there is fusion of four terminal vertebrae to form the ploughshare bone or pygostyle. This is in great contrast to the long lizardlike tail of the earliest known fossil bird (Archaeopteryx), which had 20 free vertebrae. In ordinary flying birds the ploughshare bone forms a basis for the insertion of the tail feathers or rectrices, and may thus be interpreted as adaptive. Reference will be made later to the fusions that occur in the regions of the wrist and palm and in the region of the ankle and instep. In the running birds, where the pectoral girdle is unimportant, the scapula and the coracoid are fused into one bone.

Other Adaptations to Flight.—Some additional adaptations to flight may be summed up. The keel or carina on the sternum serves for the insertion of the pectoral muscles, and its varying prominence in relation to the body of the sternum in different types stands in correlation with the power of flight. A keel is slightly developed in bats and also in moles, both of which have strong pectoral muscles. It is absent in Palaeognathae. It is degenerate in the rare burrowing parrot (*Stringops*) of New Zealand. In contrasting the keeled and the unkeeled breastbone, it is interesting to notice that the former is usually carried far back, forming a supporting floor for the viscera, of especial value in flying and swimming, whereas the latter is a broad shield, not carried backward, the weight of the viscera being borne by the thoracic and lumbar vertebrae, and by backward extension of the rib.

The sabrelike scapula of flying birds is bound by ligaments to the ribs and backbone; the strong coracoid is braced movably in a deep groove on each side of the front of the breastbone; the two clavicles fuse to form the "wishbone" with the "head" attached by ligament or sometimes fused to the tip of the keel; except in the South American screamers (Anhimidae) many of the ribs have a backward-projecting uncinate process, which overlaps the rib behind, to which it is lashed by ligament, thus binding the rib system into a coherent basket; the lower or sternal parts of the ribs, which reach the breastbone, are bony, not gristly as in mammals. The total result it to form a coherent springy framework (of backbone, breastbone, ribs and pectoral girdle) against which the wings can work with maximum efficiency. The arrangements prevent any incrushing on the heart during the downstroke of the wings, yet the alteration in the capacity of the chest cavity, as the breastbone is raised and the backbone depressed, facilitates the outrush of air from the lungs. The glenoid cavity, formed by the scapula, clavicles and coracoid, is much more open than in mammals, and is thus well suited for the free play of the wings. If the clavicles, forming the wishbone, are broken, the bird cannot fly. They are rudimentary or absent in running birds, and reduced in some birds that do not fly much, *e.g.*, certain parrots. M. Hilzheimer calls attention to the marked mobility of the joint between coracoids and sternum in hummingbirds, and connects it with the great rapidity of the wingstrokes. It allows rapid expansion and compression of the chest cavity, thus facilitating respiration. In general, it is one of the perfections of birds that flying helps breathing.

In the wing itself the chief adaptation is that there is greatly reduced mobility in the different parts, so that the feather-bearing skeleton works as a unified whole. Thus in flight the radius does not move on the ulna; there are only two free wrist bones; the distal half of the wrist and the whole of the palm bones—six bones in all—are fused to form the carpometacarpus, carrying most of the primary pinions; the thumb has considerable mobility, but the two other digits are stiff. But while the fore limb may be said to act *en bloc* in striking the air, the other side of the adaptation is the way in which it folds up in one plane into the resting position, forming a compressed letter Z, the elbow pointing backward, the wrist joint forward, the tips of the digits (probably I, II, and III) backward. This is a space-economizing arrangement, useful when the bird is swimming or diving with its feet, or threading its way afoot through thick herbage.

Adaptations to Bipedal Progression.—Among the adaptations to bipedal progression, we have already noticed the synsacrum, which consists in a pigeon of one thoracic vertebra, five or six lumbars, two sacrals and five caudals. This gives the hip girdle a long and strong grip of the backbone, and thus facilitates balancing the body on the rounded head of the thigh bone. The elongation of the different regions of the leg is suited for rapid running, and the most striking feature is the long, more or less vertical, tarsometatarsus—a unique piece of skeleton. Except in the two-toed ostrich, it consists of three coalesced metatarsals (or instep bones), and to the upper end of these the distal ankle bones or tarsals are fused. With the exception named, the lower end bears three articular knobs for the three toes. If there are four toes, the first is turned backward and each toe has one more joint than its number if the hind toe is number one and the inner toe number two. The tarsometatarsus adds to the bird's running power and swimming power, and in the divers and their relatives it is laterally compressed into a narrow blade, which reduces friction in preparing for a stroke and concentrates the force in the region of the foot when the backward stroke is made.

At the bird's ankle joint, just as the distal row of tarsal bones fuses to the metatarsus, forming the tarsometatarsus, so the upper row fuses to the lower end of the tibia, forming the tibiotarsus. Thus all the ankle bones have disappeared as such, and this, considered in relation to the elongated tarsometatarsus, may be of mechanical advantage when the bird springs from the ground or rapidly alights.

Among the skeletal adaptations of the toes are the powerful talons of birds of prey for gripping and carrying the booty; the elongated toes of the jacana, for walking on floating leaves; the unusual arrangement in the cuckoo, the first and fourth toes pointing backward (with the fourth reversible), the second and third forward, for firm perching; the same appearance in trogons, but with the first and second toes backward, and the third and fourth forward; the forward directed four toes of the swift for climbing or for clinging to the nest. In divers and grebes and the extinct *Hesperonis*, there is an interesting prolongation of bone rising from the head of the tibia above the knee joint. As a basis for strong muscles it gives much additional power to the swimming stroke.

Other Adaptations.—The surrender of the fore limb to wing making implies an assumption of new functions by the skull, which becomes a manifold instrument. Perhaps this is facilitated by the early fusion of most of the cranial bones in flying birds, and it is interesting to notice that similar fusion occurred in the Pterodactyls.

The exaggeration of the premaxillae to form a beak is an obvious adaptation. The lower jaw consists of six bones on each side, a point that reveals the affiliation of birds to reptiles.

More important, however, from our present point of view, is the loose articulation of the lower jaw with the movable quadrate, for this increases the gape—an important feature. Thus it facilitates the rapid swallowing of large booty, and catching small insects in mid-air. The delicate nature of the infratemporal bar may be correlated with the usual absence of mastication; and where teeth are absent it is not surprising to find the maxillae are small.

The importance of vision in birds is correlated with the large orbits, and these with the restriction of the cranial cavity to the posterior region of the skull, which is markedly broadened. One of the most striking advances of birds, as compared with reptiles, is in the proportion between the brain-containing region and the size of the skull as a whole. The skull has great mobility on its single occipital condyle (another reptilian feature); and here should be noted the mobility of the neck with its characteristic heterocoelous vertebrae.

FOOD

In birds, as in all other animals, both structure and habits are in great part concerned with the quest for food: (1) many birds are vegetarian, eating fruits, seeds, buds, leaves. Most hummingbirds and honey eaters suck up nectar; geese graze on grass; grouse devour buds; ptarmigan often feed on lichens; (2) many birds are carnivorous, eating small mammals, other birds, reptiles and amphibians, fishes, slugs, insects and lower animals like earthworms. Hawks destroy voles, the golden eagle catches the grouse, the secretary bird kills snakes, storks swallow frogs, the flying osprey catches the swimming fish in its talons, rooks and gulls let mussels fall from a height to flat rocks, the English thrush breaks the shells of snails on its "anvil," the cuckoo is partial to hairy caterpillars, the swallow catches small insects in mid-air, the woodcock depends mainly on earthworms. The most important ecological fact is the indispensable check that birds keep on the multiplication of insects which would otherwise ruin the world; (3) many birds enjoy both vegetarian and carnivorous diet. Thus the thrush likes fruit as well as slugs; the normally fish-eating herring gull has become a devourer of garbage, potatoes and grain. Of special interest among the mixed feeders are those which give their young ones material different from that which forms the staple food in adult life. Thus young crows, sparrows and finches are fed for a time on insects only. In many cases the diet has necessarily to vary with the seasons; (4) there are many strange oddities of diet. Thus the kea parrot (*Nestor notabilis*) of New Zealand has learned to settle down on a disabled or dead sheep and dig out the fat and flesh from near the kidneys. This is a strange idiosyncrasy on the part of a bird that belongs to a race habitually vegetarian or frugivorous; and it must have arisen rapidly, for sheep were not taken to New Zealand till about the middle of the 19th century. The red-winged starlings of South Africa include in their menu the berries of the syringa, which they eat in such quantities that they become stupefied by some included narcotic. Similar intoxication has been observed in birds that devour fermenting fruit. Another quaint misadjustment is seen in some sea birds, like the albatross, which may make such a hearty meal that they cannot rise off the water.

Methods of Obtaining Food.—It is ecologically interesting to select a particular kind of food, let us say, fish, and to notice the variety of ways in which it is obtained. The hovering osprey catches the fish in its talons, the swooping herring gull with its bill, the gannet dives from a height, the cormorant turns head over heels from the surface, the skimmer skims the waves, the heron usually waits for a fish to swim past, the kingfisher makes a sudden plunge, the white pelicans wade shoreward in a crescent, penguins pursue their booty under water, the skuas chase the herring gulls in the air and force them to disgorge. In the ways in which food is detected, acuteness of vision counts for most; a tactile bill is important in probing birds like snipe and woodcock; of smell there is not much evidence.

Another line of enquiry may be illustrated by the way in which the bills and feet of birds are suited to particular kinds of food and food capture. The absence of teeth in modern birds is compensated for by the horny bill covering the jaws. It often has a sharp edge and a hooked tip; it varies from a massive crushing instrument in the hornbill to a delicate probe in the hummingbird. The variety of type should be considered in the light of the fact that the forelimb has been surrendered to making a wing, and that the bird's jaws have to discharge duties which in mammals usually fall to the hands.

"Bill" and "Beak."—The bones covered by the horny bill are especially the premaxillae above and the complex lower jaw below. It may be convenient to keep the word "bill" for the horny sheath and "beak" for bill and jaws together. The more primitive type of bill structure is seen in birds like the albatross and the puffin, where there are several distinct horny plates, homologous with reptile's scales. In most birds these fuse into one sheath. There is an autumnal moulting of part of the bill in the puffin, and as the plates are not replaced for some time, the puffin's bill in winter differs in size and appearance from the enlarged and decorative summer form. In his *Evolution Theory* (1904), A. Weismann discusses the regeneration of both bone and horn in the bill of the stork, and correlates this with the combats of males, in which serious injury is apt to occur. Similar regeneration is recorded for fighting cocks and for a parrot.

A generalized bill may be illustrated by the crow and its allies —strong, pointed, somewhat triangular in section. Shortening, sharpening and curving of such a bill would yield the predatory type of hawk and eagle—quick to give the death blow by piercing the skull or cutting the jugular vein, also well suited for rapid skinning and plucking, and for drawing out strips of flesh from the body. It is interesting to see an eagle deftly run down the backbone of a fish with its bill, dislocating the vertebrae. Somewhat of the same type are the bills of the owls and the parrots, though the former are carnivorous and the latter vegetarian. The parrot's beak has a movable hinge between the premaxillae and the front of the skull, and there are often strong filelike roughnesses to the inside of the bill, which serving in gnawing nuts or grinding hard seeds. Not very remote are the broadly conical strong bills characteristic of the finches, suited for breaking capsules and splitting seeds.

On another line are the delicate slender types, familiar in warblers, suited for dealing with small insects, with a climax in the elongated slender bills of hummingbirds. Not far removed, though used in a different way, are the elongated narrow bills of curlews, snipe, avocet and woodcock, for probing in mud, sand and the like. In a very different direction are the broad bills of ducks and geese, for sifting the mud and cropping vegetation, and on this line might be placed the broad bills of some storks and herons, and the spatulate type of the spoonbill. Also broadened out, but kept very short, are the insect-catching bills of nighthawk and swift. A slight specialization of the crow type leads to the sharp form of bill seen in snake birds, herons and bitterns. Lateral compression in puffin and razorbill reaches an extreme in the long, high knife blade of the skimmer (*Rhynchops*), a tropical relative of the terns. This bird flies very close to the surface and skims the water with the mandible which is longer than the upper jaw. When the knife edge of the mandible touches a small fish or crustacean it tilts the booty into the open mouth. The skimmer or scissorbill is also said to skim soft mud. There are many strange types, such as that of the crossbill, where the points of the upper and lower halves of the beak cross one another when at rest—a position that occurs as an abnormality in some birds, such as crows. The peculiarity is utilized by the crossbill in the exceedingly rapid extraction of the seeds of fir cones, a deft manipulation in which the tongue assists. In the wrybill

plover of New Zealand the bill is turned to the right-hand side, and it is interesting to notice that a one-sided twist is occasionally seen in an individual oyster catcher. In the flamingo the whole beak is bent almost at right angles on itself, half-way down its length, and is thrust upside down into the mud, where it searches for small molluscs and the like. The kiwi is the only bird in which the nostrils open at the tip of the bill. In the huia, another New Zealand rarity, there is sex dimorphism in the bill. According to Alfred Newton, the male uses his short, strong, almost straight bill to chisel holes in decaying wood where grubs may lurk, while the female uses her much longer, decurved and slender bill to probe into crevices. But when he, having discovered a grub in his excavations, is unable to reach it, she utilizes the opportunity.

Other Adaptations for Food Getting.—The tongue is often adapted to assist in food getting. Thus that of sap-suckers ends in a brush, while that of insect-eating woodpeckers bears spines. The tubular tongue of the hummingbird ends in two delicate brushes, suited for nectar sucking and for capturing small insects. In many cases there are processes on the tongue which help to guide the food backward to the gullet, or to guard the opening of the glottis, or to strain the mud, or to grip slippery booty, such as small fishes. In some fish-eating birds, like pelicans, which swallow their prey whole, the tongue is very small.

Many peculiarities in the feet of birds have to do with locomotion. Thus the webbing of the toes is adaptive to swimming, the scaling and clinching to perching; the elongation and spreading of the toes may afford a large surface in jumping off and alighting, or may facilitate movement on floating plants. But other peculiarities of the feet have directly to do with catching and handling the food. Thus a parrot sometimes uses its foot as a hand; the owls bend their fourth toe backward beside the first one, forming an effective arrangement for catching, crushing and carrying mice; fowl-like birds use their strong blunt claws for scratching the ground; the secretary bird strikes the snake with its foot, and sometimes kills with a single forward kick. These are but a few of the hundreds of instances of specially adapted feet and toes.

PHYSIOLOGICAL

It will be convenient now to consider the digestion of the food.

Salivary Glands.—The salivary glands, opening into the mouth, do not seem to have great importance in birds as far as their usual function of digesting carbohydrates is concerned. For most birds bolt their food. In insect-eating woodpeckers the glue-like saliva on the tongue must be useful; in the sea swifts (*Collocalia*) the salivary secretion, mostly consisting of mucin, is used to make the "edible" nest. Through the muscular gripping pharynx the food passes into the elastic gullet, with mucus glands lubricating it internally. In many cases the gullet is enlarged into a crop which serves for storage. It is not digestive except in so far as salivary juice from the mouth may follow the food; but there may be bacterial fermentation. In the hoatzin the crop is strongly muscular and is used to squeeze the juice out of succulent leaves. In pigeons and a few parrots there is a fatty degeneration and desquamation of epithelial cells lining the crop. This forms the "milk," which is regurgitated by both male and female pigeons into the mouth of the young bird.

The Stomach.—The stomach may be a simple sac, muscular and glandular, but in most cases it is divisible into an anterior glandular portion (the proventriculus) and a posterior muscular portion (the gizzard). The relative development of these two regions is correlated with the differences in diet. Thus a graminivorous bird, like a pigeon, has a strongly developed gizzard, while many birds of prey have practically none. Of much interest is the modification of the character of the stomach in the individual bird, according to change of diet. This has been observed in natural conditions in the herring gull, which has a relatively hard stomach in summer, when it often eats much grain, and a relatively soft stomach in winter, when it depends mainly on fish.

The Gizzard.—The gizzard which is no doubt part of the reptilian legacy, as suggested by its presence in the crocodile, is marked by the following features: (*a*) there is on each side a strong development of muscle, numerous fibres radiating outward from a central tendinous disk, and bringing the two sides toward one another when they contract; (*b*) the sac is twisted on itself so that the entrance into the duodenum is not far from the exit from the proventriculus; (*c*) there is a hard internal lining and (*d*) there are numerous small pebbles which help to triturate the food. As these grindstones get their corners rubbed off, they slip down the intestine. There are many strange gizzards, such as that of some fruit pigeons, which has numerous hard conical projections on the internal lining, or that of the snake bird (*Anhinga*), which shows a sieve of hairlike processes at the duodenal end. These prevent unbroken fish bones and the like from passing into the intestine. When the male hornbill (*Buceros hydrocorax*) passes food to his imprisoned mate, the packet is often surrounded in a tough homogeneous skin which arises as a secretion of the walls of the gizzard.

The Rectum.—The most marked anatomical peculiarity of the rest of the alimentary canal in the bird is the shortness of the rectum, which is often not more than an inch long. This shows that there must be great efficiency of digestion in the much looped small intestine. The amount of faecal matter is relatively small. At the junction of the small intestine and the rectum there are usually two caeca, which occur in all sizes from mere vestiges, as in the pigeon, to long functional tubes, as in the duck. When well developed they serve to delay the food and facilitate absorption. The terminal chamber or cloaca receives the ureters and genital ducts, and bears a dorsal pouch, the *bursa Fabricii*, which is large in young birds but disappears at maturity. Its function is unknown.

Respiration.—Some of the important peculiarities are the following: the bird's lungs, though small and hardly distensible, have through the complex branching of the bronchi, a very large internal surface for gaseous interchange; the driving out of the air from the lungs, which are fixed to the ribs, is assisted by the strokes of the wings, expiration is the active part of the respiratory process, not inspiration as in mammals; the lungs open into a system of transparent, internally ciliated air sacs which economize the work of breathing and increase the total content of air; this is useful in prolonged diving and in enthusiastic song; they allow of a "double tide" in every respiratory act, thus in expiration air passes out from the lungs to the exterior, but also into the lungs from the air sacs; they promote internal perspiration, for water vapour passes into them from the blood, thus helping to regulate the temperature of the body.

The Glottis.—At the back of the tongue lies the glottis or opening of the windpipe, with never more than a hint of the epiglottis characteristic of mammals. The glottis leads into the larynx, supported, as in amphibians, reptiles and mammals, by the hyoid bones, representatives of the branchial arches of fishes. But the larynx of birds contains no vocal cords, these being situated at the lower end of the windpipe (trachea) in the enlargement known as the syrinx. This varies considerably in development and is absent in ostriches, storks and some vultures. The voice is due to the rapid passage of out-breathed air over the vibrating membranes. (*See* SONG BIRDS.) The trachea is supported by bony rings. It is interesting to notice that the syrinx arises as a transformation of the base of the trachea and of the beginning of the two bronchial tubes. In contrast, again, with mammals, there is no true diaphragm, shutting off the chest from the visceral cavity.

The Heart.—The bird has a four-chambered heart, with a complete separation of arterial and venous blood, as in mammals; but the aortic arch, carrying pure blood to the body, turns to the right in birds, to the left in mammals. The blood of birds has more red blood corpuscles per ounce than that of any other animal, and this is an adaptation to intensity of metabolism and to aerial habits. The red blood corpuscles are elliptical, slightly biconvex, nucleated disks, like those of lower vertebrates, but unlike those of mammals, which are non-nucleated, slightly biconcave and generally circular in outline. On the whole the red blood corpuscles of birds are large as compared with those of mammals while the diameters in man, dog, horse and ox are 7.5 μ, 7 μ, 6.5 μ, and 5.5 μ, in the high-flying vulture 17.7 μ by 8 μ (μ is $\frac{1}{1.000}$ of a millimetre, about $\frac{1}{25.000}$ in.). There are several kinds

of white blood corpuscles or leucocytes. Of special interest are the phagocytes, mobile amoeboid cells, able to leave the blood altogether and to migrate into the tissues, where they engulf microbes, devour degenerating tissue, transport material from one area to another, and help to repair injuries.

As might be expected in animals of predominant muscularity and intense metabolism, the temperature of the bird's body is high, from 2° to 14° higher than that of mammals. Regulation of the temperature is automatically effected by a thermotaxic nerve centre in the *corpus striatum* of the cerebral hemispheres. If the temperature of the blood changes, the centre, being stimulated by the blood stream, sends nervous impulses to the muscles, the skin and other parts, regulating the production and loss of heat. These arrangements have not been completed in nestlings, which are therefore apt to suffer from overheating or overcooling.

Excretion.—In organisms so active as birds there is necessarily a large production of nitrogenous waste products, due partly to the wear and tear of the protein framework of the cells, and partly to the nitrogenous residue of the amino-acids into which the food proteins are changed by digestion. The elimination of the poisonous nitrogenous waste is prepared for in the liver, and completed in the trilobed kidneys which lie below the hip girdle. The result of the filtration is a clear fluid which passes from the kidneys by the ureters to the cloaca; but there, by losing water, it turns into a semisolid mass of urates and discharges with the waste from the alimentary canal.

The Endocrinal Glands.—It is impossible to understand the bird's bodily life without taking account of the regulatory system of endocrinal or ductless glands—such as the paired thyroids near the base of the neck, the yellowish suprarenals lying on the front part of the kidneys, the pituitary body on the under surface of the brain, and the glandular tissue in the reproductive organs. These structures produce hormones which are distributed through the body by the blood, and help to secure a harmonious regulation of function. Those produced by the endocrinal tissue in the gonads are important in activating or in inhibiting such structures as decorative plumes and such activities as song.

BEHAVIOUR

Sight.—The bird's sense of sight is highly developed, and the power of rapid accommodation surpasses that of all other vertebrates. The rods of the retina, which have to do with discrimination of form, far outnumber the cones, which are believed to have chiefly to do with colour sensation. Experiments show that some birds cannot see blue or violet, but they distinguish colours toward the other end of the spectrum. The usual six muscles of the eye are reduced in size, and the spherical shape of the eyeball, adapted to ready mobility, is usually departed from, though approached in ostrich and vulture. It is likely that the reduced mobility of the eye is compensated for by the freedom of movement of the neck. The eyes are on the sides of the head in most birds and command two visual fields with vision for objects at close range strictly monocular.

Hearing.—The sense of hearing is acute, but is limited to a much narrower frequency band than with the human ear. Ordinary conversation may never be heard by such birds as canaries and sparrows and the horned owl never hears the drum of the grouse. The semicircular canals of the ear show some correlation with the perfection of flight; thus they are better developed in a swallow than in a swimming bird. Birds resemble reptiles in having no ear trumpet or pinna, such as is seen in most mammals. Its absence in birds may be correlated with the mobility of the head and with the advantage of reducing friction; but the close affinities of birds and reptiles must be kept in mind.

Smell.—The sense of smell has been actually demonstrated in nighthawks, owls, magpies and some other birds, but not in many. It is by sight, not by smell, that the vultures gather to the carcase. A few birds have themselves strong odours, but recognition of kin is mainly by sight. According to some naturalists, the odour of a bird—*e.g.*, a partridge—is reduced to a minimum when brooding. As to tactility, there is not very much, for there is little exposed skin; but there are nerve endings at the base of some of the feathers; the tip of the tongue, as in ducks, may serve as a touch organ; and there may be a strong development of tactile nerve endings in the white cere near the nostrils, or at the tip of the probing bill, as in woodcock. Taste papillae have been demonstrated on the tongue of a few birds, but this sense is usually slight. Little is known of the other sensory "receptors," such as those responsive to temperature and pressure.

Brain.—The brain, compared with that of reptiles, fills a relatively large cranial cavity, and both the cerebrum and the cerebellum are large, the former covering the region of the *optic thalami* and the latter hiding the *medulla oblongata.* The optic lobes, which are on each side of the middle line in the young embryo, are displaced to the sides by the disproportionate growth of cerebrum and cerebellum. It may be that the large size of the cerebellum, which is transversely grooved, has to do with the bird's locomotor achievements, for this part of the brain has in part to do with the control of movements. The cerebrum, the seat of the higher mental functions, differs from a typical mammal's in being without convolutions and in having no more than a trace of the important transverse commissure, the *corpus callosum.* The roof of the cerebrum is relatively thin and the main mass consists of *corpora striata.*

Reflex Action.—When a nestling opens its mouth at the touch of food in its mother's bill, that is a reflex action. It is dependent on prearranged linkages between certain nerve cells—(1) sensory, (2) associative, and (3) motor—and (4) certain muscle-cells. The linkage is part of the characteristic hereditary organization; no learning is required for a reflex action; the higher nerve centres are not concerned. There are many of these reflex actions in birds, as in other higher animals; and sometimes they are complex or serial, one leading on to another. Thus the nestling's opening of its mouth is followed by other reflexes of gripping and swallowing the food. It is probable that the movements made by a young bird just before hatching are mainly reflex. Inborn reflexes, dependent on pre-established neuromuscular linkages, must be distinguished from individually acquired associations, as when a bird acts in a particular way in response to a particular sound or sight. This may become automatic.

Instinctive Behaviour.—When the activity evoked by a stimulus is a chain of acts on the part of the creature as a whole, following a definite routine and requiring no apprenticeship, it is called instinctive behaviour. From the physiological side, instinctive behaviour is like a chain of compound reflex actions, each pulling the trigger of its successor; but to many naturalists it seems necessary to postulate a psychical side also. In contrasting it with intelligent behaviour, emphasis should be laid on the fact that the routine performance as in swimming or diving when tumbled into the water, does not require apprenticeship, and may be exhibited in perfection the first time. Moreover, it is limited by the apparent absence of any understanding of the situation.

Instinctive behaviour is not all at the same level, for there is a gradation from short and simple activities, as in pecking, scratching, swimming, diving, flying, crouching and lying low, to long and complicated chains as in nest building. Care is necessary to discriminate inborn capacities from the results of early education on the mother's part. This may be done by hatching the young birds in an incubator. Thus Prof. Lloyd Morgan found that his chicks, incubated in the laboratory, paid no attention to their mother's cluck when she was brought outside the door. Although thirsty, and willing to drink from a moistened finger tip, they did not instinctively recognize water even when they walked through a saucerful. Only when they happened to peck their toes when standing in water did they appreciate water as what was needed to relieve a state of dissatisfaction. But then, the bill being moistened, they drank eagerly, lifting the bill to the sky in the instinctively prescribed fashion. In natural conditions the mother bird may play an important part in supplying stimuli which liberate instinctive predispositions; thus the grebe takes the young ones on her back and then sinks beneath the water.

Instinctive behaviour is often very precise and even specific, thus the cormorant's dive involves a complex series of movements, yet it has not to be laboriously learned by the young bird.



PAINTED FOR THE ENCYCLOPÆDIA BRITANNICA BY H. GRÖNVOLD

BRITISH BIRDS

1. Blue tit *(Parus caeruleus)*
2. House sparrow *(Passer domesticus)*
3. Skylark *(Alauda arvensis)*
4. Goldfinch *(Carduelis carduelis)*
5. Song thrush *(Turdus ericetorum)*
6. Nightingale *(Luscinia megarhyncha)*
7. Wren *(Troglodytes troglodytes)*
8. Magpie *(Pica pica)*
9. Yellow wagtail *(Motacilla flava)*
10. Robin or redbreast *(Erithacus rubecula)*
11. Barn owl *(Tyto alba)*
12. Red grouse *(Lagopus scoticus)*
13. Golden eagle *(Aquila chrysaëtos)*
14. Mute swan *(Cygnus olor)*
15. Common snipe *(Capella gallinago)*
16. Black-headed gull *(Larus ridibundus)*
17. Wild duck or mallard *(Anas platyrhynchos)*

But in the big-brained bird there is more freedom than in the small-brained bee, and this is seen (*a*) in the control of instinctive capacities in response to parental training, (*b*) in a "trial and error method" of using the instinctive reactions, in novel situations, and (*c*) in the modification of instinctive behaviour in the light of intelligence. Lloyd Morgan's chicks stuffed their crops with worms of red worsted, but they did not make this mistake more than a few times. The captive cormorants in the Amsterdam zoological gardens learned to associate a line of bubbles rising to the surface with the possible presence of fishes.

In training educable birds like the weaver bird (*Ploceus baya*) advantage is taken of the capacity to form associations. Given a particular visual signal, the bird picks out a particular card. Given a particular auditory signal, a parrot will utter a particular collocation of sounds, with an appropriateness often misleading to those who know nothing of the training. Very remarkable is the homing of pigeons, but there is no doubt that a graduated apprenticeship educates an inborn aptitude. Very interesting and apart from definite training is the spontaneous establishment of useful associations, which may sometimes involve some awareness of the significance of the situation. A moor hen chick for which Lloyd Morgan used to dig worms, learned to run to him from a distance when he took the spade in hand. It need not be supposed that the bird had any intelligent appreciation of the spade as a digging instrument, the spade was simply an item in the mental registration of a pleasant experience. In natural conditions this type of association forming must be common and invaluable.

Intelligent Behaviour.—As an instance of intelligent behaviour the following may be suggested. Herring gulls lift sea urchins and clams in their bills and let them fall on the rocks below, thus breaking the shells. It is not necessary to credit the birds with thinking out the expedient, but it is difficult to evade the conclusion that what may have been discovered by chance, as often happens in mankind, is afterward used intelligently.

The general impression left by a survey of bird behaviour in such activities as nest building and food capture may be stated as follows. There is an instinctive basis, varying greatly in definiteness in different types; on this is built up a superstructure due to parental education, imitation, simple trial and error experimenting, and the establishment of simple associations; but above this there are instances of genuine intelligence, which cannot be described without crediting the bird with some appreciation of the relations of things, some power of perceptual (not conceptual) inference, in the light of which the behaviour is adjusted.

INTERRELATIONS

Food Supply and the Abundance of Birds.—The oscillations in the abundance of birds in connection with changes in the food supply and in the number of enemies are of much interest. During a protracted plague of field voles the number of short-eared owls has been observed to increase greatly; conversely, of course, the shooting down of owls and the like is apt to be followed by increase of field voles. Destruction of rabbits may make foxes harder on pheasants; destruction of squirrels has been followed by great increase in the ranks of wood pigeons, whose squabs are often eaten by the rodents. A great lemming-year in Greenland keeps the foxes well fed, and the ptarmigan increase in numbers. But next year, when the lemmings are scarce and the foxes many, the ptarmigan suffer in proportion. In scores of ways—often very subtle—the swaying balance influences the surrounding fauna and flora.

Interrelation of the Food Supply.—A few instances of intricate interrelations may be given. Liver rot in sheep is due to the presence of the fluke worm (*Distomum hepaticum*) in the liver; the larval stages are parasitic in the small water snail (*Limnaea truncatula*), whose numbers are reduced by such birds as the pied wagtail. Similarly, water birds check the increase of various water snails (*Planorbis, Melania, Isidora,* etc.) which are the vehicles of the young stages of the serious human parasite known as Bilharzia. Bubonic plague in India, due to *Bacillus pestis,* often begins in mills, where the workers eat their frugal meal in the courtyard. The crumbs attract rats, in whose blood the bacillus is at home. A rat flea, with fouled mouth parts, leaves the rat and infects man with its bite. But if there was a dovecot, whose inmates would promptly look after the crumbs, there would be fewer rats and less plague. Darwin tells of the large clodlet he took from the leg of a red-legged partridge (*Alectoris rufa*): "The earth had been kept for three years, but when broken, watered and placed under a bell glass, no less than 82 plants sprung from it; these consisted of 12 monocotyledons, including the common oat and at least one kind of grass, and of 70 dicotyledons, which consisted, judging from the young leaves, of at least three distinct species." Small animals also, such as water fleas, water mites, wheel animalcules, sponge gemmules, and even small bivalves like *Sphaerium,* are often transported on the feet of birds from one pond to another.

Parasites.—Along with interrelations the parasites of birds must be included. The most important ectoparasites are: (1) the biting lice or Mallophaga which feed on delicate portions of the feathers; (2) the quite unrelated true lice, belonging to the order Hemiptera, which suck blood; and (3) the skin mites and scale mites belonging to the Acarine order of Arachnida. Among endoparasites, besides microscopic Protozoa, such as the Trypanosome found in the blood of owls, there are frequent representatives of the three great classes of parasitic worms. Thus the trematodes may be illustrated by *Distomum macrostomum* in various passerine birds; the cestodes by *Taenia anatina,* the common tapeworm of the duck; and the nematodes by the transparent *Trichostrongylus pergracilis* of the red grouse. The three examples mentioned live in the food canal, but other organs of the bird's body may be affected. The abundant nematode of the grouse may serve to illustrate the important point that numerous parasites may be present without doing any appreciable harm. Every grouse has hundreds of these minute threadworms, but a mutual *modus vivendi* seems to have been established between parasite and host. On the other hand, if the grouse should be enfeebled by continuous bad weather, by lack of food, or by close inbreeding within a weak stock, then the parasites may multiply enormously and bring about fatal results in the body.

Some parasites occur in several different kinds of birds, but it is more common to find a particular species of parasite in a particular species of bird. This seems to illustrate the part that isolation may play in the establishment of a species. A bird's parasites are adapted to it and cannot readily pass to a different kind of bird. Moreover the infection of the bird is usually bound up with specific feeding habits. On the other hand, there is need of crucial experiments to test whether the successful transference of a parasite, say a nematode, to a new host may not be followed by the modificational assumption of structural features at present regarded as inborn and specific characters of another species.

(*See* also ORNITHOLOGY; BIRDS, MIGRATION OF; BIRD SANCTUARIES.)

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(J. A. TH.; A. A. AN.)

REPRODUCTIVE HABITS

Any treatment of the problems connected with territory in bird life must begin by pointing out that relevant data are still meagre, and that theories put forward remain to be adequately tested by criticism and by work in the field. The far-reaching nature of these problems has only very lately been appreciated. The method here adopted is first to give a tentative sketch in the light of what is at present known, and then to summarize briefly the data on certain relevant points.

Sociability.—Some birds are solitary in their mode of life, others tolerant, and others more or less sociable. With many species sociability is at its lowest ebb during the breeding season, when the flocks or parties break up and settle in pairs, dispersed

over the country. But with others, particularly sea birds, the reverse holds good; their scattered members rally from all directions to particular points where they breed in massed colonies, often so dense that they hardly leave room to tread. These are not simply manifestations of a communist or an individualist temperament; they are solutions of the economic problem which, in one form or another, every species has to meet. This is well illustrated by the case of finches which live on seeds themselves, but feed their young entirely upon insects. In winter they are sociable, living in mixed flocks; in spring a revolution takes place, and they are found everywhere in pairs, occupying compact territories from which all others of their kind are jealously excluded. Their character has not changed its mould, but the new economic problem of rearing a delicate brood consuming its own weight in small insects every day has temporarily imposed upon the species a different manner of life.

Once this pressure is relaxed the social instincts reassert themselves, and the family parties, renouncing a fixed territory, begin to drift together into flocks again. Where the supply of food in the breeding season is more concentrated, or the foraging range more ample, obstacles to breeding in colonies may disappear.

Conditions Governing Distribution.—The fundamental law involved may be stated thus: the breeding organization of a given species in a given locality varies in direct ratio to the abundance of accessible food supply. To take the simplest possible case, a hypothetical falcon feeds entirely upon birds. Each pair has an effective foraging range of x square miles around its eyrie and k victims are required per season to enable a brood to be reared. If the bird population of x sq.mi. were as low as k it might theoretically be possible for the falcons to make a clean sweep, rearing a brood at the cost of depopulating the area. Obviously that could only be done once, and would be no more to the ultimate advantage of the falcons than of their prey. In order to maintain themselves indefinitely the falcons must confine their demands to the annual surplus of potential victims. In practice the relationship between the falcons and their prey is stabilized within that margin of safety. This is due partly to the fact that an increased toll leads to increased wariness and more difficult hunting, but above all to the territorial system, which operates to "safeguard the standard of living." There is therefore, a third factor to be considered—y, the number of victims per season which the population of x sq.mi. will yield over an unlimited period. This naturally varies in proportion as the population itself varies. Clearly, if y is smaller than k the requirements of the falcons cannot be met, and no breeding pair will be sustained. Once $y=k$ a suitable territory for a pair of falcons is available (the breeding site and freedom from human persecution being assumed). This territory must be kept inviolate; should a second pair begin to poach upon it, or to usurp a part, the food resources will prove incapable of standing the strain. If $y=4k$ there will be room for 4 pairs of falcons each with a territory of $\frac{1}{4}x$ sq.mi.; if $y=10k$ for 10 pairs each occupying only $\frac{1}{10}x$ sq.mi., and so on, for x sq.mi. is the maximum area that the species is physically capable of hunting over, and an ideal territory will be well within that margin. But nesting accommodation is limited, and as the increasing abundance of prey gradually relaxes the struggle for existence the native fierceness of the falcon ceases to be so readily stimulated. A point is reached where territory is no longer strictly held, and tolerant individualism supervenes, several pairs foraging over the same ground without serious friction and even breeding side by side where suitable sites exist with convenient access to an abundant food supply. The final stage is reached where y =not k but, say, $100k$. In this case there is enough food for 100 pairs of falcons within the effective range of one. It will therefore be unnecessary for the young of the original pair to be expelled from the territory as they grow up. On the contrary they will remain, thriving on the abundant resources, and some sort of colony of falcons will arise, subject to a numerical limit of roughly 100 pairs. There will, so far as is known, be no direct sanction for enforcing this limit, such as the territory system imposes upon individual pairs, but if the colony seriously exceeds it the increasing drain will begin to tell upon the victims, or actually drive them away, and stringency of food resources will drastically redress the balance—not by actual starvation, but by forcing a sufficient number of falcons to seek quarters elsewhere. In practice, clearly k would represent a considerable number of birds, and the immense concentrated population required to yield anything like $100k$ would only rarely be found. But if the food of the falcon were, say, grasshoppers instead of birds the demand would be much more easily satisfied, and it is actually among birds of prey feeding chiefly on insects, very small mammals and fishes that large communities usually occur, those depending upon the higher forms rarely passing beyond tolerant individualism.

Mutatis mutandis the same conditions apply to all birds, for scientifically considered all are equally birds of prey. Thus the British robin (*Erithacus rubecula melophilus*), which inhabits woods, gardens and hedgerows, has a food supply consisting of such minute insects, and so limited in proportion to its effective foraging range and the susceptibility of its nestlings to exposure, that it is forced by economic pressure to adopt strict territory, from which all other robins are excluded. In autumn and winter males and females hold separate domains, which often adjoin, and may be fused as the breeding season approaches to form a territory for a pair. The cosmopolitan starling (*Sturnus vulgaris*) is an example of a species of wider foraging range and more catholic diet, nesting in cavities not abundantly available, which commonly adopts the solution here called tolerant individualism, though for all other purposes gregarious. There may be several pairs breeding on a single house and bringing food from the same meadow; they work independently and almost ignore one another's presence. The rook (*Corvus frugilegus*) differs in maintaining the community intact through the breeding season, many nests being built on a single tree or in adjoining ones, their occupants working in company and combining to repulse an enemy. Individual pairs attempting to build independently within the communal domain are at an obvious disadvantage, and their nests are liable to be destroyed. Often the formation of communities may be brought about by restriction of breeding quarters, as in the case of the cosmopolitan sand martin or bank swallow (*Riparia r. riparia*), or of the gannets and petrels, which breed on rocky islets.

The bird population and the manner in which it is distributed at various seasons are, therefore, controlled within fairly narrow limits by the amount of suitable food available and the periodic demand for nesting sites. But it is not to be supposed that such fundamental considerations are in any sense perceived or acted upon by the birds themselves. They do not, for example, settle the extent of their territories by elaborate calculations regarding the amount of food these may be expected to yield after the young are hatched.

Song and the Selection of Territory by the Male.—The process, which has been most clearly analyzed by Eliot Howard in the case of the English buntings, is much more primitive. In spring, in response to some internal organic change, the males of these species begin to isolate themselves from the flocks in which they have spent the winter. This isolation is at first only partial; each male continues to roost and feed with the flock but retires with increasing frequency to a particular domain, consisting say of a strip of hedge and its surroundings, or a patch of scrub, where he sings persistently and drives off other males of the same species. The true song, uttered at the top of the voice, is closely associated with territory holding, and is rarely or never delivered in a finished form unless the singer is on or in search of a private territory. It is not to be confused with the low inward subsong or undersong, sometimes called *recording*, which is uttered indiscriminately by females and birds of the year as well as by males assembled in winter flocks when singing in chorus. While there are many examples intermediate between these two, whose significance is a controversial question (they may simply express *joie de vivre*), it is no longer open to doubt that song in its most highly developed forms has the effect of proclaiming ownership of territory, thereby warning rivals that there is a prior claim on the ground, and informing females that an eligible male is in possession. It has therefore a double biological value in obviating the waste of energy involved in needless collisions—for no male

will approach the singer except deliberately to offer battle—and in attracting mates, for it is undoubtedly the females which wander most in search of mates, the males being tied to their territories. The acceptance of this view involves abandoning the old vague definition of song from a musical standpoint, since all performances having the same purpose must fall in the same class. Thus larks and pipits, for example, sing as they fly, using a particular style of flight reserved for that purpose; the appeal to the eye and the appeal to the ear can only arbitrarily be separated. And just as the hidden nightingale appeals to the ear alone, so apparently other territorial species appeal to the eye alone, such as birds which always occupy prominent observation posts. The soaring of birds of prey may sometimes serve a similar purpose.

How the Extent of a Territory Is Determined.—By degrees contact with the flock is relinquished, and the male spends all his time in the chosen territory, where by wandering restlessly about he rapidly develops a customary "beat," and a favourite singing stand. Till rival males settle in the vicinity this force of custom is the only limit to his boundaries. He is constantly patrolling them without knowing why, and on meeting a rival he is impelled to drive him away. But the strength of this impulse fluctuates; if the clash occurs on the very outskirts of the territory and happens to be nearer the chosen nest site of the invader, the invader will probably carry the day, for the full powers of resistance are only stimulated when the nest site and the immediately adjoining area vital to the food supply of the young are at stake. On such provocation a bird appears to become almost invincible against members of its own species. This accounts for the fact that while outlying parts of territories are often lost, and even whole territories change hands before breeding begins, it seems exceedingly rare for a pair with a nest and eggs to be deprived of their domain by birds of the same species, however severe the pressure. Thus the size of the territory may be reduced by competition to the minimum essential to the safety of the brood, but it cannot be reduced indefinitely. That such psychological reactions are in some way linked with the question of food supply seems clear from the fact that a sudden extraordinary local concentration of prey like a swarm of locusts, a plague of mice, or a rise of may fly, will at once cause a rush to the spot on the part of species interested and a complete local breakdown of any territorial system that has previously been in force. Immediately it becomes more profitable to fetch supplies for the brood at a distance than to collect them on the home domain the most exclusive species will temporarily change their mode of life. It becomes both impossible and unnecessary for those in possession of the scene of plenty to expel the host of trespassers attracted by it, and on the other hand the foragers have no more concern in maintaining the integrity of their own territories when there is better hunting outside them.

The Adjustment of Territory Under Economic Pressure.—Territory has therefore to be understood not as a rigid system of partition into small areas each occupied by a jealous pair, but as a delicately adjusted balance created and maintained by economic pressure and varying greatly in its details from time to time and from place to place according as the pressure varies. For the sake of clarity the foregoing sketch has had to be given a rather simpler and more clearly defined shape than is often found in practice; it is merely intended to illustrate some of the principles upon which territory is based, and must not be taken as immutable law or exhaustive treatment. There is, for example, a considerable proportion of nonbreeding birds, fluctuating from season to season, and generally largest in the case of the larger species, which are slow in coming to maturity. In the case of such migrants as many storks, terns and gulls, immature birds often remain throughout the breeding season in the winter quarters of the species, while others accompany the adults. But apart from immaturity it is undoubtedly common for fully grown specimens quite capable of breeding to fail to do so. Some of these remain in flocks or parties, wandering about over ground where no territory is held by pairs of their own species. A large number of males take up territories, but are so late in doing it, or so unfavourably placed, that they fail to attract a mate, and often desert the territory in search of one. It is from this class that solitary birds noticed in towns, or away from their natural environment, in the height of the breeding season are frequently drawn; it is also, among songsters, responsible for an utterly disproportionate share of the bird music of that period. The hens, with no obligation to tie themselves down to a territory, wander much more freely, and both sexes seem always ready to fill at a moment's notice any vacancies occurring through misadventure among the mated birds. While satisfactory data respecting the ratio of nonbreeding to breeding stock have yet to be secured this is undoubtedly an important factor, amounting in ascertained cases to as much as 40%.

That different species compete with one another for food is clear, but except with regard to nesting sites the frequency and manner in which this rivalry finds vent are still uncertain. The raven (*Corvus corax*) and the peregrine falcon or duck hawk (*Falco peregrinus*) are almost world-wide forms which often hold overlapping territories and come into collision with one another freely. But there are probably few species which coincide in range and have a diet and breeding habits so nearly identical that rivalry between the two is as severe as between members of a single race. No doubt rivalry is more often potential than effective; it is not in practice a question of "taking the bread out of one another's mouths," but simply of a situation from which such a crisis would rapidly develop if the existing checks were removed. In averting such a state of famine, enemies are of the greatest biological value to a species. The dominant forms on a given area will therefore comprise a community whose activities are partly complementary, partly competitive. The study of such interrelations is the subject of Ecology (*see* ECOLOGY, ANIMAL). There is however one aspect to be dealt with here—that of bird population.

BIRD POPULATION

During 1899–1901 F. L. Burns carried out a sectional bird census at Berwyn, Chester county (Pa., U.S.A.), and reported 588 pairs of native birds and 106 of English sparrows (*Passer domesticus*) on one square mile of ground. After that time a certain amount of work was done on both sides of the Atlantic, but data are still unsatisfactory for purposes of generalization. The available British results are fairly accurate and complete but very few, while the American are more copious but less reliable.

United States Bird Census.—In 1914 the national census obtained data on a large scale for the northeastern states and much more sparsely for the remainder. Observers were not always competent, and they sometimes misunderstood instructions. Nevertheless it was considered possible to work out a preliminary average for the states north of North Carolina and east of Kansas, the figure arrived at being 119 pairs per 100 ac. for farms and 175 per 100 ac. for woodland. In 1915 the average for farms rose to 125 pairs, and the average for woodland to 199. The plains region from Oklahoma to North Dakota reported 125 pairs per 100 ac.; the average of all counts from the southern states was 76 pairs of 23 species on 58 ac.; and in all states east of the 100th meridian density of farms was roughly 125-131 pairs per 100 acres. While the averages were therefore in reasonably close agreement, the separate areas varied greatly; 40 ac. of native prairie in South Dakota supported only 12 pairs, and 80 ac. in Kansas only 31 pairs (or 40 per 100 ac.) while a 40 ac. farm with orchards adjoining the latter had 49 pairs of the same species, yielding a density more than three times as high. Virgin land in Colorado gave a figure as low as five pairs per 100 acres. Toward the other extreme a 52 ac. peach orchard in Ohio held 150 pairs; a 40 ac. farm in Connecticut 188 pairs (including 8 of sparrows and 15 of starlings) while under strict protection 8 ac. at Olney, Ill., were made to hold 70 pairs of native birds, and 5 ac. near Washington (D.C.) possessed 135 pairs of 24 species (including a colony of 74 pairs of purple martins). An 80 ac. tract at Albany (Mo.) held in 1914 298 pairs, and 23 ac. of built-up village area at Chevy Chase (Md.) showed 148 pairs of native birds and 13 of English sparrows, the most numerous being the American robin with 19 pairs. The 256 ac. campus of Cornell university at Ithaca (N.Y.) gave sectional densities ranging from 104 to 412 pairs per

100 ac. with an average of 225, 56 of these being house sparrows. An average of all reports for two years gave seven pairs of American robins and 5½ of English house sparrows over all farms covered; Burns estimated the number of house sparrows in the United States east of the Mississippi at 165,000,000.

It will be clear from what has been said about territory that the reliability of these figures is seriously compromised by the fact of their being expressed in pairs instead of individuals. To assume, as was here done, that a singing male represents a pair is to beg an important question; there is no doubt that the males of many species reduce their volume of song, or actually discontinue it, at a fairly early stage. A large proportion of song delivered at the height of the breeding season is the product of unmated males. Such a census implies, moreover, that all birds secure mates every season, which is far from being the case. The same criticisms apply to some of the European data, next to be considered.

European Census Results.—R. J. Ussher and R. Warren (*Birds of Ireland,* 1900) made an incomplete but interesting attempt at an inventory of Irish heronries, which suggests that the number of breeding herons per 10,000 ac. in Ireland at the end of the 19th century was between three and nine, so that the total population might be estimated at about 20,000 birds. A full census of British heronries was undertaken during 1928 and maintained by samples subsequently. During 1928–38 the breeding population of about 8,000 herons nesting in some 300 scattered sites in England and Wales remained remarkably steady, but there was a serious set-back after the severe opening months of 1940. The fulmar petrel, *Fulmarus g. glacialis,* has been shown to have a population of some 120,000 breeding birds in the British Isles, one-third being concentrated in the Shetlands and another third in the small St. Kilda group of islands. The great crested grebe, *Podiceps c. cristatus,* has a population in Great Britain of about 3,000 breeding birds. Much census work was also done in England on the rook, while on the continent the common heron and the white stork, *Ciconia c. ciconia,* were studied over wide areas.

C. J. and H. G. Alexander found, in 1908, 555 pairs of migratory birds breeding on 8 sq.mi. at Tunbridge Wells, and 260 pairs on 4 sq.mi. at Wye, Kent. In the first case the willow warbler, *Phylloscopus t. trochilus* (188); whitethroat, *Sylvia c. communis* (101); chiffchaff, *P. c. collybita* (56); and tree pipit, *Anthus t. trivialis* (55) were considerably the largest items; in the second the willow warbler (88), tree pipit (35), whitethroat (30) and nightingale, *Luscinia m. megarhyncha* (25). E. M. Nicholson on a 40 ac. estate near Haslemere, Surrey, obtained in 1926 a summer population of about 290 adult birds, all those which bred upon or habitually foraged over the area being included. They reared altogether about 453 young, the proportion of fledglings varying considerably with the species. The main items were: chaffinch, *Fringilla c. coelebs* (35 adults and 49 young); British robin (30 a. and 45 y.); willow warbler (29 a. and 35 y.); blackbird, *Turdus m. merula* (26 a. and 35 y.); starling (16 a. and 37 y.); song thrush, *Turdus e. ericetorum* (14 a. and 21 y.) and hedge sparrow, *Prunella modularis occidentalis* (12 a. and 27 y.). A third of the breeding stock consisted of summer migrants, but the winter (December) population of this same area was hardly changed at 258, of which finches numbered 80 (two per ac.; chaffinch and lesser redpoll, *Carduelis flammea cabaret,* each 32); titmice 74; wood pigeon, *Columba p. palumbus,* 21; and starling 13. B. D. Nicholson by a monthly census of 20 ac. of private grounds at Alloway near Ayr, Scotland, obtained on Jan. 23, 1927, 136 birds; on Feb. 20, 262; on March 20, 213; on May 1, 236; on May 29, 230; and on June 29, 209. In January the dominant species were the blackbird (30), chaffinch (28) and blue titmouse, *Parus caeruleus obscurus* (24). The sharp rise during February was accounted for mainly by an increase of 68 chaffinches; on May 1 the chaffinch still showed 47, and on May 29, 46, or more than two per acre. The rise of the throstle from 0 in Jan. and 8 in Feb. to 36 in May, and of the greenfinch, *Chloris c. chloris,* from 0 to 24 in the same period, together with the decline of the blue titmouse (Jan., 24; Feb., 45; May, 5; June, 0), were the most striking fluctuations. The general density of about 10–12 birds per acre may be taken as a typical figure for such compact and highly favourable areas; adding the next in order of numbers (starling and British robin), the dominant species are equally characteristic. In Kensington Gardens, London (an area of 275 ac., where feeding on a large scale has produced a highly artificial bird community) far higher winter densities are recorded, and the average for the whole area in November worked out at 14.47 birds per acre.

On agricultural land the population, as a rule, is much more sparsely distributed. The Oxford bird census, by repeated counts during 1927–28, obtained winter densities of 1–2 birds per acre and a summer total of 444 on 231.6 ac., the dominant forms being blackbird (75), chaffinch (58), throstle (36), whitethroat (24) and British robin (22). But on fallow in autumn, concentration of finches, skylarks, etc., produced densities over limited areas of more than 30 per acre. On rough grassland extending over 153 ac. of the South Downs near Seaford, Sussex (with some low scrub, chiefly gorse), J. F. Thomas carried out a bird census 20 times during Oct. and Nov. 1927, the density fluctuating between 0.11 and 4.44 per ac. with an average of 1.24. The detailed results showed that, at any rate in certain localities, the numbers and proportions arrived at for the various species might vary widely according to the day on which the census was taken. Only those counts which are confirmed by several checks can be accepted as satisfactory.

A world bird population census was carried out in the case of the gannet, *Sula bassana,* which had a total strength estimated at *c.* 167,000 breeding birds, two-thirds nesting in the British Isles and the remaining third being divided almost equally between Newfoundland and Canada, and Iceland and the Faeroes Islands.

Game Birds and Birds in Sanctuaries.—More data are available in the case of species shot for game or protected in sanctuaries. It is estimated that the number of breeding pairs of herring gulls (*Larus argentatus*) on the German North sea coast rose from 5,000 in 1906 to nearly 18,000 in 1923. The rise seems to have been general and is not attributable to the establishment of state sanctuaries, which harboured only 7,000 of the 1923 stock. Nevertheless, the multiplication of gulls at the expense of other species was in certain cases very marked; on Memmert the 1906 population of 550 breeding pairs included 80 of herring gulls and 400 of various species of tern, while the 1923 population of 9,700 pairs included 5,500 of herring gulls and 4,020 of terns. These figures were obtained with a high degree of accuracy by marking the nests with numbered pegs; a system which had to be discontinued elsewhere on account of the disturbance involved. In the Alps of Dauphiné (southeast France) a sectional census by E. M. Nicholson during July–Aug. 1927 resulted in densities varying from approximately 0.4 birds per 100 ac. in barren valleys between 7,240 ft. and 10,500 ft., to 7.8 in the zone between 5,300–5,700 ft. The general distribution was two to four birds per acre between 2,370 ft. and 5,000 ft.; about six per acre for 5,000–6,000 ft. and about 0.05 per acre above 6,000 ft.

Population and Rate of Reproduction.—Available figures indicate that the bird densities in cultivated and wooded parts of Europe and North America are remarkably similar, having a general average over large areas of one–four birds per acre, with a handful of species dominant. Satisfactory data from other parts of the world are wanting. Bird population tends to be lowest on wide tracts with sparse cover, and highest in small pockets formed by orchards and homesteads, open towns or villages, lakes, sea cliffs, and other obvious points of concentration. In such extreme cases as rookeries of the Adélie penguin (*Pygoscelis adeliae*) a density above 250 per acre may be maintained over as much as 30 sq.mi., but an upward limit is invariably set by the quantity of accessible food resources.

Other factors besides food supply may limit or frustrate reproduction. A. L. V. Manniche (*Meddelelser om Grenland,* xlv, 1910) found that in northeast Greenland during the highly unfavourable summer of 1907 the entire sea bird population migrated early without having been able to breed. The king eiders (*Somateria spectabilis*), paired and took up territory, "but no signs of open sea water appearing as yet the birds assembled in



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PROTECTIVE AND DAZZLE COLOURATION OF TROPICAL AMERICAN BIRDS

1. Parrot (*Amazona farinosa*). 2. Toucan (*Ramphastos swainsonii*). 3. Trogon (*Chrysotrogon caligatus*). 4. Toucan (*Pteroglossus torquatus*). 5. Parakeets (*Forpus passerinus*). 6. Macaw (*Ara macao*). 7. Trogon (*Curucujus massena*). 8. Motmot (*Baryphthengus martii*). 9. Toucan (*Ramphastos piscivorus*). 10. Woodpecker (*Scapaneus malherbii*). 11. Oropendula (*Zarhynchus wagleri*). 12. Parrot (*Amazona autumnalis*). 13. Parrot (*Brotogeris jugularis*). 14. Manakin (*Pipra mentalis*). 15. Egrets (*Casmerodius albus*). 16. Puff-bird (*Malacoptila panamensis*). 17. Curassow (*Crax rubra*). 18. Tinamou (*Tinamus major*). 19. Quail-dove (*Oreopeleia montana*). 20. Wood-rail (*Aramides cajanea*). 21. Antbird (*Formicarius analis*)

small flocks instead of building their nests, roving about for some days in the fresh waters and leaving the country at last altogether." In all regions bad weather at a critical period may destroy a large part of the product of the breeding season, and beside such catastrophies there is abundant evidence that fertility and mortality among young birds, before and after hatching, vary considerably according to locality and season. Clearly in the case of a more or less stationary population the number of eggs laid per annum must approximately equal the number of deaths from all causes. Among nidicolous young the losses at an early stage are very heavy. Thus B. D. Nicholson on the 20 ac. at Alloway already described, observed, during 1927, 156 nests containing 687 eggs (disregarding those in which no laying took place). Of these only 420 were hatched and 300 fledged. Other British statistics, which are very few, show between 40% and 60% of eggs laid as being destroyed before fledging, and a similar rate of loss is probably maintained until the young are able to fend for themselves. In an average year, apart from migration, the bird population at the end of the breeding season is probably only about double what it was at the beginning. In tropical countries there is no definite breeding season, nests of many species being met with in every month of the year. J. P. Burkitt, in the case of the British robin, shows reason to believe that not more than 0.8 young per pair survive till the following breeding season.

Longevity.—Most small birds breed at the end of their first year, and appear to have an average life in a wild state of between two and six years. Marked swallows (*Hirundo rustica*) have on more than one occasion been recovered at nine years old; gulls, plovers, ducks, herons and other larger birds frequently exceed this span. A certain great skua (*Catharacta s. skua*) at Herma Ness sanctuary, Scotland, is said to have lived there at least 32 years, and birds of prey are undoubtedly capable of still longer life. There is a satisfactory record of an eagle owl (*Bubo b. bubo*) still living in captivity at 68. But with the great majority of species generations are short and turnover rapid. The sex ratio is near equality, except in the case of polygamous species (various game birds, etc.), and a few like the European cuckoo (*Cuculus canorus*), which are polyandrous or promiscuous. Guthrie-Smith (*Bird Life on Island and Shore,* 1925), showed that the dark southern skua or sea hawk (*Catharacta s. lönnbergi*), breeding on islands off New Zealand, frequently if not habitually forms households consisting of two males and one female.

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BIRD NESTING

Bird-nesting is a general term for the collection of birds' eggs for preservation, with or without the nests themselves. The nests and eggs of wild birds are protected by local laws almost everywhere in both Great Britain and the United States. By law they may be taken for scientific purposes only, by special licence. Every egg, unless hard-set, should be blown as soon as removed from the nest. This is done by opening a small hole in its side by means of a drill with a conical head, manufactured for the purpose, a minute hole for the insertion of the drill head having first been made in the shell with a needle, which is then used to stir up the contents, so that they shall flow easily. A blow pipe with a curved mouth is then inserted, the egg is held hole downward, and the contents blown out. Should the egg be hard set a somewhat larger hole is made, and its edges reinforced with layers of paper pasted round them. Minute forceps are then introduced and the embryo cut into pieces small enough to pass through the hole. The inside of the egg is then rinsed out with clean water, and also before being placed in the cabinet, with a solution of corrosive sublimate, which prevents decay and consequent discoloration of the inner membrane. Finally the egg is placed with the hole downward upon a sheet of white blotting-paper to dry. The authentication of the eggs is the most important duty of an egg collector, next to identifying the specimens.

Many ornithologists hold that bird-nesting should be discouraged as a serious menace to all the rarer birds.

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BIRDS, MIGRATION OF. In general terms the entire world is familiar with bird migration. East and west, and in both hemispheres, human races are acquainted with the seasonal movements of the commoner species of birds. Practically the world over, the annual arrival of some well-known songster has become a local symbol of spring, tangible recognition of the fact of migration. Such interest, moreover, is very old. Homer (*c.* 1,000 B.C.), makes specific reference to bird migration as such; the Bible has a number of similar references, while the fertile brain of Aristotle (384–322 B.C.) not only recorded migration dates of numerous fowl but indulged in the first speculations as to the whither and the wherefore. Actually one may assume that observations of this nature long antedated the art of writing, for palaeolithic man had taken enough notice of birds to carve them and draw them at about 40,000 years B.C. Following the dark ages, interest in bird migration gained momentum. It grew particularly during the 20th century which witnessed the birth of the idea of bird banding, and brought in the first attempts to treat the subject on the scientific basis of experimental biology.

Definition of Migration.—In the northern hemisphere, sedentary bird populations are the exception, not the rule. The vast majority of species tend to move from one place to another, going north in the spring and south in the fall, or moving from the lowlands to the highlands or from the interior to the seacoasts. This, in the rough, is what is meant by migration. In the matter of time, these movements are not undertaken at random, for they occur primarily at the spring and the fall of the year; in the matter of space, they are typically not random either, for each species has a characteristic winter and summer distribution.

It is a familiar fact that birds arrive in the spring to breed, and depart again in the fall, or that they arrive for the winter and leave again in the spring to breed elsewhere. From this one may infer that breeding is directly involved in inducing migratory movements, a fact clearly recognized by Hans Gadow in the best definition of migration yet devised: "Migration is the wandering of living creatures into another, usually distant, locality in order to breed there; this implies a return, and the double phenomenon is annual. All other changes of the abode are either sporadic, epidemic or fluctuating within lesser limits."

It is sufficiently obvious that during the breeding season, while nesting, birds must remain stationary for the time being. Since it is the summer that provides ideal breeding conditions, with its moderate temperatures, long days and unlimited food supply, it is then that most species reproduce. Investigations, particularly in the United States, show that many species are almost equally sedentary during the winter. Theoretically, therefore, migration should be restricted to the spring and fall of the year. In actual fact, however, in the northern hemisphere, there is hardly a month in which migratory movements cannot be observed. Migration takes time, its duration depending on distances covered, the constitution of the species concerned and whether it breeds early or late. Many passerine birds travel only a few hundred miles between wintering and summering grounds: in contrast are numerous shore birds which winter in the southern hemisphere and breed within the Arctic circle. However strong they may be on the wing, a journey of many thousand miles inevitably consumes time. It has been calculated that the arctic tern, which may do a round trip between breeding seasons (lasting two

months) of 22,000 mi. from Arctic to Antarctic and back again, must average 75 mi. of flight per day for every day of the intervening ten months. If it rests at the southern end when it gets there, its average rate of travel must exceed that figure. Winter and summer months are thus incorporated in the travel period.

In the fall migration, in which the young of the year swell the total numbers, the rate of travel is slower and the period more protracted, for the parents may leave either ahead of or after their young, so stretching the time required by the species as a whole. This is commonly the case with shore birds, in which the parents typically leave their young behind them almost as soon as they can fend for themselves; the family follows after, sometimes weeks after. At high latitudes, through which pass many such species, the earliest of the parents, which may only have reached their breeding grounds in June, begin to return again in July, but the last of their young may still be straggling south in October.

The picture is further complicated by certain erratic species to whose movements the term migration can hardly be applied at all. They include, for instance, the Bohemian waxwings, crossbills and grosbeaks on the American continent. These species wander, apparently from one good feeding zone to another regardless of the points of the compass, while in some years they do not move at all, but winter and summer on the same spot. Their breeding periods are also erratic: in the British Isles the crossbill has been known to breed in 10 months out of the 12.

Direction of Migration.—In the northern hemisphere it is customary to speak about north and south migrations. This will pass as a generalization, but in detail it is anything but correct, for many species travel southeast rather than south in the fall and northwest in the spring, while others may go directly east or west first before starting south. Thus adults of the American golden plover (*Pluvialis dominica dominica*) go east from the Canadian Barren Grounds on which they breed, to Labrador, before starting southward over the Atlantic ocean to end finally in the Argentine. Endless variants of this scheme exist. In final analysis, however, northern species winter at the southern end of their range and breed in the northern, the reverse applying to migratory species of the southern hemisphere.

Summer and Winter Requirements.—If one considers only the tropics where conditions remain equable the year around, migration may appear to be a gratuitous undertaking. In the higher latitudes of the northern hemisphere, however, it is patent that most species could not survive the drastic conditions of winter. Since birds do not hibernate, the only alternative is to move to milder regions. Insectivorous species subsisting solely on adult insects obviously would have to go, likewise most waterfowl; seed eaters might also have to depart, depending on their particular requirements; certain birds of prey, especially those dependent on small rodents which either hibernate or live entirely beneath the snow, could not remain. Food may, therefore, be definitely said to be a limiting factor which, by eliminating those sedentary individuals that have remained behind during the ages, has selected those showing the life-saving migratory tendency. Migration may in this way have become established. The case for food shortage, however, is not as obvious as it appears. Crows, for example, which are among the most regular migrants of the higher latitudes, survive without difficulty if forced to remain in the north over winter. They have no more trouble eating frozen garbage and berries than their resident relatives, magpies and ravens. Yet crows, nevertheless, migrate.

Temperatures in themselves probably count for little. Even domestic canaries suffer no ill effects out-of-doors at −30°, −40° or −50° F., while no native species that has been confined in aviaries in the far north has shown more than the passing discomfort of resident birds at these extremes, provided that the food supply remains adequate. But even a brief shortage of food results in a high rate of mortality. Since such shortage is frequently due to snowfall or weather conditions other than low temperatures, in final analysis food supply must be considered the crucial factor. The short duration of the winter day-length in the north is also important, for enough daylight in which to find a sufficiency of food is obviously vital.

With many species of northern birds, therefore, it may be assumed that food supply has conditioned their migratory habits. But what of the northern migration in the spring? Why should birds comfortably wintering in the tropics or subtropics bestir themselves to go north? Certain advantages are obvious, for instance, the mere fact that myriads of birds disperse themselves for the breeding season over vast areas of the northern hemisphere, insures a better food supply for themselves and their young, while the extra day-lengths of the north give them more time for food gathering. It has been statistically shown that northern species of familiar genera of birds tend to produce more eggs to the clutch and more clutches to the season than their relatives permanently resident at lower latitudes. But can that be held to account for the habit of northward migration? In itself, the answer is probably no, but in conjunction with what must have been the evolutionary history of migration through the millennia, the answer is almost certainly, yes, for there is no doubt that migration has survival value. Having once started on a small scale, it has tended to improve itself as the ages have passed.

Migration is commonly considered extremely hazardous. Normally it is nothing of the sort. A bird spends most of its day on the wing wherever it may be, whether in an aviary, on its breeding or wintering grounds, or on migration, and actually it makes little difference whether it flies around at home in the north (as many species actually do prior to migration), or is wending its way southward by easy stages in the fall. As long as a suitable food supply remains adequate, it matters little whether it is moving south or remaining at one spot. There are exceptions, of course. Small birds crossing large bodies of water, such as the great lakes on the American continent or the Mediterranean or Baltic seas of Europe, are naturally taking chances, for an untimely storm may then decimate their ranks. Extraordinary catastrophes have overtaken birds under these conditions but they are exceptional, not general.

Although many birds migrate by day, large numbers travel almost exclusively by night even though diurnal in their normal habits. What distances are covered at one flight remain unknown but the mere fact that shore birds arrive on their northern grounds frequently so tired that they sleep away the morning hours after arrival, indicates that the last lap has been longer rather than shorter. The Pacific golden plover reaches Hawaii from Alaska, a distance of about 2,000 mi., with no land intervening. European peewits have crossed the Atlantic ocean in large numbers successfully. Land birds that travel by day appear to do so in more leisurely fashion. Crows, for instance, are doing well at 30 mi. per day and probably never exceed 50 mi., feeding as they go (figures based on actual records of banded crows).

Regularity of Migration.—One of the outstanding features about migration is its punctuality, a statement that has been combated by various writers, but it depends on one's viewpoint. As just mentioned, migratory movements occur through much of the year: one might take that to indicate irregularity. Actually, when species by species is analytically examined, the perfection of the timing mechanism is striking. Adverse weather conditions must inevitably have a retarding effect on small birds: however true their migratory clock (whatever it may be), environmental interference must play a great part in disturbing its accuracy. But this is not necessarily the case with larger birds, better equipped to meet emergencies. Thus the greater yellowlegs (*Totanus melanoleucus*) which breed in the Canadian muskegs after having arrived from Patagonia, a flight of 8,000 to 10,000 mi., have hatched their first eggs between May 26 and 29, inclusive, through 14 years of watching; such precision is almost incredible. Lighthouse keepers on the European coasts, stationed on rocks frequented by breeding colonies of marine birds, expect the first individuals back on a specific day each spring. These oceanic species are designed to stand anything at all in the way of weather, which with them virtually counts for nothing: their arrival dates are all but infallible.

Banding has shown that individuals of many species return an-

nually to the same locality and many to an identical nesting box or nest, another aspect of migratory precision. It suggests a close adherence to a particular fly line, but there are many exceptions. Waterfowl, for instance, may prefer a route one year lying hundreds of miles east or west of the previous year's. (*See* BIRD BANDING.)

Altitude and Velocity.—Earlier observers thought that birds habitually travelled very high and very fast (*cf.* Gätke, *Die Vogelwarte Helgoland,* Braunschweig, 1891): this is now known not to be so. Modern information derived from motorcar speedometers, from aeroplane pilots and banding records, indicate that altitudes of 3,000 ft. or over are exceptional, while typical speeds range only from 20 to 60 m.p.h., even for the larger species. Many birds habitually migrate at only a few feet above ground or water level: in crossing mountains, on the other hand, altitudes of 10,000 ft. and over are attained.

Homing and Migration.—From what has already been said, it is clear that there is some relation between homing and migration. When a flicker or bluebird returns from the south year after year to the same nesting box, there is no essential difference between this performance and the return to the same box after a feeding foray, except in the matter of scale: in the one case the bird travels hundreds (or thousands) of miles, in the other merely yards. It is probably this aspect that has led to the common belief that all birds find their way on migration by means of landmarks and memory. That may be so in some cases, but is not universal. The young of many shore birds, for example, whose parents have deserted them from four to eight weeks before they start their own southward journey, nevertheless reach the correct wintering grounds in due course, never having travelled before. Landmarks can have no meaning for them; their very destination is unknown. The classical example is the American golden plover. While the adults fly south via the Atlantic seaboard, the young independently follow an entirely different route over the interior of the American continent; but adults and young finally winter together in the Argentine.

An experiment in 1941 with young crows, caught and held in Alberta, Canada, till all other crows had left, showed that these untutored and unversed juveniles adopted the regular fly line to Oklahoma as directly as any experienced adults liberated under similar conditions in previous years. Certain species of antarctic penguins undertake lengthy migrations. Since they are flightless and, in fact, do much of their travelling under water, landmarks cannot figure at all in their oceanic journeyings.

Homing is a return to a familiar home: topographical memory may play a dominant part, but not necessarily. J. B. Watson and K. S. Lashley's experiments with homing sooty and noddy terns, and later R. M. Lockley's with shearwaters, have shown that some birds can find their way back to their nesting sites over enormous distances (up to 930 mi. certainly and possibly 3,700 mi.), without known landmarks. Migration, as in the case of the young plovers, may mean precisely the opposite to homing—a desertion of home for unknown fields. In this case landmarks and memory can play no part at all. As to possible explanations of this remarkable performance, none exist that bear critical examination.

The Mechanism of Migration.—Some advance has been made in understanding some other phases of bird migration. Apart from the direction-finding abilities of birds, the problem of migration presents two main aspects, the one a thing of the past, the other of the moment. Routes, dates, speeds, etc., reflect the past, all integral factors in the evolution of migrations. But annually, at the appropriate date, something releases the impulse that takes a bird north or south: it happens each year: it should be open to experimental analysis. One might suppose, for instance, that certain factors of the environment stimulate the migratory urge in spring and fall, while in the absence of such stimuli, during winter and summer, the bird remains sedentary. Food supply, temperatures, barometric pressure, even the autumnal colour changes in the leaves of trees, have been suggested as possible stimuli. However, when one considers the annual vagaries to which all of these are subject, it becomes difficult to accredit the extreme regularity of migration to any of them, they are too unstable.

The most consistent key to seasonal change is day-length. In the northern hemisphere, at a stated latitude, the day-length is the same at any given moment of the year; in the fall, the day preceding it is longer and the day following it shorter, the opposite being true of spring. These changes take place with unfailing regularity year in and year out. Day-length might well provide the environmental stimulus, for its own infallible regularity conforms with that of migration.

It has long been known that the reproductive organs of birds in both sexes undergo profound seasonal changes. During the winter they are very small: in early spring they begin to enlarge, and at the breeding season have attained their maximum size. As the summer progresses they again begin to diminish, finally to return to their winter minimum. Since certain internal secretions are produced by these glands on the activity of which are known to depend annually recurring patterns of sexual behaviour, and since migration can legitimately be considered part and parcel of such behaviour, the concept of breeding is incorporated in our definition. One might argue that migration depended on the following train of events: as the days increase in spring, the birds enjoy more activity daily; increasing activity induces the annual recrudescence of the reproductive organs and the elaboration of their internal secretions; these, in turn, provide the physiological stimulus for the northward migration. This line of argument led to the initial attempts in 1924 to apply the experimental method to bird migration. Juncos (*Junco hyemalis*) passing south through Alberta were trapped in September; some were housed in aviaries and at nights were given gradually increasing increments of artificial light in simulation of spring days; others were kept separately without artificial light on the shortening day-lengths normal to autumn. In two months the birds on the increasing light schedule began to sing: by the end of December their reproductive organs had reached spring development. Temperatures during these three months had varied from the freezing point to −52° F.: the rising temperatures of spring had formerly been considered the stimulus that induced the annual enlargement of the sex organs. These low temperatures eliminated that viewpoint for good: the first point was established.

The next step was to liberate birds in the sexual phase of spring from the illuminated aviary, as well as samples of midwinter individuals. A majority of the former disappeared on release: all the latter remained in the neighbourhood, finally to be recovered in traps, suggesting that the migratory urge might actually have been aroused in the illuminated birds. To settle this point, crows in large numbers were next used. They were submitted to the same conditions as these experimental juncos in the matter of light and then liberated together in late November. The experiment was organized in central Alberta. Through a carefully prepared publicity campaign, with rewards on some of the birds, and all of them banded, the whole of the province, as well as the northern tier of the United States, was invited to retrieve these birds by any means. Most of them were shot, the point of recovery and rate of travel being recorded and mapped, while post-mortem examinations of the corpses were subsequently carried out. Of two experiments undertaken (1929 and 1931), involving several hundred birds, more than 60% were recovered: a number had travelled northwest, the habitual spring direction. All of these northbound individuals came from the illuminated aviaries, with sex organs intact: castrated individuals, whatever their treatment, failed to reverse their direction, although many of them travelled southwest enroute for Oklahoma instead of remaining sedentary.

These experiments have shed some interesting light on the possible mechanism of migration. The sense of direction of crows was forcibly brought out: the fact that the migratory habit is inherent and not evoked annually by such factors as food shortage, changes in temperature or the colours of leaves, may also be inferred. These, and barometric pressure may, however, exert an important subsidiary effect, for it is well established that a rising barometer and falling thermometer, both in Europe and North America, may incite southern movements on an enormous scale at

a particular moment in the fall, but these birds are already preconditioned by other factors. The same meteorological combination during summer or winter evokes no response whatever.

To conclude: the evolution and historical aspects of migration may possibly forever remain a closed book; the mechanism of migration as it occurs is open to experimental solution, with a start already established; the sense of direction should also be open to scientific analysis although no attempts at elucidation have hitherto borne fruit.

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BIRDS, PROTECTION OF. The protection of birds has been rendered necessary by their excessive destruction in various ways including: (a) hunting abuses and unregulated hunting of game species (examples, extinction of the Eskimo curlew and the heath hen in America); (b) commercial destruction for market (extinction in America of the passenger pigeon which once existed in millions, one town sending 11,000,000 to market in 1869); (c) trade in ornamental plumage (near-extermination of the egret in America and other birds elsewhere which brought about the plumage acts of the United States in 1913 and of Great Britain in 1921); (d) inordinate collecting of skins and eggs of rare species (examples in England are the Dartford warbler and the osprey); (e) destruction of environment through spread of populations, draining of swamps, felling of timber, etc. (disappearance of the ivory-billed woodpecker in southern U.S.); (f) introduction of exotic birds and mammals which prey on or compete with native species (extinction of certain ground-nesting birds in the West Indies due to the introduction of the mongoose). Often a combination of causes affect the status of a species. Island bird populations are the most vulnerable, a conspicuous example being the Hawaiian Islands which have lost a very large percentage of their original avifauna.

Protection in Early Times.—A familiar verse in Deuteronomy which forbids the taking of the mother bird with the young is the first record of a law for the protection of birds. Biblical and classical allusions to the snare, the fowler and the cage indicate at what an early period men set about capturing birds for profit and pleasure. In ancient Egypt and India certain kinds, such as the ibis and the hoopoe, were held sacred, but this had no effect upon the treatment of birds in general. Conditions in Rome during the decadence of the empire are recorded by Sulla, who describes the *ornithons* and aviaries where birds were fattened for the table or kept blinded as pet songsters. One establishment in Sabinum, he says, could supply 5,000 thrushes in one year. These things were the precursors of the *roccoli* for wholesale snaring of birds in Italy today, and of the netting of quails (1,000,000 in one year) in modern Egypt to supply European gourmets.

Protection was first afforded in the interest of sport or of the nobleman's larder; game birds became private property, and the earliest laws were framed for the purpose of reserving to the landowner the right of killing certain food birds and of insuring the safety of the falcon tribe for his sport. In Britain there were laws of this kind in the reigns of Henry VII and Henry VIII, providing for penalties, with heavier punishment for the taking of certain eggs. "For two thousand years," comments a U.S. writer (G. I. Hartley), "the birds of Europe were considered the property of anyone who desired to take them. Only game birds were vouchsafed any protection, and they were reserved for slaughter by persons of rank."

Recognition of the Economic Importance of Birds.—In the course of centuries a growing consciousness of the bird's place in the economy of nature was forced upon men's minds. The imminent peril to food crops should rodents and insect pests get beyond human control became apparent. Upon an increasing knowledge of this danger are based the great majority of protection laws in all lands. Practically all of these laws had their birth in the 19th century. Two definite lines of protection were thus set up and two theories of ownership in birds recognized; viz., the rights of individual owners and the rights of the community. In mediaeval times the peasant looked upon birds mainly as inimical to his interests, or merely as a source of income and food. The thinking classes began in time to view matters differently; but lack of research and of education by the state has left much of the old feeling with the country folk of today. "Birds are to be guarded against by the husbandman as being destructive," says the *Penny Encyclopaedia* of 1788. "It is now universally recognized that birds play a most important part in checking the ravages of various animal pests, particularly in the case of insects," writes Dr. W. E. Collinge (*Food of Some British Wild Birds*, 1927).

Protective Legislation.—England almost alone among European countries, has allowed aesthetic considerations to affect legislation. The first general British statute, that of 1869, was for the protection of sea birds, and was prompted by indignation at the winging of gulls for holiday sport and plumassiers' profit. Denmark, however, prohibited, in 1894, the shooting of song birds throughout the year, and a Dutch law of 1837 gave special protection to nightingales. The general principle of British legislation in force in 1928, founded on the Act of 1880, is that of protecting all wild birds during the nesting season; landowners and occupiers, however, having the right to take species not scheduled by the act or the local order; and of leaving further preservation to the option of county councils. Sweden had a code as early as 1834. Switzerland (1904), Spain (1896), Belgium (1873) and Holland (1880) have prohibited the taking of useful birds; the definition of "useful," exceptions and conditions varying in accord with national feeling. Norway, whose resources depend largely upon shooting and fishing, gives no protection to birds of prey, nor did Russia under the laws of the empire. Italy, in spite of provincial laws dating back to the first decade of the 19th century, continues to slaughter insect-eating migrants for the pot. The movement in Germany began among farmers and foresters in 1869, though the Grand Duchy of Hesse had protected birds useful to agriculture after 1836. This protection was vigorously conducted there and, especially, in Hungary, on strictly utilitarian lines. The pole trap was prohibited in Germany in 1908. It had been made illegal in Great Britain in 1904.

In all the great British dominions and colonies—Canada, Australia, New Zealand, South Africa and in India, legislation exists in the interests of agriculture, of ornithological science, and of the public in general. In Egypt much was effected under Lord Cromer and Lord Allenby. The great sanctuaries of Canada and Africa are comparable with those of the United States, a country in which bird protection has occupied a conspicuous place. In 1886 a model law was drafted by the American Ornithologists union, protecting all birds except game (otherwise dealt with) and the English sparrow. It has been adopted, with modifications, in many states. The first state law (for game) was passed by New York in 1791. Massachusetts forbade the "wanton destruction of useful and profitable" species as far back as 1818. The Biological survey (*q.v.*) is a leading factor in federal bird preservation. In 1913 federal law gave interstate protection to migrants. In Asia, the only considerable work has been started by Japan.

International Legislation.—Following national laws it became obvious that international legislation was essential to preserve migratory species. Various congresses advanced this contention. In 1900 a convention was signed in London by seven countries for the protection of animals and birds in a wide tract of Central Africa. An elaborate international convention, following a series of congresses, mainly at Vienna and Budapest, was signed in Paris in 1902 on behalf of Austria, Belgium, France, Greece, Luxembourg, Monaco, Portugal, Sweden and Switzerland. This, however, was intended to procure similar legislation throughout Europe for protecting useful birds, rather than to create international obligation for the preservation of international birds. More significant was the treaty signed by Great Britain and the United States in 1916 for the protection of insectivorous species throughout Canada and the United States. Later, official conferences were held in Washington (1926) to check discharge of oil upon the sea, with the collateral effect of saving sea birds from destruction; and in London (1927) for the better protection of

wild fowl. A treaty between the United States of America and the united Mexican states for the protection of migratory birds and game mammals became effective in 1937.

Above and beyond laws and conventions has been the continuous work of bird protection societies in many lands, associated with the provision of watchers and wardens to guard breeding-grounds of rare species, and with the education of children and the public generally regarding the life, habits and utility of wild birds. The oldest of such societies appear to be the English R.S.P.B., founded in 1889, and the National Association of Audubon Societies, founded in the U.S. in 1902.

(*See* also Biological Survey; BIRD SANCTUARIES; ORNITHOLOGY: *Bird Protection, Economic Ornithology.*) (L. G.; R. T. P.)

BIRD SANCTUARIES. The provision of sanctuaries in which birds may nest and live safe from molestation is one of the most effective methods of protecting birds. A sanctuary may be a nature reserve, where all wildlife is encouraged, or be maintained for the benefit of certain species. Protection may be afforded by the state, a municipality, a society, or a private individual; in any case the reserve must be secure from poaching or collecting. National reserves, many state-supported, are maintained in the British Isles, Canada, Australia, New Zealand, Africa and other parts of the empire, in the United States and various European countries. Municipal parks all the world over are, as a rule, effective sanctuaries.

Guarded reserves have saved from extermination many species of economic or aesthetic importance; the plume-bearing herons and egrets in America, the kiwis in New Zealand, the spoonbill in Holland, and the Kentish plover in England are examples. Protection societies usually aim at preserving all birds on a reserve, but this policy has drawbacks; not only may unrestricted increase of predatory species decrease the birds they feed upon, but more adaptable birds, becoming competitors for food and nesting sites, often crowd out those in greater need of protection. Black-headed and herring gulls are in some sanctuaries in Britain and Holland threatening the welfare of rarer birds, and in the Shetland reserves the great skua, nearly extinct before their foundation, is now a serious problem. Privately owned sanctuaries, some even game preserves, where discreet selection of species is the rule, have done much to protect and reinstate threatened birds.

The magpie, jay and other avian egg robbers often are too numerous in municipal parks and society reserves for the welfare of smaller passerine birds; but on private estates their depredations are checked. The re-establishment in East Anglia of the bittern as a nesting species is a triumph of private protection. In all parts of the world the preservation of undrained marshes, woodland, and untilled open country has justified the public and private expenditure and care bestowed upon them, by the increase of rare, formerly exploited birds.

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The United States.—Hundreds of millions of acres in the United States are bird sanctuaries in name or in effect. The first areas to be given warden protection were islands off the coast of Maine where herring gulls nested. There were but a few thousand of these birds still breeding along the New England coast, and hunters employed by the millinery trade had made plans to destroy the remnant, when in 1900 the National Association of Audubon societies initiated guardianship. The sanctuary movement which here had its inception was soon extended to the south-eastern United States where egrets and other large wading birds were on the verge of extirpation because of plume hunting. From that day, the egrets made a spectacular come back and by the 1930s had regained their former abundance, a few nesting as far north as New Jersey. Another outstanding proof of the effectiveness of patrolled sanctuaries is the increase of the roseate spoonbill on the Texas coast.

The first federal bird reservations were set aside in 1903 by executive order of President Theodore Roosevelt. Other refuges for birds and other wildlife were added during successive administrations and are under the direction of the United States fish and wildlife service. In 1941 the number of such refuges totalled 267 in 40 states, Alaska, Hawaii and Puerto Rico. All forms of wildlife receive protection on these refuges, but many were established for particular groups or species—178 for migratory waterfowl; 50 for colonial nongame birds; 14 for big game; and 25 for upland game, migratory birds other than waterfowl, and miscellaneous forms of wildlife. The aggregate acreage of these federal refuges is 13,740,304 ac. The smallest of these are islets only an acre or two in extent where gulls and terns breed; the largest is the Aleutian Islands refuge in Alaska, with a total of 2,899,685 ac. In this vast sanctuary innumerable sea birds find protection as well as caribou and big brown bears. Typical of a well administered super-refuge for breeding waterfowl is the Bear River migratory bird refuge in Utah with an area of 58,816 ac. Similar super-refuges are located further south where waterfowl concentrate in winter.

Two of these are the Cape Romain refuge near Charleston, S.C. and the Aransas refuge on the coast of Texas. The refuges for nongame colonial birds need little management other than warden patrol. Typical is Johnston Island in the Hawaiian group where albatross, shearwaters, boobies, terns and tropic birds receive protection.

The United States national park service (1946) had under its jurisdiction 169 areas on which wild birds were protected at all times. These were classified as follows: parks (27), historical parks (4), monuments (86), military parks (11), battlefield parks (1), battlefield sites (7), historic sites (10), memorials (9), cemeteries (10), capital park (1), parkways (3). Their total area was approximately 20,500,000 ac. exclusive of private holdings.

Besides parks and big game preserves where all wildlife received the benefit of protection, there were three principal types of bird sanctuaries: those administered primarily for waterfowl and game birds; those for nongame water birds such as herons, pelicans, etc.; and those for song birds.

The United States fish and wildlife service, because of the source of its revenue, specializes in the first type, although all birds receive incidental benefit. The National Audubon Society has sanctuaries of all three types. The 40 sq.mi. Paul J. Rainey wildlife sanctuary in Louisiana was set aside for blue geese and ducks and the Roosevelt sanctuary at Oyster Bay, Long Island, for song birds, but most of the society's sanctuary efforts are directed toward the large ornamental water birds which have no value as game species: gulls, terns, pelicans, egrets, ibis and spoonbills—species with great aesthetic value and which are very open to destruction because of their habit of concentrating in large, vulnerable breeding colonies.

The National Audubon Society in 1941 patrolled 35 sanctuary areas. They were distributed as follows: Florida (8), Louisiana (1), Maine (2), New Jersey (1), New York (1), Pennsylvania (1), South Carolina (1), Texas (19), Virginia (1). The locations of Audubon sanctuaries vary somewhat from year to year dependent on the needs and movements of the birds.

Song bird sanctuaries are usually administered by local groups and individuals. Because of the territorial habits of song birds, their more wide-spread distribution and comparative freedom from persecution, such sanctuaries have little conservation significance unless operated also as educational projects in the manner of the Roosevelt memorial at Oyster Bay, N.Y., Moose Hill at Sharon, Mass., or Birdcraft at Fairfield, Conn. Each of these sanctuaries has a small museum and a nature trail.

A type of sanctuary, where the much-persecuted hawks receive protection at concentration points during migration has been established at Hawk Mountain, Pa. (Hawk Mountain Sanctuary association) and at Cape May Point, N.J. (National Audubon Society).

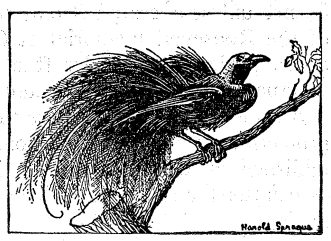
Many states established wildlife refuges which are breeding reservoirs for game species; assurance to sportsmen that there will always be enough seed stock to insure future hunting in the surrounding country. City and state parks are usually immune from hunting and likewise become in effect, bird sanctuaries.

(R. T. P.)

BIRD'S-EYE, a name applied to various small bright flowers, especially those which have a small spot or "eye" in the centre. The primula is thus spoken of, on account of its yellow centre, also the adonis, or "pheasant's eyes," and the blue veronica, or germander speedwell. The word is also applied to a sort of tobacco, in which the stalks (of a mottled colour) are cut up together with the leaves. From a similar sense comes the phrase "bird's-eye maple," a speckled variety of maple-wood, or the "bird's-eye handkerchief" mentioned in Thackeray's novels.

BIRDS OF PARADISE, the most beautiful birds in the world, are perching birds closely related to the bowerbird (*q.v.*) and crow, and belonging to the family Paradisaeidae. There are some 20 genera and 43 species, of which 17 genera and 35 species are confined to New Guinea and nearby islands (Japen, the Aru group and the archipelagos at the eastern and western ends of New Guinea); three species occur in the Moluccas, while several species of the less spectacular riflebirds (*q.v.*) are native to eastern Australia. The females and young are plain coloured, but the males are frequently rich in orange, yellow, green, blue, brown and red of many shades, with soft, velvety, long or peculiarly-shaped plumes. Some are rich black with iridescent colours, as in the riflebirds. Birds of paradise are distributed from the hot swampy lowlands through the forests of oak and beech to the upper tree line at 13,000 ft. on towering New Guinea mountains. They range from size of small thrush to magpie, and their plumes are spread in fantastic displays during courtship, solitary in most species but communal in the true plume birds (*Paradisaea*), the flagbirds (*Parotia*) and Macgregor's bird of paradise (*Macgregoria*). Some hang upside down while displaying their beautiful plumes to the female, some like the flagbirds sit on a low twig over a cleared "dance floor." Males do not usually participate in nest life, about which little is known. Eggs are generally orange streaked with brown. The largest and one of the best known is the great bird of paradise (*Paradisaea apoda*), skins of which first reached Europe on Magellan's ships. Prepared by natives who had cut off the legs, they were believed to have to fly continuously, to live in the sky high beyond human vision, the female incubating the egg on the hollowed back of the male. They were therefore named *apoda,* without feet. It is a beautiful species, rich in cinnamon and fawn, yellow on the head and back of neck, with emerald-green throat, and resplendent golden-whitish plumes cascading over the back from the sides of the breast. The lesser bird of paradise (*P. minor*) is a somewhat smaller, less brilliantly coloured species, also common throughout New Guinea. Plume hunting, each season just after the annual moult, began about 500 years ago, developed rapidly from 1880 to 1910—when 50,000 to 100,000 skins reached the European markets—and was finally prohibited in 1924. Birds congregate on special trees at the beginning of the breeding season, when the males display for the females (*see* Alfred Russel Wallace's *Malay Archipelago*). They are possibly polygamous.

Among the most beautiful are the blue bird of paradise (*P. rudolphi*), with delicate blue plumes spreading like a fan from the sides of the breast; the superb bird of paradise (*Lophorina superba*), a small dark bird with a conspicuous spreading breast shield of glossy green and a huge black velvet cape which can be raised over the head; the king bird of paradise (*Cicinnurus regius*), bright scarlet, with two very long thin-wire plumes from the tail with small coinlike green tips; the beautiful little golden-silky bird of paradise (*Loboparadisea sericea*); the magnificent bird of paradise (*Diphyllodes magnificus*), a small bird with spreading yellow, erectile cape or ruff, a glistening velvety breast-shield and two long coiled wire-plumes from the tail; the long-tailed flagbird (*Parotia wahnesi*), one of the six-wired birds of paradise, with a spreading "skirt" and a pair of triple-wires tipped with bits of feather, upward and forward from behind the eyes; the twelve-wired bird of paradise (*Seleucides ignotus*), with a magnificent large rich dark bib, bright yellow underparts and twelve long recurved wires from the tail; and the King of Saxony's bird of paradise (*Pteridophora alberti*), a small bird with two very long fern-frond plumes growing from the back of the head. These are all inhabitants of the forests of New Guinea. Wallace's standard-wing (*Semioptera wallacei*), a native of the northern Mollucas or Spice Islands, has a triangular, brilliant green breast-shield and two pairs of pale ribbonlike standards raised from the bend of the wings.



BY COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY

MARQUIS RAGGI'S BIRD OF PARADISE (PARADISAEA A. RAGGIANA, SCLATER), ONE OF THE LESS KNOWN MEMBERS OF THE BRILLIANTLY PLUMAGED FAMILY

Ten of the genera of birds of paradise are known to cross-breed and produce hybrids, and four species of *Paradisaea* have produced species hybrids, resulting in the naming of seventeen "rare species" of birds of paradise, usually described each from a single skin found among the tremendous numbers in European shipments.

(*See* RIFLEBIRD; MANUCODE; SELECTION: *Sexual Selection.*)

(G. F. Ss.)

BIRDWOOD, SIR GEORGE CHRISTOPHER MOLESWORTH (1832–1917), Anglo-Indian official and writer, son of Gen. Christopher Birdwood, was born in India on Dec. 8, 1832, and died at Ealing, London, on June 28, 1917. After taking his medical degree at Edinburgh, he joined the Bombay Medical service in 1854, and served in the Persian War of 1856–57. During 14 years' residence in Bombay he filled many important positions and rendered very great services to the community, which were recognized by his appointment as sheriff of that city in 1864. Ill health, however, compelled him to return to England in 1868, and in 1871 he entered the India office, where he served for the next 30 years. During this period he published an important book on the industrial arts of India, edited the ancient records of the India office, and first letter-book of the East India company; he also made arrangements for the Indian exhibits at the principal international exhibitions. He kept up a close connection with India through the many distinguished Indians visiting London, and he published several works on Indian botany, on which he was an acknowledged authority, and on Indian folklore. In politics he was a Conservative, and was one of the initiators of Primrose day. Birdwood was created K.C.I.E. in 1887.

BIRDWOOD, WILLIAM RIDDELL BIRDWOOD, 1ST BARON (1865–), British field marshal, born Sept. 13, 1865. He joined the 12th Lancers in 1885 and was (1886) transferred to the Indian Staff corps. After service in several frontier expeditions, and in the South African War (1899–1902), he was closely associated for several years with Lord Kitchener in India, acting as his military secretary. Lord Kitchener, in Dec. 1914, selected him for the command of the Australasian forces which were being assembled in Egypt, and in the following April he commanded this army corps in the memorable landing at Anzac. He was in charge of the troops clinging to this patch of the Gallipoli peninsula until August, and his personality won the confidence and regard of these Australasian troops in a unique degree. Birdwood carried out the masterly withdrawal of the Dardanelles forces from their dangerous positions in the following December and January. After a short period in Egypt he took his Australasian troops to the western front, where they played an important part in the last phases of the British advance in the autumn. For his services he was made a baronet, besides receiving a grant of £10,000. In 1920 he took up command of the northern army in India, was promoted field marshal in 1925, and was C.-in-C. in India 1925–30. He was Master of Peterhouse, Cambridge, from 1931 to 1938, when he was raised to the peerage.

BIREN (or BÜHREN), **ERNST JOHANN** (1690–1772), duke of Courland, was the grandson of a groom in the service of Duke Jacob III of Courland, who bestowed upon him a small estate, which Biren's father inherited. He received what little education he had at the academy of Königsberg, from which he was expelled for riotous conduct. In 1714 he set out to seek his fortune in Russia, and unsuccessfully solicited a place at the shabby court of the princess Sophia Charlotte, the consort of the



DRAWN FOR THE ENCYCLOPÆDIA BRITANNICA BY H. GRÖNVOLD

MALE BIRDS OF PARADISE

1. Princess Stephania's bird of paradise (*Astrapia stephaniae*)
2. King bird of paradise (*Cicinnurus regius*), second view showing bird with plumage spread
3. Superb bird of paradise (*Lophorina superba*)
4. Hunstein's bird of paradise (*Diphyllodes magnificus*)
5. Great bird of paradise (*Paradisaea apoda*)
6. Crown Prince Rudolph's bird of paradise (*Paradisaea rudolphi*) (blue bird of paradise), hanging by feet to display plumage
7. Republican bird of paradise (*Diphyllodes respublica*)

tsarevich Alexius. Returning to Mitau, he succeeded in gaining a footing at the court of Anne, duchess of Courland, through one of his sisters, who was the mistress of the ruling minister, Peter Bestuzhev, the lover of the duchess. Biren supplanted him in the favour of Anne, and from henceforth to the end of her life his influence over her was paramount. On her elevation to the Russian throne in 1730, Biren, who had in the meantime married Fräulein von Treiden, came to Moscow, and honours and riches were heaped upon him. At the coronation (May 19) he was made grand-chamberlain, a count of the empire, on which occasion he is said to have adopted the arms of the French ducal house of Biron, and was presented with an estate at Wenden with 50,000 crowns a year. He soon made himself cordially detested by Russians of every class. He was mean, treacherous, rapacious, suspicious and horribly vindictive. Half the bribes intended for the Russian court passed through his coffers. On the extinction of the line of Kettler, the estates of Courland, in June 1737, elected him their reigning duke. He was almost as much loathed in Courland as in Russia; but large sums of money, smuggled into Courland in the shape of bills payable in Amsterdam to bearer, speedily convinced the electors. On her deathbed Anne appointed him regent during the minority of the infant emperor, Ivan VI.

Biren's regency lasted exactly three weeks. At midnight on Nov. 19, 1740, he was seized in his bedroom by his ancient rival, Field Marshal Münnich. The commission appointed to try his case condemned him (April 11, 1741) to death by quartering, but this sentence was commuted to banishment for life at Pelym in Siberia. All Biren's vast property was confiscated, including his diamonds, worth £600,000. The ex-regent re-emerged for a brief moment in 1762, when the philo-German Peter III summoned him to court. Catherine II re-established him (1763) in his duchy, which he bequeathed to his son Peter. He died at Mitau, his capital, on Dec. 28, 1772.

See Robert Nisbet Bain, *The Pupils of Peter the Great* (1897); Christoph Hermann von Manstein, *Memoirs* (Eng. ed., 1856); Claudius Rondeau, *Diplomatic Dispatches from Russia* (St. Petersburg, 1889–92).

BIRETTA, a cap worn by the Catholic clergy. It is square and stiff, being made of a framework of cardboard covered with cloth or silk; on the top, along the sutures of the stuff, are three or four raised, boardlike, arched ridges, at the junction of which in the centre is a knob or tassel. Its colour varies with the rank of the wearer, that of the pope being white, of the cardinals red, of bishops purple, and of the lower clergy black. It is not in the strictest sense a liturgical headdress, its use not being confined to liturgical functions.

Though the form of the biretta, devised in the 17th century, is peculiar to the Roman Church, it is but a variant of the original *biretum,* "barret cap," which developed in various countries into head coverings of different shapes and significance. When the word *biretum* first appeared in the 13th century, it practically meant no more than "cap," and was used as a synonym of *pileus,* the skullcap used by the clergy, as a protection against cold. With the extension of its use, the custom grew up (*c.* 1300) of investing clerks with the *biretum* as the symbol of the transfer of a benefice, a custom which survives, in Roman Catholic countries, in the delivery of the red biretta (*zucchetto*) by the head of the state to newly created cardinals, who afterward go to Rome to receive the red hat.

This use of the *biretum* as a symbol of office or dignity was not confined to the clergy. It was worn by all persons of standing, *e.g.,* barons, judges, and doctors and masters of the universities. The "cap of maintenance" or "cap of estate," still borne before the British sovereign on state occasions, is a barret cap of the type of the 14th and 15th centuries; it is of crimson velvet, turned up with ermine. By the 16th century the barret cap in various forms had become the common headgear of all people of substance. By the 17th century it had given place in ordinary civil life to the brimmed hat; but in various shapes it still survives as official headgear in many European countries: the *barett,* worn by the Lutheran clergy, by German lawyers, and by the deans and rectors of the universities, the *barrette* of French judges and barristers, the "black cap" of the English judge, and the "college cap" familiar in English and American universities, and popularly known as the "mortar-board."

The ecclesiastical developments of the *biretum* are not without interest and significance. Originally this had been a round cap, slightly bulging out at the top, and ornamented with a knob. By the 16th century, both in England and on the continent, a tendency had begun to emphasize the ridges of the sutures and thus produce a square shape. Henceforth the evolution followed different lines. In England, in the 17th century, the square flat top began to be enlarged, forming a rim of thick stuff projecting beyond the close-fitting cap. This was the "square cap" denounced by the Puritans as a symbol of high church Erastianism. With the triumph of high church principles at the Restoration, a loyal clergy desired to emphasize this squareness, and the consequent exaggeration of the square top of the cap necessitated a further stiffening. In the 18th century, accordingly, the top began to be made of a board of wood or card covered with cloth, the close-fitting cap proper retired farther from the edges, the knob developed into a tassel, and the evolution of the modern "college cap" was complete.

On the continent, meanwhile, in the Roman Catholic Church, the *biretum* had also developed into its present form, and by a very similar process. At the beginning of the 17th century cardboard was introduced to stiffen the sides of the cap and emphasize the squareness, and the form of the biretta, as described above, became fixed.

The use of the Roman biretta has been introduced by a certain number of the clergy into the Anglican Church. There is no historical justification for this; for though both college cap and biretta are developed from the same "square cap," the biretta in its actual shape is strictly associated with the post-Reformation Roman Church, and its actual ceremonial use is of late growth.

BIBLIOGRAPHY.—*See* J. Braun, *Die liturgische Gewandung* (Freiburg, 1907); *Hierurgica Anglicana,* part ii (London, 1903); H. Druitt, *Costume on Brasses* (London, 1906).

BIRGER (d. 1266), Swedish statesman, nephew of Birger Brosa, and the most famous member of the ancient noble family of the Folkungeätten, was created jarl of Bjälbo by King Erik Eriksson in 1248 and married the king's sister. On Erik's death (1250) Birger's son Valdemar was elected king while his father acted as regent. During the 16 years of his sway Sweden advanced greatly in fame and prosperity. In 1249 he led an expedition to Finland, built the fortress of Tavastehus, and thus laid the foundations of Sweden's oversea empire. He also built Stockholm and enriched it by making it the chief mart for the trade of Lübeck, with which city he concluded a commercial treaty. In his old age he married the daughter of King Abel. There is a fine statue of the great jarl in the Riddarholm church at Stockholm, erected by Fogelberg at the expense of the Stockholm magistracy in 1884.

See *Sveriges Historia,* vol. i (1879–83).

BIRIJIK, Turkey, a town on the Euphrates in 37° N., 38° E., about 15 mi. above the railway bridge at Jerablus; it is on the telegraph line and the caravan route to Aleppo, Diarbekr, etc., and has an estimated population of 19,000, among whom are Armenians, Arabs, Jews, Kurds and Turks.

The town lies in the centre of a district engaged chiefly in the cultivation of barley and wheat, and has a certain amount of trade—mostly locally, on the Euphrates—in agricultural products, butter, grapes and olive oil. It is also a sheep market, and has a small industry in boat building.

BIRJAND, a town of Iran in the Kain district of the province of Khurasan, 35° 53′ N. and 59° 10′ E., built on low hills in a barren and treeless valley, on a plateau 4,440 ft. in elevation, and divided by the broad bed of a river. The population is believed to number approximately 12,000. It is a busy commercial town with good caravanserais and a college. It is situated 328 mi. south of Meshed on the main road to railhead at Zahidan. The surrounding district has long been famed for its carpets, which almost all come from Durruksh about 50 mi. to the northeast. Saffron is very extensively cultivated round Ghain, a town of about 9,000

population, well known for its large carpets. The barberry grows to perfection at Birjand. Wheat and barley, sufficient for local needs, are grown in normally good years. The water supply in the surrounding country is scanty. The inhabitants include a strong Sunni element; the Afghan community is also strong, and in Birjand itself and among the nomads of the region there is a large Arab-speaking element.

There is a British vice-consulate and a telegraph office at Birjand, having direct communication with Meshed and Zahidan (formerly Duzdab).

See P. M. Sykes, *10,000 Miles in Persia* (1902).

BIRKBECK, GEORGE (1776–1841), English physician and philanthropist, was born at Settle in Yorkshire on Jan. 10, 1776. In 1799, after graduating as doctor of medicine, he was appointed to the chair of natural philosophy at the Andersonian institution of Glasgow. In the following year he delivered a free course of scientific lectures for working men. He removed to London in 1805, and there, in 1823, he helped to found the Mechanics' institute, the name of which was afterward changed to Birkbeck institution or college, in honour of its founder. He was appointed director of the institute, which he had originally endowed with the sum of £3,700, and held the office till his death on Dec. 1, 1841. The scope of the institution was gradually extended, and an enlargement of the buildings was carried out in 1883–85. The college became a constituent college of London university in 1920.

See C. Delisle Burns, *A Short History of Birkbeck College* (1924).

BIRKENFELD, a market town in west Germany, 25 mi. E.S.E. of Trier, capital and seat of government of a province formerly belonging to Oldenburg. Pop. 3,194. The province (formerly principality) of Birkenfeld, wholly surrounded by Prussian territory, had a population of 58,532 in 1933. In 1937 by an exchange of territories for the sake of administrative simplicity, Oldenburg ceded Birkenfeld to Prussia. Ironstone and roofing slates are quarried and agate polishing is practised at Idar. The country is hilly and well forested.

BIRKENHEAD, FREDERICK EDWIN SMITH, 1ST EARL OF (1872–1930), British politician and lawyer, was born at Birkenhead, July 12, 1872. He was educated at Birkenhead school and Wadham college, Oxford, where he was a scholar. He took a first class degree and in 1894 was president of the Union.

Choosing the law as a career, Smith was called to the bar at Gray's Inn in 1899, and later attached himself to the local bar at Liverpool, where his natural abilities swiftly gained him a considerable practice. Following his Oxford tradition as a Conservative, he was adopted as candidate for the Walton division of Liverpool and made a speech at a public meeting which greatly impressed Joseph Chamberlain. Elected M.P. for Walton in 1906, he held that seat until raised to the lord chancellorship in 1919. He signalized his entry into the house of commons by delivering from the broken ranks of the Opposition, a maiden speech of brilliant mockery which made his reputation. A rapidly growing practice at the London bar, where he took silk in 1908, hindered him from pursuing the regular routine of parliamentary opposition.

His forensic style differed from his method of public oratory. He inclined to be quiet, dispassionate and deadly in cross-examination. A tremendous worker at the bar, he undertook tasks which would have overwhelmed most men in combining law and politics. After the retirement of Chamberlain popular Conservatism found in him its most telling exponent, and in the art of the platform even Lloyd George had to reckon with him.

Smith took a prominent part in the struggle over the parliament bill. He moved its rejection on the third reading, May 1911, and threw in his lot with the die-hards, who desired the peers to reject the measure. His growing position was recognized by a privy councillorship in 1911 and he became an accepted member of the Conservative "shadow" cabinet. The Irish question was now becoming acute and Smith was Sir Edward Carson's principal lieutenant in the resistance organized in Ulster.

World War I closed the original Irish controversy. Smith accepted the task of controlling the Press Bureau, went to France as eye-witness with the Indian corps, and did valuable work in the administration of army law. He was recalled from France to become solicitor-general in the first Coalition of 1915, and succeeded Sir Edward Carson as attorney-general in November of that year. In this year he was knighted.

When Lloyd George reconstructed his ministry after the election of 1918 the attorney-general was offered the lord chancellorship, and was raised to the peerage as Viscount Birkenhead in 1919. The appointment, though quite in the normal order of promotion, was subjected to considerable criticism, partly owing to the new chancellor's comparative youth, but chiefly to his vehement partisanship in earlier years. His chief legislative achievement during his term of office was the Law of Property Act of 1922. This reform, long overdue but perpetually held up by the inertia of the various legal authorities and interests, revolutionized the whole system of holding landed property. Among Lord Birkenhead's most notable judgments were (1) Director of Public Prosecutions *v.* Board, dealing with drunkenness as an excuse for crime; (2) Wakeford *v.* The Bishop of Lincoln; (3) the Rhondda Peerage case before the Committee of Privileges, laying down that women could not sit in the Upper House by right of peerage; (4) Admiralty *v.* s.s. "Volute"—a judgment on the law of negligence in collision cases. The fall of the Coalition government of 1922 was brought about by the desire of the rank and file of the Conservative party to regain its independence. Lord Birkenhead and some other Conservative ministers opposed this movement in vain at the Carlton Club meeting. As a consequence he was not included either in the administration of Bonar Law or in that of Stanley Baldwin, and he assumed an attitude of marked independence. On vacating the lord chancellorship he had been made an earl. Mr. Baldwin prudently healed the breach in the Conservative ranks on assuming office again in 1924, and Lord Birkenhead became secretary of state for India. He resigned from the India office and left the cabinet in Oct. 1928 in order to devote himself to a commercial career.

Lord Birkenhead, as an Oxford scholar, had a natural taste for letters, and his libraries were filled with carefully selected volumes. His work on international law has gone through several editions. The essay on Lord Salisbury, originally published in *The Times,* is his best historical work, and the short sketches of his young friends who died in World War I reveal the human side which he always showed to youth. He married in 1901 Margaret Eleanor, daughter of the Rev. Henry Furneaux of Oxford, the editor of *Tacitus.* They had one son and two daughters. Lord Birkenhead died Sept. 30, 1930. (M. W.)

BIRKENHEAD, a municipal, county and parliamentary borough and seaport of Cheshire, England, on the river Mersey, opposite to Liverpool, and 195 mi. N.W. of London. Pop. (est. 1938) 144,400, area 13.4 sq.mi.; under a mayor, 15 aldermen and 48 councillors. Rateable value £1,018,766. A Benedictine monastery was founded there (*c.* 1150) by Hamon de Massey and drew revenues from tolls levied at the Mersey ferry. In 1818 Birkenhead was a hamlet of 50 inhabitants and its development is largely due to the establishment of shipbuilding yards by William Laird, a pioneer of iron vessels, in 1824. Telford, Stevenson and other engineers favouring the conversion into a basin of Wallasey pool, a creek of the Mersey, parliamentary powers were obtained in 1843 and the first docks were carried out by James Rendel in less than five years, and opened in 1847. In 1858 they passed under the control of the Mersey Docks and Harbour board. Subsequent large additions brought the total quayage to ten miles. The town was built on the rectangular block plan; and the first street tramway in Europe was started here in 1860. The town was created a parliamentary borough returning one member in 1861, but after 1918 it returned two members. It was incorporated in 1877, but the boundaries were later considerably increased, and it became a county borough in 1888.

Besides sharing in the general trade of the Merseyside port, Birkenhead developed an individual trade in the export of Midland manufactures and in trade with the east. The two great "floats" or main basins of the dock system attracted a gigantic milling industry which made Birkenhead the largest milling centre in Europe.

A vast cattle and meat trade is carried on at lairages and abattoirs on the river front. Cammell Laird and Company, the successors of W. Laird, conduct great shipbuilding yards there. Port Sunlight lies near the southern boundary.

Birkenhead is the northern terminus of the G.W. railway. From Chester to Birkenhead the line is shared with the L.M. and S. railway, and the town is thus connected with the main lines of the largest two railway systems. Most of the other systems have depots at the docks. The corporation runs a steam ferry to Liverpool for vehicles, goods and passengers (separate steamers for the latter) from Woodside near the dock entrances, and a second (passenger) ferry from Rock ferry, farther south. Passengers and lighter goods traffic are also catered for by the Mersey tunnel (electric) railway. The great Mersey tunnel for road traffic, known as "Queensway," was opened by King George V July 18, 1934. It is more than 2 mi. long and has an internal diameter of 44 ft., allowing four traffic lanes. Its capacity per hour is 4,150 vehicles moving at 20 m.p.h. and spaced 100 ft. apart. The roadway is of cast iron, with rubber paving blocks in various sections, and the interior is lined with a glass dado. The cost of construction was about £7,000,000. The municipal undertakings include gas, water supply, electricity, tramways and omnibuses, steam ferry, public market and public baths. Public buildings include the town hall, the art gallery (1928), the central library (1934), Birkenhead park entrance arch, St. Aidans Theological college and the General hospital.

BIRKHOFF, GEORGE DAVID, (1884–1944), United States mathematician, was born at Overisel, Mich., on March 21, 1884. He obtained his early education at the Lewis Institute, Chicago, Ill., and at the University of Chicago. Thereupon he enrolled at Harvard university, where he took his A.B. and A.M. degrees in 1905 and 1906. He attained the doctorate at the University of Chicago in 1907. His teaching positions were: instructor in mathematics at the University of Wisconsin, 1907–09; preceptor and professor at Princeton university, 1909–12; assistant professor, professor and finally Perkins professor at Harvard university, 1912–44. As a teacher he was especially noted for his inspiring influence upon advanced students and younger scientists.

Birkhoff was a versatile mathematician who carried on extensive and notable research in a number of important fields in mathematical analysis. His scientific production began in 1906, his initial interests being in the field of ordinary differential equations. In this field he made significant advances in the theories of boundary value problems, of asymptotic solutions, of singular points and of expansion theorems. In 1909 he began his publications in the field of dynamics. These continued throughout his life, and were concerned with the theory of stability, the problem of three bodies, Poincare's geometric theorem, dynamical systems and ergodic theory. Over a course of years he made important contributions to the theory of difference equations of both the linear and q-difference types, and to the properties of functions defined by such equations. From the year 1922 on he lectured and wrote considerably upon the theory of relativity. Other fields in which he investigated and published include the problem of map colouring, mean-value relations, elasticity, the calculus of variations, modern physical theories and aesthetic measure.

The quality of Birkhoff's work was widely recognized. For his discoveries in differential equations and dynamics he was awarded the Querini-Stampalia prize of the Royal Institute of Science, Arts and Letters, of Venice, Italy, in 1918; the Bôcher prize of the American Mathematical society in 1923; the annual prize of the American Association for the Advancement of Science in 1926 and the prize of the Pontifical Academy of Sciences in 1933. Honorary doctorates were conferred upon him at various times by Harvard and Brown universities, by the Universities of Chicago, Wisconsin, Pennsylvania, Poitiers, Paris, Athens, Sophia, Lima, Santiago, Buenos Aires, and St. Andrews, and by the Illinois Institute of Technology. He was given membership in the National Academy of Sciences, the American Philosophical Society, the American Academy of Arts and Sciences, and was *officier* of the *Legion d'Honneur*. He held the presidency of the American Mathematical society in 1925, and of the American Association for the Advancement of Science in 1937. Corresponding or honorary memberships were his in many of the mathematical or scientific organizations of Europe and Latin America.

He died suddenly at his home in Cambridge, Mass., on Nov. 12, 1944.

Birkhoff's numerous research memoirs are scattered through the mathematical journals of many countries over the years 1907–44. His published books include: *Relativity and Modern Physics,* 1923; *The Origin, Nature and Influence of Relativity,* 1925; *Aesthetic Measure,* 1933. (R. E. L.)

BIRLING, the favourite outdoor sport of the American lumberjack. Its origin can be traced to the log drives of the New England states, particularly the state of Maine, during the early lumbering era, from whence it moved westward to the Great Lakes region and thence to the Pacific northwest. The hazardous labour of bringing down the spring drive to the sawmills was entrusted only to the men possessed of unlimited courage and the physical attainments necessary to stand the heavy work, long hours and exposure, and to preserve life and limb when the emergency arose. It was on the spring drive that the lumberjacks, turned rivermen, obtained their experience in managing themselves on the moving carpet of logs. Agility and nimble-footedness were the prime requisites, as well as level-headedness, since the slightest misstep or miscalculation of the eye might send them beneath the logs into a swirling current of white water to a watery grave.

Clad in "stagged" overalls, which were light and dried quickly, woollen shirts, high-topped calked ("corked" to a real riverman) boots that gripped the soft bark of the logs, with pike poles or peavies in their hands, they would leap from log to log, pushing, prying and pulling to keep the logs moving, and ever striving to prevent jams (the bane of the rivermen, along with low water) at curves in the river, on sandbars, rocky narrows, windfalls and deadheads. From the daily work of the rivermen the sport of birling developed. It required skill and endurance to hop on a log with an opponent, spin it rapidly in the water with the feet, stop ("snub") it suddenly, reverse its motion, and in various ways manoeuvre an adversary off balance and into the water. Dislodging an opponent constituted a fall; two falls out of three constituted a match. Birling rules became standardized as the sport progressed. Camp championship contests were held followed by inter-camp contests, and eventually they became



A BIRLING CONTEST. THE CONTESTANT ON THE RIGHT IS TAKING A FALL FROM THE BANDED, NUMBERED LOG. INSET SHOWS CALKS ON SOLE OF BIRLING BOOT

intersectional, finally culminating in national championship tournaments. The contests were usually held after the drive reached the sawmills. The lumberjacks bet freely on their favourites, and large sums of money changed hands. In the middle west, it was not until 1888 that the first public birling match was sponsored. The first world's championship tournament was held in 1898, at the Omaha, Neb., exposition. Thomas Fleming of Eau Claire, Wis., won the honour of being the first world's champion.

Shifting of the nation's logging activities to the Pacific northwest caused birling to become popular in that section. Birling tournaments of varied importance had been held there for years. In 1922, Tar Henderson was the winner; in 1923, Matt Dillon; and in 1924, A. G. Spiegle. Subsequent thereto Al Jennings, Sam Harris, Harley Foster, Russell Ellison, Bob Craig, James Herron and the Swanson brothers, Elmer, Jay and Walter, became top-flight birlers of the nation and several of them went on to win the title of world's champion.

In 1926 the National Roleo association was organized at Washburn, Wis., to perpetuate and promote the sport of birling. The word "roleo" was coined by Clay Perry, Pittsfield, Mass. After 1938 it became nationally known as the term used for a birling tournament.

The American Legion post of Cloquet, Minn., began the sponsorship of the Cloquet Belt, symbolic of the world's championship, in 1926, and continued the sponsorship through 1934 with the exception of 1927 and 1932. In the early years of its existence the Cloquet Belt rivalled the earlier Washburn tournaments.

The majority of the birlers of the nation competed in both tourneys. In 1935 and 1936 the contests were staged at North Lake, Wash. In 1937 and 1938 the tournament was sponsored by the Upper Peninsula State fair at Escanaba, Mich. The Gladstone (Mich.) City club became the sponsor of the roleo in 1941 and 1942. World War II interrupted the continuation of further championship roleos.

Women have also mastered the technique of birling. The first women birlers of record were the Thompson sisters, Hanna and Alice, of Cloquet. Their activity was confined to exhibitions at the championship contests at Washburn and Cloquet. In 1929 Agnes Hare Dixon, of Ashland, Wis., became the first woman champion in competitive birling at the tournament held at Washburn.

In 1937, at Escanaba, she lost the title to Laura Marchand Hebert, of Cloquet. In 1938, at Escanaba, Mary Jean Malott, of Cornell, Wis., became the champion and successfully defended the title at Gladstone, Mich., in 1941 and 1942. At Gladstone, in 1942, for the first time in the history of birling the men's champion met the women's champion. The match was won by James Running, of Eau Claire.

Other top-flight women birlers of the nation are Alice Reynolds, Pittsburg, N.H.; Arbutus Wilson Lamoureux, Chicago, Ill.; Marietta Phipps Terrill, Stevens Point, Wis.; Suzanne Brink Quistorf, Gladstone, Mich.; Bette Berkley King, Longview, Wash.; Catherine Gauthier, Longview, Wash.; Earlita Ward, Brinnon, Wash.; Marjorie Scates, Brinnon, Wash.; and Cilvia Winters Blair, Astoria, Ore.

The world's champions follow:

1898—Tom Fleming
1900—Al Stewart
1901—Tom McElhone
1902—Tom Fleming
1914—William Delyea
1915—Edward Oleson
1924—Joe Madwayosh
1925—Joe Madwayosh
1926—William Girard
1927—Wilbur N. Marx
1928—Wilbur N. Marx (Washburn) / William Delyea (Cloquet)
1929—Wilbur N. Marx (Washburn) / Larry Bergeron (Cloquet)
1930—Wilbur N. Marx
1931—Wilbur N. Marx
1933—Wilbur N. Marx
1934—Elmer Swanson
1935—Walter Swanson
1936—Walter Swanson
1937—Joe Connor
1938—James Herron
1941—James Herron
1942—James Running

No national Roleo in 1939 and 1940

(G. T. S.)

BIRMINGHAM, the largest city of Alabama, U.S.A., in the north-central part of the state. It is on federal highways 11, 31, and 78; and is served by the Atlanta, Birmingham and Coast, the Central of Georgia, the Frisco, the Illinois Central, the Louisville and Nashville, the Mobile and Ohio, the Seaboard Air Line and the Southern railways, and by three additional local freight carriers, including the railway of the government-owned Warrior River Terminal company, connecting (17 mi. from the switching limits of the city) with its terminal at Port Birmingham, on the Locust fork of the Warrior river, from which there is a navigable water route to Mobile. It is the county seat of Jefferson county, and a port of entry in the Mobile customs district.

The population was 178,806 in 1920, of whom 70,230 were Negroes and 6,084 foreign-born white, and was 267,583 in 1940 by the federal census. The metropolitan area, including Bessemer (*q.v.*), Fairfield (*q.v.*) and other suburban communities, had a population in 1940 of 407,851. Birmingham is the leading industrial city of the south. It has been built entirely after 1870. The city proper lies in a long narrow valley (Jones valley), at an altitude varying from 700 to 1,045 ft., and is protected by mountains to the southeast and northwest.

Its residential environs spread over the mountain slopes and into the valleys beyond. The main streets are wide (80–100 ft.) and most of the buildings are of modern construction. The 44 hotels have more than 3,500 guest rooms. Building permits issued during 1940 represented values amounting to $7,628,809.

The assessed valuation of property in 1940 was $162,097,697.

The industrial development of the city is based on immense mineral deposits: coal, including good coking varieties; limestone and dolomite, used in fluxing steel; iron, approximating 1,700,000,000 tons of red ore and 27,000,000 tons of brown ore; besides graphite, marble, barytes, bauxite, pyrite, quartz, millstone, cement rock, clays, sand and gravel and many others in smaller amounts. All the materials needed for making steel are found here in close proximity. Electric energy is supplied from hydroelectric and steam electric plants. Pig iron and steel have always been the leading products; but other industries have developed until 2,000 different commodities, ranging (alphabetically) from acetic acid to zinc sulphate, are produced by the 541 mills, mines and factories in the Birmingham district, and their annual output is valued at $650,000,000. The district produced in 1940 about 15,406,900 tons of coal; 4,600,000 tons of coke, most of it in by-product ovens yielding vast quantities of coal tar and supplying the city's mains with gas; 3,290,362 tons of pig iron; 2,614,231 tons of steel. Other important products are cast-iron pipe, wire, nails, steel cars, rails and stoves, cotton gins and machinery for coal mines, brick, cement, lumber and lumber products, cottonseed oil and meal, corn meal, cotton goods, rubber tires, chemicals and explosives. Birmingham is an important market for softwoods, especially yellow pine, of which it ships 50,000 cars annually. It is the shopping centre for a population of about 1,500,000. Post-office receipts in 1940 were $1,817,872. Deposits to individual banking accounts amounted to $130,956,048.

The city operates under a commission form of government, adopted in 1911. Its budget for 1940 was $6,086,724. The health department has a staff of 116, including 35 nurses. The board of education in 1922 made a thorough examination of the public-school plant and mapped out a building program to relieve immediately the worst conditions due to the city's rapid growth and the small amount of construction for civilian purposes during World War I; to make adequate provision by 1930, and then to provide year by year for a normal increase of population up to 1940. The city's 41 parks have an area of 1,018.36 ac.; 30 supervised playgrounds are maintained in the summer. There are two municipal golf courses and six private golf and country clubs; a municipal athletic stadium; a municipal market; and a municipal auditorium seating 6,000.

At the base of Red mountain, on a campus of 75 acres, is Howard college, a coeducational Baptist institution, which was opened at Marion in 1842 as an academy, and moved to Birmingham in 1887. Its enrolment in 1940, exclusive of the summer school, was 649. Birmingham-Southern college, under Methodist auspices, also coeducational, occupies 125 acres on a hill overlooking the entire city and valley, and had an enrolment in

1940 of 821 in the college proper. It was created in 1918 by the consolidation of Birmingham college, founded in 1897 as the North Alabama conference college, and Southern university, established at Greensboro in 1859. In 1870 the site of Birmingham was a cotton field crossed by two railways.

The city was founded in 1871, by a land company backed by railway officials, and was incorporated on Dec. 19. It was named for the city of the same name in England. At the census of 1880 the population was 3,086; in 1890 it was 26,178; in 1900, 38,415; in 1910, 132,685. Annexations of territory have increased its area to 53 sq.mi. There are 896.56 mi. of water mains within the city limits; 651.87 mi. of sidewalks; 57,620 telephones; and 76,181 motor vehicles, one to every 5.2 of the population.

BIRMINGHAM, city, county and parliamentary borough, England, in the northwest of Warwickshire, but with suburbs extending into Staffordshire on the north and west and into Worcestershire on the south, 113 mi. N.W. of London by rail. Pop. (1938 est.) 1,041,000. Area 79.9 sq.mi.

Birmingham is built upon the new red sandstone, and situated in the valleys of the Rea and other small feeders of the River Tame, near their sources, and upon the rising ground between these valleys. The site, therefore, varies from 200 to 600 ft. above the sea level, steadily rising toward the north and west, while the well marked line of the Lickey hills skirts the site on the southwest, extending thence southeastward. From the high ground to the southeast Birmingham thus presents the appearance of a vast semicircular amphitheatre. Its general situation near the centre of England makes it a great railway focus. The main lines are controlled by the L.M.S.R. and G.W.R. The plan of the town, as dictated by the site, is irregular. In the centre are several fine thoroughfares, containing nearly all the most important buildings. New street, Corporation street and Colmore row are the chief of these. At the western end of New street is a fine group of buildings, including the council house and art gallery, the town hall and post office. Corporation street was the outcome of a great "Improvement scheme" initiated in 1875 with the object of clearing away 45 ac. of insanitary property and of constructing a main thoroughfare from the centre to the northeastern outlet, starting from New street, near the railway station, to Bull street, and thence continuing to the Aston road. The scheme was finished in 1882. This led to an almost total extinction of dwellings in the centre of the town. In 1939, however, steps were taken toward replanning a further 19.7 sq.mi. of the central area. Edgbaston and Harborne lie southwest of the centre of the city, and form a residential district. To the south of Edgbaston, however, are the manufacturing districts of Selly Oak and Bournville, and south of these, Northfield and Kings Norton, in Worcestershire. The districts to the east of central Birmingham are Balsall Heath, Sparkbrook, Small Heath and Saltley. On the southeast is the residential suburb of Moseley, and on the east that of Yardley. On the east side the transition from town to country is clearly marked. This, however, is not the case on the west side, where the borough of Smethwick adjoins Birmingham, and the roads through West Bromwich and towards Oldbury and Dudley have the character of continuous streets. On this side are Soho and Handsworth. To the north lies Aston Manor, with Perry Bar beyond. To the northeast a populous district extends toward the town of Sutton Coldfield. Besides these and the Edgbaston grounds the chief parks are Summersfield park, toward Smethwick; Soho park; Victoria park, Handsworth; Adderley park, toward Saltley; and Victoria park, Small Heath. In all there are 177 parks and recreation grounds, covering 4,050 ac., maintained by the city. There is a race-course at Castle Bromwich, 3 mi. E. of the town. In 1911, Aston Manor, Erdington and Handsworth, almost the whole of Norton and Northfield and the rural district of Yardley were added to the city and further large areas on the north and east were added in 1928 and 1931. The influx of munition workers during World War I greatly increased the city's population, which in the period 1901–38 increased by 38%, a considerably greater increase than in any other large provincial city. In density it ranged in 1938 from 62 persons per acre in the central wards to 15 in the outer ring. After 1918 a housing policy was formulated, under which the corporation erected 51,500 houses by Oct. 1939. A year previously the total number of dwelling houses was 268,608, of which 105,000 or about 36% had been built after 1920, approximately half by private enterprise. About 90% of the building was in the outer ring. The air raids of World War II damaged around 100,000 houses, but since most of these were in the central and middle areas, an opportunity was provided to proceed more vigorously with rehousing in those places where it was most needed. Town planning schemes for about 25,000 ac. in the suburbs were put in operation during World War II and plans were approved for a civic centre, of which the first section of the new municipal buildings had been completed by 1943. Ambitious schemes for road widening and improvement of traffic conditions, which included the widening of all first-class arterial highways to 110–120 ft. and of other main roads to 80 ft., were adopted after World War I. By 1943, 29 mi. of road had been so widened, with the provision of two carriage ways.

History.—Although there are local evidences of early man, the first record we have of the site is in Domesday where an undertenant of William Fitz Ansculf is recorded as having four "hides" there. Other Domesday evidence leads us to the conclusion that at the end of the 11th century Birmingham was far from being the chief place in the district. By the end of the 13th century a considerable market town had grown at the focus of roads in the Bull Ring. Market charters had been granted in 1166, 1189, 1249 and 1295. In the 16th century it was visited by both Leland and Camden. The first tells us that "there be many smithes in the towne that use to make knives and all maner of cuttynge tooles, and many lorimars that make byts, and a greate many naylors, so that a great parte of the towne is mayntayned by smithes," and he adds further that these smiths obtained the "yren out of Staffordshire and Warwikshire, and their see coale out of Staffordshire." A town with an ever growing middle-class artisan population on one of the great roads between Oxford and the north and west found many opportunities for interrupting communications between the Royalist commanders. A skirmish in which Prince Rupert was involved seems to have been exaggerated by contemporary accounts on both sides. In 1665 Birmingham suffered heavy losses by the Plague. The Revolution of 1688 was a signal for the outbreak of Protestant feeling and a Roman Catholic church built under the patronage of James II in a place now known as Masshouse lane was destroyed. By the Acts of Uniformity and the Five Mile act nonconforming ministers were forbidden to dwell within a corporate town, but Birmingham though wealthy and populous had not that distinction; its government was that of a manor and hence it became a great home of dissent. Quakers, Unitarians and Jews and the persecuted of every sect found in it a sanctuary. The leader of the city in intellectual and social movements during the latter half of the 18th century was Dr. Joseph Priestley, and around him gathered such men as Baskerville, Hutton, Withering and others. The unfortunate events that followed a Bastille celebration dinner on July 14, 1791, caused this group to disperse. In the dismal period from 1817 to 1819 when the manufacturing districts were heavily distressed and were disturbed by riots, Birmingham remained quiet. Even when some of the inhabitants were tried and punished for demanding parliamentary representation, and for electing Sir Charles Wolseley as their delegate, there was no demonstration of violence. In 1831–32 the Political Union was formed, under the leadership of Thomas Attwood, to promote the passing of the Reform bill. Vast meetings were held on Newhall Hill. Ultimately the Political Union succeeded in its object, and Birmingham helped to secure for the nation the enfranchisement of the middle classes and other political reforms. The occurrence of riots in 1839, during the Chartist agitation, showed the social unrest that accompanied the rapid development of the industrial town. The interest and enterprise of the Chamberlain family during the latter half of the 19th century did much to improve the city (*see* later).

Birmingham is not rich in ecclesiastical architecture. It became a bishopric under the Bishoprics of Southwark and Birmingham act 1904. Before 1821 it was in the diocese of Lichfield. There were formerly a religious house, the priory of St. Thomas the

Apostle, and a Guild of the Holy Cross, an association partly religious and partly charitable, having a chantry in the parish church. The possessions of the priory went to the crown at the dissolution, and the building was destroyed before the close of the 16th century. Until 1715 there was but one parish church, St. Martin's, erected about the middle of the 13th century but entirely rebuilt in 1873. St. Philip's, designed by Thomas Archer, was the next church erected. It was consecrated in 1715, enlarged in 1884, and became the pro-cathedral on the foundation of the diocese. It contains a rich series of stained-glass windows by Sir Edward Burne-Jones. Then followed St. Bartholomew's in 1749, St. Mary's in 1774, St. Paul's in 1779, St. James's, Ashted, in 1791, and others. The traditional reputation for Nonconformity is maintained by the town. The Unitarians, the oldest body established here, have among their chapels, the Old Meeting, on the site of one of the original Unitarian chapels. Another chapel, the New Meeting, in Moor street, is memorable as having been the place of Dr. Joseph Priestley's ministerial labours from 1780 onward. In 1862 the Unitarians removed from this place to the church of the Messiah in Broad street. The first meeting house of the Society of Friends dates from about 1690. Among Independent chapels, that of Carr's lane has had John Angell James and Robert William Dale as ministers. The Baptists first erected a chapel in Cannon street in 1738. John Wesley himself in 1745 established the Wesleyan Methodists in Birmingham. The Presbyterians have also places of worship, and the Jews have a synagogue. From the revolution of 1688 until 1789 the Roman Catholics had no place of worship here; but Birmingham is now a Roman Catholic bishopric. Cardinal Newman was superior of the Oratory of St. Philip Neri from its foundation in 1851.

Among the city's buildings that were damaged in World War II may be mentioned the cathedral of which the roof was badly burned; St. Thomas' church, Edgbaston, of which only the west front and tower remain standing; St. Martin's and St. Gabriel's churches, both seriously injured; the town hall and art gallery; the Midland institute and the Swan hotel, one of Birmingham's oldest hotels.

Education.—The oldest educational institution is the grammar school of King Edward VI, founded in 1552 with a grant of the lands of the Guild of the Holy Cross. The principal school included in the foundation is the boys' high school; others, with a girls' high school, are on the endowment. Queen's college, founded in 1828 as a school of medicine, subsequently embraced other subjects, though in 1882 only the medical and theological departments were maintained. In 1882 a large part of the scientific teaching, hitherto done by special professors in Queen's college, was taken over by Mason college, founded by Sir Josiah Mason in 1875, and in 1892 the whole medical department was removed to the same institution under an order from the court of chancery. In 1935 the college became a fully "recognized" theological college of the Church of England, solely concerned with preparing men for Holy orders. In 1898 a public meeting carried a resolution in favour of creating a university, which was incorporated in 1900 and in which Mason college was merged. Lord Calthorpe (d. 1910) presented the new university with 50 ac. at Bournbrook, Edgbaston. On this, buildings were erected for the various departments of engineering and for other scientific departments, as well as for the Harding Memorial library and department of commerce. In 1928 the university was given a further 40 ac. in the vicinity. Other developments included a new medical school building (1938), the Barber Institute of Fine Arts (1939) and the extension to the chemistry department known as the Hills Chemistry block. The university library contained upward of 270,000 volumes (1943). There were 1,624 students in the year 1938–39. The university is associated with the Coal Owners' Mining Research laboratory and the joint board for research in mental diseases.

The College of Arts and Crafts was formed by the transference to the corporation in 1885 of the then existing school of art and the Society of Arts, and by the erection of the building in Margaret street. The Midland institute, the building of which was founded in 1855 and enlarged subsequently, includes a general literary and an industrial department. It is affiliated with the university. The Central Technical college was established in 1893 in the building of the Midland institute, and in 1895 was housed in Suffolk street, whither the whole of the scientific teaching of the institute was transferred, but subsequently it spread into four other buildings. There are nine departments.

The principal libraries are the Birmingham library, founded in 1779 and greatly enlarged in 1798 by Dr. Priestley, the Central free library, and other free libraries in different parts of the city, each with a lending department and a reading room. The General hospital, the foundation of Dr. Ash, was opened in 1779 and rebuilt in 1897. In Edgbaston is the Birmingham hospitals centre, begun in 1932 and the first of its kind in England. There are also almshouses for aged persons, kept up by old trusts, chiefly Lench's Trust and James' Charities. Among a series of public monuments are those of Priestley, Attwood, Watt, Peel, Rowland Hill and Nelson. The wide importance of Birmingham as a centre of manufactures began toward the close of the 17th century, one great factor being the absolute freedom of the town, with no guilds, companies or restrictions of any kind; besides which the easy access to cheap coal and iron indirectly helped the development. It is remarkable that two important trades, now located elsewhere, were first established here. Steel was made in Birmingham until 1797, and cotton spinning was begun here by John Wyatt, Lewis Paul and Thomas Warren as early as 1730; but the speculation was abandoned before 1800. The great staple of Birmingham is metalworking in all its various forms. The chief variety is the brassworking trade. Ironworking, though largely carried on, is less important, works of this kind being chiefly established in the Staffordshire district. Jewellery, gold, silver and gilt are old-established industries. The manufacture of guns and rifles is of the greatest importance. Until 1906 a Royal Small Arms factory was maintained by the government at Sparkbrook, but it was then transferred to the Birmingham Small Arms company, which had already extensive works in the district. Buttons, hooks and eyes, pins and other articles used for dress, constitute a large class of manufactures. Glass, especially table glass, is a renowned staple of the town. Optical and plate glass and stained glass are also made. Screws, nails, etc., are made in enormous quantities; indeed, Birmingham has a monopoly of the English screw trade. Steel pens are also a specialty, the name best known in this connection being that of Sir Josiah Mason. Electroplating, first established in 1841 by the firm of Elkington, is one of the leading trades. Among other branches of manufacture are wire drawing, metal rolling, aluminium, nickel and tin wares, railway-carriage building (a large and important industry), the manufacture of cutting implements and tools of all kinds, die sinking, papier-maché making, ropes, leather goods, chemicals, and a variety of others. In 1897 there was a sudden development of cycle manufacturing, followed in 1899 by an almost equally sudden collapse, but this industry is maintained and accompanied by the manufacture of motor cars, tires and accessories, for which Birmingham is one of the principal centres in Great Britain. Confectionery and printing on a large scale are also important. The chocolate works of Cadbury Bros. (1831) at Bournville, 4 mi. S. of the city are especially well known. The model village, founded in 1879, has 6,000 inhabitants, about half of whom are connected with the factory. The output of munitions during World Wars I and II was enormous and many of the large buildings erected during World War I facilitated the development of local industries. Fort Dunlop is a new suburb occupied by the makers of rubber goods.

Administration.—The government of the town resided originally in the high and low bailiffs, both officers chosen at the court of the lord of the manor, and acting as his deputies. A charter was granted by the crown in 1838, vesting the general government in a mayor, 16 aldermen and 47 councillors. The powers of this body, were, however, unusually restricted, and it was not until 1851 that an act of parliament was obtained, abolishing all governing authorities excepting the town council. Another local act was obtained in 1862, and in 1883 these various acts were combined into the Birmingham Corporation Consolidation act. In

1889 Birmingham was created a city. The title of lord mayor was conferred on the chief magistrate in 1897. The city council consists (1944) of 33 aldermen and 102 councillors. The gas, electricity and water supplies were in the city council's hands. The main source of the water supply is the Elan valley, Radnorshire, where extensive waterworks were completed in 1905. Justice was administered from 1838 to 1884 by a court of quarter sessions. In 1884 Birmingham was made an assize district of Warwickshire. The town was enfranchised in 1832 when two representatives were elected. In 1867 three members were assigned and in 1885 the number was increased to seven. Since 1918, 12 members have been returned to parliament.

See W. Hutton, *History of Birmingham* (2nd ed., 1783); the Birmingham Archaeological Society's *Transactions;* and the British Association *Handbook* (1913); J. T. Bunce, C. A. Vince and J. T. Jones, *History of the Corporation of Birmingham* (5 vols., 1878–1940); C. Gill, *Studies in Midland History* (1930); J. H. Muirhead (ed.), *Birmingham Institutions* (1911); G. C. Allen, *Industrial Development of Birmingham and the Black Country, 1860–1927* (1929); Bournville Village Trust Survey, *When We Build Again* (1941).

BIRNEY, JAMES GILLESPIE (1792–1857), an American leader of the political abolitionists (anti-slavery), was twice candidate for the presidency of the United States on the Liberty Party (*q.v.*) ticket, 1840 and 1844. In the first instance he spent the whole of his time as candidate speaking in Great Britain against slavery in the United States, and in the second he wielded such political power in western New York and elsewhere as to cause the defeat of Henry Clay (Kentucky Whig) and the election of James K. Polk (Tennessee Democrat). But in 1845 a fall from his horse made him an invalid and cut short his political career. Birney was born in Danville, Ky., in 1792, of Scottish-Irish parents; graduated in 1810 at the College of New Jersey (now Princeton university); and was admitted to the Bar at Danville in 1814. Although he held slaves in Alabama, where he lived for a time after 1818, he was from the beginning an anti-slavery Democrat, finally drifting into the Whig party. About 1826 he became interested in the American Colonization society, and in 1832–33 served as its agent in the south-west. He decided, however, that the society's plan was impracticable, returned to Danville to devote himself wholly to the anti-slavery cause, and in 1834 freed his own slaves. On July 15, 1834, he published his *Letter on Colonization* and gained a national reputation which carried him into the recently organized American Anti-Slavery society, in which he immediately exerted a decisive influence in favour of *"political action."*

He became executive secretary of the society in Sept. 1837. In spite of the opposition of the Garrisonian abolitionists, steps were taken at Albany, N.Y., on July 31, 1839, for the organization of an anti-slavery political party; but this caused a split in the American Anti-Slavery Society. Those who favoured political action withdrew from the annual meeting of 1840 and assumed the forms of two organizations; namely, the Liberty Party with Birney at the head of a national ticket, and the American and Foreign Anti-Slavery society for co-operation with British abolitionists led by Joseph Sturge (*q.v.*). This larger movement developed in a General Anti-Slavery convention, which was called to meet in London, on June 12, 1840. Before the work of organization was completed, however, Birney with Henry B. Stanton and others, sailed as a delegate to the general convention, London, taking with them a mass of lecture materials for the instruction of British abolitionists on the economic, social and political bearings of the anti-slavery question in the United States. Birney and Stanton, travelling together much of the time, lectured for about five months throughout the British Isles, laying foundations for an Anglo-American anti-slavery solidarity which endured through the Civil War. He died at Perth Amboy, N.J., on Nov. 25, 1857.

BIBLIOGRAPHY.—*See* E. Channing, *History of the United States,* v. (1921), 545; and T. P. Martin, *Anglo-American Relations, 1829–46* (ms. thesis, 1922, Harvard Library); and William Birney, *James G. Birney and His Times* (1890).

BIRON, ARMAND DE GONTAUT, BARON DE (1524–1592), French marshal, belonged to a family, one of the numerous branches of the house of Gontaut, which took its title from the territory of Biron in Périgord. As a page of the queen of Navarre Biron attracted the notice of the marshal de Brissac, with whom he saw active service in Italy.

His great services to the royal cause at Dreux, St. Denis, Jarnac and Moncontour were rewarded in 1569 by his appointment as a privy councillor of the king and grand master of artillery. He commanded the royal forces at the siege of La Rochelle in 1572, and four years later was made a marshal of France. From 1576 to 1588 he was almost continuously employed in high command. From 1589 he supported the cause of Henry of Navarre. Biron was killed by a cannon-ball at the siege of Épernay on July 26 1592. His *correspondance,* preserved in the Bibliothèque Nationale, was edited by E. Barthélemy (Bordeaux, 1874).

His son, CHARLES DE GONTAUT (1562–1602) duc de Biron, was in high favour with Henry IV. After his father's death Henry made him admiral of France, marshal, and governor of Burgundy. In 1596 he was sent to fight the Spaniards in Flanders, Picardy and Artois. After the peace of Vervins he discharged a mission at Brussels (1598). From that time he was engaged in intrigues with Spain and Savoy, and, notwithstanding, directed the expedition sent against the duke of Savoy (1599–1600). The duke of Savoy promised him his daughter in marriage, though the project was kept secret. His intrigues were suspected, and Henry IV. demanded explanations. Biron made a partial confession, and remained in favour. His plans were apparently much more far-reaching. He approached various malcontents with the idea of organizing risings in different parts of the country. He was suspected in many quarters. But Henry, who had loved his father, was loth to move against the marshal. At length he summoned Biron to Fontainebleau, but could extort no further confession. Biron and Auvergne were arrested. Biron was found guilty of treason, on documentary evidence which showed that he had communicated full particulars of the French army to the duke of Savoy. He was beheaded in the Bastille on July 31, 1602. Biron's fate was the subject of Chapman's contemporary tragedy, *The Conspiracy and Tragedy of Charles, duke of Biron. See* Zeller, "La Conspiration de Biron," in the *Comptes Rendus* (1879) of the Acad. des sciences, morales et politiques.

His collateral descendant, ARMAND LOUIS DE GONTAUT (1747–1793), duc de Lauzun, afterwards duc de Biron, played a part in the American War of Independence and the revolutionary wars. Until 1788, when he succeeded to the duchy of Biron on the death of his uncle—Louis Antoine de Gontaut, duc de Biron (1700–1788)—he bore the title of duc de Lauzun. He wrote an essay on the military defences of Great Britain and her colonies (*État de défense d'Angleterre et de toutes ses possessions dans les quatres parties du monde*). In 1789 he was returned as deputy to the states-general by the *noblesse* of Quercy, and attached himself to the revolutionary cause. In July 1792 he was nominated commander of the army of the Rhine and in May 1793 was transferred to the command of the army of La Rochelle, operating against the insurgents of La Vendée. He was accused by Carrier of *incivisme* and leniency to the insurgents, deprived of his command (July), and guillotined on Dec. 31, 1793. Some *Mémoires,* which come down to 1783, were published under his name in 1822 (new ed., 1858), and in 1865 letters said to have been written by him in 1789 to friends in the country, describing the states-general.

BIRR or **PARSONSTOWN,** urban district, Offaly Co. (formerly King's Co.), Eire, on rising ground on a branch of the Great Southern railway, by which it is 87 mi. W.S.W. from Dublin. Pop. (1936) 3,297. Cumberland square is the point from which the several principal streets diverge in regular form. There is a fine castle, housing a famous reflecting telescope. Among institutions the schools of the Brothers of the Presentation Order are noteworthy. Some trade is carried on in corn and timber and in brewing and distilling.

An abbey was founded at Birr by St. Brendan (d. 573), to whom the present parish church is dedicated. The district formed part of Ely O'Carroll, and was not included in King's Co. till the time of James I. A battle is said to have been fought near Birr in the 3rd century between Cormac, son of Cond, and the people of Munster. The castle was the chief seat of the O'Car-

rolls. In the reign of James I. it was assigned to Lawrence Parsons. From him the alternative name of the town is derived. The castle was taken by Ireton in 1650. It also suffered assault in 1688 and 1690.

BIRRELL, AUGUSTINE (1850–1933), English author and politician, son of a Nonconformist minister, was born near Liverpool on Jan. 19, 1850. He was educated at Amersham Hall school and at Trinity Hall, Cambridge. He went to the bar, and gradually obtained a good practice; in 1893 he became Q.C., and he was professor of law at University college from 1896 to 1899. The publication of *Obiter Dicta* (1884) showed him to be a literary critic of unusually clever style and an original vein of wit. In 1889 he was returned to Parliament for West Fife as a Liberal. In the House of Commons his light but pointed humour led to the coining of a new word, "birrelling." His books on copyright and on trusts were no less sparkling than his literary *Obiter Dicta.* A second series of the latter appeared in 1887. *Res Judicatae* in 1892 and various other volumes followed. In 1888 Mr. Birrell married as his second wife Mrs. Lionel Tennyson, daughter of the poet Frederick Locker (Locker-Lampson). Defeated at North-East Manchester at the general election of 1900, he re-entered Parliament in 1906 for a Bristol division, and as minister for education was responsible for the Education bill, which had ultimately to be withdrawn. Campbell-Bannerman then transferred him to the chief-secretaryship in Ireland, and he introduced the Irish Councils bill, which was killed by its repudiation at the Nationalist Convention. Irish administration became more and more difficult, but Mr. Birrell declined to invoke the Crimes act. He continued to be chief secretary for Ireland until the Dublin rebellion of Easter 1916, a period of over nine years. The cattle-driving agitation died down, and Irish politics, save for labour troubles, were comparatively quiet, until the two general elections of 1910 had once again made retention of office by the Liberal leaders dependent on the Irish vote. A third Home Rule bill was now inevitable, and Mr. Birrell spent much of the autumn of 1911 in preparing it. The main conduct of the measure was, however, taken out of his hands, in the sessions of 1912, 1913 and 1914, by Mr. Asquith, the prime minister.

When resistance was organized in Ulster, when volunteers were enlisted and drilled in the province, and a provincial government constituted, Mr. Birrell adopted the *laissez-faire* attitude which had throughout been the mark of his Irish administration; and he applied the same treatment to the Irish volunteers who were raised in the Sinn Fein and Nationalist interest. With the outbreak of the World War the Home Rule controversy was left in abeyance; and the danger with which Mr. Birrell had to cope came from extremists of the Sinn Fein, Irish-American and Irish Labour parties, of whom Casement and Larkin were the apparent leaders. They promoted a strong and largely successful propaganda against enlistment in Ireland, which culminated suddenly in open rebellion at Easter 1916. Immediately after the suppression of the rising, Mr. Birrell resigned; and he left Parliament and political life in 1918. Resuming his literary work, he published in 1920 a life of his father-in-law, the poet Frederick Locker-Lampson; in 1922, *Collected Essays,* in 1924 *More Obiter Dicta,* and in 1930, *Et Cetera.* His originality, satire and ripeness put him at the head of English men of letters on the critical side.

BIRTH. In law, a child not actually born, but *en ventre sa mère,* is supposed for many purposes to be actually born, and may take any benefit to which it would have been entitled if actually born, *i.e.,* it may take as legatee or devisee, or even as next-of-kin or heir, but none of these conditions will take effect, unless the child is born alive (*see* MEDICAL JURISPRUDENCE). The given year of age of a child is gained at the first instant of the day preceding the birthday, and no account is taken of parts of a day, *e.g.,* a child born at 11.59 on the night of May 2–3, 1900, would be of age the first moment after midnight of May 1–2, 1921. In English law, by the Offences against the Person Act of 1861, it is a misdemeanour punishable by a maximum of two years' imprisonment with hard labour, to endeavour to conceal the birth of a child by any secret disposition of its dead body, whether the child died before, after, or at its birth; and by the Infanticide Act 1922 a woman who causes the death of her newly-born child by wilful act or omission, but had not fully recovered from the effect of the birth, can be found guilty of infanticide (see *Rex* v. *O'Donoghue,* Nov. 1927).

The registration of baptisms is said to have been first introduced by Thomas Cromwell when vicar-general in 1538, but it is only in comparatively modern times that registration has been fully carried out. The law relating to the registration of births for England is to be found in the Births and Deaths Registration Acts 1836 to 1901 and in the act of 1926 which requires the registration of still-births. Before the passing of the Births and Deaths Registration Act 1836, the records of the births were compiled from parish registers, which were formerly a part of the ecclesiastical organization, and continued to be attached, more or less, to the Church till the passing of the act of 1836. That act provided a far more complete machinery than that before existing for the exact record of all births. The new system relieved the clergy from all functions previously thrown upon them, and finally, after improvement by subsequent acts, was made compulsory in 1874. The act of 1836 established a general register office in London, presided over by an officer called the registrar-general, with general superintendence over everything relating to registration.

By the Births and Deaths Registration Act 1874, which amended and consolidated the law, it is the duty of the father or mother of any child born alive, or in their default, then of the occupier of the house (if he knows of the birth) or of any person present at the birth or having charge of the child, to give to the registrars under penalties within 42 days after the day of the birth, information of the particulars required to be registered concerning the birth, and in the presence of the registrar to sign the register. After three months a birth can only be registered in the presence of the superintendent registrar, and after the expiration of 12 months a birth can only be registered with the written authority of the registrar-general. In the case of an illegitimate child, no person as the father of such child is required to give information, nor is the name of anyone entered in the register as the father of such a child, unless at the joint request of the mother and the person who acknowledges himself to be the father. An additional duty is placed upon the father by the Notification of Births Act 1907. By that act it is the duty of the father of a child, if he is actually residing in the house where the birth takes place at the time of its occurrence, to give notice in writing of the birth to the medical officer of health of the district in which the child is born within 36 hours of the birth. The same duty is also imposed upon any person in attendance, *i.e.,* medical practitioner or midwife, upon the mother at the time of or within six hours after the birth. The medical officer of health is then in a position to take such steps, by advice or otherwise, as may, in his opinion lead to the prevention of infant mortality. Notice under the act is given by posting a prepaid letter or postcard to the medical officer of health giving the necessary information. Failure to give notice entails on summary conviction a penalty not exceeding 20 shillings. The act was optional to local authorities, but might be enforced within any area by the Local Government Board, but now by the Notification of Births (Extension) Act 1915 the system is made universal throughout the country. By the Births and Deaths Registration Act 1874 and the Merchant Shipping Act 1894, commanding officers of ships trading to or from British ports must, under a penalty, transmit returns of all births occurring on board their ships to the registrar-general of shipping, who furnishes certified copies of such returns to the registrars-general for England, Scotland and Ireland. These returns of births (and deaths) constitute the "Marine Register Book."

As to the Registration of Births of Legitimated Persons, *see* the Legitimacy Act 1926.

Following the provisions of the Non-Parochial Registers Act 1840, which made it a felony wilfully to destroy or injure a register or record of birth and is still unrepealed, by s. 36 of the Forgery Act 1861, as amended by the Forgery Act 1913, unlawfully destroying, defacing or injuring any register of births, or knowingly inserting in such register any false entry, or giving

a false certificate relating to any birth, is a felony and the punishment penal servitude for life. By s. 3 (2) of the Forgery Act 1913, forgery of any register of births, if committed with intent to defraud or deceive, is a felony punishable with penal servitude not exceeding 14 years; and by s. 3 (3) forgery of any certificate, declaration or order under any enactment relating to the registration of births with a like intent, is a felony and the maximum punishment seven years' penal servitude. Also by s. 4 of the Perjury Act 1911, wilfully making any false statements or declarations or certificates as to births or still-births is made a misdemeanour punishable on indictment with a maximum sentence of seven years' penal servitude and on summary conviction by a fine not exceeding £50, this sum having been increased from £10 by the Criminal Justice Act 1925.

See also ILLEGITIMACY; INFANTICIDE; LEGITIMACY AND LEGITIMATION; POPULATION; LAW OF SUCCESSION; OBSTETRICS, etc.

BIRTH CONTROL. This term is commonly employed to signify any form of intentional limitation of size of family, although in some usages it is restricted to control of conception by mechanical or chemical means. The expression seems to have been used first (1914–15) by Mrs. Margaret Sanger in her monthly magazine, *The Woman Rebel.* Herself a trained nurse and the mother of children, she made a vigorous fight, often against legal opposition and arrest, for the right of physicians to give birth control advice, and for parents to regulate the size of their families. The need for birth control was impressed upon her by the high death rate and unending misery that reigned in many of the families which, as visiting nurse, she had attended in the east side, New York city. Such waste of human life seemed senseless. She organized the first American Birth Control Conference in New York city in 1921 and was the founder and first president of the American Birth Control League. Author of several volumes, the gist of her arguments and experiences will be found in her *An Autobiography* (1938).

Leagues and Clinics.—Use of contraceptives, however, had been publicly advocated in England as early as 1877 by Charles Bradlaugh and Annie Besant. Their legal prosecution for the sale of a pamphlet by Dr. Charles Knowlton entitled *The Fruits of Philosophy* gave wide publicity to birth restrictive methods and resulted in the establishment of a Malthusian League. This organization issued a periodical devoted to spreading knowledge of contraception. Dr. G. R. Drysdale and his wife, Dr. Alice Vickery, in particular, devoted their lives to writing and lecturing on the desirability of early marriage and small families. In 1921 the league established a clinic for poor mothers in south London. Wide distribution of the writings of Dr. Marie Stopes went far toward acquainting the population of Great Britain with birth control propaganda.

A Dutch neo-Malthusian League was established in 1881, followed by similar leagues in Belgium, France and Germany.

Two years after the founding of the American Birth Control League, through the efforts of Mrs. Sanger, the Birth Control Clinical Research bureau was established as a permanent clinic. This bureau and the American Birth Control League merged in 1939 to become the Birth Control Federation of America, Inc. In 1942 the name was changed to the Planned Parenthood Federation of America, Inc. (with headquarters in New York, N.Y.).

Birth control, say the spokesmen of this federation, is a justifiable social and scientific procedure because it conduces toward improvement of the family unit and the consequent betterment of the whole population. As a health measure it enables parents, particularly the wife, to become fully prepared physically and mentally; it permits of the minimal interval of 24 months between births which most doctors advocate; and avoids the psychologically harmful effects, on both mother and child, of an unwelcome pregnancy. As a social matter, according to the federation, it permits of a period of adjustment before assuming parenthood; it enables parents to establish families commensurate with their abilities to maintain reasonable living standards, and thus tends to ensure that children will be of healthful heritage, with reasonable prospects for education and a useful life.

Populations and Birth Control.—Although a discussion of birth control may at first sight appear to be of limited scope and significance, actually it ties in intimately with the much vaster problems of population growth, maintenance or decline. Even a cursory discussion of it, therefore, if it is to be significant, must be made from the standpoint of its effects, both quantitative and qualitative, on population as a whole. It is particularly of importance if a population is stratified in its abilities and the lower moiety is increasing with disproportionate rapidity.

The problem of differential fertility was deplored by such ancients as Theognis and Plato (427–347 B.C.), and discussed intelligently by Hippocrates (460–357 B.C.). Nor was the genetical complexity of the matter overlooked, since Aristotle (384–322 B.C.) noted that a genius does not always breed genius and that the sons of a great man may be fatuously dull.

It was not until the famous essay published by Malthus in 1798, that the real significance of population growth—particularly of overpopulation—came vividly to the attention of the public. Thomas Robert Malthus (1766–1834) was an English clergyman and economist. The first edition of his great work, *An Essay on the Principle of Population as It Affects the Future Improvement of Society,* was published in 1798, the sixth and last edition, in 1826. Struck by the rapid increase of the human population about him, he argued that because such increase was so much faster than that of food supply, mankind was breeding itself into starvation and unendurable poverty. He maintained that since population tends to expand in a multiplicative ratio while the means of living—food, clothing and the like based mainly on agriculture—increases only in an additive way, the inevitable outcome, unless population is deliberately restricted, is war, crime, poverty, vice and general human misery. He protested that the prevailing system of doles tended to aggravate the very evils it was supposed to remedy.

The sequel showed that Malthus fell short of quantitative accuracy in his contention that means of subsistence can increase only in simple additive ratio, for it has long since become evident that exploitation of cheap, efficient power and the results of scientific discovery have enormously enhanced production; that improvement in methods or in skill results in increased yield for the same amount of labour; and that availability of food and other necessities of life through ready distribution plays an important part in determining how many individuals can be supported in a given area. Nevertheless, there are obvious limits to the amelioration possible through such aids and the net result may be merely a postponement of the inevitable. Less was heard about arithmetical ratios and more about the *law of diminishing returns* in both agriculture and industry; however the limiting factor is labelled, the important thing to realize is that there is a limit.

To avoid dire results Malthus maintained that some check must be put upon overpopulation and advocated late marriage and sexual continence as the feasible and ethical means of establishing such control. He made no plea for artificial interference with conception.

Although temporarily exciting a certain amount of public interest and debate, the publications of Malthus seemed to have been of greater concern to such evolutionists as Charles Darwin and Alfred Russel Wallace than to the demographers of the day. Looking for causal factors of the evolutionary process, Malthus' concept and phrase "the struggle for subsistence" could readily translate itself into Wallace's "Struggle for Existence" or Darwin's "Natural Selection," since these concepts were very similar.

Declining Birth Rates of White Races.—In most countries occupied by white races, instead of the earlier heralded dangers of overpopulation, beginning with a little before the opening of the 20th century, there had come such a fall in birth rate that it was regarded as serious by many statesmen because below the level required for bare replacement. On the other hand, at least 25 other countries, in the main non-industrial, were, by the 1940s, growing through natural increase at the rate of 1.5% to 2% per year. India, for example, was known to have increased by 50,000,000 during the 1930s and the population of Japan grew from about 30,000,000 to more than 70,000,000 between 1870 and 1940.

Various European countries such as Belgium, France, Sweden

and notably Germany and Italy, showed concern over their diminishing birth rate and made efforts to promote marriage, lessen contraceptive practices, do away with abortion and encourage larger families in all but the biologically undesirable.

The Swedish population commission believed that it could "avoid as far as possible the evils of too small or too large a family" if that nation could secure a high proportion of three- and four-child families. Sweden alone tried to grasp both horns of the dilemma. Seeking to protect its culture from a decline, Sweden intentionally began promoting knowledge of birth control and the accompanying voluntary parenthood among the lower classes which had been producing the great bulk of the population. In this way it hoped to compensate for the serious decline in births among its more successful stocks. A Swedish national population commission appointed in May 1935, published voluminous reports, and many of its recommendations were enacted into laws, the main object of which was to encourage parenthood on the part of responsible parents without endangering the quality of future generations (Alva Myrdal, "A Programme for Family Security in Sweden," *Internat. Labour Rev.,* June 1939). The new legislation resulted not only in a repeal of a previous law restricting the spread of information on contraception but made provision for regulating the sale of contraceptives under observation of the National Board of Health. Alleviation of taxation for parents of children under 18 years of age; low-rent housing with model playgrounds and sometimes co-operative nurseries; progressive annual rebates for families with three or more children; organization of health centres and clinics for mothers and children; attendance at birth delivery; free school meals; and free supply of such protective medicines as cod liver oil, calcium and the like were among the provisions made by the Swedish parliament.

According to the League of Nations estimate made in 1933, the total world-population was then 2,057,000,000, much of it the result of a population growth in European stocks beginning in the 17th century, incident to a gradual release from the ravages of famine and plague. In later years, the rapid industrialization and urbanization of society temporarily accelerated the process. European stocks increased approximately seven-fold between 1650 and 1933. Although such rates of increase had ceased among white stocks in western Europe and North America by the 20th century, they still were found among Asiatic peoples.

While among the white races there was a marked reduction in the death rate during the 19th and 20th centuries, the decline in the birth rate was even greater. Man's control over disease and accident has been outdone by his control over conception. In England and Wales, for example, from about 1800 to 1880 the annual birth rate ranged around 35 per 1,000. Approximately the same rate prevailed in the United States. A decline set in in the early '80s and by 1930 it was well under 20 per 1,000 in England and Wales, and by 1933 in the U.S. it had reached a low of 16.6 per 1,000. Inasmuch as the death rate of that year was only 10.7 per 1,000 there was still a natural increase of some 750,000. In the U.S., however, during the 1930s and 1940s, a high proportion of the inhabitants were at optimal reproductive age, and when these reproducers passed into old age, with the prevailing low birth rate, there would be fewer and fewer to replace them, consequently smaller and smaller additions to the population. The same condition seemed to obtain in various other civilized countries.

When corrected for temporary concentration of reproductive ages it was revealed, according to the calculations of Louis I. Dublin (statistician, Metropolitan Life Ins. co.), that, in terms of generations, the net reproductive rate in the U.S. was only 94% in 1933. Even though birth rates were slightly on the rise in the five years between 1935 and 1940, the net rate continued at 96%, according to Dublin. The upward trend, reaching a level of 21 per 1,000 in 1942, was mainly among young married people and was probably the aftermath of increased marriages following the depression years, and the hastening incident to approaching military service.

In England and Wales, and such continental countries as France, Belgium, Germany and Sweden, the situation was even more unsatisfactory and the respective governments showed great concern. In a speech made in 1943, Herbert Morrison, home secretary for England, maintained that the size of the average British family had to be increased 25% if Britain was to continue at its existing level and provide better standards of living for all.

By means of various economic devices but mainly through suppression of abortion and the cultivation of a special psychologic attitude, Germany was able to raise the number of live births per 1,000 from 14.7 in 1933 to approximately 19.5 in 1938, but even so, the net reproduction rate was still short of replacement. Germany's drive to increase birth rates was accompanied by an equally implacable effort to reduce hereditary imperfections by means of sterilization of persons who manifested what were considered hereditary diseases or defects. In a single year (1934) 56,250 persons were ordered sterilized.

The French law, largely ineffective, it is said, strictly forbade dissemination of birth control knowledge and heavily fined persons engaging in propaganda for birth limitations.

Factors in Differential Fertility.—Although in 1930 the United States as a whole was scarcely replacing its numbers, the rural areas had a net reproductive rate 60% above that required for replacement. In the U.S. in general, indeed, the highest group fertility occurs preponderantly in the less industrialized, less urbanized, less economically advanced regions. Children no longer have the economic value they did when 80% of the population lived on farms.

The problem is not one of recent origin nor is it simple. Many complex factors are involved. While undoubtedly one factor, some question any great significance of deliberate birth control in general population declines. Where birth rates have changed notably in relatively recent times, the possible influences of changed habits and of altered environmental conditions must also be reckoned with. Apart from contraception and abortion, important factors contributing to differential fertility are economic circumstances, the crowding and consequent restrictions imposed by city compared with country living, early as against late marriage, and restricted versus varied mental interests. Not only the high cost of living, but the endless variety of activities, recreations and intellectual interests in competition with the duties of child-rearing are significant. There is little or no evidence of innate genetical differences in reproductive capacity in different groups or races. Students of population all agree that the reproductive differences are due broadly to environmental influences. Even in the depopulation in various of the South Pacific islands, the several investigators (J. R. Baker, P. A. Buxton, W. H. R. Rivers, G. H. L. F. Pitt-Rivers, S. H. Roberts) were in agreement on this point, though differing in opinion on which environmental factors were most responsible.

In his studies, P. K. Wattal (1934) clearly showed that whether one is dealing with Hindus, Muslims, Parsees or Animists, fertility stands in inverse ratio to standards of living and of intellectual development, and that differences in birth numbers were probably attributable to such nongenetic factors as relative age at marriage and to the extent of contraceptive practices. Raymond Pearl in 1936 in a study of fertility and contraception in urban whites and Negroes found no significant differences between these races in innate fertility. About 70% of the potential mothers in each group became actual mothers.

Optimal Maternal Age for Conception.—Statistical generalization of world-wide samples showed the average age at menarche to lie between 14.8 and 15.2 yrs. Although presumably capable of reproduction after puberty, in young married women even without contraceptive effort, there is generally considerable time lag before complete fertility is established. This fact has been widely noted by many investigators in studies made on varied populations ranging from those of primitive island races to those of great metropolitan clinics. Moreover, there is a normal change in fertility with advancing age. After the average optimal maternal age for conception, which is 20 to 24 yrs. and most commonly 22.5 yrs., average fertility declines toward the menopause, even though no contraceptive efforts are made. Considering extensive data from several sources, Raymond Pearl figured

that of women who have borne children, approximately 56% have no more after the central age of 27.5 years. According to P. K. Whelpton and N. E. Jackson (*Pop. Index,* July, 1939), in the U.S. about 43% of married couples are childless or have only one child, 19.4% have two children and the remaining 37% have three or more.

From data based on 5,097 women, Pearl computed that the average age at menopause is between 46 and 47 years. Assuming the beginning of reproductive capacity as at age 15, this leaves the average age of reproductive life in women as approximately 31 years. Disregarding the relatively infrequent dual or multiple ovulations which result in twins or multiple births, the ovaries of the human female probably release only 13 ova in one year; that is, one in each interval between menstrual periods. With a fecund life period of 31 years this would mean 403 ova during a lifetime. It is by no means certain, however, that ovulation is always correlated with menstruation, particularly at the onset and toward the close of the reproductive span. It was shown by both G. W. Corner and C. G. Hartman that menstruation without ovulation may occasionally occur in monkeys. For women who bear children, indeed, the total number of ova released is less, since they do not normally ovulate during pregnancy and for some time thereafter. How slight is the chance for conception at any desired time is indicated in Pearl's studies of the 30,949 reproductive histories in his collection. Persons who abandoned contraceptive practices in order to secure a desired pregnancy experienced intervals of from a few months to 2, 3 or 4 years before pregnancy resulted.

Quality of Population.—Such facts as the foregoing raise the question of possible qualitative differences in a population. Are there inborn differences in ability and desirable qualities and if so do they tend to produce a social stratification with abler persons at the top and the least able at the bottom? To each of these queries the eugenist would answer yes, although in many specific instances he would find it difficult or impossible to prove how much of a given individual's success was due to native ability, how much to early conditioning and favourable surroundings.

The fact is that the poorest and least successful families, commonly handicapped in health and education as well as economic resources, produce and rear more than their proportion of children. Approximately half of more than 2,000,000 children born in the United States each year during the 1930s were in families on relief or with an annual income of less than $1,000. In general, birth rates are high among groups which are economically and educationally ill-favoured, low among those with high living standards This is possibly in considerable measure because of ignorance of the contraceptive aids which are known and used by the more successful and informed families. The resulting imbalance would, if the difference in social status is due to actual inborn abilities, mean eventually a gradual deterioration in the quality of the national population.

J. Bertillon made an interesting tabulation in 1899 showing that in the same economic groups in four large European cities (Paris, Berlin, Vienna and London) similar differential fertility prevailed in the six economic groups listed by him, ranging from the very poor to the very rich. A study published by P. K. Wattal in 1934 showed that a similar occupational class differential birth rate prevailed in India. The story is almost invariably the same; it is the successful members of the more industrialized and supposedly advanced populations who seem headed toward extinction for lack of fruitful breeding.

The eugenist wishes to see a major portion of births from sections of the population which are fundamentally healthy in body and mind and possessed of those innate capacities which make for intelligence and the finer traits in human conduct. Other things being equal, it is evident that children reared among people well able to care for them will have greater cultural and economic opportunity. What seems to be needed is opportunity for the poor and handicapped to limit their family size if they so desire, and the arousing of a feeling of responsibility on the part of the more favourably situated normal individuals to have more children, at least up to the level of self-replacement (2.62 children per family in the U.S. according to the estimates of Dublin and Alfred J. Lotka.)

Optimal Population.—The disadvantages of an ever-increasing population in a country with limited resources are evident. A stationary population, once a size adequate to defense and self-maintenance is attained, can, by means of expanding per capita production, heighten and vary its consumption of goods and services, and thus raise its living standards to no one can say what limit. To determine what would be the optimal size of population for a country one would not only have to give careful consideration to its resources but also to the prevailing level of living or the level desired by its inhabitants. If physical possessions and their disposal at will be the ideal of the citizens—as it apparently is of many individuals—then economic welfare would be the test. Full employment in producer-goods industries, with high per capita income would seem to be the measure of prosperity. Other things being equal, anything that raised the price of industrial products or lowered the wages of the producers of those products would lower the average living level. Once it reached a high economic level, a given country might live at optimal efficiency and comfort with a stationary population as long as it did not have to exploit less accessible or less rich mineral lands, marginal farm lands, or other resources that would reduce the return per worker and thus raise the cost of production.

The thing most to be feared from undue increase in numbers is a drain on natural resources and the consequent impairment of standards of living. In the United States all statistical studies of birth rates and population trends indicate that this country is likely to reach a population of approximately 160,000,000 between 1960 and 1980, followed by a decline in numbers. This is contingent, of course, upon continuance of existing ways and means of living. Such white European countries as we have data for are already declining numerically. Countries which have high birth rates are being opened up more and more to modern restrictive influences, however, and it may be that eventually their birth rates will reflect the impact of this by becoming lower. Their diminishing death rates already show the influence of modern medicine and hygiene, but this makes it all the more evident that continuation of unrestricted reproduction can lead only to chronic depression and economic disaster.

Contraception and Declining Birth Rates.—Though a decline in birth rate obviously must result from the use of contraceptives intelligently applied, it may not follow that a decline in birth rates in a general population is necessarily due to contraception. There is wide difference of opinion on this point. Some rate it as the chief factor, others look upon it as relatively unimportant. Still others take an intermediate position. It is agreed that it is of significance in special groups of the socially better known countries. It is evident that a highly intelligent woman instructed in the technique of contraception will be successful in avoiding unwanted pregnancy where many women in the population at large would fail or be only partially successful. As noted earlier, on a live birth basis, the white and the Negro women in the U.S. display almost equal fertility—the Negro woman running slightly higher.

The experience in birth control clinics is that though some Negroes come to employ birth control techniques effectively, the great mass of them do not. Data from such clinics show that as against 45.9% urban white women only 17% of Negro women were making any contraceptive effort. Yet there has been a decline in the American Negro group. The reason must evidently be sought elsewhere than in contraceptive practices. Such a careful investigator as Raymond Pearl was inclined to believe that birth control in neither race plays a very important part. He found, however, that both unprovoked sterility and the employment of contraception increased with age in married women. From extensive investigations started in 1931 with the co-operation of large hospitals in or near cities in 15 states east of the Mississippi river he accumulated many important findings. Data secured from a total of 25,316 white women, mainly from the obstetrical services of the better urban hospitals, revealed that some 42.7% of them had practiced contraception regularly or intermittently. This was

true of only 16.4% of the 5,633 Negro women reporting in the same series of investigations. This does not tell the whole story, of course, since childless wives would appear relatively infrequently in an obstetrical hospital.

Public Opinion.—Although in an earlier era literature about, or discussion of, birth control was commonly regarded as reprehensible, or even immoral, the attitude underwent a rapid change in the 20th century. Many of the earlier restrictive laws were nullified by laws or by court decisions. Even in the earlier years of the 20th century the laws of most of the states in the U.S. forbade the dissemination of contraceptive information. In 1937 the federal courts ruled that it was not illegal to send contracaptive information through the mail, and by 1946, 40 or more of the 48 states no longer prohibited the use of contraceptives in medical practice. Only in Massachusetts and Connecticut was it illegal for physicians to give information about birth control technique to women when health required it. Various samplings of opinion concerning birth control were made throughout the U.S. during the late '30s and the early '40s, and the majority opinion always favoured it. In the U.S. there were, in 1946, more than 800 certified birth control clinics existing as a part of a larger program of maternal care, each operating under a medical advisory board. These are commonly connected with city public health services and hospitals but are also sometimes located in settlement houses or other health centres. Centres were also established in the Virgin Islands and Puerto Rico.

Medical Attitude.—The medical profession as a whole, in the U.S. at least, was slow to accept birth control as a routine practice, probably in part from a sense of moral responsibility for the future of the American stock. They saw it practised mainly by the abler classes, leaving it to the more irresponsible and inefficient to keep up the population. Twelve state medical societies and the national American Medical association have gone on record, however, as approving its employment under special conditions.

Unprescribed sale of contraceptives, though supposedly illegal in the U.S., became common in all sorts of places ranging from drug stores to comfort stations, barber shops and even slot machines. Many of the chemicals are worthless and some of them harmful. From a survey made in 1938, *Fortune* magazine estimated that approximately $200,000,000 is spent annually by American women on some 636 such products, many of them sold under the disguise of "feminine hygiene."

The Safe Period.—Some physicians believe that when carefully calculated, confinement of intercourse to the so-called "safe period" is a fairly reliable method of controlling conception. It is based on the probable fact that a woman can become pregnant only during a brief period in her monthly cycle: namely, the day before and the two or three days following the discharge of the egg from the ovary into the Fallopian tube. This commonly occurs about midway between the onset of two successive menstrual periods.

From the standpoint of conceptual control the difficulty is that many women vary as much as five or more days in their cycle. The cycle, moreover, may be changed by illness, anxiety or even excitement. Then, too, in twinning family strains there may be more than a single ovulation and at different times. It seems probable that, when carefully calculated from exact records, the rhythm method may be sufficiently reliable to reduce the chances of conception materially even though not 100% effective.

Abortion.—Birth control should not be confused with abortion, either therapeutic or criminal. The amount of criminal abortion in the U.S. had become appalling by the 1940s. An estimated 90% of it was among married women. The secretary of the American Medical association estimated in 1943 that abortions increased 20% to 40% after the outbreak of World War II. Studies of abortions in hospitals of such large cities as New York, Chicago and Cincinnati showed that approximately 30% of them were criminally induced. The figures, furthermore, were not based primarily on unmarried women or those of loose morals, but were records of American families representing every economic level from very poor to rich. The percentage given was probably an underestimate rather than an overestimate. Not only is criminal abortion an important factor in determining net fertility, but natural abortion has also to be reckoned with. It seems well-established from several sources that natural abortions become more frequent with increasing pregnancies. Approximately 20% is the value commonly assigned for such reproductive wastage in countries of advanced culture.

Sterilization.—Technically considered, there is a sharp distinction, both in purpose and technique, between birth control and sterilization. Since the latter affects birth ratios, however, it can not be ignored in a discussion of population problems. Sterilization is a procedure directed by the state or with its sanction in the eugenic interests of its citizens. Its function is to protect society by preventing the production of defective offspring. It is applied to individuals who have not the intelligence to handle contraceptives nor the ability to care properly for children.

The operation consists in cutting and sealing the tubes through which the germ cells (spermatozoa or ova) must pass. It is not a process of asexualization but merely a means of insuring sterility. It enables many handicapped persons to marry and lead a sexual life normal in practically every respect except the begetting of children. Although 29 states of the U.S. and Puerto Rico had passed selective sterilization laws by 1946, these had been applied but sparingly in most of them except California, where, up to Jan. 1, 1941, 14,568 sterilizations of insane and feebleminded had been performed. After a careful case-history study of the first 10,000 of these, the Human Betterment foundation, a non-profit corporation of mainly professional and business men, organized in 1928 under the laws of California to investigate the possibilities of human betterment in the state, pronounced the practice a protection, not a punishment.

In all, 35,878 legally approved sterilizations had been performed in the U.S. up to Jan. 1941. Other countries which had adopted eugenic sterilization laws were the Canadian provinces of Alberta and British Columbia, Norway, Sweden, Denmark, Finland, Esthonia, Germany, the city of Danzig, the state of Vera Cruz, Mexico and the canton of Vaud, Switzerland.

The Religious Attitude.—It is well known that objections to birth control have been voiced by various religious bodies, notably the Roman Catholic Church. Inasmuch as His Eminence Cardinal Bourne, archbishop of Westminster (1861–1935), had the attitude of his church drawn up in specific form for publication, excerpts from this statement may well serve to voice the religious objections. To quote him:

"The teaching of the largest organized body of Christians in the world has an inherent interest of its own. The Catholic doctrine is embodied in the constant and universal tradition of the Church, and has been the subject of repeated instructions from the Holy See. It is not a matter of theological opinion, but is the considered judgment of an authority which every Catholic knows can not err in defining Christian morals. For a Catholic this is sufficient, but if a reasoned analysis of the position is desired, it may be explained as follows:

"i. There is no law requiring married people to have large families and if they wish to live in continence they are entitled to do so, but they are absolutely forbidden to exercise the act of generation and frustrate its natural purpose. Birth prevention is prohibited because it is wrong, with an initial fundamental wrongness antecedent to any ecclesiastical law or tradition. The prohibition is based on a principle of natural morality, which no human authority can change or dispense, and which can be accepted by non-Catholics, provided their moral conduct is not based on an ethical philosophy at variance with Christianity.

"ii. Just as certain physical laws govern non-rational things, so also in the human being there is a law regulating the exercise of his faculties and the satisfaction of his desires, whether individual or social. In his free and deliberate movements man should act in accordance with the law of his being, which because of this distinctive element of freedom is called the 'moral' law; actions performed in harmony with it perfect his nature and are morally good; those which disregard it are morally bad. The wrongness of certain actions may be demonstrated to some extent

by examining their subsequent effects on the individual or on the race. It is a line of enquiry offering a strong contributory argument, and the physical, domestic and social evils attendant on birth prevention have been indicated elsewhere. But, except on a principle which is frankly utilitarian, it falls just short of a complete demonstration of the wrongness of contraception. This must be sought primarily, directly, objectively and intrinsically in the action itself, not merely in its effects. In a complex organism the good of the whole is achieved by employing the parts each in accordance with its natural purpose. Birth prevention is wrong for the same reason that any other unnatural sexual vice is wrong, namely, because sexual pleasure is gratified in a manner which frustrates the natural purpose of the action.

"iii. The moral or natural law is a participation in the rational creature of the eternal law of God, Who has fixed the sanction of punishment to its non-observance. Birth prevention is supremely evil because it is sin, *i.e.*, an offense against a personal God, the fear of Whom is the beginning of wisdom, and experience shows that the fear of committing sin is the only adequate reason deterring people from this practice.

"iv. An action which is intrinsically and naturally evil can never for any reason be tolerated, no matter how pressing the circumstances which appear to justify it, and no matter how good the intention of the agent may be. Anything short of a rigid and logical application of this principle would be permitting the patently immoral doctrine that the end justifies the means.

"v. The admitted difficulty of observing this law is lessened from the fact that Christian marriage is a sacrament, and the grace it bestows carries with it a title to the special assistance of God, enabling married people to surmount the difficulties of their state, the burden of rearing children, and the observance of continence in circumstances where conception must be avoided at all costs short of sin. It is, moreover, a sacrament symbolizing the union between Christ and the Church (Ephesians v, 25–32), by which human beings, raised to a supernatural dignity, cooperate with God, in peopling Heaven with the sons of God."

The strong opposition to contraception voiced by the Catholic Church is shared by members of the orthodox Jewish faith and by some Protestant sects. Various denominations in the Protestant and Jewish faiths, however, have officially shown themselves in favour of planned parenthood. Although the Roman Catholic hierarchy stands opposed to mechanical and chemical methods of contraception, under ecclesiastical approbation it permits distribution of informational literature about the so-called "safe period" (Leo J. Latz, M.D.: *The Rhythm of Sterility and Fertility for Women*, 1932). The Reverend Francis J. Connell, a prominent moralist of the Church, asserted in the *Atlantic Monthly*, Oct. 1939, that, "The Catholic Church does not teach that married couples are obliged, or even always counselled, to have as large a progeny as is physically possible. Reasons of health or of economy not infrequently make it advisable for a couple not to have more."

Complexities of the Problem.—While birth control advocates stress the hygienic and social importance of fewer children properly spaced and better cared for, the majority of people seem to continue their way unheedingly. If they practice contraception —as in certain classes many do—it is apparently motivated mainly by a desire for more unhampered pleasure and the avoidance of the responsibilities attendant upon a family of children.

Most population authorities maintain, however, that any nation will bear children in sufficient numbers for replacement where conditions are favourable for early marriage and the economic burden of parenthood is not too heavy, particularly if a favourable social attitude toward child-bearing is cultivated. It was seemingly in part a matter of fashion; social classes tended to imitate each other in family size. The small family was probably in no small part the result of an accepted "culture pattern" or way in which the community regarded family size. Birth control techniques have doubtless been an important factor in maintaining their small size. However, the personal attitudes and values of the community can probably be swayed by education. Too many complex human variables are involved to permit of positive conclusions. Far more than any other organism man makes his own environment, and inasmuch as the relation between organism and environment is always reciprocal—neither has significance without the other—his environment inevitably also moulds man. By and large he fits into the social pattern that has been established consciously or unconsciously by his fellow men.

The small family system is in large measure a natural product of the conditions of contemporary life. In an industrial society and the accompanying crowding into cities, children become a liability—even to the point of impoverishment in some cases—instead of the economic asset they were in an earlier agricultural economy. Since, then, the reduction in family size is primarily the result of changed social and economic forces, if larger families are desirable in certain classes, the most practical way of obtaining this objective is by determining and correcting the restrictive factors. The most pressing of these seems to be the cost and inconvenience of rearing children.

Various European countries in particular, alarmed by their declining birth rates, were endeavouring to improve the situation. In general their efforts were taking the form of attempts toward relieving parents of part of the expense of caring for children, and toward improving economic conditions. Instances of state aids of various kinds such as marriage loans, extensive services for parents and children and reduction of economic burdens have already been cited earlier in discussing the situation in Sweden and Germany. In France wage payment on a family allowance basis was put into effect. According to the French family code proclaimed July 29, 1939, the scheme covers all families of farmers, farm-labourers, share-farmers and even the liberal professions. As an extreme, a worker on average wages, with four dependent children could receive a current allowance equal to 60% of his basic pay. At the other extreme childless families with high incomes are subject to special surtaxes on income and inheritance. The rewards of any direct bounty on reproduction, however, would probably merely stimulate families of the less able to increased fruitfulness. The desirable outcome, if it is attainable, is a population in which the abler strains will increase their numbers and the less able will decline.

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BIRTH RATE. In order to compare communities with different numbers of population, birth statistics are commonly expressed in the form of crude birth rates per 1,000 of population. For example, there were recorded 2,287,980 births in the United States during 1938; with an estimated population of 130,215,000 in that year, the crude birth rate is found to be 17.6 per 1,000. England and Wales had a crude birth rate of 15.1 per 1,000 during 1938. Negroes in the United States experience crude birth rates much higher than do white persons, the rates per 1,000 in 1937 being 20.6 and 16.6 respectively.

Age Incidence.—The ratio of the number of births among mothers of any particular age to the total female population living at that age, is known as the age-specific fertility rate. Fertility rates vary widely with the age of the mother within the reproductive period of life. Thus, in the United States during 1937, the fertility rates per 1,000 white females within successive five-year age groups were: 15 to 19 years, 41; 20 to 24 years, 118; 25 to 29 years, 108; 30 to 34 years, 73; 35 to 39 years, 44; 40 to 44 years, 15; and 45 to 49 years, 2. By considering the numbers of sons

and daughters separately, age-specific fertility rates may also be made specific according to the sex of the child. When the numbers of births are classified according to whether they were first, second, third, etc., births to their mothers, age-specific fertility rates may be computed separately for each rank in order of birth. Fertility rates may also be computed specifically for the married women by relating the births to their numbers, instead of those of all women.

It is evident that the crude birth rate of a community is strongly influenced by the proportion of its total population which is included in the reproductive ages, and also by the distribution of the population within the reproductive ages. Other factors that may influence the crude birth rate are the ratio of males to females in the population, the proportion of females who are married, and the ages at marriage. However, information regarding these factors is not always available, and it therefore is necessary to make some mental allowance for their influence upon crude birth rates when comparisons are being made.

International Comparisons.—Most countries of western Europe had (1940) a birth rate of less than 20 per 1,000—a rate which was considered low not many years ago. Thus, the Scandinavian countries, the countries of the British Isles, Belgium, France, Germany and Switzerland, among others, had birth rates of 20 per 1,000, or less, during the period 1936 to 1938. Countries with the highest birth rates are principally in South America and in Asia. The following countries had birth rates of 30 per 1,000, or greater, in the period 1935 to 1938: Chile, 33.9; Colombia, 30.6; Egypt, 43.1; India, 34.9; Japan, 30.7; Mexico, 40.4; Palestine, 42.1; Rumania, 30.6; and Venezuela, 33.4. Most of these countries with high birth rates also experience high death rates (*see* DEATH RATE) and high infant mortality. Birth rates

TABLE I. *Average Annual Births per 1,000 Total Population in Certain Countries for the Period 1936 to 1938*

Country	Birth Rates per 1,000 1936 to 1938	Country	Birth Rates per 1,000 1936 to 1938
NORTH AMERICA		EUROPE (Continued)	
United States	17.1	Ireland, Northern	20.0
Canada	20.1	Italy	23.0
Mexico	40.4	Latvia	18.1
SOUTH AMERICA		Lithuania	23.0
Argentina	24.2	Netherlands	20.2
Chile	33.9	Norway	15.2
Colombia	30.6	Poland	25.2
Uruguay	20.0†	Portugal	27.4
Venezuela	33.4	Rumania	30.6
EUROPE		Scotland	17.8
Austria	13.3	Spain	25.9*
Belgium	15.4	Sweden	14.5
Bulgaria	24.0	Switzerland	15.3
Czechoslovakia	17.4	Yugoslavia	28.8†
Denmark	18.0	ASIA	
Eire	19.4	India, British	34.9†
England and Wales	14.9	Japan	30.7†
Estonia	16.2	Palestine	42.1
Finland	19.6†	OTHER COUNTRIES	
France	14.8	Australia	17.3
Germany	19.1	Egypt	43.1†
Greece	27.6†	New Zealand	17.3
Hungary	20.0	Union of South Africa (Whites)	24.6†

†Average for 1935 to 1937. *Average for 1934 and 1935.

as high as the foregoing would undoubtedly be found in many populous countries which at present have no adequate system for recording births. A comparison of birth rates for a number of countries may be made in Table I.

Trend.—Birth rates have been declining rapidly since the last quarter of the 19th century in practically all important countries of the world. Thus, England and Wales, which had a crude birth rate of about 35 per 1,000 in the years from 1851 to 1880, already had evidence of a decline in the decade 1891–1900, when the birth rate averaged 29.9 per 1,000. This level was halved by 1931–38, during which period the birth rate was about 15 per 1,000. In the United States the birth rate fell from 25.1 per 1,000 in 1915, the earliest year of official record, to a low point of 16.5 in 1933; however, by 1938, the rate had risen to a point higher than that for any year since 1931. (See Table II for other countries.)

World War I seriously affected the birth rates of the countries engaged. For example, in France the prewar birth rate of 18.8 per 1,000 in 1911–13 was reduced to half, 9.4, in 1916. Following the cessation of hostilities, the birth rates in the warring countries rose to a sharp peak in 1920. For a better understanding of the decline in the birth rate, it is necessary to study the changes that have taken place in age-specific fertility rates and in the fertility rates with regard to births of successive orders of children. A comparison based on data for the U.S. in the periods

TABLE II. *Average Annual Births per 1,000 Total Population in Selected Countries for Specified Periods and Years from 1851 to 1938*

Period or Year	United States	England and Wales	France	Germany	Italy	Sweden
1851–60	*	34.2	26.4	35.3	*	32.8
1861–70	*	35.2	26.3	37.2	*	31.5
1871–80	*	35.4	25.4	39.1	36.9	30.5
1881–90	*	32.5	23.9	36.8	37.8	29.1
1891–1900	*	29.9	22.2	36.2	35.0	27.2
1901–10	*	27.3	20.6	33.0	32.7	25.8
1911–13	*	24.1	18.8	28.1	31.9	23.7
1914	*	23.8	17.8	26.8	31.1	22.9
1915	25.1	21.9	11.6	20.4	30.5	21.6
1916	25.0	20.9	9.4	15.2	24.0	21.2
1917	24.7	19.8	10.4	13.9	19.5	20.9
1918	24.6	19.8	12.2	14.3	18.1	20.3
1919	22.3	18.8	12.8	20.0	21.4	19.8
1920	23.7	25.5	21.3	25.9	31.8	23.6
1921–25	22.5	19.9	19.3	22.1	29.7	19.1
1926–30	19.8	16.5	18.2	18.4	26.8	15.9
1931–35	17.2	15.0	16.5	16.6	23.8	14.1
1936	16.7	14.8	15.0	19.0	22.4	14.2
1937	17.0	14.9	14.7	18.8	22.9	14.3
1938	17.6	15.1	14.6	19.7	23.6	14.9

*Not available.

1920–24 and 1930–34 showed that the decline in fertility rates was least in the early reproductive ages of women and became more pronounced with increase in age. Thus, in the age group 20 to 24 years, there was an 18% decline in the fertility rate, while in the age group 40 to 44 years, the decline amounted to 34%. It was also found that the rate at which first children were born declined least and that the declines became greater as the order at birth advanced, particularly as far as the first four children were concerned. From these findings it was concluded that the fall in the birth rate in the United States may be attributed more to the limitation of size of families than to a general decline of fertility rates.

Social Status.—Birth rates generally are highest in the social classes at the bottom of the economic scale and lowest in the classes at the top of the scale. Thus, data collected in the national health survey conducted by the United States public health service, 1935–36, and relating to a large white urban population, show that where the family income was $3,000 or over, the birth rate was 7.8 per 1,000, while in families where the income was under $1,000, the birth rate was 17.3 per 1,000. The difference is not so marked when the births are related to married women within each social class, rather than to the total population.

Net Reproduction Rate.—Most countries which experience a birth rate greater than the death rate owe this excess, commonly called the crude rate of natural increase, to a temporarily large proportion of population at the reproductive ages of life. For these countries, the continuation of present age-specific fertility rates and death rates will remove this temporary circumstance

TABLE III. *Net Reproduction Rate in Certain Countries*

Country	Period	Net Reproduction Rate	Country	Period	Net Reproduction Rate
Austria	1934	.64	Italy	1935–37	1.13
Australia	1937	.99	Japan	1930	1.54
Belgium	1936	.83	Latvia	1938	.95
Bulgaria	1933–36	1.19	Netherlands	1937	1.12
Canada	1930–32	1.30	New Zealand	1938	1.02
Chile	1930–32	1.30	Norway	1936	.79
Czechoslovakia	1935	.79	Poland	1934	1.11
Denmark	1937	.95	Portugal	1933	1.29
Eire	1935–37	1.16	Russia	1926–28	1.7
England and Wales	1937	.78	Scotland	1936	.96
Estonia	1933–35	.73	Sweden	1936	.76
Finland	1931–35	.96	Switzerland	1938	.79
France	1937	.87	United States, Whites	1937	.97
Germany	1938	.95	Union of South Africa, Whites	1937	1.30
Greece	1930–32	1.25			
Hungary	1933	.91			

and the birth rate will then fall below the death rate. The situation is clarified when the reproductive capacity is gauged by computing the ratio of female births in two successive generations under prevailing age-specific fertility rates and death rates. This is effected by tracing a group of, say, 100,000 females from birth to the end of their reproductive period, with proper allowance for survival on the basis of current age-specific death rates, and noting how many female births would occur among them if they experienced at each age the age-specific fertility rates observed in an actual population. The ratio of the resulting total number of female births to the number in the original group is termed the net reproduction rate, or the rate of increase per generation. From this can be computed the corresponding true or intrinsic annual rate of natural increase. The net reproduction rate for white females in the U.S. for 1937 was found to be 0.965, with a corresponding intrinsic rate of −1.3 per 1,000, the minus sign indicating a rate of decrease. For England and Wales, in 1937, the net reproduction rate was 0.78. Corresponding rates for other countries are shown in Table III.

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BIRUNI (ABU-R-RAIHAN MUHAMMAD AL-BIRUN) (973–1048), Arabian scholar of Persian parentage, was a Shī'ite in religion. He pursued the study of history, chronology, mathematics, astronomy, philosophy and medicine. He corresponded with the Ibn Sīnā (*see* AVICENNA), and the answers of the latter are still preserved in the British museum. He went to India, where he taught Greek philosophy and learned that of India. In 1017 he was taken by Mahmūd of Ghazni to Afghanistan, where he remained until his death in 1048.

An English translation of his *Athār ul-Bākiya* under the title of *Chronology of Ancient Nations* appeared in 1879, and his *History of India* was issued in English in 1888.

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BIS (Lat.), twice. A term employed in music to signify, when printed in a score, that the passage in question is to be repeated; also used by French audiences as an exclamation equivalent to "encore."

BISALTAE, a Thracian people on the banks of the lower Strymon, in the district between Amphipolis and Heraclea Sintica on the east and Crestonice on the west. They also made their way into the peninsulas of Acte and Pallene in the south, beyond the river Nestus in the east. Under a separate king at the time of the Persian wars, they were annexed by Alexander I (498–454 B.C.) to the kingdom of Macedonia. At the division of Macedonia into four districts by the Romans after the battle of Pydna (168 B.C.) the Bisaltae were included in Macedonia Prima (Livy xlv, 29).

Their country was rich in figs, vines and olive trees; the silver mines in the mountain range of Dysorum brought in a talent a day to their conqueror Alexander. The Bisaltae are referred to by Virgil (*Georgics,* iii, 461) in connection with the treatment of the diseases of sheep. The fact that their eponymus is said to have been the son of Helios and Ge points to a very early settlement in the district.

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BISBEE, a mining city of Cochise county, Arizona, U.S., on the Southern Pacific railway, 7 mi. from the Mexican border. The population in 1930 was 8,023; in 1940, 5,853; including the residential suburbs of Warren and Lowell, it was over 11,500 by federal census. The main street, which is a section of federal highway 80, runs along a canyon 5,300 ft. above sea level, and the city has spread up the slopes and over the still higher adjacent plateaus. Three of the largest copper mines of the country are there. The mines of the Bisbee district employ 2,000–2,500 men, and ship thousands of pounds of ore daily to the smelters at Douglas and elsewhere. Their total annual production of copper is valued at more than $12,500,000. Silver, gold, lead and zinc are also mined. A striking landmark is "The Pit," a hole several hundred feet deep and covering 18 ac., which has been excavated out of the solid copper ore of Sacramento hill.

BISCACHA: *see* VISCACHA.

BISCAY (VIZCAYA), a maritime province, and former *seigneurie,* of northern Spain. Pop. (1940) 511,135. Area 836 sq.mi. The *seigneurie* was vested in the Crown of Castile and León in 1379, but the province, like Álava and Guipúzcoa, enjoyed a certain amount of autonomy and desired more. In particular, relations of the Basque provinces (*Vascongadas*) with the national exchequer were governed by a special agreement. This *Concierto Económico,* signed for the Basque provinces in 1925, was cancelled for Biscay after the Nationalist victory in 1937. Of the three Basque provinces, Biscay and Guipúzcoa lie in a zone of hills and low mountains of confused alineation between the Pyrenees and the Cantabrian mountains, and wholly on the northern side of the main crestline connecting these systems, marked by the Sierra de Aralar, Sierra de San Adrián and Peña de Gorbea (1,538 m.). The third province, Álava, lies to the south of this line, on the platforms, separated by ranges of hills, which descend step-like to the structural basin of the middle Ebro (*see* ÁLAVA). The confused network of hills in the north and east of the area has undoubtedly contributed to the isolation of the Basque people and to the preservation of their language, which has disappeared from the Alavese platforms and from the western Biscayan district of Las Encartaciones, bounded on the south by the distinctly lower Montes de Ordiente (800-1,000 m.). Biscay may be defined roughly as the area of main east-and-west drainage by the rivers Cadagua and Ibaizábal, which unite with the Nervión, descending from the Enclave of Orduña in the province of Burgos, to form the estuary on which stands Bilbao. Guipúzcoa is the area of main northward drainage by the rivers from the Deva eastward to the frontier with France, but the province narrows out in the east to a coastal strip on the lower courses of the Urumes and Bidassoa. The poverty of the soils, derived mainly from sandstones and compact limestones, and the humidity of the climate determine the pastoral character of these two northern provinces. The coast is dangerous to approach, and the rias which indent it are blocked by the alluvium brought down by the rivers; thus harbours are difficult to maintain. The town of San Sebastián is largely built on the alluvium joining broken sections of the Cantabrian coastal platform which is here without human significance.

Biscay is the most important iron-producing province of Spain, the most important lode being that of Matamoros (Somorrostro); 150,000,000 tons of ore have been extracted since the close of the Carlist Wars, and the reserves are now estimated at 60,000,000 tons. Guipúzcoa has several small lodes; at Arditurri 4,000,000 tons of iron ore have been proved by borings.

Less than 10% of the province is under cultivation, and 80% forest and rough pasture. The farms are small, and the isolated *caseríos* or farmhouses are scattered over the hillsides. The main cereal crop is maize (about one-third of the cultivated area); apples are the chief fruit crop. But the agricultural production of the province is entirely secondary to its mineral and industrial wealth, and food-stuffs are imported. The humid climate favours the growth of forage plants, and, as in the other Basque provinces, practically all the farmers are also stock-raisers. Livestock includes horned cattle, bred for milk and meat as well as for labour; the numbers, reduced by exportation during World War I, were restored by the exertions of the provincial authority (*Diputación*), which has fine model stock farms. The forests are managed by the same authority. Fisheries, principally of cod, bream and anchovy, are active along the coast.

In mineral production Biscay is second only to Oviedo; iron of fine quality is found in almost every part and forms a main article of export. Tinplate, railway rolling stock, chemical manures, soaps and vegetable oils, cement, bricks and tiles, glass, jute and other textiles, preserved foods, dynamite and other explosives and paper are important products. Mineral spas and springs attract visitors from all parts of Spain. The mining and industrial interests of Biscay were assisted by the rapid development, after 1870, of railways, and the excellence of the roads, kept up by the provincial authority. The inhabitants are enter-

prising and well educated; the percentage of illiteracy is among the lowest in Spain. The density of population (611.4 persons per square mile) is the second highest in Spain.

Bilbao (pop. 1940, 183,200), the capital and principal port, and Baracaldo (pop. 1940, 4,396), important industrially, are described in separate articles. Other towns with 1940 population figures, are Sestao (18,625), Basauri (10,605), Elorrio (1,490) and Guecho (17,795). The port of Bermeo (10,235) is the chief fishing station; Durango (5,965), on the Ibaizábal, was founded by the early kings of Navarre in the 10th century, obtained the rank of a countship in 1153, and contains one of the oldest churches in the Basque provinces, San Pedro de Tavira; Guernica (1,977), on the river Mundaca, is celebrated for its oak tree, still the meeting-place of the representatives of the valleys, although the main business of the meetings has long been transacted in a neighbouring *ermita*. The *Árbol de Guernica* was celebrated by the Basque poet, José María Iparraguirro, in a song which is regarded by the Spanish Basques almost as a national anthem.

The Basque autonomy movement was checked violently by the nationalists' conquest of the region in 1937 and by Franco's subsequent complete victory over the government forces in 1939. The province was the scene of some of the heaviest fighting during the civil war. Miners joined the regular loyalist forces as irregulars, sometimes delaying nationalist troops by throwing sticks of dynamite in their path of advance. For the history of the Basques, *see* BASQUE PROVINCES; for the language, *see* BASQUE LANGUAGE; for the people, *see* EUROPE.

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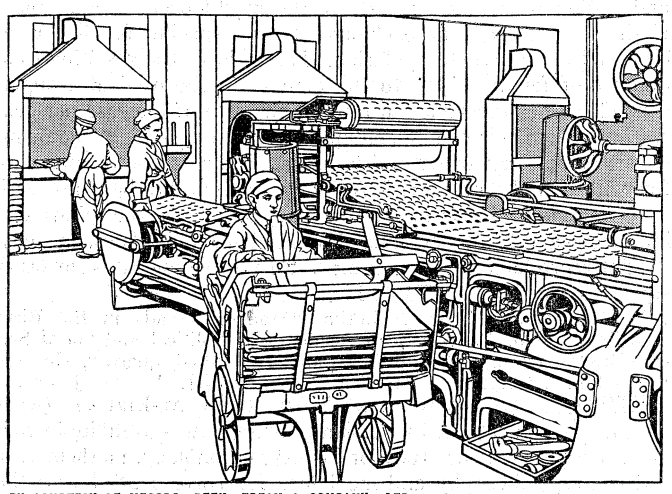
BISCAY, BAY OF (Fr. *Golfe de Gascogne;* Sp. *Golfo de Vizcaya*), an inlet of the Atlantic ocean; bounded on the east and northeast by France, and on the south by Spain. It was called by the Romans *Sinus Aquitanicus, Sinus Cantabricus* or *Cantaber Oceanus,* whence the term Cantabrian sea. The name Biscay is a corrupt form of the Spanish *Vizcaya.* The curve of the bay is broken on the French seaboard by the estuaries of Loire, Garonne, etc. The mountainous Spanish coast has many fjord-like inlets, especially in the west, where navigation is difficult. The bay, with its exposed position and varied currents, is notorious for its storms.

BISCEGLIE (perhaps anc. *Natiolum*), episcopal see, Apulia, Italy, on the east-southeast coast, province of Bari, 21½ mi. by rail N.W. from Bari. Pop. (1936) 32,552 (town), 33,552 (commune). Three towers, one some 90 ft. high, of a strong Norman castle still remain; the cathedral and S. Adoeno belong to the same period. S. Margherita (1197) has fine canopied Gothic tombs of the Falcone family.

BISCHOFSWERDA, a town in the *Land* of Saxony, Germany, 22 mi. E. of Dresden, in the governmental division of Bautzen. Pop. (1939) 10,141. There are factories for cloth and artificial flowers; also glassworks and potteries; and in the neighbourhood large granite quarries. It is famous as the scene of a battle, May 12, 1813, between the French and the Allies, after Napoleon's retreat from Moscow. It was the residence of Benno, bishop of Meissen, in the 11th century, and the "Bishop's Road" still runs from there to Meissen.

BISCUIT. The variety of products embraced by the term biscuits has shown a marked increase since the beginning of the 20th century, and the products of a large modern biscuit bakery include a great number of specialized varieties of which the composition and methods of manufacture differ widely. In the United States the most popular varieties are soda crackers; spray-type crackers (described later); graham crackers (made from graham and white flour); oyster crackers; sweet, lunch or milk biscuits; iced or marshmallow covered cakes; sandwiches (filled biscuits); snaps (small, thin, crisp cookies); sugar and other wafers.

The ingredients used in biscuits are numerous and of these wheat flour is the most important. The type of flour used depends upon the kind of biscuit to be produced and varies from a very soft flour, *i.e.,* one which contains only a moderate amount of soft elastic gluten (protein), used in the more tender cookies, to "stronger" flours, used in soda crackers, containing more and stronger gluten, and approaching the type of flour used in bread. (*See* BREAD AND BREAD MANUFACTURE.) In addition to the common white wheat flour, other cereal flours such as whole wheat, oatmeal, rye, corn, rice, soy and arrowroot flour may be used to



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A FEW OF THE STEPS INVOLVED IN MAKING BISCUIT WITH MACHINERY
The dough passes on an endless travelling band to the rollers, which reduce the thickness of the slab. After passing between another pair of rollers, which give the correct thickness for the particular biscuit to be made, it comes under the cutters to be stamped into shapes, and from there is carried to the oven (rear), in this case the well known older type called the reel oven

give variations in flavour, nutritional value and appearance. Sugar in its many forms is a very important ingredient and this sweetening agent contributes much to the variation in types of sweet biscuits. Highly refined cane or beet sugar in various degrees of fineness is the most important of the sweetening agents, but raw sugar, invert sugar, molasses, corn syrup, honey and malt extract are used to give distinctive flavours and characteristics to the finished product. The type and amount of shortening used largely determine the tenderness or shortness of the finished product, and contribute to the flavour as well. The more important shortenings commonly used in biscuits are lard, oleo oil, coco-nut oil, butter and hydrogenated vegetable oils. Other ingredients commonly used in biscuit products include frozen eggs, condensed or powdered milk, dried fruit, chocolate, cheese, coco-nut, nuts, spices and flavouring essences. The leavening agents are used in small quantities to make the biscuits light. They produce gas within the dough, whereby the dough is expanded. In fermented doughs, such as are used to make soda crackers, the leavening generally is yeast, otherwise ammonium bicarbonate, or baking powder composed of a mixture of bicarbonate of soda and tartaric or other acids is used. The bicarbonate of soda and acid ingredient of the baking powder react to give off a gas, carbon dioxide, necessary for the lightening of the dough. The careful preparation of raw materials by inspection, grading and washing is of great importance, and chemical analysis of all ingredients is necessary to maintain the purity and quality of the finished product. Biscuit and cracker bakeries must carry a stock of a variety of ingredients, and their storage under suitable conditions and regulated supply to the mixing rooms require careful organization.

Manufacture of Biscuits.—The more important types of biscuits may be divided into five general classifications: (1) soda biscuits made from fermented doughs similar to bread dough, (2) lunch or milk biscuits, (3) plain sweet biscuits or cookies, (4) filled biscuits or sandwiches, (5) iced biscuits or cakes.

The manufacture of biscuits varies considerably depending upon the type to be produced, but in general the procedure is as follows:

Mixing and Machining.—After careful inspection the various ingredients are weighed and assembled for each individual dough.

These ingredients are then blended in large electric mixers, which have a capacity of 1,000 to 1,500 lb. The mixing arms revolve and thoroughly knead the dough. Length of mixing and consistency of the dough vary with the type of biscuit to be made.

In the case of fermented doughs such as are used for soda crackers, portions of the flour, yeast and water are mixed to form a "sponge" and allowed to ferment for a period of time in large steel troughs. When the fermentation period is completed the remainder of the flour, the shortening and other ingredients are added to the "sponge" and the dough remixed and allowed to ferment again for a shorter period of time. The dough is then passed through several sets of rollers, reducing the thickness of the sheet to the desired amount, which may be as thin as $\frac{1}{16}$ of an inch. This sheet of dough is then conveyed on canvas aprons to the cutting or stamping machine, where the individual biscuits are cut out and stamped with the design desired. At the same time the dough is pierced with small dockers producing holes through which the steam may escape during the baking process.

In the case of lunch or milk biscuits some type of baking powder rather than yeast is used as the leavening agent. The dough is mixed in one operation and allowed to "proof" or stand for a short period of time, usually two to four hours, before it is rolled and stamped out. These biscuits are slightly sweet and often contain appreciable quantities of milk.

A popular cracker introduced in the United States in 1934 is characterized by a delightful nutlike flavour produced by a vegetable oil spray applied as the baking is completed.

Sweet biscuits, or cookies, as they are called in the United States, contain considerably more shortening and sweetening agents than the aforesaid types and vary greatly in flavour, shape and design. The dough is mixed in one operation and leavened with baking powder. Immediately after mixing, these doughs may be rolled out in sheets and cut into individual shapes as outlined above or pressed into moulds and the biscuits released directly onto the apron conveying them to the oven. In the case of batter-type cookies or wafers, the dough may be fed from nozzles and deposited directly on the pans or other baking surface. In making sugar wafers the proper quantity of thin batter is poured on a plate and a second plate of the same size is clamped down on it to produce a thin sheet of waffle type.

Baking.—There are three general types of ovens used for the baking of biscuits. First, the older type, known as the reel oven, consists of a number of shelves which rotate in a large brick oven. The heat for baking is furnished by the burning of gas, coke, or coal at the bottom of the oven. The biscuits are either placed on pans and the pans on shelves, or the biscuits may be placed directly on the shelves of these ovens. Second, the travelling type of oven, in which pans are carried through a long baking chamber either on chains or plates attached to chains, and the heat for baking is generally supplied by gas burners above and below the pans. Third, the continuous band oven which was developed after 1920. In this type, the biscuits are fed directly from the cutting or moulding machine by means of canvas aprons and deposited on a thin metal band or wire mesh band which conveys the biscuits through the baking chamber, the latter heated by gas burners located above and below the steel or wire mesh band. The length of the baking chamber varies from 100 to 300 ft. The travelling and band type of ovens, normally heated with gas, are easier to clean than reel ovens and the temperature is more easily controlled. Some types of biscuits require a short baking period at a high temperature, whereas other types may require a longer baking period at a lower temperature. This is accomplished by variations in the temperature of the oven and by increasing or decreasing speed and the resultant movement of the biscuits through the oven. For the more common sweet biscuits and soda crackers the baking time is from $3\frac{1}{2}$ to 6 min. at a temperature of 400 to 500° F. When the biscuits are baked on pans they are cooled and conveyed to tables where they are packed in receptacles in which they are offered for sale. In the case of biscuits baked on continuous bands the biscuits are removed from the band at the end of the oven and conveyed on aprons to tables where they are packed in containers.

Icing.—Filled biscuits or sandwiches are made using lunch-type biscuits or plain sweet biscuits as the base cakes. In the former variety the filler may be cheese or peanut butter, and between the sweet biscuits a sweetened cream filler is generally used. In either case the base cake is fed from a hopper or magazine onto a travelling canvas apron where the filler is deposited or stencilled on it and a second base cake is automatically placed on top, forming a sandwich.

A popular fancy iced biscuit or cake is produced by depositing marshmallow on a plain sweet biscuit and coating it with pure chocolate or icing. This may be decorated with nuts or fruit.

Packaging of Biscuits.—Since the beginning of the 20th century there has been a marked evolution in the type of containers used for packaging biscuits. Prior to this time biscuits and crackers were commonly packed in barrels, large wooden boxes or tins and sold to the consumer by the pound.

At the turn of the century small cardboard boxes or cartons were introduced, and the biscuits packed in these containers were sold to the consumer through food stores. Individual cartons of various design have almost entirely replaced the barrel and box containers and have led to the merchandising of biscuits in various sized packages suited to the needs of the individual consumer.

These sanitary and attractive cartons are especially designed to retain the crispness and flavour of the product. About 1930 cellophane containers were designed to permit the consumer full view of the biscuits contained in the package. This type of package has been found to be particularly advantageous in the selling of the fancier sweet biscuits. In the modern biscuit bakery sanitation and efficiency are stressed. Many types of biscuits are being produced in such a manner that the ingredients, dough and finished products are never touched by human hands but are carefully inspected and controlled by trained operators throughout the manufacturing process to ensure the finest uniform quality.

Home-made Biscuits.—These can be made in great variety. In the United States the term "biscuit" is used for small chemically-leavened unsweetened breads, usually round, 2 to $2\frac{1}{2}$ in. in diameter. Biscuits are made of flour, leavening, salt, shortening and milk. When sweet milk is used, the leavening is baking powder—when sour milk, soda, hence the name "soda biscuit." In the south, where biscuits are a part of almost every meal, they are often made of self-rising flour, shortening and milk. Although biscuit dough is usually kneaded, rolled, and then cut with a cutter, "drop" biscuits are sometimes made by making a softer dough which is dropped in spoonfuls on a baking pan. Biscuits are eaten hot, with butter or margarine, sorghum, honey or preserves. In the south, a thinner, crustier biscuit is generally preferred, while in the north a taller biscuit with a larger proportion of soft crumb seems to be preferred.

Beaten biscuits, traditional colonial bread of the southeastern United States, are plain, hard biscuits. A stiff dough of flour, salt, shortening and water is kneaded until smooth. Then it is beaten with a rolling pin until thin, folded, beaten again. This process is repeated until the dough is satiny smooth, but slightly blistered under the surface. The dough is then rolled $\frac{1}{4}$ in. thick, cut into small rounds $1\frac{1}{2}$ to 2 in. in diameter, pricked with a fork, and baked $\frac{1}{2}$ hr. in a moderate oven.

BISECTOR, a point which divides a line segment into two equal parts (also used in the Latin feminine form "bisectrix"); a line which divides a plane angle into two equal angles; a plane that divides a dihedral angle in the same way; or, more generally speaking, any line or plane that divides any geometric magnitude (like a parallelogram, sphere, or cube) into two congruent parts. In crystallography, it denotes the bisector of the angle between the optic axes.

BISECTRIX: *see* BISECTOR.

BISHARIN: *see* BEJA.

BISHOP, SIR HENRY ROWLEY (1786–1855), English musical composer, was born in London on Nov. 18, 1786. He studied with Francisco Bianchi, and his first work, a collection of 12 glees and some Italian songs, shows his master's influence.

After various earlier efforts the *Maniac,* an opera written for the Lyceum in 1810, established his reputation, and probably secured for him an appointment for three years as composer for Covent Garden theatre. The numerous works—operas, burlettas, cantatas, incidental music to Shakespeare's plays, etc.—which he composed while in this position, are, however, in great part forgotten. The most successful were—*The Virgin of the Sun* (1812), *The Miller and His Men* (1813), *Guy Mannering* and *The Slave* (1816), *Maid Marian* (1822) and *Clari* (1823), introducing the air of "Home, Sweet Home." In 1825 Bishop was induced by Elliston to transfer his services from Covent Garden to the rival house in Drury Lane, for which he wrote the opera of *Aladdin,* intended to compete with Weber's *Oberon,* commissioned by the other house. The result was a failure, and with *Aladdin* (1826) Bishop's career as an operatic composer may be said to have closed. On the formation of the Philharmonic Society in 1813 Bishop was appointed one of the directors. In 1830 he was appointed musical director at Vauxhall; during this period he produced his popular song, "My Pretty Jane," which Sims Reeves made world famous. In 1841 he was appointed Reid professor of music in the University of Edinburgh, but resigned in 1843. He was knighted in 1842, being the first musician who ever received that honour. In 1848 he succeeded Dr. Crotch in the chair of music at Oxford. He died on April 30, 1855. Bishop was twice married: to Miss Lyon and Miss Anne Rivière, both of whom were singers. His name lives in connection with his numerous glees, songs and smaller compositions.

See Richard Northcott, *The Life of Sir Henry R. Bishop* (1920).

BISHOP, ISABELLA (1831–1904), English traveller and author, daughter of the Rev. Edward Bird, rector of Tattenhall, Cheshire, was born at Boroughbridge hall, Yorkshire, on Oct. 15 1831. Isabella Bird began to travel when she was 22. Her first book, *The Englishwoman in America* (1856), consisted of her correspondence during a visit to Canada undertaken for her health. But her reputation was made by the records of her extensive travels in Asia: *Unbeaten Tracks in Japan* (1880), *Journeys in Persia and Kurdistan* (1891), *Among the Tibetans* (1894), *Korea and her Neighbours* (1898), *The Yangtze Valley and Beyond* (1899), *Chinese Pictures* (1900). She married in 1881 Dr. John Bishop, an Edinburgh physician, and was left a widow in 1886. In 1892 she became the first lady fellow of the Royal Geographical Society, and in 1901 she rode a thousand miles in Morocco and the Atlas mountains. She died in Edinburgh on Oct. 7 1904.

See Anna M. Stoddart, *The Life of Isabella Bird* (1906).

BISHOP, in certain branches of the Christian Church, an ecclesiastic consecrated or set apart to perform certain spiritual functions and to exercise oversight over the lower clergy (priests or presbyters, deacons, etc.). The title is derived from the Greek ἐπίσκοπος, Latin *episcopus,* meaning "overseer." In the Catholic Church bishops take rank at the head of the sacerdotal hierarchy and have certain spiritual powers peculiar to their office, but opinion has long been divided as to whether they constitute a separate order or form merely a higher degree of the order of priests.

Roman Catholic.—In the Roman Catholic Church the bishop belongs to the highest order of the hierarchy and, in this respect, is the peer even of the pope, who addresses him as "venerable brother." By the decree of the Council of Trent he must be 30 years of age, of legitimate birth, and of approved learning and virtue. The method of his selection varies in different countries. In some countries, as formerly in France under the Concordat, the head of the state has the right of nomination. In others the bishop is elected by the cathedral chapter (as in Württemberg), or by the clergy of the diocese (as in Ireland). In others, as in Great Britain, the United States of America, and Belgium, the pope selects one out of a list submitted by the chapter. In all cases the nomination or election is subject to confirmation by the Holy See. Before this is granted the candidate is submitted to a double examination as to his fitness, first by a papal delegate at his place of residence and afterwards by the Roman Congregation of Cardinals assigned for this purpose. In the event of both processes proving satisfactory, the bishop-elect is confirmed, preconized, and allowed to exercise the rights of jurisdiction in his see. He cannot, however, exercise the functions proper to the episcopal *order* until his consecration. The bishop is consecrated, after taking the oath of fidelity to the Holy See and subscribing the profession of faith, by a bishop appointed by the pope for the purpose, assisted by at least two other bishops or prelates, the main features of the act being the laying on of hands, the anointing with oil, and the delivery of the pastoral staff and other symbols of the office. Besides the full functions of the presbyterate, or priesthood, bishops have the sole right (1) to confer holy orders, (2) to administer confirmation, (3) to prepare the holy oil, or chrism, (4) to consecrate sacred places or utensils (churches, churchyards, altars, etc.), (5) to give the benediction to abbots and abbesses, (6) to anoint kings. The powers, belonging to their order, are in general claimed by all bishops, whether Oriental or Anglican, belonging to churches which have retained the Catholic tradition in this respect. In the matter of their rights of jurisdiction, however, Roman Catholic bishops differ from others in their peculiar responsibility to the Holy See. Some of their powers of legislation and administration they possess in virtue of their position as diocesan bishops, others they enjoy under special faculties granted by the Holy See; but all bishops are bound, by an oath taken at the time of their consecration, to go to Rome at fixed intervals to report on the state of their dioceses. The Roman bishop ranks immediately after the cardinals. In England he is styled "right reverend" and addressed as "my lord bishop."



AFTER A WOODCUT IN "FRANCISCI MODI," 1585

A BISHOP OF THE 16TH CENTURY, IN HIS ROBES AND SEATED ON HIS THRONE

The insignia (*pontificalia* or pontificals) of the Roman Catholic bishop are (1) a ring with a jewel, symbolizing fidelity to the Church, (2) the pastoral staff, (3) the pectoral cross, (4) the vestments, consisting of the caligae (stockings and sandals), the tunicle, and purple gloves, (5) the mitre, (6) the throne (*cathedra*) on the gospel side of the choir in the cathedral church.

Anglican.—The spiritual function and character of the Anglican bishops, allowing for doctrinal changes effected at the Reformation, are similar to those of the Roman. They alone can administer the rite of confirmation, ordain priests and deacons, and exercise a certain dispensing power. In the established Church of England the appointment of bishops is vested effectively in the crown, though the old form of election by the cathedral chapter is retained. They must be learned presbyters at least 30 years of age, born in lawful wedlock, and of good life and behaviour. The mode of appointment is regulated by 25 Henry VIII. c. 20, re-enacted in I. Elizabeth c. I. (Act of Supremacy, 1559). On a vacancy occurring, the dean and chapter notify the king thereof in chancery and pray leave to make election. A licence under the Great Seal to proceed to the election of a bishop, known as the *congé d'élire,* together with a letter missive containing the name of the king's nominee, is thereupon sent to the dean and chapter, who are bound under the penalties of *Praemunire* to proceed within 12 days to the election of the person named in it. In the event of their refusing obedience or neglecting to elect, the bishop may be appointed by letters patent under the Great Seal without the form of election. Upon the election being reported to the crown, a mandate issues from the crown to the archbishop and metropolitan requesting him and commanding him to confirm the election and to invest and consecrate the bishop-elect. Thereupon the archbishop issues a commission to his vicar-general to examine formally the process of the election of the bishop, to supply by his authority all defects in matters of form, and to administer to the bishop-elect the oaths of allegiance, of supremacy, and of canonical obedience (*see* CONFIRMATION OF BISHOPS). In the disestablished and daughter Churches the election is by the synod

of the Church, as in Ireland, or by a diocesan convention, as in the United States of America.

In the Church of England the consecration of a bishop is usually carried out by an archbishop, who is assisted by two or more bishops. The essential "form" of the consecration is in the simultaneous "laying on of hands" by the consecrating prelates. After this the new bishop, who has so far been vested only in a rochet (*q.v.*) retires and puts on the rest of the episcopal habit, viz., the chimere (*q.v.*). After consecration the bishop is competent to exercise all the spiritual functions of his office; but a bishopric in the Established Church, being a barony, is under the guardianship of the crown during a vacancy, and has to be conferred afresh on each new holder. A bishop, then, cannot enter into the enjoyment of the temporalities of his see, including his rights of presentation to benefices, before doing homage to the king. This is done in the ancient feudal form, surviving elsewhere only in the conferring of the M.A. degree at Cambridge. The bishop kneels before the king, places his hands between his, and recites an oath of temporal allegiance; he then kisses hands.

Besides the functions exercised in virtue of their order, bishops are also empowered by law to exercise a certain jurisdiction over all consecrated places and over all ordained persons. This jurisdiction they exercise for the most part through their consistorial courts, or through commissioners appointed under the Church Discipline Act of 1840. By the Clergy Discipline Act of 1892 it was decreed that the trial of clerks accused of unfitness to exercise the cure of souls should be before the consistory court with five assessors. Under the Public Worship Regulation Act of 1874, which gave to churchwardens and aggrieved parishioners the right to institute proceedings against the clergy for breaches of the law in the conduct of divine service, a discretionary right was reserved to the bishop to stay proceedings in accordance with their opinion of the case.

The bishops also exercise a certain jurisdiction over marriages, inasmuch as they have by the canons of the Church of England a power of dispensing with the proclamation of banns before marriage. These dispensations are termed marriage licences, and their legal validity is recognized by the Marriage Act of 1823.

The bishops are still authorized by law to dedicate and set apart buildings for the solemnization of divine service and grounds for the performance of burials, according to the rites and ceremonies of the Church of England; and such buildings and grounds, after they have been duly consecrated according to law, cannot be diverted to any secular purpose except under the authority of an act of parliament.

The bishops of England have also jurisdiction to examine clerks who may be presented to benefices within their respective dioceses, and they are bound in each case by the 95th canon of 1604 to inquire and inform themselves of the sufficiency of each clerk within 28 days, after which time, if they have not rejected him as insufficiently qualified, they are bound to institute him or to license him, as the case may be, to the benefice, and thereupon to send their mandate to the archdeacon to induct him into the temporalities of the benefice. (*See* BENEFICE.)

As spiritual peers, bishops of the Church of England have (subject to the limitations stated below) seats in the House of Lords. The question whether a bishop of the Church of England, being a lord of parliament, could resign his seat in the Upper House was definitely settled in 1869 by the Bishops' Resignation Act. It provided that, on any bishop desiring to retire on account of age or incapacity, the sovereign should be empowered to declare the see void by an order in council, the retiring bishop or archbishop to be secured the use of the episcopal residence for life and a pension of one-third of the revenues of the see, or £2,000, whichever sum should prove the larger.

In view of the increase of the episcopate and the objection to the consequent increase of the spiritual peers in the Upper House, it was enacted by the Bishoprics Act of 1878 that only the archbishops and the bishops of London, Winchester and Durham should be always entitled to writs summoning them to the House of Lords. The rest of the 25 seats are filled up, as a vacancy occurs, according to seniority of consecration.

Bishops of the Church of England rank in order of precedency immediately above barons. They may marry, but their wives as such enjoy no title or precedence. Bishops are addressed as "Right Reverend" and have legally the style of "Lord," which, as in the case of Roman Catholic bishops in England, is extended to all, whether suffragans or holders of colonial bishoprics, by courtesy.

The insignia of the Anglican bishop are the rochet and the chimere, and the episcopal throne on the gospel side of the chancel of the cathedral church. The use of the mitre, pastoral staff, and pectoral cross has, however, been very commonly, though not universally, revived; and, in some cases, the interpretation put upon the "Ornaments rubric" by the modern "Anglo-Catholic" school has led to a more complete revival of the pre-Reformation vestments.

Orthodox Eastern.—In the Orthodox Church of the East and the various communions springing from it the spiritual powers conceived as residing in the bishop are the same as in the Western Church. Among his qualifications the most peculiar is that he must be unmarried, which, since the secular priests are compelled to marry, entails his belonging to the "black clergy" or monks. The insignia of an oriental bishop, with considerable variation in form, are essentially the same as those of the Catholic West.

Subordinate Bishops.—Besides bishops presiding over definite sees, there have been from time immemorial in the Christian Church bishops holding their jurisdiction in subordination to the bishop of the diocese. Bishops *in partibus infidelium* (in the parts of the infidels) were originally those who had been expelled from their sees by the pagans, and, while retaining their titles, were appointed to assist diocesan bishops in their work. In later times the custom arose of consecrating bishops for this purpose, or merely as an honorary distinction, with a title derived from some place once included within but then beyond the bounds of Christendom. The custom is still followed, but the words *in partibus infidelium* have been dropped. *Coadjutor bishops* are appointed to assist the bishop of the diocese when incapacitated from fulfilling his functions alone. Coadjutors in the early church were appointed with a view to their succeeding to the see; but this, though common in practice, is no longer the rule. *Suffragan bishops* are those appointed to assist diocesan bishops in their pontifical functions. In the Roman Church the appointment of the suffragan rests with the pope, on the petition of the bishop. In the Church of England the status of suffragan bishops was regulated by the Act 26 Henry VIII. *c.* 14. Under this statute, which, after long remaining inoperative, was amended and again put into force by the Suffragans' Nomination Act of 1888, every archbishop and bishop may name two spiritual persons for the crown to give to one of them the title, name, style, and dignity of a bishop of any one of 26 sees enumerated in the statute, as the crown may think convenient. The crown, having made choice of one of such persons, is empowered to present him by letters patent under the Great Seal to the metropolitan, requiring him to consecrate him.

Lutheran Churches.—The title of bishop survived the Reformation in certain of the Lutheran churches of the Continent, in Denmark, Norway, Finland, Sweden, and Transylvania; it was temporarily restored in Prussia in 1701 for the coronation of King Frederick I., again between 1816 and 1840 by Frederick William III., and in Nassau in 1818. In these latter cases, however, the title bishop is equivalent to that of "superintendent," the form most generally employed. The Lutheran bishops, as a rule, do not possess or claim unbroken "apostolic succession"; those of Finland and Sweden are, however, an exception. The Lutheran bishops of Transylvania used to sit, with the Roman and Orthodox bishops, in the Hungarian Upper House. In some cases the secularization of episcopal principalities at the Reformation led to the survival of the title of bishop as a purely secular distinction. Thus the see of Osnabrück (Osnaburgh) was occupied, from the peace of Westphalia to 1802, alternately by a Catholic and Protestant prince. From 1762 to 1802 it was held by Frederick, duke of York, the last prince-bishop. Similarly, the bishopric of Schwerin survived as a Protestant prince-bishopric until 1648, when it was finally secularized and annexed to Mecklenburg, and the see of

Lübeck was held by Protestant "bishops" from 1530 till its annexation to Oldenburg in 1803.[1]

In other Protestant communities, *e.g.*, the Moravians and the Methodist Episcopal Church, the office and title of bishop have survived or been created. Their functions and status will be found described in the accounts of the several churches.

BIBLIOGRAPHY.—*See* Wetzer and Welte, *Kirchenlexikon, s.* "Bischof" and "Weihen"; Hinschius, *Kirchenrecht,* vol. ii.; Herzog-Hauck, *Realencyklopädie, s.* "Bischof" (the author rather arbitrarily classes Anglican with Lutheran bishops as not bishops in any proper sense at all); Phillimore's *Ecclesiastical Law;* the articles MINISTRY, THE CHRISTIAN; VESTMENTS; ECCLESIASTICAL JURISDICTION; EPISCOPACY.

BISHOP AUCKLAND, urban district, Durham, England, 11 mi. S.S.W. of the city of Durham, the junction of several L.N.E.R. branch lines. Pop. (1938) 35,440. Area 14.6 sq.mi. It is on high ground near the confluence of Wear and Gaunless. The parish church at Auckland St. Andrews is Early English. The fine palace of the bishops of Durham stands at the northeast end of the town; its site was first chosen by Bishop Anthony Bek, in the time of Edward I, and it is surrounded by a park of 800 ac. On the Wear 1½ mi. above Bishop Auckland there is a small, probably 7th century church at Escomb, massively built and tapering upward; some stones are from a Roman building, one bearing an inscription. These, no doubt, came from Binchester, a short distance up stream, where remains of a Roman fort (*Vinovia*) are traceable. It guarded the Roman road from York to Hadrian's Wall. The town is the centre of a coal mining area, and during the depression of the 1930s was very severely affected, over 50% of the insured population being unemployed in 1934.

BISHOPS CASTLE, municipal borough, Shropshire, England, situated on a steep hillside above an important lowland route from south Shropshire into Wales (*see* MONTGOMERYSHIRE). Pop. (1938) 1,302. This historic road from Ludlow past Stokesay was controlled by the castle of the bishops of Hereford, placed where the gap between the mountain line of Longmynd and Stiperstones and that of the Clun Forest narrows at the watershed between the rivers Camlad and Onny. The position is said to have been held by the bishops from the 8th century and the castle was built by them between 1085 and 1154 to guard the route. By the 13th century a town had sprung up round the castle walls, and the historic "Road of the Castles" saw movements of many kinds. Richard II gave the town a market every Wednesday and a fair on Nov. 2, and two days following. Although it was evidently a borough by the 13th century it has no charter earlier than the incorporation charter granted by Elizabeth in 1572. The estates of the bishops appropriated by Queen Elizabeth amounted to 18,000 ac. Only slight fragments of the castle remain. The Castle hotel stands on the site. There is an old bowling green. The church, with the exception of the tower, was rebuilt in 1860. There are important fairs for the sale of the cattle and sheep bred in the valleys of the Onny, Camlad and Clun tributaries. The coach road into Wales under the Kerry hills has been replaced by a modern road avoiding the steep slopes through the town; and Bishops Castle suffers in consequence. The town was represented in parliament until 1832, but now forms, with the boroughs of Ludlow and Bridgnorth, etc., part of the Ludlow parliamentary division of Shropshire. Area 2.9 sq.mi.

BISHOP'S STORTFORD, urban district, east Hertfordshire, England; 30½ mi. N.N.E. of London by the L.N.E. Ry. Pop. (1938) 10,960. Area 3.7 sq.mi. It lies on the river Stort, close to the county boundary with Essex, and has water communication with London through the Lea and Stort navigation. Before the Conquest the manor is said to have belonged to Eddeva the Fair, wife of Harold, who sold it to the bishop of London. It was taken by William the Conqueror, who restored it and with it gave the bishop a small castle called Waytemore, of which there are scanty remains. The dungeon of this castle, called "Bishop's Hole" or "Bishop's Prison," was used as an ecclesiastical prison until the 16th century. The town is mentioned as a borough in 1311, in which year it returned two members to parliament. The privileges were allowed to lapse after the 14th century. The church of St. Michael, high above the valley, is a Perpendicular building with western tower and spire. The high school, formerly the grammar school, was founded in 1579, while Bishop's Stortford college, a boys' boarding school, was founded in 1868. There is also a diocesan training college for women, and other educational establishments. The industries include brewing and malting, coachbuilding and metalworking, and there are important horse and cattle markets.

[1]The title prince-bishop, attached in Austria to the sees of Laibach, Seckau, Gurk, Brixen, Trent, and Lavant, and in Prussia to that of Breslau, no longer implies any secular jurisdiction but is merely a title of honour recognized by the state, owing either to the importance of the sees or for reasons purely historical.

BISHOPS WARS, the name given in English history to the two brief campaigns between Charles I and the Scots in 1639 and 1640, caused by Charles' endeavour to enforce Anglican observances in the Scottish Church, and by the determination of the Scots to abolish episcopacy. The Bishops Wars are chiefly important as the final embarrassment which forced Charles at last to summon parliament—the Long Parliament—and so to precipitate the Great Rebellion.

BISKRA, a town of Algeria, *arrondissement* of Batna, department of Constantine, 150 mi. S.W. of the city of Constantine and connected with it and with Philippeville by rail, the railhead for the desert. It lies in the Sahara 410 ft. above the sea at the exit from the gorges of El-Kantara on the right bank of the Wad Biskra, nearly dry for many months but a mighty torrent after one or two days' rain in winter. Five or six villages of the usual Saharan type are scattered through an oasis 3 mi. in length by less than 1 mi. broad, and separated by huge gardens full of palm and olive trees. The houses are built of hardened mud, with doors and roof of palm wood. The foreign settlement is on the north of the oasis. The main street is lined with European houses, the whole in the style of a typical French winter resort. East of the public garden is Fort St. Germain, named after an officer killed in the insurrection of the Zaatcha in 1849, in which the whole of the civil population took refuge during the rebellion of 1871. It contains barracks, hospital and government offices and commands the water supply. The population (1936) of the town was 11,231; oasis, 22,273.



ALGERIAN CAVALIER ON THE DESERT NEAR BISKRA

His headdress is composed of a bunch of ostrich feathers topping the conventional turban, and a white silk handkerchief serves as a mask

The delightful climate with genial temperature and clear skies has made Biskra a famous winter resort, and while in summer the thermometer often registers 110° in the shade, and 90° at night, the pure dryness of the air in this practically rainless region makes the heat endurable. The mean average rainfall is about 8 in., falling in an average of 32 days per year. High cold winds in winter cause temperatures as low as 36°, but the main reading, on an average of ten years, is 73°.

In the oasis are some 200,000 fruit trees, of which about 150,000 are date-palms, the rest being olives, pomegranates and apricots. In the centre of the oasis is the old kasbah or citadel.

In 1844 the duc d'Aumale occupied this fort, and here, on the night of May 12 of that year, the French garrison was massacred by Arabs. In the fort are a few fragments of Roman work—all that remains of the Roman post *Ad Piscinam.*

Biskra lies in the centre of the Ziban (plural of Zab), of mixed Berber and Arab origin, whose villages, in oases, extend from the southern Aures to the Shat Melrir, containing about 2,000,000 palms and 500,000 other fruit trees. The most interesting is Sidi

Okba, 12 mi. southeast of Biskra, built of houses of one story made of sun-dried bricks. In the northwest corner of the mosque is the tomb of Sidi Okba, the leader of the Arabs who in the 1st century of the Hegira conquered Africa for Islam from Egypt to Tangier. Sidi Okba was killed by the Berbers near this place in A.D. 682. On his tomb is the inscription in Cufic characters, "This is the tomb of Okba, son of Nafi. May God have mercy upon him." No older Arabic inscription is known to exist in Africa.

BISKUPITZ, formerly a satellite town 5 mi. W. of Beuthen, in the Prussian province of Upper Silesia. Pop. was 17,225. On Jan. 1, 1927, it was incorporated with Hindenburg (*q.v.*), the name given in 1915 to Zabrze.

BISLEY, village, Surrey, England, 3½ mi. N.W. of Woking and 29 mi. from London. Pop. of civil parish (1931) 1,099. The ranges of the National Rifle Association were transferred from Wimbledon there in 1890.

BISMARCK, OTTO, PRINCE VON (1815–1898), was born on April 1, 1815, at Schönhausen, an estate belonging to his father, Ferdinand von Bismarck, a retired captain of the Prussian army. The family had been established in the Mark of Brandenburg for many centuries, and Bismarck's own appearance, habits and methods of thought always betrayed his origin from the country gentry. His mother belonged to a middle-class family of the name of Mencken, which had given the world a number of men of learning in the 17th and 18th centuries, and had more recently entered the higher classes of Prussian officialdom.

Early Years.—Bismarck passed the first years of his life in the country in Pomerania, where his father also possessed some estates. He then went to a school in Berlin, where he also attended the gymnasium. At 17 years of age he went to Göttingen university to study law, and his parents intended him for an official career, while his elder brother, Bernhard, was to succeed to the family estates. He completed his studies in Berlin, where he passed his first examination in law, and worked on the judicial side in the Government offices at Aachen and Potsdam. The work of a civil servant, however, gave him no real satisfaction. As the financial circumstances of his family had changed for the worse, and the proper management of the estates seemed to require further help, in view of his father's increasing age, he resigned from the civil service, and took over the management of the Kniephof estate in Pomerania. His letter defending this decision is the first record of his way of thinking that we possess. The document shows that his principal motive was the revolt of his innate love of independence, characteristic of the country gentleman, against the calling of a civil servant, with its necessary obedience to superiors and subordination of self to a whole, functioning independently of his own will. He needed a field for independent activity, in which he could exercise his powers as he himself thought best. He soon adapted himself to his new tasks, and by ceaseless labour was able in a few years to restore the somewhat neglected estate to a flourishing condition. He did not, however, relax his attention to the things of the mind during these years of quiet country life. His astonishing knowledge of German and foreign literature and history dates chiefly from this period. Travels in England and France helped to enlarge his mental horizon.

The most important development was, however, the revolution in his whole philosophy of life that took place during these years. Under the influence of his masters, and partly also, no doubt, of his mother, he had wholly lost his belief in the doctrines of Christianity, but his attempts to gain a new philosophy of life by study of the philosophers of the day, Hegel, Strauss and Feuerbach, had been fruitless. The mutual contradictions of philosophy confused his mind, the bent of which was positive and pragmatical; he required firm principles which should serve him as a guide for his actions. His studies finally convinced him that the mind of man is not able to reach positive conclusions on the ultimate (and supreme) problems of human life. While in this mood he became one of a circle of deeply religious country gentlemen, which centred round the person and the house of von Thadden at Trieglaff. Puritans at heart, they attempted to base their lives on the principles of Christianity, held divine service for themselves in their own homes, and looked on the official Church as far too lukewarm and indifferent. Although at first inclined to mock at the tone current in this circle, Bismarck soon came to feel that these men had something which he himself lacked—inner peace and a profound sense of communion with eternal truth—and could, with their eyes fixed on eternity, endure with a light heart the changes and chances of this life. Bismarck was most deeply struck by this attitude of mind on the sudden death of von Thadden's daughter, who had married his best friend, Moritz von Blankenburg, and had also exercised a powerful influence over himself. The almost cheerful resignation with which her relations bore what they felt to be only a brief separation from the deceased filled him with admiration, and almost with envy. Gradually he began to adapt himself to their ideas, especially as he had himself conceived a warm affection for a young lady of this circle, Johanna von Puttkamer, and could not hope to win her hand unless her father and relations became convinced of his adherence to their views. It is certain that Bismarck was at heart never altogether one with these Pomeranian pietists. Religion was never so wholly a determining force for all his actions and thoughts as it was for them. It is certain, however, that what led him back to the fundamental principles of Christianity was not merely interest, but inner conviction. Christianity henceforward seemed to him the only stable and certain thing in the welter of human opinions. This fact had its importance for his career, since it was only this change that brought him into complete spiritual contact with the social class to which he belonged by birth, and with which he certainly felt the fullest sympathy at heart.

Meanwhile Bismarck's father had died, and he had moved to his birthplace, Schönhausen, near Stendal. Here in 1847 he married Johanna von Puttkamer, and here he came for the first time into close contact with that political life which was to absorb him more and more.

In the summer of 1847 the *Vereinigte Landtag,* the first general parliamentary assembly ever known in Prussia, sat in Berlin. Bismarck attended its sittings as deputy for the representative of his district, who was ill. In his speeches before this body he championed the Christian character of the State and monarchy by divine right, and thus attracted the attention of King Frederick William IV. and his confidential advisers, the so-called "Camarilla," the most important members of which were the two brothers von Gerlach. When the revolution which was destined to end absolutism in Prussia as elsewhere broke out in the spring of 1848, Bismarck hurried back to Berlin and in vain endeavoured to urge the king to vigorous counter-measures. It is easy to understand why Bismarck with his strong Conservative views, was not elected either for the Prussian national assembly or for the German parliament at Frankfurt-am-Main. He threw himself with the more energy into founding a well-organized Conservative party, and was one of the most indefatigable contributors to its first organ in the press, the *Kreuzzeitung.* It was only after the dissolution of the Prussian national assembly and the grant of a constitution and a new franchise by the king that Bismarck was elected to the Prussian second chamber. Here he again advocated the Christian State, corporate organization of industry and the maintenance of the patrimonial rights of the nobles in the rural districts. His most influential speech was in the debate of April 1849 on the acceptance or rejection of the German imperial crown, which had been offered by the Frankfurt parliament to the Prussian king. To accept would have seemed to him a capitulation before the revolution, and at the same time a subordination of Prussia to an outside power; he opposed it on both grounds, and was delighted when Frederick William refused the crown. On later occasions, he again championed the independence of Prussia, arguing that the Prussian eagle would only be able to cover Germany with its pinions from Memel to the Donnersberg if it had free and unhampered use of them. When von Radwitz's attempt to unite the German states, excluding Austria, into a federation under Prussian leadership led to the verge of war with Austria, Bismarck, in his famous "Olmütz speech" of Dec.

1850, pleaded for the preservation of peace, because he believed that such a struggle would strengthen Liberalism, and because he did not think it would, at any rate at the moment, advance the interests of Prussia. The king, who at the bottom of his heart agreed with Bismarck, now resolved to offer him a post where he could give his abilities full scope in the service of the State, and appointed him Prussian envoy at the Federal diet in Frankfurt-am-Main (1851).

Bismarck in Frankfurt.—The diet, which was composed of representatives of all German governments, had been, since 1815, the only institution which gave expression, though in very imperfect fashion, to the sentiment of national homogeneity among these States. Bismarck had here an unrivalled opportunity of acquainting himself with the policy of the German governments and the personalities of the leading statesmen. The seven years which he spent in Frankfurt (1851–58) were his real schooling in diplomacy and statesmanship. When he went there he was still convinced that German interests would be best served if Prussia and Austria were associated in the conduct of affairs, always with the proviso that Austria should honestly recognize Prussia as an equal. His experiences in Frankfurt soon, however, taught him that he could reckon on no such assumption; that Austria, on the contrary, was aiming of set purpose to reduce Prussia's influence in Germany. His Prussian pride rebelled against such an attempt, and he was at pains to thwart it by every means in his power and to establish closer contact with Bavaria and the other smaller states. During the Crimean War (1854–56) he did all in his power to prevent German forces being used to further Austria's interests in the East. He warned his Government urgently not to chain the fine, sea-worthy frigate Prussia to the old, worm-eaten flagship Austria. Co-operation with Austria was desirable only if the latter guaranteed a substantial return and recognized Prussia's equal standing in German affairs. As this could not be expected, they must accustom themselves to looking on Austria as an enemy. As early as April 1856 he said in a dispatch: "German dualism has regulated its internal relations at intervals for a thousand years, and, since Charles V., regularly once a century by a thorough internal war, and our century too will find no other means than this to set the clock of development to the correct time. . . . I only want to express my conviction that before very long we shall have to fight for our lives against Austria, that it is not in our power to escape this, because the progress of events in Germany has no other issue." Both Prussia's State interests and his sentiments as a German thus led Bismarck to take a course directly opposite to that which he had recommended even in 1850. In other respects also he had thoroughly revised his ideas during his stay in Frankfurt, and had moved in spirit ever further from the views of Frederick William IV. and the Camarilla.

Bismarck had formerly been opposed to parliamentary institutions in any form. Gradually, however, he became convinced that a modern state could no longer exist without them. In the interests of foreign policy also it seemed to him important that a channel should exist through which popular feeling could express itself, as this would afford a firmer support, abroad as well as at home, to a sensible policy adapted to the real interests of the country. He recommended to his Government strict observance of the constitution, a more liberal treatment of the press, and the maintenance of contact with popular opinion, especially in economic questions.

Most characteristic of all was Bismarck's rupture with the ideas of the romantic politicians who had controlled affairs under Frederick William IV. The king himself and the brothers Gerlach saw in the world only the great conflict between belief and unbelief, between monarchical authority by divine right and liberal and democratic demands based on human caprice and presumption. They were convinced that those powers whose form of state was based on similar principles should also hold together in foreign politics. They looked on Russia, Austria and Prussia as the main champions of authority, on France as the champion of revolution, while on England they hesitated to pronounce judgment. They therefore held that Russia and Austria were Prussia's natural allies, France her natural enemy. Bismarck preached with increasing emphasis the contrary principle that no state should be swayed by anything but its considered interest, and that its friendship with or hostility to another state must be judged by the sole consideration whether it would be advantageous or disadvantageous to itself. "In politics," he said, "no one does anything for his neighbour unless he finds it to his own interest."

These years in Frankfurt were of extraordinary value for Bismarck's political development. He did not, of course, acquire here the qualities which made him a great statesman; they were innate in him; but here he harvested the experience which is as necessary to a statesman as to a man of any other profession. It was here that he first freed himself from the political dogmatism that naturally clung to him so long as he remained simply a Conservative party man, and learned to judge facts without prejudice and solely with an eye to the interest of the State. The inner transformation which took place in him here was known, indeed, to few, and the wider public still saw in him only a convinced supporter of the extreme Conservative party, of the *Kreuzzeitung* group.

Ambassador in St. Petersburg (Leningrad) and Paris.—In 1858 the health of Frederick William IV. was so seriously affected as to prohibit him from further conduct of affairs and his brother William took his place as prince regent, and in 1861 as king. In both domestic and foreign policy his principles differed widely from his brother's; in particular he wished to establish good relations with the Liberals, who were in the majority in the Prussian House of Deputies, and to govern impartially. Sharing the general view of Bismarck as a Conservative party man, he thought it better to remove him from Frankfurt and replace him by someone of more liberal tendencies. He therefore sent him to St. Petersburg as Prussian ambassador. Bismarck himself relished this turn in his fortunes but little. He looked on it as a sign of mistrust, and declared that he had been sent into exile on the Neva. Yet this was a most important stage in his development. He left the confined circle of German conditions and came to one of the great European courts, in which he could observe the policy of the great Powers much more closely and directly than had been possible in Frankfurt. His new experience did not alter his political convictions. During the war of 1859 between Austria, Sardinia and France, Bismarck again urged most strongly that no support should be given to Austria without a return. He remained in St. Petersburg for more than three years; then events occurred which brought about his translation into a wider sphere of action.

King William had become involved in a violent conflict with parliament. It had arisen out of the proposed expansion and reorganization of the army. The king had proposed to remove the limitations on the general three-years' service and to link the *Landwehr* (*q.v.*) more closely with the standing army. The Liberal majority of the House of Deputies opposed this vigorously, not only on the score of the heavy cost, but also from fear that the democratic character of the *Landwehr* might be impaired. In the course of the conflict the deputies called on the king to take men who possessed the confidence of the house into his ministry, and on his refusing, proceeded to throw out the budget. The struggle grew ever more acute. The army question developed into a constitutional one, and the king saw himself faced with the alternatives of giving in to the demands of the House of Deputies, or of carrying on the government without a budget passed by the peoples' representatives. A dissolution of the house only resulted in increasing the Liberal majority, and the decision could no longer be delayed. The king's conscience was acutely tormented; against the oath which he had sworn to the constitution, stood his conviction of the sovereign's right to choose his ministers himself, and of the necessity of the proposed reforms. For a time he even thought of abdicating in favour of his son. The minister of war, von Roon, was chiefly responsible for persuading him to abandon this idea and carry the struggle with the parliament through to the end. It was Roon again who repeatedly urged on the king that Bismarck was the man who could give him the best support in this struggle. As early as the spring of 1862 the idea of making

Bismarck head of the ministry was mooted. The king could not, however, make up his mind to this, and appointed him ambassador in Paris.

During his stay in Paris in the summer of 1862 Bismarck made himself better acquainted with conditions in France, and in particular with the personality of the emperor Napoleon III.—a matter of great importance for his later judgments on French policy. In September Roon at last won the king's consent to the appointment of Bismarck as Minister-President. In his decisive conversation with the king on Sept. 22, Bismarck declared himself prepared to carry through the struggle with parliament, but refused to lay down a definite programme, on the ground that events could not be foreseen.

Character and Intentions on Assumption of Office.—Bismarck was now 47 years of age, and in the prime of his power and faculties. His tall, imposing figure, his piercing light-grey eyes, his easy and cultivated bearing revealed an extraordinary personality. His sure gift of observation, his swiftness to seize a situation and his unfailing decision were exceptional qualifications for politics. His cultivated mind, his mastery of language, his ready wit and dry humour were characteristics which raised him, as a man, far above the level of the ordinary professional politician. The broad lines of his political programme had already been determined. The basic idea of his creed was his unquenchable belief in Prussia's destiny to unite Germany under her leadership. Foreign diplomats said at this time that this was his fixed idea. Bismarck had always felt himself a German; but his inspiration derived neither from the sentimental idealism of the Romantics, nor the Liberals' and the Democrats' desire for a common domestic political life and a more powerful common representation of the people. He was first and foremost determined that Germany, by achieving a closer political consolidation, should once more become mistress of her own destinies, free herself from the foreign political influences which had played so great a part in her history ever since the Thirty Years' War, and secure for herself a respected and equal position beside the other great nations of the world. He was convinced that the starting-point of such an organization of the national forces of Germany must be Prussia, and that every increase in the power of Prussia must benefit the whole of Germany.

Like the Liberals, he considered a measure of internal unification necessary for united Germany, but thought it should be less extensive than they demanded. He proposed to leave to the individual German States, as they had been moulded by the course of history, as much independence as was compatible with the indispensable unified control. He too, indeed, desired a national representative body; but only as a legislative and advisory organ, while the real conduct of policy was to remain in the hands of the Government. He knew that his object could only be attained through a conflict with Austria, and wished to maintain good relations with France and Russia, to ensure their not attacking Prussia in the rear during this necessarily severe struggle. At first he also considered whether the desired union of Germany without Austria could not be achieved by successive stages, beginning with the formation of closer ties between Prussia and the northern States of Germany, and only bringing the southern States into the federation at a later date. He never considered the restoration of the absolutist system, but was determined to defend the independence of the crown, particularly in the conduct of foreign policy, by all means in his power, and not to shrink from a temporary dictatorship, should this prove necessary.

In all his decisions the supreme criterion was the interest of the State; he took no account of political theories and convictions except to consider how numerous were their adherents and consequently, how far they had to be reckoned with in the attainment of particular ends. He was no cold calculator or mere brain-machine, like Cardinal Richelieu; often enough his impulsive character led him to make statements which he would not have made in cold blood. He was a man of strong passions and emotions; he clung with deep love and devotion to his wife, his family, his home, his State and his sovereign's dynasty; but towards mankind as such he felt no profound obligation. He has often been accused of despising humanity; he did so no more and no less than every great statesman or general prepared to use human forces and sacrifice human lives for the attainment of great ends.

His contemporaries at first were completely puzzled by his policy, because the habit of the day was to judge political facts from the standpoint of theories which were held to be immutable truths, while Bismarck cared nothing for the sanctity of theory and only employed theoretical catchwords as weapons for achieving certain ends. His respect for public opinion, and indeed for any opinion but his own, was always small; for he was aware that actions, and not beliefs or speeches, are what count in controlling a great state. It was easy, he thought, for journalists and politicians to write and make speeches on the sensible and necessary course; they had not to take the consequences if their advice led to unfortunate results, not being responsible for the actions or omissions of the Government.

Now Bismarck's supreme political quality was precisely his readiness to take responsibility. If he thought a policy right, he staked his public and private reputation on it without reservation, and never considered the possible consequences to himself of a failure. At any moment he would have been prepared to exchange the brilliant position of a minister-president for the modest but independent life of a country gentleman, if he had not been conscious that as minister he could accomplish something for his fatherland of which others were incapable, and that his true destiny lay in accomplishing it.

First Measures.—The first months of his work as minister-president were occupied in domestic politics, with the struggle against parliament—the real cause of his appointment to his post. Bismarck declared that if the House of Deputies rejected the budget, the Government had the right to continue collecting existing taxation, and to carry on the Government without a budget in legally sanctioned form; for the constitution contained no provision in the case of disagreement on the budget between the three factors (King, Upper House and House of Deputies) whose united consent was necessary for a bill to become law. He even raised the question whether an assembly elected on the three-class suffrage could be considered truly representative of the people, in view of the predominant influence exercised on its composition by the richer classes. He attempted to cow his opponents by restricting the freedom of the press and influencing elections. He was, however, unable to do away with the Liberal majority in the House of Deputies; and the conflict between the crown and parliament continued unabated for some years.

Bismarck directed his attention, however, mainly to foreign policy. If he could achieve great successes in this field, and satisfy the deepest ambition of every German patriot by uniting Germany under Prussian leadership, the position of his Government would certainly be greatly strengthened. It was even probable that popular opinion would veer round in favour of a Government which could point to such successes, and that such a change in public opinion would bring a different majority into parliament, and one which would be more amenable to compromise than the present one.

Bismarck was faced with his first important decision in Aug. 1863. The Austrian emperor had invited all German princes to assemble at Frankfurt-am-Main to debate and approve proposals of his own for a reform of the German Bund. The court at Vienna hoped to utilize the conflict between the Prussian Government and the representatives of the people and the consequent ill-feeling in Germany, where Liberal opinion was dominant, to remodel arrangements in Germany to the advantage of Austria. Austria proposed, while making apparent concessions to the Liberals, to invest the real Government of Germany in a "Directory" of five members, in which Austria, with the help of the small states with which she was closely allied, would always have commanded the majority. The plan was inacceptable to Prussia, and would not, indeed, have permanently satisfied the national requirements of the German people; for what was here proposed—an assemblage of delegates from the diets of individual states—could never have taken the place of a real German parliament, particularly if it had only an advisory character.

Bismarck prevailed on his sovereign to return a polite refusal to the invitation, on the ground that a personal conversation between the princes would be pointless unless the Governments had come to previous agreement in principle on the reforms to be effected. Bismarck knew that no resolutions of importance could be taken in Frankfurt without the co-operation of Prussia. The princes assembled in Frankfurt were equally aware of this, and sent King John of Saxony to King William to urge him not to refuse his collaboration in the work of reform. The king hesitated; it looked as though his profound sense of the community of dynastic interests would prevail. Then Bismarck threw the whole weight of his personality into the other scale; he threatened to resign if the king insisted against his advice in attending the diet of princes. After a hard struggle he carried his point, and William refused the king of Saxony's request.

This was the first time that Bismarck had been engaged in a violent personal conflict with his king, whom he genuinely loved and respected. Victory in this instance was the necessary preliminary for his later successes. Some months before, he had explained his own ambitions for Germany to the German Governments and to all the world: a closer German federation under Prussian leadership, with a parliament representative of the whole nation, parallel with the individual governments. If Austria were prevented by her close connection with Hungary, Bohemia, and other non-Germanic lands, from participating in so close a federation, she must remain outside it, and not be permitted to prevent the closer union of the rest of Germany. By thwarting the Viennese plan of reform, Bismarck cleared the way for the realization of his own proposal. Before he could set about it seriously, however, unforeseen events intervened, which proved unmistakably to what a great extent the German question was also a European question. The scene was Schleswig-Holstein, on the northern frontier of Germany.

The Schleswig-Holstein Question; War with Denmark (1864).—The preceding generation had striven in vain to solve the Schleswig-Holstein question. During the revolution of 1848 the German inhabitants of Schleswig-Holstein had attempted to free themselves from the close bond with Denmark created by the common dynasty. At the time they had been unsuccessful. By the London Protocol of 1852 the European Powers had recognized the attribution of these provinces to the Danish State. On extinction of the branch of the Oldenburg dynasty then regnant in Denmark, the Holstein-Glücksburg line, to which the succession passed under Danish law, was also to retain the government of the duchies; but Schleswig and Holstein were to be left their own administration and their own diets within the framework of the Danish State. In 1855 the king gave Denmark a constitution incompatible with these provisions; thereupon the estates of Holstein (Holstein being a member of the German Bund) appealed to the Bund for help. The king of Denmark was forced to retract the constitution as respecting Holstein, under threat of a Federal Execution; it remained, however, in force for Schleswig, which was not a member of the German Bund. The Bund, however, called on the king to issue a wholly new general constitution and one in accordance with the London Protocol. On his refusal a Federal Execution was decreed against him, in his capacity of duke of Holstein, and preparations for its enforcement were made.

At this juncture Frederick VII. of Denmark died (Nov. 15, 1863), and the regnant branch of his house became extinct in the male line. The prince of Glücksburg now assumed the government of Denmark and the duchies as Christian IX., but the inhabitants of Schleswig and Holstein maintained that the succession should pass, by old local usage, to another branch of the Oldenburg family, the Augustenburg line. Prince Frederick of Augustenburg appeared in the country and proclaimed himself duke of Schleswig-Holstein, under the title of Frederick VIII.

The situation thus created was extraordinarily difficult. Public opinion in Germany pronounced strongly in favour of the prince of Augustenburg and the complete separation of the German duchies from Denmark, but the two great German Powers were pledged by their signatures to the London Protocol to recognize the succession of Christian IX. Bismarck aimed from the first at utilizing this opportunity to liberate Schleswig-Holstein from Danish rule. He had no intention, however, of allowing the formation of a fresh small state under the prince of Augustenburg. He wished to unite this territory, whose geographical situation between the North sea and the Baltic gave it great importance, with Prussia. He often said afterwards that the diplomatic campaign which he had to carry out here had been the hardest of his whole life.

At the beginning he stood quite alone. The majority of the population of Schleswig-Holstein wished to form a new state under the prince of Augustenburg; King William, and even more, his son, the Crown Prince Frederick William, who was a close personal friend of the prince of Augustenburg, also favoured this solution, which was mainly supported by the medium and smaller German States, the Liberal parties of every German parliament, and public opinion in Germany as a whole. Austria and the non-German Great Powers stood for the maintenance of the London Protocol with the grant of a certain measure of independence to the duchies. Russia and England, in view of their own interests in the Baltic and the North sea, were particularly anxious to prevent union between Schleswig-Holstein and Germany, while Austria desired to prevent any increase of Prussian power. The one circumstance which favoured Bismarck was the lack of unanimity among the Powers themselves.

Only one Great Power offered Bismarck its support from the first. This was France. Napoleon III. was prepared to allow Prussia to acquire Holstein and Southern Schleswig, provided that Northern Schleswig were left in entirety to Denmark. His main object was to create permanent hostility between Prussia and Austria in order to leave Prussia wholly dependent on his good will. Bismarck was, however, much too cautious to become party to such a pact; he knew that King William regarded Napoleon with the greatest suspicion, and that the emperor's hostility towards German unity was the greatest obstacle in the way of his national plans. He therefore refused this offer and determined to take another course.

To avoid having to face three adversaries simultaneously, he first sought a rapprochement with Austria, with which State he concluded a treaty to solve the Schleswig-Holstein question by joint action, beginning with an attempt to put pressure on Denmark to carry out the London Protocol in good faith. Denmark, trusting in the support of the other Great Powers, refused to make any concession. Prussia and Austria thereupon declared war on Denmark (1864). Bismarck succeeded in keeping Austria Prussia's ally until the campaign, which was no very difficult one, was ended and the danger of intervention by the European Powers was past. As soon as Denmark's defeat was assured, the allies granted her an armistice, and a European conference met in London to discuss the termination of the conflict. On Denmark's repeating her refusal to grant the duchies a wholly independent constitution and administration, the German Powers proposed the complete separation from Denmark and the establishment of an independent duchy. This suggestion, again, Denmark refused; the conference broke down and the campaign proceeded. Receiving no foreign assistance, Denmark was finally obliged to cede Schleswig-Holstein unconditionally to Austria and Prussia. The decision on the future of the duchies now lay with the two principal Germanic Powers. (*See* also SCHLESWIG-HOLSTEIN QUESTION.)

Relations with Austria; War of 1866.—The treaty concluded between them prior to the campaign contained a clause providing that neither contracting party should take any decision on the further destinies of the duchies, if taken from Denmark, without consulting the other. Bismarck knew of course that agreement in the question would prove very difficult; but by this provision he had made certain that the question could not be settled against Prussia's wishes and interests. At first the two Powers assumed the joint administration of the duchies; but this arrangement soon gave rise to very serious difficulties. Austria had now changed her attitude, and wished to recognize the prince of Augustenburg as sovereign of Schleswig-Holstein. Bismarck, however, was determined not to allow the creation of a new small state unless the new duke entered into the closest union with

Prussia, left the army, posts and telegraphs entirely in Prussian hands and allowed Prussia to construct and garrison a canal between the North sea and the Baltic. As soon as he was convinced that Prince Frederick would not agree unconditionally to these terms, Bismarck definitely opposed his candidature. He had never recognized its validity in law. Austria's refusal to expel the prince of Augustenburg from Schleswig-Holstein and to repress the agitation which was being conducted in his favour gave rise to grave differences between herself and Prussia, which nearly led to war as early as the summer of 1865. King William's urgent desire to avoid such a war, and the uncertainty as to the attitude which Napoleon III. would adopt in such a case, led Bismarck to consent to the conclusion of the Treaty of Gastein with Austria (Aug. 14, 1865), by which, to avoid further friction, Prussia took over the sole administration of Schleswig and Austria of Holstein. As an expression of his delight that war had been avoided, the king conferred on Bismarck the rank of count.

Bismarck was well aware that the solution afforded by this agreement was only apparent. He was more firmly convinced than ever that no permanent solution could be reached either of the Schleswig-Holstein or of the German question without an armed conflict with Austria. Believing it to be inevitable, he used his utmost endeavours to ensure that the conflict should take place under the most favourable conditions for Prussia. He had to overcome his king's desire for peace, the sympathies entertained by all the Conservative elements in Prussia for Austria, the aversion of all parties from a fratricidal war between Germans; and at the same time to avoid the danger which threatened from France. Napoleon wished to utilize the coming war to establish himself in the position of mediator in Germany and if possible to advance the frontier of France to the Rhine. Bismarck knew this, and boldly decided to restrain the French emperor if possible by holding out prospects that his wishes would be fulfilled in the event of a Prussian victory, while making no definite promise; he did this in the confident expectation that if Napoleon could be kept from intervening before a decision had been reached, it would be possible, when victory was won, to adopt a very different tone towards him. The details of his policy cannot be given here. The decisive impulse in all important decisions taken in these years came not from the old king, but from Bismarck. The treaty with Italy of April 8, 1866, the object of which was to hold part of Austria's fighting forces in the south, was his work, as was the Federal reform plan which he laid before the Federal diet during the critical days, which envisaged a German parliament based on general and equal suffrage.

On Austria's attempting to convoke the Holstein diet and secure through it the recognition of the prince of Augustenburg as duke, Bismarck declared this to be a breach of the Treaty of Gastein, which provided only for a division of the administration of the duchies, and not of their sovereignty. The convocation of the diet was a sovereign prerogative which could only be exercised by Austria and Prussia jointly. This action had annulled the Treaty of Gastein; and Prussia therefore claimed that her right to have a voice in the administration of Holstein, and to station troops there was restored. Prussian troops actually entered Holstein. Austria declared this action a breach of peace of the Bund, and demanded that the diet should undertake a Federal execution against Prussia. Bismarck let the assembly know that any vote cast in favour of the Austrian motion would be regarded by him as a declaration of war against Prussia. The diet, nevertheless, accepted the Austrian resolution, in a somewhat attenuated form, by a small majority. Bismarck then declared the treaties on which the German Bund was based to be broken and the Bund dissolved. At the same time he called on the other German States to conclude a fresh treaty with Prussia on the basis of the plan of reform mentioned above.

Napoleon's Intervention. Peace of Nikolsburg (1866).—These events made war inevitable. Although the South German States, with Hanover, Hesse and Nassau, stood by Austria, the war ended, after a short campaign, in the complete defeat of Austria at the battle of Königgrätz (July 13, 1866). Napoleon now intervened, however, with an offer couched almost as a command, to the two belligerent States to mediate for the restoration of peace. All Bismarck's diplomatic skill was required to save the fruits of his victory in this difficult hour. By accepting the offer of mediation, but consenting to an armistice only on condition that the main conditions of peace were laid down in advance, he enabled the advance of the Prussian troops on Vienna to proceed despite the French intervention. Napoleon, whose army was not ready for armed intervention, was in danger of becoming a laughing-stock before the whole world by his futile offer of mediation. To escape this situation, he agreed to Bismarck's proposal that Austria should secede from the German Bund, and that the North German States should form a North German federation under Prussian leadership, while the South German States (Bavaria, Württemberg, Baden and Southern Hesse) should remain independent. He also allowed Prussia to incorporate Schleswig-Holstein, and the chief North German States, which had taken Austria's side in the war, in her territory. The only condition he made was that the kingdom of Saxony should suffer no diminution.

This plan for a provisional reorganization of Germany did not wholly harmonize with Bismarck's ideas; yet it meant a first step on the road to their realization. He therefore carried it through in the teeth of the legitimist scruples of the king and the Conservatives, who saw in the removal of legitimate sovereign dynasties an offence against the principles of their political creed. King William wished to take only a part of each conquered state, without extinguishing any of them. The injured princes would then, however, have been members of the new federation, and would have formed, as Bismarck saw, a grave danger for its inner harmony. After a heated struggle with the king he carried through his plan for the complete incorporation of Hanover, Kurhessen, Nassau and the free city of Frankfurt, all the other States being left intact. Thus he ensured to the Prussian State a compact, unbroken territory, and prepared the way for an honest understanding and a later alliance with the surviving States. He was far-sighted enough to insist that no cession of territory should be demanded from Austria; he wished to leave open the possibility of a later reconciliation with the opponent of to-day.

After the signature of the Peace of Nikolsburg with Austria (July 26, 1866), Napoleon suddenly demanded a reward for his good offices. At first he asked for the whole of the Bavarian Palatinate and the Hessian territory on the left bank of the Rhine, including the fortress of Mainz. When Bismarck refused this demand, Napoleon asked to have at least Landau and the Saar district, with the Grand Duchy of Luxembourg; Prussia to compensate the king of the Netherlands, the actual ruler of the province, for its loss. With these demands again Bismarck could not and would not agree, since any cession of German territory to France would have been imputed to Prussia as treachery to the German cause, and would have made his task of assuming the leading rôle in the union of Germany extraordinarily difficult. Napoleon was obliged to content himself finally with Prussia's renouncing the right to keep a garrison in the fortress of Luxembourg—a right which in any case had no longer any justification in law, since the Grand Duchy of Luxembourg had seceded from the German Bund in 1866. The French demands created for a while some danger of a war with France. Bismarck utilized the occasion to persuade the South German States to conclude an offensive and defensive alliance with the North German federation, and thus to lay the foundations for the future union of North and South Germany.

Expansion of the North German Federation.—After the victorious close of the war with Austria and the foundation of the North German federation, Bismarck thought the time had come to restore peace in the domestic politics of Prussia also, and to put an end to the constitutional struggle. He prevailed on the king, despite his resistance, to bring in an Indemnity Act, asking the diet for retroactive approval of the taxation levied in the preceding years without parliamentary sanction. The elections held after the successful war had brought considerable changes in the composition of the diet. The Liberal party had split; the right wing, which had constituted itself, under the leadership of Rudolf von Bennigsen, into a separate National

Liberal group, was ready for a reconciliation with Bismarck, recognizing in him the man most likely to bring about the union of Germany. The diet accepted the Indemnity Act, thereby restoring domestic peace. Only this circumstance restored to Prussia the internal solidity necessary to enable it to become the head of the federal German State.

The extraordinary interplay of boldness and forethought, of broad calculation and wise regard for the needs and circumstances of the moment, which characterizes Bismarck's whole political career, is nowhere so evident as in his policy during 1866. If Germany emerged from this war, not indeed wholly united, but yet a nation which already held within it the nucleus of a new political form and the potentiality of further development, this is due to Bismarck's intervention at the critical moments.

The work of German unity, or Bismarck's vision of it, was, however, not yet complete. The Zollverein was, indeed, extended and renewed, and a close economic bond thus at once created between the south German States and the north. A common Customs parliament sat in Berlin, and offered the deputies from the various parts of Germany, for the first time since the days of the Frankfurt parliament, a fresh opportunity of promoting, through their common labours, the community of their interests. The competence of this assembly, was, however, strictly confined to economic questions. Even the offensive and defensive alliances, the conclusion of which has been noted above, afforded no absolute guarantee that all Germany would unite in arms in case of danger from an outside power, since the contracting States could raise the question whether the *casus foederis* had really arisen. Even during the Luxembourg crisis some of the South German statesmen had sought to weaken the interpretation of the treaties. The completion of the constitution of the North German federation in the summer of 1867, giving a preponderant influence in the government of the new federal State to its most powerful member, the king of Prussia, strengthened the opposition widely felt in the south against adherence to the federation. Added to this, Bismarck had differences of opinion and conflicts with his old party associates, the Conservatives, who could not forgive him for dethroning German princely houses and for the Indemnity Act, while he was equally at variance in many important points with his new parliamentary allies, the National Liberals. It often seemed likely that the old bitter parliamentary conflicts would be renewed in the new State. These were anxious and gloomy years for Bismarck; his work made no progress; for there was a danger that the division of Germany by the line of the Main might be permanently established and that the last result of all these battles and labour might be a sundered Germany, instead of a Germany for ever united.

Origins of the Franco-German War of 1870. The Ems Telegram.—This situation was terminated only by the great Franco-German War of 1870. It has often been said that Bismarck provoked this war of set purpose. This, however, was not the case. The real cause of the war was Napoleon's anger at the humiliation which he had undergone in the preceding years; his fear that the existence of a unified Germany, powerful both as a military and an economic factor, would make it impossible for France to gain the left bank of the Rhine and to maintain her hegemony on the continent; and finally, his fear that his own rule in France might end abruptly if he failed to achieve some solid success in foreign policy. Since 1867 he had been negotiating with Austria and Italy for an alliance against Prussia. He had not, indeed, been successful; but these endeavours are clear enough indications of the final objects of the emperor's policy. It would have been easy for Bismarck to provoke war with France as early as 1867, in connection with the Luxembourg crisis. At the time, however, he declared unequivocally that he wished to avoid it if possible. The necessary condition was, indeed, that France should abandon all further interference in German affairs, and reconcile herself to the union of Germany. As Bismarck always thought it doubtful whether the emperor would, or whether, indeed, in the state of public opinion in France, he could pursue such a policy, he was obliged always to be prepared for war with France. When he learned of Napoleon's endeavours to bring about an alliance against Prussia, it was his duty to take advantage of every opportunity to strengthen Prussia's position against France.

Such an opportunity arose when the Spaniards, after expelling Queen Isabella, offered the crown of their country to a German prince of the Catholic cadet line of the Prussian royal house, Leopold von Hohenzollern-Sigmaringen. Bismarck knew that it would be disagreeable to Napoleon should this offer be accepted, because close understanding between Spain and Germany would force him to keep troops on the Pyrenean frontier in case of war. Yet he could not admit that Napoleon had any right to interfere in this question, and persuaded Prince Leopold to accept the Spanish offer. When this became known, before the election took place, Napoleon attempted to persuade King William to forbid the prince to accept the crown. The old king, who wished to avoid a war if possible, went to the extreme limit of possible concessions. He refused to influence the prince officially in any way, but informed him privately that he would like him to renounce his candidature. France was not, however, satisfied. She thought the moment had come to humiliate the Prussian king publicly and thus damage his position in Germany. She demanded that King William should address a letter of apology to Napoleon, and forbid the prince to renew his candidature at any later date, should he be elected by the Spaniards after all. The king, who was at that time taking a cure at Ems, rejected this demand and communicated the facts to Bismarck, who had hurried back to Berlin from his estates at Varzin, in Pomerania, on receipt of the news, at the same time empowering him to communicate his refusal to the other Powers and to the general public. Bismarck made use of this permission. He immediately published the king's telegram, omitting certain details which were unsuitable for publication. These are the facts on the strength of which he has often been accused of falsifying the famous "Ems telegram." The accusation is entirely unfounded. He was never ordered to publish the unabridged text of this telegram; the king simply authorized him to make public the facts reported therein (Napoleon's demand and his own refusal). He was left entirely free to do this in whatever form he wished, and in his published version he did not add one detail which was not in the telegram. His only intention was to show the world as clearly and definitely as possible the humiliation which Napoleon had tried to inflict on the King of Prussia, and the fact that this demand had met with a refusal. The emperor Napoleon and his advisers were thus placed in a disagreeable situation. Instead of scoring a diplomatic success, it was they who had incurred a rebuff. They thought it impossible, in the interests of French prestige, to accept this quietly, and declared war on Prussia. It is probable that Bismarck anticipated and expected this result of his action; but having reached a stage when things must end with a humiliation either for France or for Prussia, he thought it his duty to stand firm and let France make this a *casus belli* if she really desired. The French statesmen were to blame for causing such a situation to arise; had they contented themselves with Prince Leopold's withdrawal of his candidature, the affair would have ended without war, with a minor success for France. By refusing to be satisfied with this, and attempting to force King William to a step humiliating for himself, they created the situation which led to war.

Conclusion of Peace and Foundation of the German Empire (1871).—After the war had ended in victory for Germany, the French empire had collapsed and the German troops were outside Paris. Bismarck approached the difficult task of bringing about a favourable peace for Germany and at the same time ensuring that the German States, which had waged this war jointly, should now be welded together permanently in a solid political union.

The South German States had all admitted the *casus foederis* after the French declaration of war, and had placed their troops, in compliance with the treaties, under the supreme command of the king of Prussia. At that time, however, none of them, except Baden, had any intention of joining the North German

confederation. Only the overwhelming enthusiasm manifested by the entire people after the great victories of the war made the kings of Bavaria and Württemberg conscious that it would hardly be possible for them to preserve the old relationship after the end of the war. It was hard enough, for all that, to find a form of adherence satisfying to all parties. Bismarck scrupulously avoided putting any sort of pressure on the South German Governments, not wishing to expose himself to the reproach of having exploited the moment when those sovereigns had loyally placed their troops under Prussian command to rob them of their independence. He waited until the force of public opinion drove them to approach him. After the negotiations had once begun, however, he made it quite clear from the first that he could not conceive of any other possible form of union but their entry into the existing confederation. He showed himself ready, however, to allow Bavaria and Württemberg certain special privileges, particularly in matters of taxation and of a certain independent status for their troops within the imperial army. He refused Bavaria's more far-reaching demands for a share in the direction of imperial policy, but allowed the establishment of a diplomatic committee under Bavarian presidency in the imperial council. This institution, however, always remained a purely decorative one. Bismarck's guiding principle was to secure the necessary unity in political and military control, while leaving the individual States all possible liberty in other matters. After difficult negotiations, he succeeded in bringing the treaties with the South German States, which were to form the basis of the German empire, to their conclusion at Versailles, on Nov. 20, 1870. It was at his instance, too, that King Louis II. of Bavaria decided, in agreement with the other princes, to ask King William to assume the title, hallowed by old German tradition, of German Emperor; the letter in which the king of Bavaria set forth this request was drafted by Bismarck. When the proclamation of the new German empire was effected in the Hall of Mirrors at Versailles on Jan. 18, 1871, and the banners of all the German States were lowered to salute the new emperor, Bismarck could truthfully say that the great object to which he had devoted the whole force of his extraordinary personality was now fully attained.

Peace had not yet been concluded with France. After the great victories of 1870, public opinion in Germany had declared with increasing insistence that the time had now come to recover Alsace and Lorraine, two provinces which had been forcibly separated from Germany in the hour of the old empire's greatest weakness. Bismarck regarded their recovery as essential in the interest of the military security of Germany's south-western frontier. He therefore insisted at the peace negotiations that France, besides paying a war indemnity of 5,000,000,000 francs, must also cede these territories. A much contested point was the cession of the fortress of Belfort, on which Bismarck finally gave way, although he could probably have gained this also. It has often been suggested that Bismarck was mistaken in requiring these territorial concessions from France, and that friendly relations between France and Germany could have been re-established more easily had the French frontiers been left intact. But setting aside the fact that these were old German districts, it seems safe to say that France's embitterment against Germany would hardly have been less had she been left in possession of them. The strongest incentive to revenge was anger at the military defeats she had incurred and the loss of her hegemony on the Continent; and this idea did not first appear after 1870; it began to show itself active in French public opinion after the events of 1866. At that time the cry was for revenge for Sadowa; later it became revenge for Sedan and Alsace-Lorraine.

The future destiny of Alsace-Lorraine also demanded fateful decisions. Bismarck rejected all suggestions for a partition of these territories among the different German states, because he feared that such a scheme might awaken the jealousy of those states which received no part of them. His idea was to keep Alsace-Lorraine the common property of all Germany, thus forging them into a fresh link of unity. They were accordingly made a "Reichsland" (imperial province), and placed under the government of an imperial viceroy.

Foreign Policy After 1871: Alliances.—Fresh tasks awaited Bismarck after the conclusion of peace with France and the establishment of the new imperial constitution. The emperor now recognized his great services by elevating him to princely rank (March 21, 1871) and appointing him imperial chancellor. As such he was responsible for the direction of the whole of Germany's policy. He now had to secure peace abroad, and maintain the new-born German empire in the position which it had won, at the same time seeing to it that the new internal arrangements, which existed only on paper, really became vital and penetrated the national consciousness.

The recently published documents of the German foreign office have shown beyond cavil that Bismarck's principal aim in foreign policy during the next decades was the maintenance of peace. The peace of Europe was liable to be threatened from two directions; from the East or from the West. In the West France's desire to be revenged for 1870 and to recover Alsace-Lorraine might prove a danger; in the East the Balkan problems were a constant potential source of war between Turkey and the Christian States of the Balkans, or between Russia and Austria. To avoid both dangers Bismarck wished to isolate France as far as possible, knowing that for a long time she would be unable, without powerful allies, to resume the struggle against Germany. In the East he wished, at least, to reconcile the interests of Russia and Austria, and thus to prevent war. When France began to entertain plans for colonial expansion in Africa and East Asia, Bismarck gave all possible encouragement to her endeavours, hoping that France, diverted from her single pursuit of the idea of revenge, would be compensated by the acquisition of a colonial empire for the loss of prestige which she had suffered in Europe.

In Eastern Europe Bismarck first sought to establish a close understanding between Germany, Russia and Austria, and thus to secure the possibility of intervention and mediation should disputes arise. For some time he seemed successful, but the Eastern crisis which broke out in consequence of the rising of Bosnia and the Hercegovina against Turkey in 1875 made the continuance of this policy impossible for the time. He refused an offer of alliance from Russia in 1876 in order not to desert Austria-Hungary and leave the Tsar the dominant figure in all South-Eastern Europe. Throughout the Russo-Turkish war of 1877–8 he continually exerted his offices to prevent the intervention of Austria or England in the conflict. At the Congress of Berlin, over which he presided, he pursued the same policy, and it was largely due to his endeavours that a compromise between the conflicting interests was found.

Russia was not satisfied with the result of these negotiations. She had been forced to renounce the establishment of a Great Bulgaria and leave Bosnia to Austria, and principally to the support which Bismarck had given to Austria she attributed her failure to harvest all the fruits of her victories. When Germany again supported Austria in the questions of frontier regulation, the Tsar Alexander II. assumed a directly threatening tone in a letter which he addressed to the emperor William. This led Bismarck to seek closer relations with Austria. He opened up conversations with Count Andrássy, the leading statesman of the Danube monarchy, and agreed with him on the draft of a defensive alliance against possible attack from Russia. The old emperor was very reluctant to give his consent to this draft, partly out of traditional respect for Russia, partly because he considered that such an alliance, which chiefly benefited Austria-Hungary, would be inacceptable to Germany unless it contained an assurance of help from Austria in case of an attack by France. Austria, however, refused to extend the treaty along these lines. Bismarck was so convinced of the necessity of this alliance that he threatened to resign unless the emperor approved it. Unable to face the loss of his great adviser, William I. ended by giving way, although unwillingly.

It was not, however, Bismarck's intention to commit himself wholly to Austria by this treaty, and to remain on permanently unfriendly terms with Russia. On the contrary, he desired to

re-establish good relations with St. Petersburg at the earliest possible opportunity, and in 1881 he succeeded in bringing about the Three Emperors' Alliance, which seemed to restore the old relations between the three Powers of Eastern Europe. It was renewed in 1884, at his instance, for a further three years. At the same time Bismarck yielded to Italy's wish to enter upon closer relations with Germany. He made the condition that Austria must be a party to this alliance. Italy consented, although unwillingly, the result being the conclusion of the Triple Alliance Treaty of 1882. By this move Bismarck not only prevented a possible alliance between France and Italy, but also ensured the possibility of mediating between Austria and Italy; and since Serbia and Rumania, by means of separate treaties, had also thrown in their lot with the Triple Alliance, the result was a great Central European defensive alliance against any attempt to alter the *status quo* in Europe. In the drafting of these treaties, Bismarck took care to limit their application solely to defence against attack by another power, and to make it quite impossible for any of the contracting parties to use them for aggressive purposes. He was also opposed to any further expansion of Austria in the Balkans, and for this reason, when the Triple Alliance was renewed in 1887, he advocated the insertion of a clause giving Italy a right to compensation if Austria came into permanent or temporary possession of further territory in the Balkan Peninsula. Bismarck's whole system of alliances, as expressed in these various treaties, aimed at preventing any of the participating States from taking individual action in regard to the extension of their existing territories, and at making it possible for Germany to intervene and mediate should disputes arise between them.

His policy aimed at the maintenance of peace; but it was put to a severe test when grave complications arose once more in the Balkans consequent on Russia's intervention in Bulgaria, the fall of Prince Alexander of Battenberg and the election of Ferdinand of Coburg to the Bulgarian throne. The tension between Austria and Russia again reached such a point that when the Three Emperors' Treaty expired in 1887, renewal of it was impossible. To preserve the basic principle of his policy, and to avoid breaking the thread with St. Petersburg, Bismarck now concluded the so-called "Reinsurance Treaty" with Russia, its purpose being the same as that of the earlier treaties, only its methods being different, and adapted to the new situation. Russia promised to remain neutral should France attack Germany, while Germany recognized Bulgaria as lying within the Russian sphere of influence, and even promised her diplomatic and moral support should Russia find herself compelled to undertake a temporary occupation of Constantinople. No permanent alteration of the territorial *status quo* in the Balkans might, however, be effected without previous arrangement with Germany. In concluding this treaty Bismarck did not in any way infringe the provisions of the German-Austrian treaty, which only guaranteed Austria's existing frontier, without allowing her any claim to extend her influence over Bulgaria. Bismarck had always taken the view that Russia and Austria should come to an understanding on the Balkan question, the former taking Bulgaria, the latter Serbia into her sphere of influence; and the Austrian statesmen had long been aware that this was his opinion. His purpose in concluding this treaty was not to encourage Russia to take military action, but to keep in close touch with the Russian court and thus to retain the possibility of affecting the Tsar's decisions in the direction of moderation. He was fully agreeable to Austria's concluding an agreement at the same time with England and Italy for the maintenance of the *status quo* in the Mediterranean and the Balkans, such a treaty being intended to safeguard the Danube monarchy against any Russian aggression. In these difficult circumstances, Bismarck thought that the only way to maintain peace was to keep in close touch with all the mutually mistrustful Powers, and, if possible, prevent collisions between them by Germany's conciliating influence. He did indeed succeed in preventing the outbreak of a European war in the critical years 1887 and 1888. Every detail of his policy was regulated by consideration for the general European situation. He knew that Germany's danger lay in the formation of an over-powerful hostile coalition, and considered it the first object of German policy to prevent such an eventuality.

Bismarck's Colonial Policy.—His vision, however, was not confined to Europe. He saw that the development of world commerce and world communications, in which Germany's part grew more prominent from year to year, must also have political consequences. The partition of Africa among the great colonial Powers had begun soon after 1880, and it could only be a question of time before the same problem arose in Asia. In view of the importance of the overseas countries as markets for European commerce and sources of many raw materials indispensable for European industry, Germany could not stand aloof while other Powers partitioned up these countries. There had long been a demand for Germany to acquire colonies of her own. Bismarck had long been opposed to it. But when German commercial enterprises began to establish branches in parts of Africa which were not under the suzerainty of any European power, and to demand official protection for them, he felt that this ought not to be refused. Thus the acquisition of the first German colonies in 1884, although not due to his initiative, was to a great extent his work. But for his diplomatic intervention it would have been impossible to overcome the difficulties which arose from the opposition of the other colonial Powers, England in particular, to Germany's expansion. Bismarck never, indeed, proposed to found a German colonial empire, properly speaking; he only wished to ensure that, where the economic enterprise of German subjects had won a footing and created economic values on territory not claimed by other powers, such fruits of German labour should not be injured or destroyed. He considered that districts acquired in such fashion ought not to be considered as integral parts of the German empire, but as protectorates, to be administered by the firms which had founded them, and only protected by the empire against foreign aggression. Only later developments led to the abandonment of this point of view.

Bismarck remained true to the leading principles of his foreign policy to the end of his public career. He would have liked to extend the system of alliances which he had created to include England, and made repeated efforts to this end. His wishes, however, were received with marked reserve by English statesmen—first Lord Beaconsfield and later Lord Salisbury. They had scruples against promising their assistance in case of a French attack on Germany, while Bismarck considered this to be the essential point.

Bismarck's Domestic Policy: the "Kulturkampf."—Although Bismarck did not achieve all his ambitions in foreign policy, yet during the two decades in which he governed the new German empire, he was on the whole successful in this field, and at the end of his life was considered the leading statesman of Europe. His success in domestic policy during the same period was not so great. From the first the situation was difficult because the Government had not a safe majority. Apart from the opponents on principle of the new empire (the Poles, Danes and Guelfs), the Catholic party of the Centre, which disliked the rule of the Protestant dynasty of Hohenzollern, was hostile to the Government, as were the representatives of middle-class democracy, a comparatively weak group, most strongly represented in South Germany. Part, at least, of the Conservatives mistrusted Bismarck for the reasons discussed above. His chief supporters were the Liberal groups, the strongest of which was that of the National Liberals; but they never commanded a majority unsupported (in 1871 they had 125 deputies out of 382), and disagreed with Bismarck over many points of domestic policy. Bismarck desired to form a coalition (the so-called Cartel) between the National Liberals, after splitting off the left wing, which was too democratic for his views, and the Conservatives, and thus ensure himself a secure majority. But these parties themselves were not at present prepared for this step. For every separate legislative measure he was therefore obliged to conduct preliminary negotiations with the parties to secure a majority, which was never composed twice in the same way. Being unable in any case to do without the support of the National Liberals, he was forced to make extensive concessions to their wishes. At their desire, he extended the competence of the imperial legislature to the whole field of civil law, while the constitution had only proposed unification of the law of debentures and real

property. The laws on copyright, limited companies and the press were also liberal in conception; full liberty for trade and press was now introduced for the first time. In return the Liberals allowed the Chancellor to fix the period of service with the colours of the standing army at seven years (the so-called *Septennat*), despite their reluctance to consent to this limitation of the budgetary powers of parliament.

Bismarck was also in agreement with the Liberals when his great struggle against the claims of the Catholic Church, commonly known as the "Kulturkampf," began. It originated in action taken by the ecclesiastical authorities against those Catholics who refused to recognize the decisions of the Vatican Council of 1870, and their demand that the State should dismiss all such "Old Catholics" from teachers' posts in the State schools. Bismarck introduced a number of measures directed against interference by the ecclesiastical authorities in questions of state. The clergy were forbidden to discuss state questions in the pulpit. The regulation and supervision of education and of marriage were declared to be purely civil matters and withdrawn from the influence of the Church. The teaching of the monastic orders was placed under State supervision and the Jesuits expelled. In face of the opposition of the Catholic priests, the State not only instituted special tribunals, but also attempted to regulate the future preliminary training of priests on its own lines. When the pope forbade obedience to these laws, salaries were suspended and recalcitrant clergy dismissed. It is perhaps doubtful how far Bismarck was personally responsible for these measures. It is possible that he would not have done more on his own initiative than was necessary to prevent ecclesiastical interference in State affairs. In any case, however, he ended by approving the further measures, and supporting them in parliament, at first, indeed, with the intention of revoking part of them later when peace with the Church should prove possible. These measures excited very great bitterness throughout the Catholic population of Germany, and brought the Centre party many adherents.

Bismarck's Financial and Social Policy.—One of the great difficulties of the new empire was the construction of its financial system. Bismarck's plan was to take over all railways as an imperial concern and introduce a tobacco monopoly. Finding this impossible, he proposed increased tariffs, as demanded by the representatives of commerce and agriculture for economic reasons. This suggestion, however, encountered the violent opposition of the Liberal parties, the overwhelming majority of whom were free-traders. As Bismarck considered the increase of tariffs to be absolutely necessary, the attitude of the Liberals forced him to consider the possibility of getting together a majority in the Reichstag without them. This was only possible if the Conservatives and the Centre supported the Government motions. The support of the Centre could only be won if the State made peace with the Catholic Church. The death of Pope Pius IX. and the election of the less uncompromising Leo XIII. in 1878 seemed to offer an opportunity. Yet Bismarck still hesitated to take the decisive step, until a fresh conflict alienated him altogether from the Liberals.

The social question had long occupied his thoughts. The enormous increase of the class of factory workers attendant on the rapid development of Germany into an industrial state, and the growth of socialistic and radical doctrines among their ranks, filled him with concern. Fresh problems had been raised, and he saw that new measures would be necessary. These were to be twofold. On the one hand, he wished to offer the workmen permanent economic advantages through state-guaranteed insurance against sickness, accidents, old age and disability, and show them that they too might expect substantial advantages from the existing form of the State. At the same time he proposed to introduce stricter penal laws and subject to severe penalties any agitation against the existing form of State, property, marriage and the family. Here again he found the Liberals unsympathetic. They looked on compulsory insurance as an infringement of civic liberties, and emergency penal legislation as an offence against equality before the law. In the spring of 1878, shortly after two attempts, erroneously attributed to Social Democratic agitation, had been made against the life of the aged emperor William, Bismarck, although aware of Liberal opinion, thought the time ripe to introduce emergency measures against Social Democracy. He dissolved the Reichstag after the second attempted assassination, by this stratagem securing a considerable increase in the strength of the Conservative party at the elections. The National Liberals, who had lost a large number of seats, now showed themselves ready to accept Bismarck's plan, to avoid losing all influence over the Government. The Socialist Act was passed in Oct. 1878 with the help of the National Liberals and the Conservatives. It declared illegal all associations, meetings and printed matter directed towards the overthrow of the existing form of society and State, and empowered the Government to place under supervision or to expel socialist agitators, and in extreme cases to proclaim a state of siege in whole districts. This law remained in force, with small modifications, till 1890.

Being unable to count on the help of the Liberals either for his tariff measures or for the workmen's insurance, Bismarck now determined at last to make his peace with the Centre party. His interview of March 31, 1879, with Windthorst, its most important leader, was a turning-point in his domestic policy. He secured the support of this party for the introduction of his tariff bill, which was effected on July 1879, agreeing in return to the revocation of the greater number of measures issued against the Catholic church in the preceding decade. The preliminary training of the clergy was again placed in the hands of the Church. The civil court of justice for ecclesiastical affairs was abolished; there remained only the obligation incumbent on the ecclesiastical authorities to furnish the State with personal details before filling an ecclesiastical post, in case the civil authorities desired to raise an objection. The revocation of the earlier laws was carried through gradually in the course of the next years, and it was only in 1887 that Leo XIII., in an address to the cardinals, was able to describe the conflict as closed.

Bismarck now returned to the idea of universal workmen's insurance, but was not able to carry it through to the full extent which he had wished. His plan embraced a great imperial insurance department, in which all factory workers and miners were to be insured, at first against accident. Although Bismarck induced the old emperor to send a special message to the Reichstag recommending the acceptance of this measure, he could not secure its passage in that form. He had to give up the imperial department; the contribution and administration of the funds was left to the employers and workers, who were organized for the purpose in trade associations. In this form the bill for insurance against injury became law in 1884; it was followed by similar acts for the institution of sick funds and insurance against old age and disability (1887), the arrangements regarding contribution and administration being somewhat altered.

All this legislation is certainly only patch-work compared to Bismarck's original conception. Instead of a great imperial department there were a number of mutually independent funds, the respective competencies of which were ill-defined. In these circumstances the workmen could not become imbued with the feeling that they were receiving the advantages of the new legislation direct from the empire. Their sentiments towards the existing State remained as negative as ever. But the State had abandoned its purely passive attitude towards social problems and had become conscious of its duties and rights in view of the increasing frequency of social conflicts. Bismarck can claim the personal credit of having established the view, in the face of public opinion and the dominant theories in Germany, that one of the most important positive tasks of the state is the establishment and maintenance of social peace, and that the state shatters the foundations of its power if it neglects this duty. Whether the means which he tried to employ to reach this end were always the right ones is, of course, another question; in any case the application of emergency measures and force against those currents which he thought too extreme had not the success which he anticipated.

A general survey of Bismarck's domestic policy after the foundation of the empire reveals, as its chief defect, his failure to indicate the direction in which national institutions should develop in

order to keep pace with the radically altered economic and social conditions in his country. His own views and feelings were too deeply rooted in the old predominantly agricultural era and the feudal class which had been supreme in that era. His intellect and keen political eye showed him the importance of the new problems which arose with the transition to an industrial state, and in certain respects he met them. In his heart of hearts, however, he could never sympathize with the institutions of the modern political life of which he was himself the author. He looked on domestic politics as a tactical struggle in which the business of the Government was to get its way in the face of the parties by cleverly exploiting their disunion. The people was and remained in his eyes purely a thing to be governed, unfit, in his opinion, to influence the conduct of its own affairs in any large degree.

Accession of William II.: Bismarck's Fall.—In these circumstances his whole position depended on his close agreement with the sovereign, to whom he owed his appointment and his authority, and whose confidence had kept him at his post so long despite all changes of political majorities and vagaries of public opinion. So long as Emperor William I. lived he could be certain that this foundation of his position would never be shaken. The old emperor had, indeed, often opposed his advice vehemently, but had always given way in the end when he saw that Bismarck's decision was unalterable, being unable to bear the idea of parting from the man who had stood by his side through his whole reign and whom he had to thank for his great successes. When William I. died on March 9, 1888, at the age of 91, the situation changed entirely for Bismarck. The new emperor, Frederick, who had always inclined, at heart, to Liberal views, might have left him in office; but he was a dying man, and destined only for a short span of life. The young emperor William II., who succeeded his father on June 14, 1888, had always shown the greatest admiration for Bismarck; but he was a man of strong self-will and uncontrolled temperament, and it could not be expected that he would in all circumstances bow before the authority of a minister who belonged to a quite other generation and, as was soon to appear, differed wholly from him in his entire way of political thought and action.

The conflict between the two men that led to Bismarck's dismissal began soon after William II.'s accession and became so acute in the spring of 1890 that reconciliation no longer seemed possible. The actual points at issue—the prolongation of the anti-Socialist law and the emperor's desire to introduce far-reaching labour legislation—were not of decisive importance. The real point was that the emperor saw in Bismarck's opposition to his plans in both cases an attempt to prevent him from carrying out his own ideas in the conduct of imperial policy. If gossips, who are never lacking at such moments of crisis, told the emperor that Bismarck was attempting to get for himself and his family the position of a mayor of the palace, like that of the Carolingians in old France before the dethronement of the Merovingians, they had touched here on the emperor's feelings and fears. He felt himself most painfully oppressed and cramped by the aged and experienced statesman's overwhelming authority, not always expressed in the most tactful way, while he yet felt it to be his good right as monarch to have the last decision himself in all questions.

It is indubitable that during the weeks through which this struggle lasted, Bismarck endeavoured by all means in his power to retain his office even against the will of the emperor. This was not only from personal ambition, although it was certainly hard for him to renounce the power he had so long wielded, but also from a conviction that a personal régime of William II. would have fateful consequences for Germany. He attempted to persuade the other ministers to say that they would stand or fall with him; but he had himself always supported the view that a minister must be in the first instance a servant of his sovereign, and this conviction also animated his colleagues. Faced with the choice between obedience to their monarch or to their minister-president, they chose the former. When Bismarck revived an old cabinet order forbidding individual ministers to render account to the sovereign except in the presence of the minister-president, the emperor demanded the revocation of that order. On Bismarck's refusing to obey this command, the emperor let him know that he expected him to resign. Neither could Bismarck expect public opinion to afford him any strong support. His great services lay in the past, and were already half forgotten by the mass of the people. He had already embittered the Catholics by his ecclesiastical legislation, he had alienated himself from the Liberals, the workmen saw in him only a representative of the class State and class domination; thus he could not expect that the great mass of the people would unite to support him in this conflict. He was obliged to give way to the emperor's demand, and on March 18, 1890, he offered his resignation, which was immediately accepted. The honours which the emperor conferred on him at the same time, particularly his promotion to be duke of Lauenburg, could not conceal the fact that emperor and chancellor had parted as personal enemies.

The great tragedy in Bismarck's life is that he fell by the application of that very principle the maintenance of which he had urged with all his powers; that the sovereign in the last resort must be the decisive power in the State, the ministers representing only the executive organs of his will.

Bismarck's Last Years and Death.—After his dismissal Bismarck retired to Friedrichsruh, near Hamburg. Here he passed the last eight years of his life in sullen retirement in the old manor-house in the Sachsenwald. He often criticized the policy of the emperor and his new advisers sharply, both in conversations with his frequent visitors and in the articles which he published in the *Hamburger Nachrichten.* This was very disagreeable to the new men, and they let him feel their anger at every opportunity. The most undignified manifestation of this hatred took place on a journey which Bismarck made to Vienna in June, 1892, to attend his son's wedding. The German ambassador in Vienna was ordered to see that the aged statesman was completely ignored in official circles. Only when Bismarck fell gravely ill in 1893 was he reconciled with the emperor William II. This, however, made no change in his attitude towards the "new course."

Having now no field for action, Bismarck attempted to lay all his experiences and ambitions before his contemporaries and posterity in a great literary monument. His *Gedanken und Erinnerungen*—the two first volumes of which were issued immediately after his death, while the third volume, dealing with the period of his dismissal, only appeared after the fall of William II.—are his political testament. The historical portions are not invariably accurate in detail and show the shortcomings of all recollections written from memory after the event. As a whole, however, the work gives us the noblest and most truthful picture of Bismarck as a statesman; one-sided and ruthless, as he always was in action, so he is as writer and critic of his contemporaries; from both his actions and the pages of this book emanates the breath of mighty political passions, softened by supreme practical intelligence. The work forms the great statesman's last legacy to his nation and to the world. He died in Friedrichsruh on July 28, 1898, at the age of 83, three years after the death of his wife. In his last words he expressed his devotion to his old emperor and his dislike of his new master by choosing the following inscription for his tomb:

"A true German servant of the Emperor William I."

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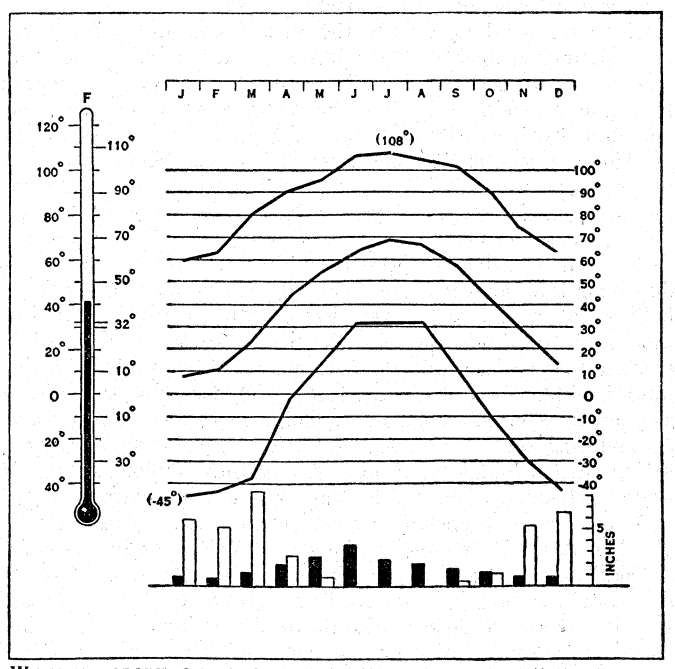
BISMARCK, the capital of North Dakota, U.S.A., and the county seat of Burleigh county, on the east bank of the Missouri river, in the south central part of the state. It is on Federal highway 10 and the main line of the Northern Pacific railway, and is served by the Soo line. It is served also by air lines in all directions. The population was 7,122 in 1920 (15% foreign-born white); 11,090 in 1930; and 15,496 in 1940 by the federal census.



WEATHER GRAPH OF BISMARCK, NORTH DAKOTA. THE THERMOMETER INDICATES MEAN ANNUAL TEMPERATURE. THE MIDDLE CURVE SHOWS MONTHLY MEAN TEMPERATURE; THE CURVES ABOVE AND BELOW, THE HIGHEST AND LOWEST TEMPERATURE EVER RECORDED IN EACH MONTH. THE COLUMNS INDICATE MONTHLY PRECIPITATION: THE SOLID COLUMN TOTAL PRECIPITATION (INCLUDING MELTED SNOW), THE WHITE COLUMN, SNOWFALL

The city is 1,692ft. above sea-level. The annual precipitation is 18 or 19in. and the extremes of temperature range from −40° to over 100°. It lies in the heart of the spring wheat region, where diversified farming, dairying, fruit and truck-raising are growing industries, and is the supply centre for a wide agricultural territory. The lignite mines of the county employ several hundred men. There are several Federal offices in Bismarck, as well as the State departments and the State penitentiary. On the capitol grounds is the log-house from Roosevelt's Dakota ranch; and across the river, in a State park, is Ft. Abraham Lincoln, from which Custer started on his last expedition. The city has a commission form of government.

The first white man whose visit to this region is recorded was Verendrye (1738–42). Lewis and Clark wintered 50m. north of Bismarck in 1804–05. The city was founded in 1873 and incorporated in 1876. It was the western terminus of the Northern Pacific from 1873, when construction was suspended, on account of the financial panic, until 1878. From 1883 to 1889 it was the capital of Dakota Territory, and when the territory was divided it became the capital of the northern State.

BISMARCK ARCHIPELAGO, the collective name of a large number of islands lying north and north-east of New Guinea, between 1° and 7° S., and 146° and 153° E., which were a German protectorate from 1885, but under the Treaty of Versailles (1919) were made part of the mandated territory of New Guinea and mandated to Australia. The largest island is New Britain (formerly New Pomerania), and the archipelago also includes New Ireland (formerly New Mecklenburg), Lavongai (formerly New Hanover), with small attendant islands, the Admiralty islands and a chain of islands off the coast of New Guinea. Most of the group, including New Britain and New Ireland, were occupied by Japan in Jan. 1942. (*See* ADMIRALTY ISLANDS; NEW IRELAND; NEW BRITAIN; NEW GUINEA.)

BISMARCK-SCHÖNHAUSEN, HERBERT PRINCE VON (1849–1904), German diplomat, the eldest son of the great Chancellor, was born on December 28, 1849, and was early destined for a diplomatic career. After leaving the University of Bonn, Count Herbert Bismarck took part in the Franco-Prussian War, and was severely wounded in the famous charge of the 1st Guards Dragoons at Mars-la-Tour. Entering the diplomatic service he became councillor at the German embassy in London in 1882. In London he won for himself many friends and, with the possible exception of Prince Münster and Count Hatzfeldt, Herbert Bismarck understood England and English habits of thought better than any of his contemporaries. In 1885 his father made him Under-Secretary for Foreign Affairs, and in the following year obtained for him the secretaryship. Between 1886 and 1890 he was his father's right-hand man in the Wilhelmstrasse. He was mainly responsible for the Samoan Agreement between Germany, England and America, signed in 1889, and he has been held to be the author of the *condominium* set up by that Agreement in Samoa. Another achievement, and one for which he was severely censured in Germany, was the conclusion of the East African Convention of 1890 by which Germany obtained Heligoland in exchange for her rights, real or alleged, over Zanzibar and her possession of Witu-land. When, in 1890, the great Chancellor fell from power, Herbert Bismarck ranged himself on his father's side. Despite a personal appeal from the Kaiser to remain in office, he resigned and for some years completely retired from public life. During these years, and until his father's death in 1898, Herbert Bismarck stayed by the aged Chancellor, aiding him in his campaign against the "New Course" on which the Kaiser was steering Germany. At the same time he is believed to have disapproved of many of his father's more violent outbursts in the Press. In 1892 he married the Countess Margaret Höyos—the wedding in Vienna being taken advantage of by the Kaiser to give a public snub to Prince Bismarck. A year later he entered the *reichstag* as an

"Independent," but he invariably voted with the Free Conservatives and revealed himself an extremist in agrarian policy. Although he had very largely been the Kaiser's mentor in foreign affairs, their former cordial relations were never resumed after the Chancellor's dismissal; but with Hohenlohe and Bülow his relations were at any rate outwardly friendly. In the few years of life that remained to him after his father's death Herbert Bismarck showed himself an opponent of *Weltpolitik* and of a policy of colonial expansion.

He succeeded to his father's title on July 30, 1898, and died at Friedrichsruh on Sept. 18, 1904, being succeeded in his title and estates by his eldest son, Prince Otto von Bismarck-Schönhausen.

BIBLIOGRAPHY.—The best sketch of Herbert Bismarck's character is to be found in the writings of his intimate friend Prince Philipp zu Eulenburg-Hertefeld—*Aus 50 Jahren* (1923). A selection from his public speeches was published in 1905 under the title *Fürst Herbert von Bismarck's politische Reden.* (I. F. D. M.)

BISMILLAH, an Arabic exclamation, meaning "in the name of God."

BISMUTH, a metallic element; it was probably unknown to the Greeks and Romans, but in the middle ages it became familiar, notwithstanding its frequent confusion with other metals. In 1450 Basil Valentine referred to it by the name "wismut"; some years later Paracelsus termed it "wissmat," and, in allusion to its brittle nature, affirmed it to be a "bastard" or "half-metal"; Georgius Agricola used the form "wissmuth," latinized to "bisemutum," and also the term "plumbum cineareum." Its elementary nature was imperfectly understood; and the impure specimens obtained by the early chemists explain, in some measure, its confusion with tin, lead, antimony, zinc and other metals; in 1595 Andreas Libavius confused it with antimony, and in 1675 Nicolas Lemery with zinc. These obscurities began to be elucidated by the researches of Johann Heinrich Pott (1692–1777), a pupil of Stahl, published in his *Exercitationes chemicae de Wismutho* (1769), and of N. Geoffroy, whose contribution to our knowledge of this metal appeared in the *Mémoires de l'académie française* for 1753. Torbern Olof Bergman reinvestigated its properties and determined its reactions; his account, published in his *Opuscula,* contains the first fairly accurate description of the metal. Its symbol is Bi, its atomic number 83, and its atomic weight 209.

Ores and Minerals.—The native metal is usually found either in reticulated and arborescent shapes or as foliated and granular masses with a crystalline fracture. Although bismuth is readily obtained in fine crystals by artificial means, yet natural crystals are rare and usually indistinct. Bismuth crystals, like those of arsenic and antimony, belong to the rhombohedral system, the three elements forming an isomorphous series. When not tarnished, the mineral has a silver-white colour with a tinge of red, and the lustre is metallic. Hardness 2–2½; specific gravity 9·70–9·83. The slight variations in specific gravity are due to the presence of small amounts of arsenic, sulphur or tellurium, or to enclosed impurities.

Bismuth occurs in metalliferous veins traversing gneiss or clay-slate, and is usually associated with ores of silver and cobalt. Well-known localities are Schneeberg in Saxony and Joachimsthal in Bohemia; at the former it has been found as arborescent groups penetrating brown jasper, which material has occasionally been cut and polished for small ornaments. Considerable deposits of bismuth occur in South Australia, California, Ontario, Spain, southern China, Rhodesia and India. The mineral has been found in some Cornish mines and is fairly abundant in Bolivia; the latter country is the chief commercial source of bismuth and the principal ore is a hydrated bismuth oxide.

The oxide, bismuth ochre, Bi_2O_3, and the sulphide, bismuth glance or bismuthinite, are also of commercial importance. The former is found, generally mixed with iron, copper and arsenic oxides, in Bohemia, Siberia, Cornwall, France (Meymac) and other localities; it also occurs admixed with bismuth carbonate and hydrate.

Metallurgy.—The dry process of extraction is most frequently practised, for the easy reducibility of the oxide and sulphide, together with the low melting-point of the metal, renders it possible to effect a ready separation of the metal from the gangue and impurities. The extraction from ores in which the bismuth is present in the metallic condition may be accomplished by a simple liquation, or melting, in which the temperature is just sufficient to melt the bismuth, or by a complete fusion of the ore. The first process never extracts all the bismuth, as much as one-third being retained in the matte or speiss; the second is more satisfactory, since the extraction is more complete, and also allows the addition of reducing agents to decompose any admixed bismuth oxide or sulphide. In the liquation process the ore is heated in inclined cylindrical retorts, and the molten metal is tapped at the lower end, the residues being removed from the upper end. The fusion process is preferably carried out in crucible furnaces.

Sulphide ores are smelted, either with or without a preliminary calcination, with metallic iron; calcined ores may be smelted with carbon (coal). The reactions are strictly analogous to those which occur in the smelting of galena (*see* LEAD), the carbon reducing any oxide, either present originally in the ore or produced in the calcination, and the iron combining with the sulphur of the bismuthinite. A certain amount of bismuth sulphate is always formed during the calcination; this is subsequently reduced to the sulphide and ultimately to the metal in the fusion. Calcination in reverberatory furnaces and a subsequent smelting in the same type of furnace with the addition of about 3% of coal, lime, soda and fluorspar, has been adopted for treating the Bolivian ores, containing the sulphides of bismuth, copper, iron, antimony, lead and a little silver. The lowest layer of the molten mass is principally metallic bismuth, the succeeding layers are a bismuth copper matte, which is subsequently worked up, and a slag. Ores containing the oxide and carbonate are treated either by smelting with carbon or by a wet process.

In the wet process the ores, in which the bismuth is present as oxide or carbonate, are dissolved out with hydrochloric acid, or, if the bismuth is to be extracted from a matte or alloy, the solvent employed is *aqua regia* or sulphuric acid. The solution of metallic chlorides or sulphates so obtained is precipitated by iron, the metallic bismuth filtered, washed with water, pressed in canvas bags, and finally fused in graphite crucibles, the surface being protected by a layer of charcoal. Another process consists in adding water to the solution and so precipitating the bismuth as oxychloride, which is then converted into the metal by heating with charcoal and sodium carbonate.

The crude metal obtained by the preceding processes is generally contaminated by arsenic, sulphur, iron, nickel, cobalt and antimony, and sometimes with silver or gold. A dry method of purification consists in a liquation on a hearth of peculiar construction, which occasions the separation of the unreduced bismuth sulphide and the bulk of the other impurities. The wet refining process is tedious and expensive, and is only exceptionally employed, as in the case of preparing the pure metal or its salts for pharmaceutical or chemical purposes. The basic nitrate is the salt generally prepared, and in general outline the process consists in dissolving the metal in nitric acid, adding water to the solution, boiling the precipitated basic nitrate with an alkali to remove the arsenic and lead, dissolving the residue in nitric acid, and re-precipitating as basic nitrate with water. Chemically pure bismuth is obtained by fusing the metal with sodium carbonate and sulphur, dissolving the bismuth sulphide so formed in nitric acid, precipitating the bismuth as the basic nitrate, redissolving this salt in nitric acid, and then precipitating with ammonia. The bismuth hydroxide so obtained is finally reduced by hydrogen.

A considerable proportion of the bismuth manufactured in the U.S.A. is derived from anode slimes obtained in the Betts process for desilverizing lead. These slimes are fused with sodium hydroxide and carbonate to remove lead and arsenic and with sodium sulphide to extract copper. The residue, containing 94% bismuth with silver and gold, is cast into slabs and made the anode of a second electrolytic process with bismuth chloride electrolyte; pure bismuth is deposited at the cathode, gold and silver being precipitated at the anode.

Properties.—Bismuth is a very brittle metal with a white crystalline fracture and a characteristic reddish-white colour. The specific gravity of solid bismuth is 9·82, and of molten bismuth

is 10·055. The metal therefore expands on solidification; and as it retains this property in a number of alloys, the metal receives extensive application in forming type-metals. Bismuth melts at 271°C, is appreciably volatile at red heat and boils at about 1,500°C. At 1,700°C its vapour contains a mixture of monatomic and diatomic molecules. Its thermal conductivity is the lowest of all metals, being 18 as compared with silver as 1,000; its coefficient of expansion between 0° and 100° is 0·001341. Its electrical conductivity is approximately 1·2, silver at 0° being taken as 100; it is the most diamagnetic substance known, and its thermoelectric properties render it especially valuable for the construction of thermopiles.

The metal tarnishes very slowly in dry air at ordinary temperatures, but somewhat more rapidly in moist air or when heated. At a bright red heat it burns with a bluish flame to the trioxide. Bismuth combines directly with the halogens, and with the elements of the sulphur group. It readily dissolves in nitric acid, *aqua regia,* and hot sulphuric acid, but tardily in hot hydrochloric acid. It is precipitated as the metal from solutions of its salts by the metals of the alkalis and alkaline earths, zinc, iron, copper, etc. In its chemical affinities it resembles arsenic and antimony; but its hydride (BiH_3?) is only obtained in minute traces by the action of nascent hydrogen on bismuth salts.

Alloys.—When present in other metals, even in very small quantity, bismuth renders them brittle and impairs their electrical conductivity. Bismuth is a component of many alloys characterized by their low fusibility and expansion in solidification. Its eutectics with lead and with tin melt at 127°C and 133°C respectively. Ternary and quaternary alloys have even lower melting points (*see* FUSIBLE METAL).

Compounds.—Bismuth trioxide, Bi_2O_3, occurs in nature as bismuth ochre, and may be prepared artificially by oxidizing the metal at a red heat, or by heating the carbonate, nitrate or hydrate. Thus obtained it is a yellow powder, soluble in the mineral acids to form soluble salts, which are readily precipitated as basic salts when the solution is diluted. It melts to a reddish-brown liquid, which solidifies to a yellow crystalline mass. The hydrate, $Bi(OH)_3$, is obtained as a white powder by adding potash to a solution of a bismuth salt. When chlorine oxidizes bismuth trioxide suspended in caustic potash, potassium bismuthate $KBiO_3$ is obtained. The alkali bismuthates are employed as oxidizing agents in analysis. The corresponding hydrate $HBiO_3$ has been isolated. Bismuth pentoxide, Bi_2O_5, is obtained by heating bismuthic acid, $HBiO_3$, to 130°C.

Bismuth trichloride, $BiCl_3$, obtained by Robert Boyle by heating the metal with corrosive sublimate, is the final product of burning bismuth in an excess of chlorine. It is a white substance, melting at 225°–230°C and boiling at 435°–441°. With excess of water, it gives a white precipitate of the oxychloride, BiOCl. Bismuth trichloride forms double compounds with hydrochloric acid, the chlorides of the alkaline metals, ammonia, nitric oxide and nitrosyl chloride. The other bismuth halides closely resemble the trichloride in their methods of preparation and their properties, forming oxyhalides, BiOX, with water, and double compounds with ammonia, etc.

Carbonates.—The basic carbonate, $2(BiO)_2CO_3{\cdot}H_2O$, obtained as a white precipitate when an alkaline carbonate is added to a solution of bismuth nitrate, is employed in medicine. Another basic carbonate, $3(BiO)_2CO_3{\cdot}2Bi(OH)_3{\cdot}3H_2O$, constitutes the mineral bismutite.

Nitrates.—The normal nitrate, $Bi(NO_3)_3{\cdot}5H_2O$, is obtained in large transparent asymmetric prisms by evaporating a solution of the metal in nitric acid. The action of water on this solution produces a crystalline precipitate of basic nitrate, probably $Bi(OH)_2NO_3$, though it varies with the amount of water employed. This precipitate constitutes the "magistery of bismuth" or "subnitrate of bismuth" of pharmacy, and under the name of pearl white, *blanc d'Espagne* or *blanc de fard* has long been used as a cosmetic.

Sulphides.—Bismuth combines directly with sulphur to form a disulphide, Bi_2S_2, and a trisulphide, Bi_2S_3, the latter compound being formed when the sulphur is in excess. Bismuth trisulphide, Bi_2S_3, constitutes the mineral bismuthinite, and may be prepared by direct union of its constituents, or as a brown precipitate by passing sulphuretted hydrogen into a solution of a bismuth salt. It is easily soluble in nitric acid. When heated to 200°C it assumes the crystalline form of the mineral. Bismuth forms compounds similar to the trisulphide with selenium and tellurium. The tritelluride constitutes the mineral tetradymite, Bi_2Te_3.

Bismuth sulphate, $Bi_2(SO_4)_3$, is obtained as a white powder by dissolving the metal or sulphide in concentrated sulphuric acid. Water decomposes it, giving a basic salt, $Bi_2(SO_4)(OH)_4$, which on heating gives $(BiO)_2SO_4$.

Analysis.—Traces of bismuth may be detected by treating the solution with excess of tartaric acid, potash and stannous chloride, a precipitate or dark coloration of bismuth oxide being formed even when only one part of bismuth is present in 20,000 of water. If bismuth is present heating on charcoal with potassium iodide and sulphur gives a brilliant scarlet incrustation. The blackish brown sulphide precipitated from bismuth salts by sulphuretted hydrogen is insoluble in ammonium sulphide, but is readily dissolved by nitric acid.

Pharmacology and Therapeutics.—In the older therapeutic applications of bismuth compounds the following salts have been employed, the benzoate, carbolate, carbonate, citrate (including the double ammonio citrate contained in *liquor bismuthi et ammonii citratis B.P.*), oxide, salicylate, sulphocarbolate, subnitrate (basic nitrate), subgallate and tannate. These substances have an extended vogue in various disorders of the digestive tract on account of their ability to form a coating—probably bismuth oxychloride—which protects the lining membranes from irritation. Such bismuth salts have also sedative, astringent and antiseptic properties; they are safe drugs owing to the absence of remote actions. The faeces are coloured black owing to the formation of bismuth sulphide.

Bismuth carbonate, oxychloride and subnitrates are employed for diagnostic purposes in X-ray examinations, when these compounds serve to determine the outline of the oesophagus, stomach and other sinuses in different parts of the body.

A compound known as "B.I.P.P.," extensively used as a dressing for wounds during the World War, is composed of iodoform and the subnitrate made into a cream with liquid paraffin.

A more recent employment of bismuth compounds is in replacing mercurials in the treatment of syphilis. Neutral sodium bismuthyl tartrate and sodium potassium bismuthyl tartrate in solution, or more generally in suspension, have been injected intramuscularly. But as these applications are attended by local pain and by secondary effects on skin and mucous membranes, digestive tract and kidneys, a fine suspension of metallic bismuth has been recommended also for intramuscular injection. Considerable doses are given as the metal is slower than arsenic in the form of arsenobenzene in healing active signs of disease.

Bismuth hydroxide and salicylate have been similarly employed and the French Codex, Nouveau Supplement, 1926, indicates quinine iodo-bismuthate with directions for preparing a suspension for injection.

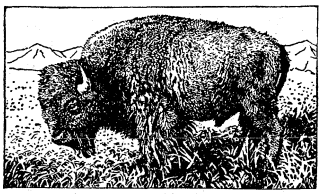
See W. H. Martindale and W. W. Westcott, *Extra Pharmacopoeia* (1926); new ed., Vol. i., 1928. (G. T. M.)

BISMUTHINITE, a somewhat rare mineral, consisting of bismuth trisulphide (Bi_2S_3). It crystallizes in the orthorhombic system and is isomorphous with stibnite (Sb_2S_3), which it closely resembles in appearance. It forms loose interlacing aggregates of acicular crystals, or as masses with a foliated or fibrous structure. An important character is the perfect cleavage in one direction parallel to the length of the needles. The colour is lead-grey. The hardness is 2; specific gravity 6·4–6·5.

BISON, the name given to two large animals of the ox family: the European bison (*Bison bonasus*) and the American bison (*B. bison*), the latter in North America commonly called buffalo. The bisons differ from typical oxen (*Bos*) in their greater breadth, the convexity of their foreheads, their larger limbs, the hump on the shoulders, and in having 14 instead of 13 pairs of ribs. The forehead, neck and shoulders (the shoulders in winter in *B. bonasus*) are covered with long, shaggy hair.

Formerly inhabiting the whole of Europe, the European species is now restricted to the forests of the Caucasus and a few parks in Russia and Lithuania. The American bison, once roaming the prairies in countless millions, nearly became extinct at the end of the last century, but is now protected and is increasing in the national parks of the United States and Canada.

The beef of the bison is nearly equal to that of domestic cattle. There are two races of the American animal, the prairie form and a somewhat larger woodland variety. The bison feeds on grass and the leaves, twigs, shoots and bark of trees.



BY COURTESY OF THE NEW YORK ZOOLOGICAL SOCIETY

THE BISON, NOW ALMOST EXTINCT ON THE PLAINS OF NORTH AMERICA WHERE IT ROAMED IN COUNTLESS NUMBERS A HUNDRED YEARS AGO

BISQUE (a French word of unknown origin, formerly spelt in English "bisk"), a term for odds given in the games of tennis, lawn tennis, croquet, and golf; in the two former a bisque is one point to be taken at any time during a "set" at the choice of the receiver of the odds, while in croquet and golf it is one extra stroke or turn to be taken similarly. The name is given, in cookery, to a thick soup, made particularly of crayfish or lobsters.

BISSELL, GEORGE EDWIN (1839–1920), American sculptor, was born at New Preston (Conn.), on Feb. 16, 1839. During the Civil War he served as a private in the 23rd Connecticut volunteers in the department of the gulf (1862–63), and on being mustered out became acting assistant paymaster in the South Atlantic squadron. He studied the art of sculpture abroad in 1875–76, and lived much in Paris during the years 1883–96, with occasional visits to America. Among his more important works are the soldiers' and sailors' monument, and a statue of Col. Chatfield, at Waterbury (Conn.); of Gen. Gates at Saratoga (N.Y.); of Chancellor John Watts in Trinity churchyard, New York city; of Col. Abraham de Peyster in Bowling Green, New York city; of Abraham Lincoln at Edinburgh; of Burns and "Highland Mary," in Ayr, Scotland; of Chancellor James Kent, in the congressional library, Washington; and of President Arthur in Madison square, New York city. He died on Aug. 30, 1920, at Mt. Vernon, New York.

BISSEXT or **BISSEXTUS,** the day intercalated by the Julian calendar in the February of every fourth year to make up the six hours by which the solar year was computed to exceed the year of 365 days. The day was inserted after Feb. 24, *i.e.,* the sixth day before the calends (1st) of March; there was consequently, besides the *sextus,* or sixth before the calends, the *bissextus* or "second sixth," our Feb. 25. Hence the name "bissextile" for leap year.

BISSOLATI-BERGAMASCHI, LEONIDA (1857–1920), Italian politician, was born at Cremona, Feb. 20, 1857. The son of Demetrio Bergamaschi, he was adopted by and took the name of his stepfather, Prof. Bissolati, the philosopher. He was an active member of the Italian Socialist party from its foundation in 1892, and he exercised considerable influence as a journalist, editing the official organ of the party, *L'Avanti.* In 1897 he entered parliament as member for Pescarolo and was afterwards elected for the second division of Rome (1908), which he represented until his death. Although a confirmed Socialist, Bissolati became dissatisfied with certain aspects of the policy of the party, notably with its anti-patriotic attitude at the time of the Libyan War. In 1912 he seceded from the party and founded the Reformist Socialist group. At the outbreak of the World War Bissolati declared himself an interventionist, whereas the "official" Socialist party was frankly neutral. In June 1916 he was minister without portfolio in the Boselli National cabinet. He resigned in Dec. 1918 owing to disagreements with Signor Orlando's Government over the Treaty of London. He opposed the annexation of the Alto Adige because of its German population and of north Dalmatia with its Slav majority; but he advocated the annexation of Fiume as a purely Italian town. His attitude on the Alto Adige and Dalmatian questions lost him much of his former popularity, but his undoubted honesty and patriotism caused wide regret for his death, which occurred at Rome on May 6, 1920.

BISTRE, the French name of a brown paint made from the soot of wood; now largely superseded by Indian ink.

BISTRIȚA, a town of Transylvania, yielded in 1940 to Hungary, capital of the former Rumanian department of Nasaŭd, on the river Sieul, on the edge of the Carpathians. Pop. (1930), 13,251, including 5,000 Germans, 4,000 Rumanians. A railway runs west to the main system, via Dej; 18 mi. east of Bistrița (at Borgo Bistrița) the line ends, but a motor train runs through the mountains to the watering place of Dornavatra and the Bukovina. Bistrița is a Saxon settlement, centre of the old "Nösnerland." There is an interesting Gothic church with oriental carpets (*cf.* BRAȘOV) and arcaded market place.

BIT, a piece of anything. The word is used in various special senses, all derivable from its origin ("to bite"), either literally or metaphorically. The most common of these are (1) its use as the name of various tools; *e.g.,* centre-bit; (2) a horse's "bit," or the metal mouthpiece of the bridle; (3) a small sum of money of varying value; *e.g.,* threepenny bit. In the United States, especially the western part, the term "two bits" is commonly used for twenty-five cents.

BITCHE (Ger. *Bitsch*), town, France, department of Moselle, on the Horn, at the north foot of the Vosges between Hagenau and Sarreguemines. Pop. (1936) 8,869. The town, formed of the villages of Rohr and Kaltenhausen in the 17th century, derives its name from the stronghold (mentioned in 1172 as Bytis Castrum) on a rock some 250 ft. above it. This had given its name to the countship of Bitsch, once belonging to the dukes of Lorraine. In 1297 it passed by marriage to Eberhard I of Zweibrücken, whose line became extinct in 1569, when the countship reverted to Lorraine. It passed with that duchy to France in 1766. The citadel on the site of the old castle was restored and strengthened in 1740. It was defended in 1793, 1815 and 1870. It was restored with the neighbouring regions to France in 1919. Industries include shoe-making and watch-making, and trade in grain and timber.

BITHUR, a town in the Cawnpore district of the United Provinces of India, 12 mi. N.W. of Cawnpore city. Pop. (1941) 2,543. The last of the peshwas, Baji Rao, was banished to Bithur, and it was his adopted son, the Nana Sahib, who became the villain of the Cawnpore tragedy in 1857. The town was captured by Havelock on July 19, 1857, when the Nana's palaces were destroyed.

BITHYNIA, a district in the north-west of Asia Minor (Gr. Βιθυνία), adjoining the Propontis, the Thracian Bosporus and the Euxine. On the east it adjoined Paphlagonia, on the west and south-west Mysia, and on the south Phrygia and Galatia. It is in great part occupied by mountains and forests, but has valleys and districts of great fertility near the sea-coast. The most important mountain range is the "Mysian" Olympus (7,600ft.), whose summits are covered with snow for a great part of the year. The country between the mountains and the coast, covered with forests and traversed by few lines of route, is imperfectly known. The west coast is indented by two deep inlets, the Gulf of Ismid (anc. Gulf of Astacus), and the Gulf of Mudania or Gemlik (Gulf of Cius).

The principal rivers are the Sangarius (mod. Sakaria), which traverses the province from south to north, and the Billaeus (Filiyas), which rises in the Ala-Dagh, about 50m. from the sea, and after flowing by Boli (anc. Claudiopolis) falls into the Euxine, about 40m. N.E. of Heraclea, having a course of more than 100m.

The natural resources of Bithynia are imperfectly developed. Its forests would furnish vast supplies of timber if rendered accessible. Coal is known to exist near Eregli (Heraclea). The valleys towards the Black Sea abound in fruit trees of all kinds, while the valley of the Sangarius and the plains near Brusa and Isnik (Nicaea) are fertile and well cultivated. Extensive plantations of mulberry trees supply the silk for which Brusa has long been celebrated.

The ancient Bithynians were an immigrant Thracian tribe.

Herodotus (i, 28) mentions the Thyni and Bithyni as existing side by side; but ultimately the latter became the more important, and gave their name to the country. They were incorporated by Croesus (*q.v.*) with the Lydian monarchy, with which they fell under the dominion of Persia (546 B.C.). Before the conquest by Alexander the Bithynians asserted their independence, under Bas and Zipoetes, the last of whom transmitted his power to his son Nicomedes I, the first to assume the title of king. This monarch founded Nicomedia, which soon rose to great prosperity, and during his long reign (278–250 B.C.), as well as those of his successors, Prusias I, Prusias II, and Nicomedes II (149–91 B.C.), the kingdom of Bithynia held a considerable place among the minor monarchies of Asia. The last king, Nicomedes III, was unable to maintain himself against Mithridates of Pontus, and, after being restored to his throne by the Roman senate, he bequeathed his kingdom by will to the Romans (74 B.C.). Bithynia now became a Roman province. Its limits were frequently varied, and it was often united for administrative purposes with the province of Pontus. This was the state of things in the time of Trajan, when the younger Pliny was appointed governor of the combined provinces, (A.D. 103–105). Under the Byzantine empire Bithynia was again divided into two provinces, separated by the Sangarius, to the west of which the name of Bithynia was restricted. The most important cities were Nicomedia and Nicaea; both were founded after Alexander the Great; but at a much earlier period the Greeks had established on the coast the colonies of Cius, Chalcedon, and Heraclea Pontica. All these rose to be flourishing places of trade, as also Prusa at the foot of Mt. Olympus (*see* BRUSA). The only other places of importance at the present day are Kocaeli (Nicomedia) and Uskudar.

See G. Perrot, *Galatie et Bithynie* (1862); Pliny, *Correspondence with Trajan* (ed. E. G. Hardy, 1889), introduction pp. 51–65; Epp. xcvi (xcvii) and xcvii (xcviii) and appendix, pp. 239–243.

BITLIS or **BETLIS,** the chief town of the vilayet of Bitlis in Turkey, situated at an altitude of 4,700 ft., in the deep and narrow valley of the Bitlis Chai, a tributary of the Tigris. The main part of the town and the bazaars are crowded alongside the stream, while suburbs with scattered houses among orchards and gardens extend up two tributary streams. The houses are massive and well built of a soft volcanic tufa, and with their courtyards and gardens climbing up the hillsides afford a striking picture. At the junction of two streams in the centre of the town is a fine old castle, partly ruined, which, according to local tradition, occupies the site of a fortress built by Alexander the Great. It is apparently an Arab building, as Arabic inscriptions appear on the walls, but as the town stands on the principal highway between the Van plateau and the Mesopotamian plain it must always have been of strategic importance. The bazaars are crowded, covered across with branches in summer, and typical of a Kurdish town. There are some fine old mosques and medresses. Pop. (1940) 12,002. The climate is healthful and the thermometer rarely falls below 0° F., but there is a heavy snowfall and the narrow streets are blocked for some five months in the year. A good road runs southward, passing after a few miles some large chalybeate and sulphur springs. Roads also lead north to Mush and Erzerum and along the lake to Van. Postal communication is through Erzerum with Trebizond. Tobacco of an inferior quality is largely grown, and the chief industry is the weaving of a coarse red cloth. Manna and gum tragacanth are also collected. Fruit is plentiful, and there are many vineyards close by. The Bitlis vilayet includes the Mush plain and the plateau country west of Lake Van, as well as a large extent of wild mountain districts on either side of the central town of Bitlis. The mountains have been little explored, but are believed to be rich in minerals; iron, lead, copper, traces of gold and many mineral springs are known to exist.

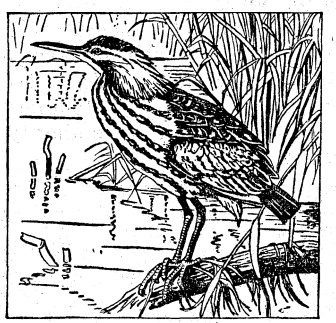
BITONTO (anc. *Butunti*), episcopal see, Apulia, Italy, province of Bari, 10 mi. W. by steam tramway from Bari. Pop. (1936), 27,341 (town); 30,622 (commune). Its fine Romanesque cathedral (1175–1200) has escaped damage from later restorations.

BITTER, KARL THEODORE FRANCIS (1867–1915), American sculptor, was born in Vienna on Dec. 6, 1867. After studying art there, in 1889 he removed to the United States, where he became naturalized. Among his principal works are: the Astor memorial gates, Trinity church, New York; "Elements Controlled and Uncontrolled," on the Administration building at the Chicago exposition; a large relief, "Triumph of Civilization," in the waiting room of the Broad street station of the Pennsylvania railway in Philadelphia; decorations for the Dewey naval arch in New York city; a sitting statue and a bust of Dr. Pepper, provost of the University of Pennsylvania; and the Villard and Hubbard memorials in the New York chamber of commerce. In 1911 he finished a model designed for the Henry Hudson monument. He was director of sculpture at the San Francisco exposition (1912–16) and at the time of his death in New York (April 10, 1915) was president of the National Sculpture society.

BITTERFELD, a town of Germany, in the Prussian province of Saxony, 26 mi. N. of Leipzig by rail, on the river Mulde, and an important junction of railways from Leipzig and Halle to Berlin. Pop. (1939) 23,887. Its manufactures include drainpipes and machinery; there are several coal mines in the vicinity. Its important aluminum works were bombed several times by the British during World War II. It belonged to Saxony from 1476 to 1815, when it was ceded to Prussia. Owing to its pleasant situation and accessibility, it became a favourite residence of business men of Leipzig and Halle.

BITTERLING (*Rhodeus amarus*), a little carplike fish of central Europe, belonging to the Cyprinid family. In it we have a remarkable instance of symbiosis. The genital papilla of the female acquires a great development during the breeding season and becomes produced into a tube nearly as long as the fish itself; this acts as an ovipositor by means of which the comparatively few and large eggs (3 millimetres in diameter) are introduced through the gaping valves between the branchiae of pond mussels (*Unio* and *Anodonta*), where, after being inseminated, they undergo their development, the fry leaving their host about a month later. The mollusc reciprocates by throwing off its embryos on the fish, in the skin of which they remain encysted for some time. the reproductive period of fish and mussel coinciding.

BITTERN, the name for wading birds of the subfamily Botaurinae, containing 4 genera and 13 species allied to the heron (*q.v.*), but with shorter neck, stouter body, variegated brown colours and streaked neck. They are solitary, nocturnal inhabitants of wet meadows, marshes and reedy swamps, where they skillfully spear frogs, small fish, meadow mice, crayfish and other animals. The true bittern (*Botaurus*) escapes detection by standing upright among reeds, bill pointed upward, camouflaged by its dark streaks. It is well known for its "thunder-pumping" or booming during the breeding season. During courtship it erects two tufts of feathers in the shoulder region. Four species occur: *B. stellaris* breeds in temperate Europe and Asia and in South Africa; *B. lentiginosus* in Canada and northern and western United States, wintering south to Guatemala; *B. pinnatus* from Columbia to southeastern Brazil; and *B. poiciloptilus* in Australia and New Zealand. The much smaller least bittern (*Ixobrychus exilis*), which builds a similar but smaller rude nest of reeds or flags, with 4 or 5 eggs more bluish-white than the olive-buff of the larger bittern, ranges from southern Canada to Paraguay; the little bittern (*I. minutus*) occurs over the old world, while other species are found in South America (*I. involucris*), Africa (*I. sturmii*), China to India and the Malays (*I. cinnamomeus*), central Asia to Japan (*I. eurhythmus*), and eastern Asia and Japan to the Philippines, Guam and Truk (*I. sinensis*). The South American *Zebrilus undulatus* occurs from the Guianas to central Brazil, while *Dupetor flavicollis* is found in S.E. Asia, the Malays, Australia and Guadalcanal. (G. F. Ss.)



BY COURTESY OF THE NATIONAL ASSOCIATION OF AUDUBON SOCIETIES

THE BITTERN, A MARSH BIRD COMMONLY CALLED "STAKE DRIVER" BECAUSE OF THE PECULIAR CALL IT UTTERS DURING MATING SEASON

BITTERROOT (*Lewisia rediviva*), a North American plant of the purslane family (Portulacaceae), native to mountain regions from Montana to British Columbia and southward to Colorado, Arizona and southern California. Crowning its stout root is a thick perennial rootstock from which rise small fleshy leaves and short, jointed stalks each bearing a beautiful rose-red, cactus-like flower, 2 in. or more across. In early spring the flowers bloom in immense numbers in stony soil on ridges and in alpine valleys. The large starchy tap root was highly esteemed for food by the Indians. The plant became known to science from specimens collected by Meriwether Lewis (*q.v.*), of the Lewis and Clark expedition (1806–07), and the botanical genus *Lewisia* was named in his honor by Frederick Pursh (*q.v.*). The Bitterroot river and the Bitterroot mountains in Montana are named after this plant, which has been chosen the State flower.

BITTERS, aromatized and often alcoholic beverages containing a bitter substance or substances, used as tonics, appetizers or digestives. The bitterness is imparted by such substances as bitter orange rind, gentian, rhubarb, quassia, cascarilla, angostura, quinine and cinchona. Juniper, cinnamon, carraway, camomile, cloves and other flavouring agents are also employed in conjunction with the bitter principles, alcohol and sugar. Some bitters are prepared by simple maceration and subsequent filtration (*see* LIQUEURS), others by the more complicated distillation process. Those prepared by the latter process are the finer commercial articles. Bitters are usually sold under the name of the substance which has been used to give them the predominant flavour, such as orange, angostura, or peach bitters, etc. The alcoholic strength of bitters varies, but is generally in the neighbourhood of 40% of alcohol. Some bitters, although possessing tonic properties, may be regarded as beverages pure and simple, notwithstanding the fact that they are seldom consumed in an undiluted state; others again, are obviously medicinal preparations.

BITTERSWEET, a name for the woody nightshade (*Solanum Dulcamara*). (*See* NIGHTSHADE.) Also applied in the United States to *Celastrus scandens,* a woody vine, called more properly climbing bittersweet (*q.v.*).

BITUMEN, the name applied by the Romans to the various types of natural hydrocarbons, the word petroleum not being used in classical Latin. Classical and Biblical references to bitumen are of frequent occurrence. In Genesis xi. 3 we are told that "slime had they for morter" and in Genesis xiv. 10 that the vale of Siddim "was full of slimepits," the word slime in the latter quotation appearing as bitumen in the Vulgate.

In the modern use of the word, largely owing to its commercial application, there is a tendency to restrict its popular meaning to the solid or semi-solid hydrocarbons, although in its widest sense it includes all the natural hydrocarbons. In the classification now generally accepted, but not, as yet, established by authority, gaseous hydrocarbons are, however, excluded.

Bitumens.	Liquid petroleum.	Paraffin base.	
		Mixed base.	
		Asphaltic base.	
	Native mineral waxes.	Ozokerite (called Ceresine when refined).	
		Montan wax (extracted from peat).	
	Native asphalts.	Vary from a pure solid bitumen to an impure bitumen containing a high percentage of sand, clay, etc.	
	Asphaltites.	Gilsonite	Characterized by a higher fusing point than the asphalts.
		Glance pitch	
		Grahamite	
Pyrobitumens.	Asphaltic Pyrobitumen.	Elaterite	Infusible and insoluble, derived from petroleum.
		Wurtzilite	
		Albertite	
		Impsonite	
		Oil shale.	
	Non asphaltic pyrobitumens.	Peat.	Infusible and insoluble, derived from vegetable matter.
		Lignite.	
		Bituminous coal.	
		Anthracite coal.	
		Lignitic & coal shales.	

The solid bitumens are characterized by being fusible and largely soluble in carbon disulphide. Allied to, but distinct from the bitumens are the Pyrobitumens, a group of solid substances characterized by being infusible and insoluble, but which, on heating, generate or become transformed into bodies resembling bitumens in their solubility and physical properties.

In its various forms bitumen is one of the most widely distributed of substances. It occurs, though sometimes only in small quantities, in almost every part of the globe and throughout the whole range of geological strata, from the Laurentian rocks to the most recent members of the Quaternary Period. All the asphalts, asphaltites, and asphaltic pyrobitumens, with the exception of oil shale, have probably been derived from liquid petroleum, either by the evaporation of the lighter fraction under atmospheric conditions or by deeper seated metamorphism. A range of products similar to many of the native solid bitumens is obtained as residues on the distillation of various types of crude petroleum, these forming many of the "asphalts" and "bitumens" of commerce. (*See* ASPHALT.) (J. R.)

See Herbert Abraham, *Asphalts and Allied Substances* (New York, 1918); Percy E. Spielmann, *Bituminous Substances* (Berne, 1925).

BITUMINOUS COAL: *see* COAL AND COAL MINING.

BITUMINOUS SHALES: *see* ASPHALT.

BITURIGES (bĭt-ōōr'ĭ-gās), a Celtic people, according to Livy (v. 34) the most powerful in Gaul in the time of Tarquinius Priscus. At some period they split up into two branches—Bituriges Cubi and Bituriges Vivisci.

The Bituriges Cubi in Caesar's time acknowledged the supremacy of the Aedui, inhabited the departments of Cher and Indre, and partly that of Allier. Their chief town was Avaricum (Bourges). At the time of the rebellion of Vercingetorix (52 B.C.), Avaricum was taken by assault, and the inhabitants put to the sword. In the following year, the Bituriges submitted to Caesar, and under Augustus they were incorporated (28 B.C.) in Aquitania. Their district contained a number of iron works, and Caesar says they were skilled in driving galleries and mining.

The Bituriges Vivisci occupied the strip of land between the sea and the left bank of the Garonne, comprising the greater part of the modern department of Gironde. Their capital was Burdigala (Bordeaux), even then a place of considerable importance and a wine-growing centre. Pliny refers to both Cubi and Vivisci as *liberi; i.e.,* they enjoyed some degree of independence.

See A. Desjardins, *Géographie historique de la Gaule romaine,* ii. (1876–93); T. R. Holmes, *Caesar's Conquest of Gaul* (1899).

BITZIUS, ALBRECHT (1797–1854), best known by his pen name of "Jeremias Gotthelf," Swiss novelist, was born on Oct. 4, 1797, at Morat, where his father was pastor. He studied theology at Bern, took orders in 1820, and from 1832 till his death on Oct. 24, 1854, was pastor of the village of Lützelflüh, in the Upper Emmenthal (between Langnau and Burgdorf). His first work, the *Bauernspiegel,* appeared in 1837. It purported to be the life of Jeremias Gotthelf, narrated by himself, and this name was later adopted by the author as his *nom de plume.* It is a living picture of Bernese (or, strictly speaking, Emmenthal) village life, marked by simplicity, humour, a high moral tone, and scrupulous truth to nature. It at once became very popular. His best known novel is *Uli der Knecht* (1841), of which an English translation was made by J. Firth, with notes by Ruskin, under the title of *Uli the Farm Servant* (1888). His other chief works include *Uli der Pächter* (1846; a sequel to *Uli der Knecht*); *Geld und Geist* (1842), portraying the patriarchal life of the rich peasant (1842; Eng. tr. 1866); *Jakobs, de Handwerkgesellen, Wanderungen durch Schweiz* (1847); *Zeitgeist und Berner Geist* (1852; these two dealing with the political questions of the day); *Erlebnisse eines Schuldenbauers* (1854), depicting the struggles of a peasant proprietor; and *Käthi die Grossmutter* (1847). He also wrote many short stories.

BIBLIOGRAPHY.—A complete edition of his works, in 30 vols., was published in 1855–58; another, in 24 vols., in 1916–29. In 1923 appeared a selection from this, in 14 volumes. His life has been written by A. Bartels (1902), G. Muret (1912; French), C. Manuel (1923) and others. *See* also studies by Ricarda Huch (1917), R.

Hunziker and Ineichen (1920), and his correspondence with K. H. Hagenbach (1910).

BIVOUAC, originally meant a night-watch by a whole army under arms to prevent surprise. In modern military parlance the word is used to mean a temporary encampment in the open field without tents, as opposed to "billets" or "cantonment" on the one hand and "camp" on the other. Shelter in bivouac is usually improvised by stretching blankets or waterproof sheets on a support formed by sticks or branches driven into the ground. The use of bivouacs permits an army to remain closely concentrated for all emergencies and avoids the necessity for numerous wagons carrying tents. Constant bivouacs, however, are trying to the health of men and horses, and this method of quartering is never employed except when the situation demands concentration and readiness.

BIWA, a lake of South Japan having an area of 18osq.m. which is about the size of the Lake of Geneva. It lies (35° 15′ N. 136° 5′ E.) in a zone of dislocation which cuts in a north-easterly to south-westerly direction across the entire width of the Japanese arc. The frontier between the Japanese invaders (the Yamato) and the aboriginal Ainu long lay about this zone. It was not until after the introduction of iron and the expulsion of the Japanese ruling house from South Korea in the latter half of the 7th century that the Japanese finally advanced beyond it into North Honshu. During the halt the Japanese capital was for strategic reasons removed from Kyushu to Kyoto, within a few miles of Lake Biwa, where it remained until 1868. Lake Biwa and its vicinity are rich in the historical associations and legends of Old Japan, and its beauty has been the theme of much Japanese poetry.

BIXIO, NINO (1821–1873), Italian soldier, was born on Oct. 2 1821. After numerous adventures at sea he returned to Italy in 1846, and joined the Giovine Italia. He fought through the campaign of 1848, became captain under Garibaldi at Rome in 1849, and in 1859 commanded a Garibaldian battalion. Joining the Marsala expedition in 1860, he turned the day in favour of Garibaldi at Calatafimi, was wounded at Palermo, but recovered in time to besiege Reggio in Calabria (Aug. 21 1860), and took part in the battle of Volturno. Elected deputy in 1861, he endeavoured to reconcile Cavour and Garibaldi. In 1866 he covered the Italian retreat from Custozza. Created senator in February 1870, he was in the following September given command of a division during the movement against Rome, took Cività Vecchia, and participated in the general attack upon Rome Sept. 20, 1870.

Bixio died of cholera at Achin bay in Sumatra *en route* for Batavia, whither he was leading a commercial expedition (Dec. 16, 1873).

See G. M. Trevelyan, *Garibaldi and the Thousand* (1909).

BIZERTA, a seaport of Tunisia, in 37° 17′ N., 9° 50′ E. Pop. (1936) 25,872 of whom 8,054 were French and 2,980 were Italian. Next to Toulon, Bizerta has been the most important naval port of France in the Mediterranean, in a commanding strategical position in the narrowest part of the sea, 714 mi. E. of Gibraltar, 1,168 mi. W.N.W. of Port Said, 240 mi. N.W. of Malta, and 420 mi. S. by E. of Toulon. It is 60 mi. by rail N.N.W. of Tunis.

The town is built on the Mediterranean at the point where the lake of Bizerta enters the sea through a natural channel, the mouth of which has been canalized. The modern town lies almost entirely on the north side of the canal. A little farther north are the ancient citadel, the walled "Arab" town and the old harbour (disused). The outer harbour covers about 212½ ac. and is formed by two converging jetties and a breakwater. The north jetty is 3,300 ft. long, the east jetty 3,100 ft., and the breakwater—which protects the port from the prevalent northeast winds—2,000 ft. long. The entrance to the canal is in the centre of the outer harbour. The canal is 2,600 ft. long and 787 ft. wide on the surface. Its banks are lined with quays, and ships drawing 26 ft. of water can moor alongside. At the end of the canal is a large commercial harbour, beyond which the channel opens into the lake—in reality an arm of the sea—roughly circular in form and covering about 50 sq.mi., two-thirds of its waters having a depth of 30 to 40 ft. The lake contains the naval port and arsenal. The principal naval works are at Sidi Abdallah at the southwest corner of the lake and 10 mi. from the open sea. An enclosed basin covering 123 ac. existed here with ample quayage, dry docks and everything necessary to the accommodation, repair, revictualling and coaling of a numerous fleet. The town and the harbour works, which were taken over by the axis, Nov. 14, 1942, were found to be almost completely ruined when, on May 7, 1943, Moroccan *goumiers* and the United States 2nd corps entered Bizerta.

The western shore of the lake of Bizerta (Arabic, *Tinja*) is low, and in many places is covered with olive trees to the water's edge. The southeastern shores are hilly and wooded. A channel leads from the western side of the lake into the lake of Ishkul, so-called from Jebel Ishkul, a hill on its southern bank 1,740 ft. high.

Bizerta occupies the site of the ancient Tyrian colony, Hippo Zarytus (Diarrhytus), the harbour of which, by means of a spacious pier protecting it from the northeast wind, was rendered one of the safest and finest on this coast. The town became a Roman colony, and was conquered by the Arabs in the 7th century. The place thereafter was subject either to the rulers of Tunis or of Constantine, but was noted for frequent revolts. It threw in its lot (*c.* 1530) with the pirate Khair-ed-Din, and subsequently received a Turkish garrison.

Bizerta was captured by the Spaniards in 1535, but not long afterwards came under the Tunisian government. Centuries of neglect followed, and the ancient port was almost choked up, though the value of the fisheries saved the town from utter decay. In 1890 a concession for a new canal and harbour was granted to a company, and five years later the new port was formally opened. Since then the canal has been widened and deepened, and the naval port at Sidi Abdallah created.

BIZET, (ALEXANDRE CÉSAR LÉOPOLD) **GEORGES** (1838–1875), French musical composer, was born at Bougival, near Paris, Oct. 25, 1838, the son of a singing-master. He studied at the Paris Conservatoire under Halévy and in 1857 won the Grand Prix de Rome for a cantata called *Cloris et Clotilde.* After the three years spent in Rome, Bizet returned to Paris, where he achieved a reputation as a pianist and accompanist. His first opera, *Les Pêcheurs de perles,* was produced (Sept. 23, 1863) at the Théâtre Lyrique, but did not enjoy a very long run. It contains none the less some delightful music and some of its dances are now usually introduced into the fourth act of *Carmen.*

On June 3, 1865, Bizet married a daughter of his old master, Halévy. His second opera, *La Jolie Fille de Perth,* was produced at the Théâtre Lyrique on Dec. 26, 1867, and one number, the favourite and characteristic Bohemian dance, has been interpolated into the fourth act of *Carmen.* In his third opera *Djamileh* (Opéra Comique, May 22, 1872) Bizet returned to an oriental subject. In all these works Bizet was accused of Wagnerian tendencies, which was then a most serious condemnation in Parisian musical circles. But he won a great popular success with the incidental music which he wrote to Alphonso Daudet's drama, *L'Arlésienne,* produced in Oct. 1872.

Bizet's masterpiece, *Carmen,* was produced at the Opéra Comique on March 3, 1875. It was based on a version by Meilhac and Halévy of a study by Prosper Mérimée. In reconstructing the familiar story in dramatic form the authors produced one of the most striking and successful libretti in the whole range of opera. In this "book" Bizet found material exactly fitted for his romantic music, and the resulting opera, although at first coolly received in Paris, has long since taken its place, by universal consent in every operatic repertoire.

On June 3, three months after the production of *Carmen* in Paris, Bizet died of heart disease.

BJERKNES, VILHELM (1862–), Norwegian physicist, a son of Carl Anton Bjerknes, professor of mathematics in the University of Christiania (Oslo), was educated at the university of that city. At an early age he gave an experimental confirmation of his father's prediction, on theoretical grounds, of the remarkable apparent actions at a distance between pul-

sating and oscillating bodies in a fluid, and their analogy with electric and magnetic actions at a distance. From 1890–91 he studied electric waves at Hertz's Laboratory at Bonn in Germany, and in 1895, after carrying out much valuable work at Oslo (Christiania) and at Stockholm, where he was appointed lecturer in the university in 1893 and professor of mechanics and mathematical physics in 1895, he gave a complete theory of the phenomenon of electric resonance which has contributed much to the development of wireless telegraphy.

Bjerknes subsequently returned to hydrodynamics and particularly the problems of meteorology, in which he was supported by the Carnegie Institute of Washington. Two introductory volumes of a larger work, *Dynamic Meteorology and Hydrography,* were published in 1910–11, under the auspices of this institution. In 1917 he went to Bergen, where, as professor of physics, in the new Geophysic Institute there, he was the originator of an improved and more scientific weather service, afterwards controlled by his son and collaborator, Jakob Bjerknes (b. 1897), which occasioned a new view of cyclones and anticyclones. His papers on electric oscillations were published in *Annalen der Physik* (1891–95). In his *Vorlesungen über Hydrodynamische Fernkräfte nach C. A. Bjerknes' Theorie* (1900–02), he gave the first complete exposition of his father's discoveries, and in a later book *Die Kraftfelder* (1909), he stated the same theory in a generalized form according to methods of his own.

Vilhelm Bjerknes was elected vice president of the Congress of Scandinavian Geophysicists in 1918 and an honorary member of the Royal Institution in 1922.

BJÖRNEBORG: *see* PORI.

BJÖRNSON, BJÖRNSTJERNE (1832–1910), Norwegian poet, novelist and dramatist, was born at the farmstead of Björgen, in Kvikne, in Österdal, Norway. In 1837 his father, who had been pastor of Kvikne, was transferred to the parish of Noesset, in Romsdal; in this romantic district the childhood of Björnson was spent. He matriculated at the University of Oslo in 1852, and soon began to work as a dramatic critic. In 1857 appeared *Synnöve Solbakken,* the first of his peasant-novels; in 1858 this was followed by *Arne,* in 1860 by *A Happy Boy,* and in 1868 by *The Fisher Maiden.* These are the most important specimens of his *bonde-fortaellinger* or peasant-tales.

Björnson was anxious "to create a new saga in the light of the peasant," as he put it, and he thought this should be done, not merely in prose fiction, but in national dramas or *folke-stykker.* The earliest of these was a one-act piece, *Between the Battles,* written in 1855, but not produced until 1857. It was followed by *Lame Hulda* in 1858, and *King Sverre* in 1861, but these efforts were far excelled by the splendid trilogy of *Sigurd the Bastard,* which Björnson issued in 1862. This raised him to the front rank among the younger poets of Europe. His *Sigurd the Crusader* should be added to the category of these heroic plays, although it was not printed until 1872.

At the close of 1857 Björnson had been appointed director of the theatre at Bergen, a post which he held for two years, when he returned to the capital. From 1860 to 1863 he travelled widely throughout Europe. Early in 1865 he became manager of the Oslo theatre, and brought out his popular comedy of *The Newly Married* and his romantic tragedy of *Mary Stuart in Scotland.* Although Björnson has introduced into his novels and plays songs of extraordinary beauty, he was never a very copious writer of verse; in 1870 he published his *Poems and Songs* and the epic cycle called *Arnljot Gelline;* the latter volume contains the magnificent ode called "Bergliot," Björnson's finest contribution to lyrical poetry. In 1871 he began to supplement his journalistic work as a radical agitator by delivering lectures in the northern countries. His new departure as a dramatic author began with *A Bankruptcy* and *The Editor* in 1874, social dramas of a realistic cast.

The poet now settled on his estate of Aulestad in Gausdal. In 1877 he published another novel, *Magnhild*—an imperfect production, in which his ideas on social questions were seen to be in a state of fermentation, and gave expression to his republican sentiments in the polemical play called *The King,* to a later edition of which he prefixed an essay on "Intellectual Freedom," in further explanation of his position. *Captain Mansana,* an episode of the war of Italian independence, belongs to 1878. Extremely anxious to obtain a full success on the stage, Björnson concentrated his powers on a drama of social life, *Leonarda* (1879), which raised a violent controversy. A satirical play, *The New System,* was produced a few weeks later; but none of these plays of his second period (except *A Bankruptcy*) pleased on the boards, and when once more he produced a social drama, *A Gauntlet,* in 1883, he was unable to persuade any manager to stage it, except in a modified form, though this play gives the full measure of his power as a dramatist. In the autumn of the same year he published a mystical or symbolic drama *Beyond our Powers,* dealing with the abnormal features of religious excitement with extraordinary force; this was not acted until 1899, when it achieved a great success.

Meanwhile, Björnson's political attitude had brought upon him a charge of high treason, and he took refuge in Germany, returning to Norway in 1882. Convinced that the theatre was practically closed to him, he turned back to the novel, and published in 1884, *Flags are Flying in Town and Port,* embodying his theories on heredity and education. In 1889 he printed another long and still more remarkable novel, *In God's Way,* which is chiefly concerned with the same problems. The same year saw the publication of a comedy, *Geography and Love,* which continues to be played with success. A number of short stories, of a more or less didactic character, dealing with startling points of emotional experience, were collected in 1894; among them those which produced the greatest sensation were *Dust, Mother's Hands,* and *Absalom's Hair.* Later plays were a political tragedy called *Paul Lange and Tora Parsberg* (1898), a second part of *Beyond our Powers* (1895), *Laboremus* (1901), *At Storhove* (1902), and *Daglannet* (1904).

Björnson was one of the original members of the Nobel committee, and was awarded the Nobel prize for literature in 1903. He died on April 26 1910.

See Björnson's *Samlede Digter-Verker* (Christiania and Copenhagen, 1919–20); *The Novels of Björnstjerne Björnson* (1894), etc. edited by Edmund Gosse; G. Brandes, *Critical Studies* (1899); E. Tissot, *Le drame norvégien* (1893); C. D. af Wirsén, *Kritiker* (1901); Chr. Collin, *Björnstjerne Björnson* (German ed., 1903); and B. Halvorsen, *Norsk Forfatter Lexikon* (1885). His *Poems and Songs* have been translated by A. Hubbell Palmer (1915).

BLACHE, VIDAL DE LA (1845–1918), French geographer, was born in Pézénas, Hérault, on Jan. 22, 1845. He was educated at the École Normale Supérieure in Paris, and entered upon the study of geography by way of that of history. The relations between geographical causes and historical effects were with him the subject of a life-study, the results of which are seen in one of his best-known works, the *Tableau Général de la Géographie de France* prefixed to Lavisse's *Histoire de France* (1903) and later republished separately; but he always refrained from pressing the theory of geographical "control" to an extreme. He joined the French school at Athens in 1867. From 1872 to 1877 he was in charge, latterly as professor, of the department of history and geography at Nancy; from 1877 to 1898 he taught geography in the higher grades at the École Normale Supérieure, and from 1898 to 1909 he held the chair of geography in the Faculté des Lettres at Paris. He lectured widely, and among his publications is the monumental *Atlas Général: Histoire et Géographie,* first published in 1894. He founded in 1891, and edited until his death, the periodical *Annales de Géographie,* and contributed constantly to its pages. He died at Tamaris-sur-Mer (Var) on April 5, 1918.

BLACK, ADAM (1784–1874), Scottish publisher, founder of the firm of A. and C. Black, the son of a builder, was born in Edinburgh on Feb. 20, 1784, and died there on Jan. 24, 1874. He began business for himself in Edinburgh in 1808. By 1826 he was recognized as one of the principal booksellers in the city; and a few years later he was joined in business by his nephew Charles. The two most important events connected with the history of the firm were the publication of the 7th, 8th and 9th editions of the *Encyclopædia Britannica,* and the purchase of the stock and copyright of the Waverley Novels. The copyright of the *Encyclopædia* passed into the hands of Adam Black and a few friends in 1827.

In 1851 the firm bought the copyright of the Waverley Novels for £27,000; and in 1861 they became the proprietors of De Quincey's works. Adam Black was twice lord provost of Edinburgh and represented the city in parliament from 1856 to 1865. He was succeeded by his sons, who removed their business in 1895 to London.

See *Memoirs of Adam Black,* edited by Alexander Nicholson (2nd ed., Edinburgh, 1885).

BLACK, JEREMIAH SULLIVAN (1810–1883), American lawyer and statesman, was born in Stony Creek township, Somerset county, Pa., on Jan. 10, 1810. He was largely self-educated, and before he was of age was admitted to the Pennsylvania bar. He gradually became one of the leading American lawyers, and in 1851–57 was a member of the supreme court of Pennsylvania (chief-justice 1851–54). In 1857 he entered President Buchanan's cabinet as attorney-general of the United States, and in this capacity successfully contested the validity of the "California land claims." From Dec. 17, 1860 to March 4, 1861, he was secretary of State. Perhaps the most influential of President Buchanan's official advisers, he denied the constitutionality of secession, and urged that Fort Sumter be properly reinforced and defended. "For . . . the vigorous assertion at last in word and in deed that the United States is a nation," says James Ford Rhodes, "for pointing out the way in which the authority of the Federal Government might be exercised without infringing on the rights of the States, the gratitude of the American people is due to Jeremiah S. Black." After 1862 he devoted himself almost exclusively to law practice, appearing in important cases before the supreme court. After the Civil War he vigorously opposed the Congressional plan of reconstructing the late Confederate states, and himself drafted the message of President Johnson, vetoing the Reconstruction Act of March 2, 1867. Black was also for a short time counsel for President Andrew Johnson, in his impeachment trial, and for William W. Belknap (1829–90), secretary of war from 1869 to 1876, who in 1876 was impeached on a charge of corruption; and with others he represented Samuel J. Tilden before the Electoral Commission (*q.v.*) in 1877. He died at Brockie, Pa., on Aug. 19, 1883.

See *Essays and Speeches of Jeremiah S. Black, with a Biographical Sketch* (1885), by his son, C. F. Black.

BLACK, JOSEPH (1728–1799), Scottish chemist and physicist, was born at Bordeaux, where his father—a native of Belfast but of Scottish descent—was engaged in the wine trade. He was educated at Belfast, and at Glasgow university. There he had William Cullen for his instructor in chemistry, and the relation between the two soon became that of professor and assistant rather than of master and pupil. In the thesis *De humore acido a cibis orto, et magnesia alba,* which he presented for his doctor's degree in 1754, he described his investigations in causticization, and anticipated Lavoisier and modern chemistry by indicating the existence of a gas distinct from common air, which he detected by using the balance. A fuller account of them was read before the Medical Society of Edinburgh in June 1755, and published in the following year as *Experiments upon magnesia, quicklime and some other alkaline substances.*

It is curious that Black left to others the detailed study of this "fixed air" he had discovered. Probably the explanation is pressure of other work. In 1756 he succeeded Cullen as lecturer in chemistry at Glasgow, and was also appointed professor of anatomy, though that post he was glad to exchange for the chair of medicine. He also practised as a physician. Moreover, his attention was engaged on studies which ultimately led to his doctrine of latent heat. He noticed that when ice melts it takes up a quantity of heat without undergoing any change of temperature, and he argued that this heat, which, as was usual in his time, he looked upon as a subtle fluid, must have combined with the particles of ice and thus become latent in its substance. This hypothesis he verified quantitatively by experiments performed at the end of 1761. In 1764, with the aid of his assistant, William Irvine (1743–87), he further measured the latent heat of steam, though not very accurately. This doctrine of latent heat he taught in his lectures from 1761 onwards, and in April 1762 he described his work to a literary society in Glasgow. But he never published any detailed account of it, so that others, such as J. A. Deluc, were able to claim the credit of his results. In the course of his enquiries he also noticed that different bodies in equal masses require different amounts of heat to raise them to the same temperature, and so founded the doctrine of specific heats; he also showed that equal additions or abstractions of heat produced equal variations of bulk in the liquid of his thermometers. In 1766 he succeeded Cullen in the chair of chemistry in Edinburgh. He died in Edinburgh on Dec. 6, 1799 (not on Nov. 26 as stated in Robison's life).

Apart from the work already mentioned he published only two papers during his lifetime—"The supposed effect of boiling on water, in disposing it to freeze more readily" (*Phil. Trans.,* 1775), and "An analysis of the waters of the hot springs in Iceland" (*Trans. Roy. Soc. Ed.,* 1794).

After his death his lectures were written out from his own notes, supplemented by those of some of his pupils, and published with a biographical preface by his friend and colleague, Professor John Robison (1739–1805), in 1803 as *Lectures on the Elements of Chemistry, delivered in the University of Edinburgh.*

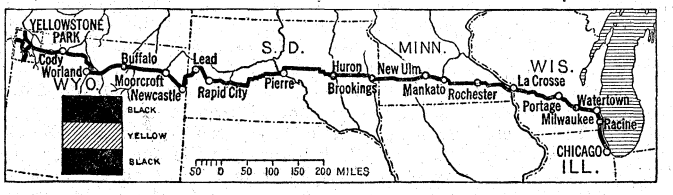
BLACK, WILLIAM (1841–1898), British novelist and journalist, was born at Glasgow on Nov. 9, 1841, and died at Brighton on Dec. 10, 1898. He joined the staff of the *Morning Star* in London, and during the war between Prussia and Austria in 1866 acted as war correspondent, and was taken prisoner. Later Black served on the *Daily News,* and for some time edited the *Examiner.*

His first novel, *James Merle,* published in 1864, was a complete failure; his second, *Love or Marriage* (1868), attracted but very slight attention. *In Silk Attire* (1869) and *Kilmeny* (1870) marked a great advance on his first work, but in 1871 *A Daughter of Heth* suddenly raised him to the height of popularity, and he followed up this success by a string of favourites. Among the best of his books are *The Strange Adventures of a Phaeton* (1872); *A Princess of Thule* (1874); *Madcap Violet* (1876); *Macleod of Dare* (1878); *White Wings* (1880); *Judith Shakespeare* (1884); *White Heather* (1885); *Donald Ross of Heimra* (1891); and *Wild Eelin* (1898). Black's best stories are those which are laid amid the breezy mountains of his native land, or upon the deck of a yacht at sea off its wild coast.

BLACK is now technically classified as a colour, being a terminal member of the so-called achromatic series of colours, ranging through a scale of greys to white. From the psychological standpoint black is as positive a phenomenon as any other colour, and cannot be identified with the absence of visual consciousness. It is also a mistake to regard black as an accompaniment of non-stimulation of the visual sense organs, since the normal result of this condition is a variable grey. In order to secure a true black either simultaneous or successive contrast is required, involving concomitant excitation of an outlying retinal area or prior excitation of the same area, respectively.

See *Psychological Review,* vol. xxxii., p. 248, and vol. xxxi., p. 498.

BLACK AND YELLOW TRAIL, a highway extending from Chicago, Ill., to Yellowstone park by way of the Black Hills and the Bad Lands of South Dakota. It is about 1,570m. in length. Paved and improved through Wisconsin, the balance



is graded and improved with some dirt stretches in Minnesota, South Dakota and Wyoming. This road passes through Cody, Wyo., and is often spoken of as the "Cody Way." It is the shortest route from the Great Lakes to Yellowstone park. Wind Cave National park, with an area of 10,522ac., lies in its path, while Milwaukee, Portage, Rapid City, Deadwood and Newcastle are some of the cities through which it passes.

BLACK APE, a black, short-tailed, long-faced macaque inhabiting Celebes, and forming a genus by itself, *Cynopithecus niger.* The nostrils open obliquely some distance from the end of the snout, and the head carries a long crest. (*See* PRIMATES.)

BLACKBALL, a token used for voting by ballot against the election of a candidate for membership of a club or other association. White and black balls were used to represent votes for and against a candidate for such election. The rules of most clubs provide that a stated proportion of "blackballs" shall exclude candidates proposed for election, and the candidates so excluded are said to have been "blackballed"; but the ballot is now usually conducted either by voting papers or by balls cast into different compartments of a ballot box.

BLACK BEAR TRAIL, a highway connecting Quebec and Ontario, Canada, with Miami and St. Petersburg, Florida. It has a total length of 1,950 mi. The road is paved from Quebec to North Carolina, and then again through Florida. Beginning at Montreal, it first follows the St. Lawrence river and then passes through the Adirondacks and the Catskill mountains. Plattsburg, Ticonderoga, Albany, West Point, Bear Mountain, Gettysburg, Harper's Ferry, Staunton, Natural Bridge, Roanoke, Augusta and Jacksonville are some of the places along this route.

BLACK BELT, a part of the southern United States, extending from central South Carolina, across central Georgia, through Alabama and Mississippi, so called because it is the area of greatest density of Negro population. The Black Belt is slowly moving southward and westward into Louisiana, Arkansas and Texas. This is a country of large rice and cotton plantations. More than half of its population is Negro. In the country districts living conditions and returns for labour are poor, with a greater tendency toward poverty with its shiftlessness and isolation than is found in the cities. After 1865 there was a steady migration from the farms to the towns. After 1914 Negroes moved northward and westward in increasing numbers.

BLACKBERRY or BRAMBLE, prickly, fruit-bearing bush of the genus *Rubus* (family Rosaceae), a native of the north temperate regions of the old and new world, particularly abundant in eastern part and the Pacific coast of North America and in the British Isles and western Europe as a copse and hedge-plant. It is characterized by its prickly, erect, semi-erect, or trailing stem, leaves with usually three or five ovate, coarsely toothed stalked leaflets, many of which persist through the winter, white or pink flowers in terminal clusters, and black or red-purple fruits, each consisting of numerous succulent druplets crowded on a juicy conical receptacle. It is a most variable plant, exhibiting many more or less distinct forms. In Europe evidence indicates that the ice age brought together two widely different species groups, the northern and southern. When they hybridized, the pseudogamic blackberries of Europe that come true to seed originated. Because of coming exactly true to seed, they have reproduced themselves down through hundreds and thousands of years and in some cases have become widely distributed. In Europe there are thousands of forms. A few are good species. Many are ancient hybrids, some of which come true to seed, some continually segregate, while many segregate in part and come true to seed in part. The Evergreen and Himalaya are varieties of European origin, coming true to seed, which are cultivated in the United States. This type is a pest over large areas of Australia, New Zealand and other countries.

In North America there are two groups of blackberries, the Pacific coast trailing one which grows from southern California to British Columbia and the eastern group, both erect and trailing, which grows from southern Florida to Canada and west to the Great Plains. The Pacific coast group consists of only three to five trailing species which have very high flavour, best known in the Logan, Young and Boysen varieties (*see* LOGANBERRY). Species of the eastern group have hybridized freely, especially since the forests were cut and the species could grow side by side. Originally there were probably some 20 species; one or more southern evergreen, slender-caned, dewberry species, some 4 deciduous dewberries, and possibly 15 with erect or recurving canes. Now there are hundreds of hybrids and segregates of various types. Most cultivated erect-growing varieties have been derived from *Rubus allegheniensis, R. argutus* and *R. frondosus,* while the Lucretia and Mayes dewberries are probably derived from *R. bailyanus* x *argutus*. For 1939 the blackberry and dewberry acreage in the United States was 34,995 acres with a crop value of $3,761,024. In Oregon and Washington Evergreen, Logan, Young and Boysen are the chief varieties; in California the Young, Boysen and Logan; in eastern states the Eldorado, Early Harvest, Early Wonder and Lawton blackberries and the Lucretia dewberry are the chief varieties.

The erect varieties are propagated by suckers and root cuttings; the trailing and semi-trailing varieties by both tip-layers (the tips being covered in late summer) and by root cuttings. The plants are usually set in early spring, the erect-caned varieties 4 by 8 ft., the dewberries 5 by 5 ft. or 5 by 8 ft., and the Himalaya and Evergreen 16 by 8 ft. The canes of the dewberries and the Himalaya and Evergreen are commonly trained to a 1-, 2-, or 4-wire trellis, though the dewberry is often trained to stakes set about 5 ft. by 5 ft. Virus diseases, the orange rust disease, leaf spots and anthracnose are common diseases. The cane borer and red berry mite are serious insects.

See "Blackberry and Raspberry Improvement" in U.S. Dept. of Agric. Yearbook 1937, p. 496. (G. M. D.)

BLACKBIRD, name given to a bird originally known as ousel (*q.v.*), though this has since been transferred to other species. The blackbird (*Turdus merula*) is a member of the thrush (*q.v.*) family. It is one of the commonest of British birds. The males, which are said to preponderate, are recognizable by their black plumage and orange bill. The females are more thrush-like, being a dusky brown and the beak is also dark.

The blackbird is an early nester, often beginning to lay in February, and raises two broods in the year. The nest, usually placed in bushes or hedgerows, is made of hay and coarse grass, neatly interwoven and lined with hair and fine grass. The eggs, 3 to 5 in number, are pale blue-green, mottled with brown. The young resemble the female in colour. Its food consists of fruits, buds, insects, worms, snails, etc. The song is mellow and flutelike, and by some people is preferred to that of the thrush. The blackbird is widely distributed over Europe and Asia, and, despite occasional raids on fruit trees, is, on the whole, a beneficial species. The typical race occurs in Europe and the British Isles, with allied races in Madeira and Canaries, Azores, northwest Africa, southeast Europe and southern Asia.

For the North American "blackbirds," *see* GRACKLE. (G. F. Ss.)

BLACKBIRD, RED-WINGED (*Agelaius phoeniceus*), a common North American bird, breeding from the Gulf of Mexico northward. The feathers of the male are black, tipped with rust-colour in winter, the wing-coverts being scarlet and buff. The female is brownish black above, and white streaked with black below, with the wing-coverts tinged with red. The bird is gregarious and possesses a liquid song and a shrill alarm note. There are 14 races north of the Mexican border, the typical race breeding in southeastern Canada and the eastern United States; other races occur on the Florida Keys, in Florida, along the Gulf coast, the Texas coast to Vera Cruz, northern Great Plains, Rockies of the United States, the Great Basin, the northwest coast, central coast of California, Pacific slope of southern California, the Arizona-California border desert, the Sacramento-San Joaquin valleys, and the south fork of the Kern river in California. The tricoloured red-wing (*A. tricolor*) occurs in the valleys of Oregon, California and Lower California.

Other species are the tawny-shouldered red-wing (*A. humilis*) of Cuba and western Haiti, recorded at Key West, Fla.; and the yellow-shouldered red-wing (*A. xanthomus*) of Puerto Rico. (G. F. Ss.)

BLACK BODY. The term black is commonly applied to any substance, such as coal or pitch, which absorbs nearly all the light falling on it and reflects very little. Lampblack or smoke black consisting of very fine particles of carbon is usually taken as a typical example of a black substance. The majority of black substances owe their blackness to the presence of particles of carbon embedded in a binding medium, but reflect some light at the surface when smooth or polished. For scientific experiments in which complete absorption of the incident light is required, reflection at the surface must be avoided as far as possible. For this reason the internal surfaces of optical instruments, such as telescopes and cameras, are coated with a "dead-black" varnish, having a matt surface, to eliminate internal reflections which would obscure or fog the image.

In the case of visible light, a very small defect of perfect blackness can be detected readily by eye, but the visible rays form a very small proportion of the total radiation from any source of artificial light, and are completely absent in the case of any radiator at a temperature below a red heat. It cannot be assumed that surfaces which appear black to the eye and are practically perfect absorbers of visible light, are equally perfect absorbers of the invisible rays. Receiving instruments for detecting or measuring radiation, such as the thermopile or bolometer (*see* HEAT), depend for their accuracy on the completeness of the absorption of all radiation over a range of wave length about 100 times greater than that of visible light. The sensitive receiving surfaces of such instruments are necessarily metallic, and would be very bad absorbers of radiation. They are accordingly coated with a film of smoke black or platinum black to render the absorption as complete as practicable. An absorption equivalent to 98% of the incident radiation may thus be obtained under favourable conditions, but it is very difficult to estimate the percentage defect and to make sure that it is the defective absorption in modern experiments, but it remains one same for all wave lengths. Some allowance is usually made for

of the chief sources of uncertainty in accurate measurements. The condition of complete absorption cannot be met satisfactorily except by the adoption of the "black body" principle which has long been recognized as essential to the construction of a source of radiation possessing the characteristics of definite intensity and quality.

The theory of the black body as a perfect absorber is extremely simple. The apparatus consists merely of an aperture in the side of an otherwise light-tight chamber, the inside of which is blackened. Any radiation entering through the hole is scattered and absorbed by repeated reflection so that an infinitesimal fraction only could possibly escape. It is easy to convince oneself of the perfect blackness thus secured by removing the lens from a box camera and covering part of the aperture with a card painted with the best dead-black. The uncovered part of the aperture will appear of a much higher order of blackness than the most perfect dead-black coating procurable. The advantage of the method lies in the fact that the blackness thus secured is equally perfect for all wavelengths owing to the complete elimination of surface reflection at the aperture.

The practical application of the principle to the construction of a perfect receiver is not quite so easy. With a simple chamber as above described, the radiation entering through the aperture would be scattered over the inner surface and could not easily be collected and measured. The experimental difficulties of this problem cannot be discussed here but are illustrated in the article on HEAT. The application of the same principle to the construction of sources of radiation, also termed "black bodies," is described in the same article, but it will be well to explain here how the apparent misnomer "black" has come to be applied to a body emitting radiation.

It follows from the theoretical reasoning of Balfour Stewart (1858) and Kirchhoff (1859), based on the equilibrium of temperature, that a body capable of absorbing radiation perfectly at any temperature must be equally perfect in the emission of radiation. Further it follows that the intensity of radiation inside a hollow chamber at a uniform temperature, can depend only on the temperature, is the maximum possible at the given temperature, and is independent of the form of the chamber or of the materials of which it is composed. Chambers of this kind, provided with suitable heating appliances and with apertures for the emission of the internal radiation, are commonly termed black bodies and are employed as sources of radiation of definite quality and intensity. The radiation they emit is the same as that of a perfectly black surface at the same temperature and is often called "black" radiation. The black-body temperature of a source like the sun is the temperature at which a black body would emit radiation of the same intensity. (H. L. C.)

BLACK BUCK (*Antilope cervicapra*), the Indian antelope, the sole species of its genus. An adult male stands about 32 in. high at the shoulder; the general hue is brown deepening with age to black; chest, belly and inner sides of limbs pure white, as are the muzzle and chin, and an area round the eyes. The horns are long, ringed, and form spirals with three to five turns. The doe is smaller and yellowish-fawn above. These antelopes frequent grassy districts and are found in herds (*see* ANTELOPE).

BLACKBURN, COLIN BLACKBURN, BARON (1813–1896), British judge, was born in Selkirkshire, and educated at Eton and Trinity college, Cambridge. He edited the eight volumes of the Ellis and Blackburn reports, and had a considerable commercial practice, but was unknown to the general public when he was promoted to a judgeship by Lord Campbell in 1859. "Who is Mr. Blackburn?" enquired *The Times,* but Blackburn proved one of the soundest lawyers on the bench, and when he went to the court of appeal in 1876 was considered the highest authority on common law. In the same year he was made a lord of appeal. Blackburn wrote a standard book on *The Law of Sales. See* E. Manson, *Builders of Our Law* (1904).

BLACKBURN, HELEN (1842–1903), British suffragist, was born at Knightstown, Valencia Island, Ireland, on May 25, 1842, the daughter of Bewicke Blackburn (1811–1897), a well-known engineer, who settled in London in about 1859. Helen Blackburn was secretary of the central committee of the National Society for the Promotion of Women's Suffrage from 1874–95; sole editor of *The Englishwoman's Review* from 1881–90, and author of *Women's Suffrage: a Record of the Movement in the British Isles* (1902), which is the standard work on the subject. She left her library on questions connected with women to Girton college, Cambridge, England.

BLACKBURN, JOSEPH (*c.* 1700–1760), American portrait-painter, probably came from England, landing in New York and going almost immediately to Boston, where most of his work was done. It was not until 1920 that his Christian name was definitely known. No record of his birthplace or antecedents has been found; nor is there any knowledge of his connections in America or where and when he died. For many years he has been called Jonathan B., all his paintings being signed "J" or "I." His patrons came mainly from important early American families, including the Apthorps, Bowdoins, Bethunes, Bulfinches, Ervings, Faneuils, Phillips and Winslows of Boston; the Atkinsons, Cutts, Warners and Wentworths of Portsmouth; and the Bours and Brown families of Newport. His work, in treatment and method of painting costume, resembles that of Thomas Hudson, who may have been his master, and to some extent that of Joseph Highmore. It is inferior to the work of Robert Feke, his contemporary, but he surpasses Smybert in decorative quality and truthful drawing. Blackburn's influence was felt by Copley, then in his formative period; and until recently much of his work has been attributed to Copley. More than 80 portraits by him are now known to exist, most of them owned by private individuals; the remainder scattered among museums of art, colleges and historical institutes. Two are in the Metropolitan Museum in New York city; others in the art museums of Cleveland, Worcester, Boston and Brooklyn.

BLACKBURN, municipal, county, and parliamentary borough of Lancashire, England, 24½ mi. north-northwest of Manchester, served by the L.M.S.R., with lines from all parts of the county. Pop. (1938) 113,000. Area 12.6 sq.mi. It lies in the valley of a stream called in early times the Blackeburn, but now known as the Brook. The parish church of St. Mary (now the cathedral) is on a site which seems to have had associations with early Christianity. Blackburn was for some time the chief town of a district called Blackburnshire, and as early as the reign of Elizabeth ranked as a flourishing market town. About the middle of the 17th century it became famous for its "checks" which were afterwards superseded by a similar linen-and-cotton fabric known as "Blackburn greys." In the 18th century the ability of the townspeople fostered its cotton industry and James Hargreaves invented his spinning jenny here about 1764. Coal, lime and building-stone abound in the neighbourhood, factors which helped the rapid development of the town during the last century.

The cotton industry employs thousands of operatives, especially women, the iron trade is very considerable, and many are engaged in the making of machines; a former woollen manufacture is almost extinct. Blackburn's speciality in the cotton industry is weaving. Many men are also employed in the local collieries.

There is an Elizabethan grammar school (1567) housed in modern buildings (1884), and a fine technical school. There are four parks and ten recreation grounds (140 ac.) and an art gallery and museum. Blackburn is now a separate diocese, having been carved out of that of Manchester in 1926. St. Mary's church became the cathedral. Although an ancient foundation, it was almost entirely rebuilt, 1826–57, and a further large extension plan was being carried out (1944).

The town received a charter of incorporation in 1851. The county borough was created in 1888. The parliamentary borough has returned two members since 1832.

BLACKBURNE, FRANCIS (1782–1867), lord chancellor of Ireland, was born at Great Footstown, Co. Meath, Ireland, on Nov. 11, 1782, educated at Trinity college, Dublin, and called to the English bar in 1805. He practised with success. Called to the Irish bar in 1822, he vigorously administered the Insurrection Act in Limerick for two years. In Ireland (1826) he became serjeant-at-law, attorney-general (1830 and 1841), master of the rolls

(1842), chief justice of the queen's bench (1846), lord chancellor (1852 and 1866), lord justice of appeal (1856). He prosecuted Daniel O'Connell and presided at the trial of Smith O'Brien. He died on Sept. 17, 1867.

BLACKCAP (*Sylvia atricapilla*), a small warbler (*q.v.*), notable for the beautiful song and black cap of the male, the female having the top of the head brown. The rest of the plumage in both sexes is gray. The blackcap is a summer resident in northern Europe and the British Isles, but lives the year round in southern Europe, northwest Africa and nearby islands. The male often helps to incubate the eggs and may betray the nest by singing while sitting. (G. F. Ss.)

BLACKCOCK (*Lyrurus tetrix*), a bird of the family Tetraonidae, or grouse, the female of which is known as the greyhen. In size and plumage the two sexes offer a striking contrast, the male weighing about 4 lb., its plumage, for the most part, of a rich glossy black, shot with blue and purple, the lateral tail feathers curved outwards so as to form a fanlike crescent, and the eyebrows bright vermilion and destitute of feathers. The female weighs only 2 lb., its plumage is of a russet brown colour, irregularly barred with black, and its tail feathers are but slightly forked. The males are polygamous, and, during the spring, assemble on definite display grounds, where they display and fight fiercely for possession of the females. The nest, composed of a few stalks of grass, is on the ground, and the female lays from six to ten eggs of a dirty yellow colour, speckled with dark brown. She hatches and rears her brood alone. The plumage of both sexes is at first like that of the female. The blackcock is distributed over the highland districts of northern and central Europe and central and northern parts of Asia. It is usually shy and wary, lives in forest, woodland and moor, and feeds on tender twigs, berries and seeds. The Great Britain race (*L. t. britannicus*) is abundant in the Scottish Highlands. The typical race ranges over Europe and northern Siberia, while five other races are recognized from southeastern Russia to Manchuria. An allied species, the Georgian or Caucasian black grouse (*L. mlokosiewiczi*), smaller and blacker, lives at 5,000 to 11,000 ft. in the Caucasus mountains. (G. F. Ss.)

BLACK COUNTRY, THE, name applied to a district of the English Midlands including south Staffordshire with parts of Worcestershire and Warwickshire. The name is due to the numerous collieries and furnaces, and the desolation of scenery and agglomeration of houses consequent upon the mining of coal, ironstone and clay and dependent industries. The district is intersected by canals now mostly derelict, and by numerous branches of the G.W.R. and L.M.S.R. For localization of industries *see* BIRMINGHAM; WOLVERHAMPTON; WALSALL, etc.

BLACK DIAMOND HIGHWAY, THE, extends from Truro, Nova Scotia, to Port Hawkesbury, Sydney and Glace bay on Cape Breton Island. It is about 223 mi. long and mostly good gravel road, broken by ferry across the Strait of Canso from Mulgrave on the mainland to Port Hawkesbury. Glasgow and Antigonish lie along this route.

BLACK DROP, in astronomy, an apparent distortion of the planets Mercury or Venus at the time of internal contact with the edge of the sun at the beginning or end of a transit. It has been in the past a source of much perplexity to observers of transits, but is now understood to be a result of irradiation, produced by the atmosphere or by the aberration of the telescope.

BLACK EARTH AREA (Central), a unit of agricultural administration in Russia created by the soviet government in May 1928. It consists of the regions of Voronezh, Kursk, Tambov, Orel and Penza, with part of Tula and of Ryazan. The steppe black earth of chernozem, characteristic here, occurs over deposits of many kinds and ages, in a more or less continuous belt from Manchuria through Siberia to south Russia, Rumania, Hungary, Moravia and Bohemia. These regions have a high temperature and strong evaporation in summer with consequent desiccation of the soil, and, in winter, prolonged soil frost. During the winter, water accumulates and provides for a luxuriant spring crop of grass, the strong root systems of which supply organic matter and thus a soil is formed having a humus content varying from 6% to 12% or more. When this belt lies on the loess (*q.v.*) the mobility of water in that formation favours the development of black earth, which under these circumstances spreads into less strictly arid areas. During the intense summer evaporation, the water accumulated in winter rises to the drying upper layers of the soil, and gypsum and calcium carbonate are deposited in distinct horizons, at various depths; the gypsum usually lies beneath the calcium carbonate stratum. The soil is loose in texture, very crumbly and of a deep black colour; the humus content decreases from above downwards, and humus layers 28 to 40 in. thick are common. The lower soil (A_2 of the Russian investigators) is irregularly coloured, being usually light or yellowish brown, with dark veins and patches. The humus layer merges into bedrock in the lower layer of the soil without any sharp division.

In the Central Black Earth area of Russia, the climate is continental (av. Jan. temp. −8° C. to −9° C., av. July temp. +20° C. to +22° C.). The frost in winter is severe, the rivers are icebound from 110 to 120 days, and there is much snow. The rainfall, averaging about 20 in. is sufficient for the local vegetation. The high summer insolation and the severe winter frost retard the decay of the humus. To the north is much gray forest soil, while to the southeast are a few patches of the salted soil so characteristic of the lower Volga area. Along the river courses are sandy and alluvial soils. To the east of the Don river is a plain not more than 660 ft. above sea level, while the west is part of the central Russian plateau rising to 1,640 ft. The prevailing character of the area is level plain, deeply entrenched by ravines and river valleys, the slopes of which are everywhere forest covered, so that steppe alternates with forest (lyesso-steppe), though in the south the steppe is continuous. In the central course of the Don and its tributaries are chalk outcrops and in the central Don area high white chalk pillars appear. The prefix "Byel" (white) or "Myel" (chalk) is often given to the picturesque settlements in these areas, *e.g.*, Byelgorod, Byelpolye, Byelgorye, Myelovaya.

The area is 77,200 sq.mi. and every bit of suitable land is cultivated. Of the population of 11,600,400, no fewer than 10,450,200 were engaged in agriculture, but in spite of this and of the fertility of the chernozem, the harvest is insufficient for the needs of the people, and many go as seasonal labourers to other provinces, while others are occupied in koustar (peasant) industries, especially the manufacture of hempen rope and string. The standard of life is low, and miserable hovels without chimneys and with earthen floors are common. The three-field system is general and the transition to grass and root-crop cultivation and to the four-field system is slow. War and famine decreased fertility and reduced harvests, undermined the stamina of the people, diminished live stock (and consequently manure), horses by 50%, working cattle, sheep and pigs even more, and prevented renewal of agricultural implements. In 1926 the number of livestock was still markedly less than in 1913. The area sown in 1926 was about 80% of that in 1913 and the harvest per acre was much less. In a drought area the vegetation period is important, and varies for different crops. Rye, buckwheat, flax, millet and barley need 100 days or less, summer wheat and oats 105 days or more, while maize and potatoes may need 150 days. The chief crops are rye, millet and oats. Other crops are summer wheat and potatoes, hemp (especially in Voronezh, Orel and Kursk), sunflower seed (especially in Voronezh) and sugar beet in the southern region, where beekeeping is also very successful. Fruit is cultivated to some extent in the south and centre, the northwest corner lies beyond the northern limit of cherry production and the northeast beyond that of pear production. The northwest of the area has a good supply of timber, and sawmilling is extensively carried on, but much of the remaining area is markedly deficient in timber. Factory industries are little developed and are mainly agricultural, *e.g.*, sugar beet factories in Kursk and Voronezh, oil pressing from sunflower seeds in Voronezh and Tambov, while flourmilling is widespread, mainly dependent on wind. The electrification of the area is proceeding very slowly.

As regards mineral wealth, the marked magnetic needle anomaly has led to the recent discovery at a depth of 160 to 180 metres of iron ore in the Kursk and Shchigry areas, and this may result in industrial developments here. There are also phosphorite regions extending from Orel to Shchigry, and in the Morshansk area. Lipetsk is noted for its mineral springs and for the deposits of iron to the northwest of the town. Communications by rail, river and road are better than in many other districts of Russia, and several towns have grain elevators. The chief towns are Voronezh, the administrative centre, Tambov, Byelgorod, Lipetsk, Elets (*qq.v.*), Orel and Kursk. The population is mainly Great Russian, though in the southwest there is a high proportion of Ukrainians, who demand to be treated as a national minority, and of Mordvins near Penza.

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BLACK-EYED SUSAN. A species of coneflower (*Rudbeckia hirta*), called also yellow daisy, native to dry open grounds from Ontario to Manitoba southward to Florida and Texas and widely distributed east of this area as a troublesome weed. It is a rough, hairy herb, about 2 ft. high, with thick, lance-shaped leaves and long leafless flower stalks with a single large head, 3 in. to 4 in. across, composed of brilliant golden-yellow ray flowers surrounding a dark brown cone-shaped centre (disk). It is a handsome but weedy American wild flower, rarely grown for ornament, and is the state flower of Maryland.

(*See* GOLDEN GLOW.)

BLACKFISH, the name applied to various dark-coloured fishes. In England, it is *Centrolophus niger,* a scombroid fish about 2 ft. long and shaped like a perch. In the United States, it most commonly refers to the tautog, but is also used of a sea bass (*Centropristes striatus*) of Atlantic waters, and a minnow (*Orthodon microlepidotus*) of central California. In Alaska, the blackfish is the small, fresh-water *Dallia pectoralis.* By whalers the word is used to denote Cetacea (*q.v.*) of the genus *Globicephalus,* which includes the ca'ing or pilot whale (*G. melas*).

BLACK FLY, any member of the family Simuliidae of the order Diptera (*q.v.*), regardless of colour, which is generally black or gray, only a few being yellowish. They are small, humpbacked flies with gauzy wings, stout antennae and legs, and rather short mouth parts adapted for blood sucking. Only the females bite; they are sometimes so abundant as to kill chickens, birds and other domestic animals. Simuliid adults, *S. caecutiens* in Africa and *Eusimulium avidum* and *E. ochraceum* in America, are vectors of nematode worms; *Onchocerca volvulus,* causing the disease onchocerciasis in man, is known from Mexico, Central America and Africa, and results in blindness if the worms settle in the eye; otherwise it causes subcutaneous nodules. The larvae and pupae are aquatic, living only in flowing or moving water, in streams and on wave-washed shores. The larvae occur on stones, dams, weeds, etc., in fast flowing streams. The adults emerge directly from the water; the pupa frees itself from its cocoon, rises to the surface on a bubble of air, the back splits open, and the adult emerges and flies away. Repellents used for mosquitoes keep them away. About 300 kinds are known, 19 from Great Britain.

(*See* ENTOMOLOGY: *Medical.*) (C. H. CN.)

BLACKFOOT, a group of three closely related and allied Algonkin tribes in Alberta and Montana, also known as Siksika and comprising the Blackfoot proper, Piegan and Blood. During the 19th century the Athabascan Sarsi and the Atsina, a branch of the Algonkin Arapaho, were closely associated with them. Although situated near the northwestern limit of the abundant range of the bison, the Blackfoot shared the culture of the Plains tribe in pure form.

Their separation both from the central eastern Algonkin and the Arapaho must be ancient, as shown by the specialization of their language. They originally numbered perhaps 3,000 per tribe, of whom 4,635 remained in 1909—2,440 on three reservations in Alberta, 2,195 on American soil.

See G. B. Grinnell, *Blackfoot Lodge Tales* (1892); J. W. Schultz, *My Life as an Indian* (1907); C. Wissler, *Am. Mus. Nat. Hist. Anthr. Pap.,* vols. v, vii (1910–12).

BLACKFOOT, a city of Idaho, U.S.A., on the Snake river, federal highway 91, and the Salt Lake-Butte line of the Union Pacific railroad, about halfway between Pocatello and Idaho Falls, at an elevation of 4,508 ft.; the county seat of Bingham county. The population in 1940 was 3,681. It is in the centre of the Idaho russet potato district and the Grimm alfalfa seed producing area; it also produces sugar beets, mined ores, dairy products, beef cattle, hogs and sheep in large numbers. In Blackfoot are the State Hospital South for the insane, a sugar factory, cheese factory, mattress factories, fishing boat manufactories, creameries, an alfalfa seed warehouse and large livestock auction yards. Blackfoot is the "tourist gateway" to Craters of the Moon national monument and the Sun Valley mountain resort. It is the junction of the Blackfoot-Aberdeen and Blackfoot-Mackay branches of the Union Pacific railroad.

BLACK FOREST, a mountain range of southwest Germany, mainly in the *Land* of Baden, with about a third in Württemberg (Ger. *Schwarzwald*). Area about 1,800 sq.mi.; total length, about 100 mi.; breadth varying from 10 to 15 mi. Structurally and topographically the Black Forest forms the counterpart of the Vosges, which stand across the sunken Alsace valley drained by the Rhine.

The range is cut off sharply by the Rhine on the south. It is divided into two parts by the deep Kinzig valley, with the highest summits, *e.g.,* Feldberg (4,900 ft.), Herzogenhorn (4,600), and Blössling (4,260), to the south. The northern half has an average height of 2,000 ft. The climate in the higher districts is raw and only hardy cereals are grown; but the valleys are warm, with good pasture land and vineyards. Oak and beech woods clothe the lower spurs, while stretching up to 4,000 ft. are the extensive forests of fir which have made the terms "forest" and "mountain" synonyms here. The excellent timber is partly sawn in the valleys and partly exported down the Rhine in logs. The manufactures of watches, clocks, toys and musical instruments are typical of this and other forested areas of central Europe. There are numerous mineral springs and watering places, *e.g.,* Baden-Baden and Wildbad. The towns of Freiburg, Rastatt, Offenburg and Lahr lie under the western slopes. The Black Forest is a favourite tourist resort and is reached by numerous railways.

BLACK FRIDAY, a team applied to several Fridays upon which serious upheavals or crises occurred. The outstanding financial Black Fridays are: (1) May 11, 1866, when the banking house of Overend and Gurney, of London, failed, resulting in widespread business and financial distress. (2) Sept. 24, 1869, the American Black Friday. For some time the balance of trade had been setting steadily against the United States and gold was being drained out of the country in tremendous amounts. So acute had conditions become that the U.S. treasury had even discontinued the sale of gold. Many had gone "short" on gold and this suggested to Jay Gould and his associate, James Fisk, an opportunity to corner the available gold supply, engineer a "bull market" and compel the "shorts" to cover at high prices. In less than a month the price of gold was pushed up from 133 to 162½, which culminating price was reached on Black Friday and brought about a crisis in the securities market. The government was largely responsible for breaking the corner by the purchase of $4,000,000 of its bonds with gold.

BLACK HAW (*Viburnum prunifolium*), a North American shrub or small tree of the honeysuckle family (Caprifoliaceae), called also stagbush and sheepberry. It grows in dry soil from Connecticut and southern New York westward to Michigan and southward to northern Georgia and eastern Kansas. Although somewhat bushy in habit, with a short, usually crooked trunk, 6 in. to 8 in. in diameter, and rigid, spreading branches, it sometimes reaches 30 ft. in height. It bears smooth, ovate, very finely toothed leaves and numerous small white flowers in compact clusters, 2 in. to 4 in. broad, and sweet, edible, bluish-black fruits

(drupes), about ⅓ in. long, each containing a much flattened stone. The similar but larger southern blackhaw (*V. rufidulum*), sometimes 40 ft. high, with fruit ½ in. or more long and containing a nearly orbicular stone, is found in dry upland woods from Virginia westward to Missouri and southward to Florida and Texas. The nannyberry (*V. lentago*), in some districts is called also blackhaw. (*See* VIBURNUM.)

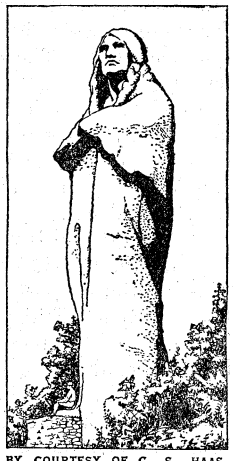
(E. S. HR.)



BY COURTESY OF THE WILD FLOWER PRESERVATION SOCIETY

THE BLACKHAW

BLACK HAWK [*Ma 'kata-wimesheka 'ka,* "Black Sparrow Hawk"] (1767–1838), American Indian warrior, was born at the Sauk village on Rock river, near the Mississippi, in 1767. This beautiful territory was long coveted by the whites, and he and his people, who were so much under British influence as to be called the British band, were subjected to various acts of abuse by encroaching white squatters. As early as 1804 a few chiefs agreed to remove to the west of the Mississippi in return for an annuity of $1,000, a manifestly unfair agreement obtained by very questionable methods, but which was reaffirmed by the Indians in later treaties. In 1831 Black Hawk's threat of force to evict the usurpers caused the Illinois volunteers to march to the latter's rescue and the Indians to withdraw to the west bank of the Mississippi, whence they agreed not to return without the Government's permission. Famine conditions prevailed among the red men who had left their growing crops in the Illinois country; and the next spring with women, children and tribal possessions Black Hawk recrossed the river to plant a new crop. Instant panic prevailed among the settlers, and the undisciplined militia shot down one of the Indians carrying a flag of truce. Black Hawk, enraged, began to harry the border, for a time being successful. He was defeated, however, at Wisconsin Heights by volunteers under Colonel Henry Dodge and James D. Henry, and fleeing westward, his band, which was by this time in a starving condition, was practically destroyed at the battle, or rather massacre, of the Bad Axe river. The cold-blooded way in which old men, little children and women were all destroyed and a plea for mercy and a flag of truce alike disregarded make the whole affair one of the darkest blots in the shameful record of the whites' spoliation of the Indian. Black Hawk himself was captured, confined for a short time in Fortress Monroe, Va., and then taken by the Government through the principal eastern cities. On his release he settled on the Sauk and Fox reservation on the Des Moines river, in Iowa, where he died on Oct. 3, 1838. A statue commemorating him by Lorado Taft has been erected on a high bluff on the Rock river near Oregon, Illinois. Black Hawk was of a romantic and ambitious temper, and though he lacked the vision and the statesmanship of Pontiac or Tecumseh, there can be no doubt of the sincerity of his feeling for his territory and his people and of the shamefulness of the treatment accorded to him and his followers by the whites.



BY COURTESY OF C. S. HAAS, AFTER A STATUE BY LORADO TAFT (NATIONAL PHOTO CO.)

BLACK HAWK, THE AMERICAN INDIAN CHIEF WHO FOR MANY YEARS OPPOSED THE WESTWARD EXPANSION OF WHITE SETTLERS

Black Hawk's own story was told in *Life of Ma-ka-tai-me-she-kia-kiak* (1834); Benjamin Drake's *Life of Black Hawk* (1846) was a popular early biography. An example of the numerous contemporary accounts is A. Wakefield's *History of the Black Hawk War* (1834), which was edited by F. E. Stevens in 1908. *See* also F. E. Stevens, *The Black Hawk War* (1903); numerous articles in the Wisconsin Historical Society *Collections;* the essay in R. G. Thwaites, *How George Rogers Clark Won the Northwest* (1903); J. F. Snyder, "The Burial and Resurrection of Black Hawk," *Ill. State Hist. Soc. Jour.,* vol. iv., p. 47–56 (Springfield, Ill., 1911); and Amer Mills Stocking, *The Saukie Indians and Their Great Chiefs Black Hawk and Keokuk* (Rock Island, Ill., 1926).

BLACKHEATH, an open common in the south-east of London, England, mainly in the metropolitan borough of Lewisham. This high-lying tract was crossed by the Roman Watling Street from Kent, on a line approximating to that of the modern Shooter's Hill; and was a rallying ground of Wat Tyler (1381), of Jack Cade (1450), and of Audley, leader of the Cornish rebels, defeated and captured here in 1497. The citizens of London greeted Henry V. here on his return from Agincourt, and here the army of the Restoration met Charles II. The introduction into England of the game of golf is traditionally placed here in 1608, and attributed to King James I. and his Scottish followers. The common, the area of which is 267 acres, is used as a pleasure resort. For the residential district to which Blackheath gives name, *see* LEWISHAM.

BLACK HILLS, an isolated group of mountains in the U.S.A. covering an area of about 6,000 sq.m. in the adjoining corners of South Dakota and Wyoming. They rise on an average some 2,000ft. above their base, the highest peak, Harney, having an altitude above the sea of 7,242ft. They are drained and in large part enclosed by the North (or Belle Fourche) and South forks of the Cheyenne river, and are surrounded by semi-arid, alkaline plains lying 3,000 to 3,500ft. above the sea. The mass has an elliptical shape, its long axis, which extends nearly north-north-west to south-south-east, being about 120m. and its shorter axis about 40m. long. The hills are formed by a short, broad fold, which is flat or nearly so on its summit. From this fold the stratified beds have in large part been removed, the more recent having been almost entirely eroded from the elevated mass. The edges of these are now found encircling the mountains and forming a series of fairly continuous rims. The carboniferous and older stratified beds still cover the west half of the hills, while from the east half they have been removed, exposing the granite. Scientific exploration began in 1849, and systematic geological investigation about 1875. Rich gold placers had already been discovered, and in 1875 the Sioux Indians, within whose territory the hills had until then been included, were removed, and the lands were open to white settlers. Low grade quartz mines were later found, which furnished a large portion of the country's gold supply (about $100,000,000 from 1875 to 1901). There is still a good yield from deep mines (over 500,000 fine ounces in 1933 with a current value of about $15,200,000). Silver production from 1879 to 1901 was about $4,154,000, and nearly $43,000 for 1933. Deposits of copper, tin, iron, tungsten, and a variety of other minerals have also been discovered. In contrast to the surrounding plains the climate is sub-humid, especially in the higher Harney region. There is an abundance of fertile soil and magnificent grazing land. A third of the total area is covered with forests of pine and other trees, which have for the most part been made a forest-reserve by the national government.

BIBLIOGRAPHY.—*See* the publications of the U.S.A. geological survey (especially Professional Paper No. 26, *Economic Resources of the Northern Black Hills,* 1904), and of the South Dakota School of Mines (Bulletin No. 4, containing a history and bibliography of Black Hills investigations); also R. L. Dodge, *The Black Hills: A Minute description . . .* (1876).

BLACKIE, JOHN STUART (1809–1895), Scottish scholar and man of letters, was born in Glasgow on the 28th of July, 1809. After attending classes at Edinburgh University (1825–1826), Blackie spent three years at Aberdeen as a student of theology. In 1829 he went to Germany, and after studying at Göttingen and Berlin he accompanied Bunsen to Italy and Rome. The years spent abroad extinguished his wish to enter the Church, and at his father's request he gave himself up to the study of law. By the time he was admitted a member of the Faculty of Advocates (1834) he had acquired a strong love of the classics and a taste for letters in general. A translation of *Faust,* which he published in 1834, met with considerable success. He was (May 1839) appointed to the newly-instituted Chair of Humanity (Latin) in the Marischal College. From the first his professorial

lectures were conspicuous for the enthusiasm with which he endeavoured to revivify the study of the classics; and his growing reputation, added to the attention excited by a translation of Aeschylus which he published in 1850, led to his appointment in 1852 to the professorship of Greek at Edinburgh, a post which he continued to hold for thirty years. He was somewhat erratic in his methods, but his lectures were a triumph of influential personality. A journey to Greece in 1853 prompted his essay *On the Living Language of the Greeks*, a favorite theme of his, especially in his later years; he adopted for himself a modern Greek pronunciation, and before his death he endowed a travelling scholarship to enable students to learn Greek at Athens. Scottish nationality was another source of enthusiasm with him; and in this connection he displayed real sympathy with Highland home life and the grievances of the crofters. The foundation of the Celtic chair in Edinburgh University was mainly due to his efforts. He died in Edinburgh on the 2nd of March, 1895.

See Anna M. Stoddart, biography, *John Stuart Blackie* (1895); A. Stodart-Walker, *Selected Poems of J. S. Blackie*, with an appreciation (1896); Howard Angus Kennedy, *Professor Blackie* (1895); *Letters of John Stuart Blackie* (1909), and *Notes of a Life* (1910) both edited by A. Stodart-Walker.

BLACKING. The manufacture of blacking, a compound used in the polishing of old-fashioned coarse leathers, is a very ancient one, and was at one time a large and flourishing industry. Blacking is composed of charcoal black, lamp-black, sugar, oil, and fat in varying proportions, and is prepared either as a paste packed in tins or as a liquid put up in bottles. The blacking is spread upon the leather and then polished to give a brilliant "shine," as the boot-black calls it. The "cleaning" of leather boots by this process thus amounts to the application to footwear of an exceedingly dirty substance. While boots were made of the old-fashioned coarse leathers, blacking was largely called for; but the modern introduction of willow-calf and other fancy leathers and the general substitution of light for heavy footwear have made it unnecessary to use blacking. Willow-calf, whether finished black or brown or any other colour, can with ease and comparative cleanliness be polished with a preparation of wax and turpentine, and many forms of such "boot-polish" are made and sold.

The turnover from blacking to boot-polish, although a small detail of trade, is significant of the general change of fashion from the heavy to the light, from the shapeless to the graceful, from the dull to the bright, which has characterized the beginning of the twentieth century.

BLACK ISLE, THE, a district in the east of the county of Ross and Cromarty, Scotland, bounded north by Cromarty Firth, east by Moray Firth, south by Inner Moray Firth (or Firth of Inverness) and Beauly Firth, and west by the river Conon and the parish of Urray. (*See* Ross and Cromarty.)

BLACK JACK, a bludgeon-like weapon consisting of a lead slug attached to a leather thong. The more carefully contrived black jacks contain a spring within the handle which serves to ease the effect of the impact upon the wrist of the one who wields the weapon. The black jack has the reputation of being a characteristic weapon of urban gangsters and rowdies. In England a black jack or black-jack was a big leather quart pot or drinking cup, often with a silver rim; *see* the conclusion of the song, "Simon the Cellarer":

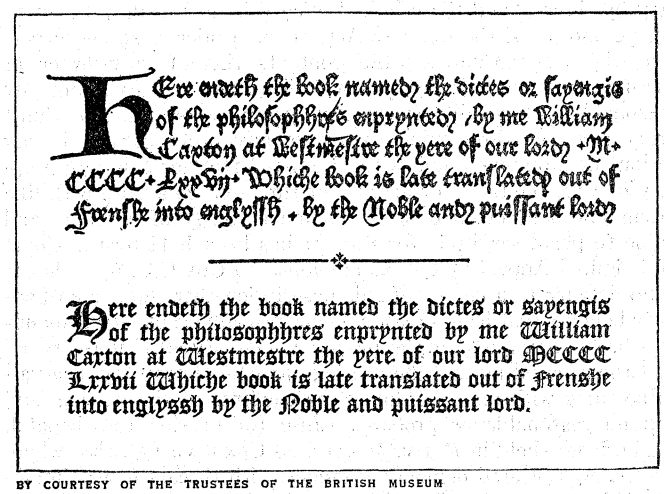
> "But yo, ho, ho! His nose doth show
> How oft the Black Jack to his lips doth go."

BLACKLEAD, a name for graphite (*q.v.*) or plumbago. Preparations of graphite are commonly sold as "blacklead," and were at one time largely used for the cleaning and brightening of iron firegrates and iron fenders. Many homes were at one time, and some still are, fitted with iron stoves made upon the supposition that their users would regularly coat them with blacklead. This dirty and unnecessary work has been rendered obsolete by the introduction of better-finished appliances. In moulding with wax, blacklead is used as a coating for the mould in order to keep it from sticking.

BLACKLEG, a slang term in use since the 18th century for a cheat or turf swindler. Its modern use is as a term of reproach for a worker who refuses to come out on strike with his fellows, or, sometimes, but less correctly, for those who decline to join their appropriate trade society or union. Similarly, to "blackleg" is to return to work before the union or the general body of strikers have agreed to do so; or to take the place of workers who are on strike or have been locked out.

Like the equally opprobrious word "scab," "blackleg" originally means a disease of cattle or sheep.

BLACK LETTER, the name of the type copied from the fifteenth-century style of handwriting used in Germany, Holland and England. It was first employed by Caxton before 1480, and


Here endeth the book named the dictes or sayengis of the philosophhres enprynted by me William Caxton at Westmestre the yere of our lord M CCCC Lxxvii Whiche book is late translated out of frenshe into englysshe by the noble and puissant lord

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BY COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM

SPECIMEN OF BLACK LETTER, OR GOTHIC TYPE, AS USED BY CAXTON IN THE FIRST DATED BOOK PRINTED IN ENGLAND (1477). BELOW IS THE SAME PARAGRAPH IN MODERN "OLD ENGLISH"

was later used in all his books. Black letter, also called Gothic, did not give way to the Roman type revived in the Italian Renaissance until the 16th century. In the accompanying drawings are shown (1) a reproduction of Caxton's type and (2) a specimen of modern "Old English" used for decorative purposes. Black letter is still commonly used in Germany in books and newspapers. (*See* Typography.)

BLACK LIST. A general term used to describe a list of persons considered obnoxious for reasons good or bad. In the World War, the blockade of Germany by the allies was rendered very difficult by the free trading of neutral traders, especially those of Scandinavia, Holland and Switzerland, with the Central European powers (*see* Blockade). This led to the drawing up by the British Government of a list of Continental and other firms and persons, acting as suppliers to the enemy, with whom British subjects were forbidden to trade under the Trading with the Enemy act. This was called the black list. The term has also been used to describe a list of defaulters and unreliable persons circulated to traders by trade protection institutions.

BLACKLOCK, THOMAS (1721–1791), Scottish poet, the son of a bricklayer, was born at Annan, Dumfriesshire, on Nov. 10, 1721, and died at Edinburgh on July 7, 1791. When not quite six months old he lost his sight by smallpox, and his career is largely interesting as that of one who achieved what he did in spite of blindness. About 1740, some of Blacklock's poems began to be handed about among his acquaintances and friends, who arranged for his education at the grammar-school, and subsequently at the University of Edinburgh, where he was a student of divinity. His first volume of *Poems* was published in 1746. In 1754 he became deputy librarian for the Faculty of Advocates, by the kindness of Hume. He was eventually estranged from Hume, and defended James Beattie's attack on that philosopher. Blacklock was among the first friends of Burns in Edinburgh, being one of the earliest to recognize his genius. In 1762 he was ordained minister of the church of Kirkcudbright, a position which he soon resigned.

An edition of his poems in 1793 contains a life by Henry Mackenzie.

BLACK MAGIC: *see* Conjuring.

BLACKMAIL, in English law, a term used with three special meanings at different times. (1) The primary meaning of "black-

mail" was rent paid in labour, grain or baser metal, *i.e.,* money other than sterling money, called *reditus nigri* in contradistinction to rent paid in silver or white money (*mailles blanches*). (2) In Scotland and the northern counties of England it signified a tribute in money, corn, cattle or other consideration exacted from farmers and small owners by freebooters in return for immunity. By a statute of 1601 it was made a felony without benefit of clergy to receive or pay such tribute, but the practice lingered until the union of England and Scotland in 1707. (3) The word now signifies extortion or attempted extortion of money or property by threats, and the criminal offence is now dealt with by ss. 29, 30 and 31 of the Larceny Act, 1916. Under s. 29 every person who utters, knowing the contents thereof, any letter or writing demanding of any person with menaces, and without any reasonable or probable cause, any property or valuable thing, or accusing or threatening to accuse any other person of any serious or infamous crime with intent to extort or gain any property or valuable thing, or accuses or threatens to accuse with like intent another person of a like crime is guilty of a felony and liable to penal servitude for life. It has been held by the Court of Criminal Appeal in *Rex* v. *Dymond,* 26 Cox C.C. 621, that it is no defence to a charge of this description that the person honestly believes that he has reasonable or probable cause for demanding the money, but that the offence is constituted if it is proved that the accused uttered the writing, demanded property or a valuable thing with menaces, knew the contents of the writing, and had no reasonable or probable cause for making the demand. Again, it was held in *Rex* v. *Denyer,* 28 Cox C.C. 153, that where a letter was uttered demanding money with threats it was immaterial that the motive in writing the letter was the protection of trade interests. By the same section a similar penalty may be inflicted where a person, with intent to defraud or injure, by unlawful violence or by accusing or threatening to accuse a person of a like crime, compels or induces the execution, alteration or destruction of valuable securities. Section 30 deals with demanding with menaces with intent to steal, where the maximum period of penal servitude is five years, and s. 31 with threatening to publish or proposing to abstain from publishing libellous or other matter with intent to extort. This last is declared to be only a misdemeanour and the maximum imprisonment is for a term not exceeding two years. (W. DE B. H.)

In America.—In American law blackmail, or extortion, which is frequently treated as a synonymous term, is, obtaining or endeavouring to obtain money or property or to procure any wrongful act by threats or intimidation. The threat may be to accuse of a crime, do an injury, publish a libel or to bring disgrace and shame upon the person threatened. It may be a threat to injure a third party as well as to injure the person from whom the money is demanded. In some jurisdictions a distinction is made between intimidation under colour of official right and other threats or intimidation. The term extortion is confined to the former and blackmail to the latter. In other jurisdictions, blackmail by written threat is made a more serious offence than by oral threats, the latter being classed as a misdemeanor, the former as a felony. It is not blackmail to demand in good faith indemnity for a wrong actually suffered even though legal proceedings to enforce the demand might in fact bring shame and disgrace upon the person addressed. (B. RE.)

BLACKMORE, SIR RICHARD (*c.* 1650–1729), English physician and writer, was born at Corsham, in Wiltshire, and educated at Westminster school and St. Edmund hall, Oxford. After graduating in medicine at Padua, he settled in practice as a physician in London, and held the office of physician in ordinary both to William III. and Anne. Blackmore was a prolific writer of verse. His *Prince Arthur, an Heroick Poem in X Books* appeared in 1695, and was followed by six other long poems before 1723. Of these *Creation . . .* (1712), a philosophic poem intended to unfold the intellectual philosophy of Locke, was the most favourably received.

BLACKMORE, RICHARD DODDRIDGE (1825–1900), English novelist, was born at Longworth, Berks, of which village his father was curate-in-charge. He was educated at Blundell's school, Tiverton, and Exeter college, Oxford, and was called to the bar at the Middle Temple in 1852. His first publication was a volume of *Poems by Melanter* (1854), which showed no particular promise, nor did the succeeding volume, *Epullia* (1855), suggest that Blackmore had the makings of a poet. In 1864 he published his first novel, *Clara Vaughan,* the merits of which were promptly recognized. *Cradock Nowell* (1866) followed, but it was in 1869 that he suddenly sprang into fame with *Lorna Doone.* This fine story was a pioneer in the romantic revival; and, appearing at a jaded hour, it was presently recognized as a work of singular charm, vigour and imagination. Though Blackmore wrote many other capital stories, he is remembered almost exclusively as the author of *Lorna Doone,* now an accepted classic of the West country.

BLACK MOUNTAIN, mountain range and district on the Hazara border of the North-West Frontier Province of India, in 34° 30′ N., 73° E. Length, 25 to 50m.; average height, 8,000ft. It rises from the Indus basin near the village of Kiara, and runs north parallel to the river. The tribes which inhabit the west of the Black Mountain are all sub-sections of the Yusafzai Pathans. The Black Mountain is chiefly notable for four British expeditions:

1. Under Lt.-Col. F. Mackeson, in 1852–54, against the Hassanzais. The occasion was the murder of two British customs officers. A force of 3,800 British troops traversed their country, destroying their villages and grain, etc.

2. Under Maj.-Gen. A. T. Wilde in 1868. The occasion was an attack on a British police post at Oghi in the Agror Valley by all three tribes. A force of 12,500 British troops entered the country and the tribes made submission.

3. The first Hazara expedition in 1888. The cause was the constant raids made by the tribes on villages in British territory, culminating in an attack on a small British detachment, in which two English officers were killed. A force of 12,500 British troops traversed the country of the tribes, and severely punished them. Punishment was also inflicted on the Hindustani Fanatics of Palosi.

4. The second Hazara expedition of 1891. The Black Mountain tribes fired on a force within British limits. A force of 7,300 British troops traversed the country. The tribesmen made their submission and entered into an agreement with the Government to preserve the peace of the border.

The Black Mountain tribes took no part in the general frontier rising of 1897, and after the disappearance of the Hindustani Fanatics they sank into comparative unimportance.

BLACK PLATE: *see* TIN-PLATE AND TERNE-PLATE.

BLACKPOOL, municipal, county and parliamentary borough, Lancashire, England. Pop. (est. 1938) county borough, 125,800; area 16.5 sq.mi. It is 46 mi. N. of Liverpool and is served by the L.M.S. railway.

The town is almost entirely of 19th and 20th century growth, its rapid development being related to that of the Lancashire industrial area. With the development of a fast railway service, together with many places of public amusement, Blackpool attracted visitors from all over the country. The sea-front with its sandy beach is well laid out, 7 mi. of promenade have been constructed in rising tiers, sunken gardens, cliffs and colonnade esplanades. There are open air (50,000 sq.ft.) and indoor swimming pools and an amusement park. Blackpool has about 7,000,000 visitors annually. Stanley park, opened in 1926, provides over 300 ac. of pleasure gardens. The town was incorporated in 1876, became a county borough in 1904 and a parliamentary borough in 1918.

The constituency includes Lytham St. Annes and returns one member.

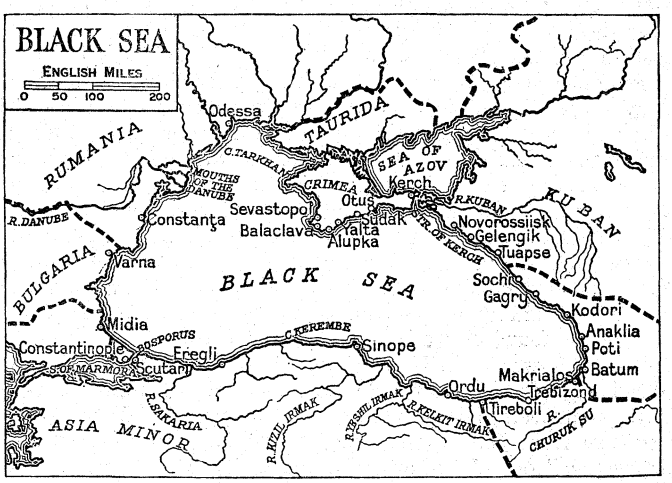
The Pool or the Blackpool often occurs in 17th century documents. It was in the township of Layton in Bispham parish.

BLACK ROCK DESERT, an arid region in Humboldt and Pershing counties, Nevada, U.S.A., about 70 mi. long and in some places 20 mi. wide, embracing an area of about 1,000 sq. miles. The belt of greatest aridity (less than 4 in. of rainfall annually) extends from the north-east to the south-west just east of the Pine Forest and Black Rock mountain ranges. The desert serves as the "sink" of the Quinn river, and, at times, is largely covered

with water only a few inches deep. When the water evaporates in the summer it leaves a clay-bed of remarkable hardness, which is frequently encrusted with saline matter of a snowy whiteness. This barren plain is practically devoid of vegetation, and from its surface alkaline dust is blown into vast clouds by the summer winds.

BLACK ROD (more fully, "Gentleman Usher of the Black Rod"), an official of the House of Lords, instituted in 1350. His appointment is by royal letters patent, and his title is due to his staff of office, an ebony stick surmounted with a gold lion. He is a personal attendant of the sovereign in the Upper House, and is also usher of the order of the Garter, being doorkeeper at the meetings of the knights' chapter. He is responsible for the maintenance of order in the House of Lords, and on him falls the duty of arresting any peer guilty of breach of privilege or other offence of which the House takes cognizance. In this respect his duties correspond to those of serjeant-at-arms in the Commons. But the duty which brings him most into prominence is that of summoning the Commons and their speaker to the Upper House to hear a speech from the throne (*see* ADDRESS), or the royal assent given to bills. Black Rod is on such occasions the central figure of a curious ceremony of much historic significance. As soon as the attendants of the House of Commons are aware of his approach, they close the doors in his face. Black Rod then strikes three times with his staff, and on being asked "Who is there?" replies "Black Rod." Being then admitted he advances to the bar of the House, makes three obeisances and says, "Mr. Speaker, the King commands this honourable House to attend His Majesty immediately in the House of Lords." This formality originated in the famous attempt of Charles I. to arrest the five members, Hampden, Pym, Holles, Hasilrige and Strode, in 1642. The House of Commons has ever since maintained its right of freedom of speech and uninterrupted debate by the closing of the doors on the king's representative.

BLACK SEA, a body of water between lat. 41° and 45° N., but extending to about 47° near Odessa, bounded north by south Russia; west by Rumania, Bulgaria and Turkey; and south and east by Asia Minor. It is also called Euxine (anc., *Pontus Euxinus*); the early Greek navigators named it *axeinos* ("hostile to strangers"), but with the growth of Greek colonies on its shores, it became *Euxeinos* ("friendly to strangers"). The northern boundary is broken at Kertch by a strait of the same name connecting it with the Sea of Azov, and at its south-west end it opens through the Bosporus, the Sea of Marmora and the Dardanelles to the Mediterranean. Its area of about 164,000sq.m. is approximately the same as that of the Baltic; its average depth is much greater than that of the Baltic, namely, 650 fathoms. The greatest depth is 1,160 fathoms near the centre, there being only one basin. Large powerful rivers flow into the Black sea, the Danube, Dniester, Dnieper, Don, etc. The Black sea shows conditions different from those of the Mediterranean or any other sea. The existence of sulphuretted hydrogen in great quantities below 80 fathoms (4cu.cm. per litre and more in the depths below 350 fathoms), the extensive chemical precipitation of calcium carbonate, the stagnant nature of its deep waters and the absence of deep sea-life are highly peculiar features. Higher organic life is not known to exist below 80 fathoms. Fossil *Dreissena, Cardium* and other molluscs have, however, been dredged up, which help to show that the Black sea was formerly much like the Caspian to-day. According to N. Andrusov, when in an earlier geological period the union of Black sea and Mediterranean through the Bosporus took place, salt water rushed into it along the bottom of the Bosporus and killed the fauna of the less saline waters. This produced sulphuretted hydrogen (H_2S) which is found in the deposits, as well as in the deeper waters.



MAP OF THE BLACK SEA, SHOWING EUROPEAN AND ASIATIC BOUNDARIES
The Black Sea is an important outlet for the wheat harvest of Southern Russia and Bessarabia and, through Batum and Poti, for the produce of the Caspian oilfields. It has an area of about 164,000 sq. miles, and is connected with the Mediterranean through the Bosporus, Sea of Marmora, and Dardanelles. A unique feature is the absence of organic sea life below a depth of 80 fathoms

Another explanation of the existence of this sulphuretted hydrogen in the waters of the Black sea is based upon present conditions. This sea receives far more fresh water from rain and rivers than it loses by evaporation; the salt-content of the surface water in summer and in winter is therefore only 15 to 18‰ (against 37 to 39‰ in the Mediterranean); below 50 fathoms the water is more salt (20 to 22·5‰), and this salt water is largely brought by the undercurrent through the Dardanelles and Bosporus. This salter water occupies the deeps of the Black sea. Apart from two winter months the surface water is much warmer than the deep water and both temperature and relative freshness make the surface water comparatively light; this holds good even in winter. This covering impermeable layer lies, therefore, like a coating of oil over the deep water of the Black sea and hinders gaseous exchange with the atmosphere; the water below 50 fathoms receives no oxygen and the living organisms of the surface waters sinking after death into the deeps, their remains cannot be oxidized but decay into carbonic acid and sulphuretted hydrogen. However this may be, there is an immense depth of water in the Black sea (800 to 1,160 fathoms) without any organic life, a unique feature for the world's seas. This explanation is also supported by the fact that the coldest water (44·5°) is not on the sea floor as in the open ocean, but round about a depth of 50 fathoms. The cold winter water cannot sink below this, and this is the downward limit of life; the water below is poisoned.

There is a counter-clockwise surface current in the Black sea and the surplus fresh water flows off from the Bosporus. Tides are hardly distinguishable. The climate is very harsh save in the summer months; strong cold north, north-east and north-west winds are dominant, especially in winter, when they give rise to frequent severe storms. Only the south coast of the Crimea resembles in any way the Mediterranean in climate. Clouds are common in spring. At Odessa there is ice on the sea for an average of 16 to 20 days in winter, in the Strait of Kertch for 41 days.

Black sea was formerly the name of a military district of the Kuban, Russia, now included in the N. Caucasian area (*q.v.*).

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HISTORY

The Black Sea, the "Pontus Euxinus" of the Romans, has played an important part in the economic and political history of Eastern Europe from earliest times. Across it sailed Jason to Colchis, the modern Georgia, in search of the Golden Fleece; and many legends of antiquity are doubtless idealized versions of early commercial or political ventures. With the establishment of Constantinople as capital of the later Roman empire, the political and strategic importance of the Black sea was greatly increased. Merchandise from Persia and its adjacent lands was shipped from Trebizond to Constantinople, for distribution through Western Europe. Another great trade route led from the Baltic to the

Crimea, and hence to Constantinople. The name Euxeinos, "hospitable to strangers," was probably a propitiatory euphemism for the older Axenos, "inhospitable."

With the capture of Constantinople by the Ottoman Turks in 1453, the trade of the Black sea suffered a set-back; soon, however, Italian, French, and, somewhat later, English traders, revived commerce across its waters; and the system of Capitulations (*q.v.*) instituted by the Ottoman Sultans enabled them to do so with some security. For nearly 300 years the Black sea was virtually a Turkish lake. Its sole ingress and egress—the Bosporus and the Dardanelles—was controlled by the Porte, which levied dues upon all vessels passing the straits.

The situation changed after the accession of Peter the Great to the Russian throne. Peter was the first Russian tsar to appreciate fully the importance of commercial enterprise in national life, and he made every effort to promote Russian trade with the East Mediterranean ports. He further recognized the importance of a strong fleet to protect his traders both from the pirates then infesting the coasts of the Black sea and from possible Turkish depredations in case of war. He constructed arsenals in the Sea of Azov and the Crimea and laid the foundations of Russia's later naval strength in the Black sea. His successors carried on his policy, blending commercial enterprise with the more idealistic ambitions of Panslavism (*q.v.*). As Russia's communications were improved and her commerce developed in the 19th century, the Black sea became more prominent in the eyes of Europe as a highway of commerce. To the corn and similar products of Southern Russia was presently added the oil of the Caspian; and the trade carried by the Black sea increased annually in value until 1914.

Partly to protect this commerce, partly for political purposes, Russia built up a strong Black sea fleet, fear of which, entertained both at the Porte and in Western Europe, particularly in London, led to the imposition of Draconian restrictions upon Russian maritime enterprise in the Treaty of Paris, which concluded the Crimean War (*q.v.*) in 1856. Fourteen years later, however, Russia seized the opportunity presented by the Franco-Prussian War to repudiate these restrictions. From this date until 1914 Russia remained free to develop her naval resources in the Black sea.

During the 18th and 19th centuries Russia, Rumania and Bulgaria took the place of Turkey on the northern and western coasts of the Black sea. The Balkan Wars of 1912–13 slightly extended Rumania's frontier at the expense of Bulgaria; while in 1919 Rumania, besides receiving confirmation of this change, also received Bessarabia (*q.v.*) from Russia: a transference which the Soviet Government refused to recognize as valid. Further east, the Ukraine and Georgia took the place of Russia as riparian States, but as both remained parts of the U.S.S.R., the change was really one of internal organization only. The Black sea trade suffered severely through the World War and its sequels in Russia. The export of corn from Rumania and Russia ceased altogether for some years. Russia's naval strength was also temporarily reduced, but later steps were taken to restore it.

For the diplomatic history of the Straits and the Dardanelles, *see* the article STRAITS. (*See* also RUSSIA; TURKEY; EASTERN QUESTION, THE; CRIMEAN WAR; PANSLAVISM.) (I. F. D. M.)

BLACK SHIRTS: *see* UNIFORMS.

BLACK SNAKE (*Coluber constrictor constrictor*), a common North American colubrine snake harmless to man, noted for its great speed. It is also an expert climber and swimmer. The black snake is black above, lighter beneath, with a white chin. It is slenderly built and sometimes exceeds 5 ft. in length. A western form, the blue racer, is bluish gray above with a yellow belly. Black snakes and blue racers feed on frogs, toads, small snakes, mammals, birds and their eggs, and even insects. (*See* SNAKE.) (K. P. S.)

BLACKSTONE, SIR WILLIAM (1723–1780), the most famous of English jurists, was born in Cheapside on July 10, 1723, the posthumous son of Charles Blackstone, silkman, citizen and bowyer, of London. From Charterhouse school he went at the age of 15 to Pembroke college, Oxford, and was entered at the Middle Temple in 1741. He was elected in 1744 a fellow of All Souls, devoted himself ardently to the interests of the college, became bursar and prepared his *Essay on Collateral Consanguinity* to defeat the claims of people who were of any degree of kin to the founder, to fellowships, claims which threatened to lower the prestige and efficiency of the foundation of Archbishop Chichele. Called to the bar in 1746, he was chosen by the ancient borough of Wallingford as its recorder in 1749. He tried to practise at the bar during this period, but with so little success that in 1753 he was minded to quit London altogether and devote himself to an academic life. In Michaelmas term 1753 he began to read law lectures at Oxford. His hearers were captivated by the lucidity and charm of his style and by the simplicity with which he presented the subject, slurring over the difficulties and contrarieties of the law, giving the whole subject an air of completeness and mutual interdependence as if it were a uniform logical system, suppressing or ignoring the archaic learning, and putting forward the English law as the embodiment of 18th century wisdom.

But from the first he antagonized his rival for the position of the greatest English jurist, Bentham, who seemed to dislike him as much as a man as he mistrusted him as a teacher. Bentham wrote of him that he was "a formal, precise and affected lecturer, just what you would expect from the character of his writings, cold, reserved and wary, exhibiting a frigid pride"; he, however, qualified to some extent this mordant censure when he also wrote:—"correct, elegant, unembarrassed, the *style* is such as could scarce fail to recommend a work still more vicious in point of *matter* to the multitude of readers. He it is, in short, who, first of all institutional writers, has taught jurisprudence to speak the language of the scholar and the gentleman." In 1758 the lectures were first delivered in their present form. Blackstone having been elected to the newly-founded Vinerian professorship, delivered the introductory lecture "On the Study of the Law" which is prefixed to the first volume of the *Commentaries.* It was some years before the author decided to present the *Commentaries* as a finished work; but notes of the lectures were in circulation, so in Nov. 1765 the first volume appeared, and the three remaining parts were published in the four succeeding years.

On May 5, 1761, he had married Sarah, daughter of James Clitherow of Boston House, Middlesex; on July 28 in the same year the earl of Westmorland, the chancellor of the university, made him principal of New Inn hall.

Professional advancement came side by side with academic. On May 6, 1761, the very day after his marriage, he received a patent of precedence giving him the rank of king's counsel. In 1763 he was made solicitor-general to the queen, the first to hold that office under Queen Charlotte, to whom he dedicated the *Commentaries;* and about the same time he became a bencher of the Middle Temple where his well-known portrait by Gainsborough hangs. In that year his success at the bar led him to resign the professorship and the headship of New Inn hall, two positions which he is said by his anonymous biographer to have intended to use for the foundation of a law school. His career in parliament, to which he was elected for Hindon first (1761), afterwards for Westbury, was somewhat inglorious. He took the ministerial side in the controversy about the Middlesex election, and drew a severe criticism from Junius who boasted that he had answered "Dr. Blackstone" out of his own *Commentaries,* and seems to have completely silenced him.

Blackstone disliked attendance in parliament; this aversion, no doubt, determined him to refuse the solicitor-generalship in 1770 and in February of the same year to accept a judgeship in the court of common pleas. In the ten years of his judgeship he administered the law satisfactorily but attained no special distinction, and his career is not associated with any famous trial. He seems to have given signs of rather premature decay towards 1780, attributed to his sedentary habits and avoidance of physical exercise, and on Feb. 14 of that year he died in London. Two volumes of his *Reports of Decided Cases,* with a brief memoir by his brother-in-law James Clitherow, appeared in 1781, but added little to his fame either as reporter or judge; the reports of his nephew Henry Blackstone are thought better of by the profession.

The Commentaries.—The famous *Commentaries* deserve some detailed account and criticism. Their design is exhibited in his first Vinerian lecture printed in the introduction to them. The author there dwells on the importance of noblemen, gentlemen and educated persons generally being well acquainted with the laws of their country; and his treatise, accordingly, is as far as possible a popular exposition of the laws of England. Falling into the common error of identifying the various meanings of the word law, he advances from the law of nature (being either the revealed or the inferred will of God) to municipal law, which he defines to be a rule of civil conduct prescribed by the supreme power in a State commanding what is right and prohibiting what is wrong. On this definition he founds the division observed in the *Commentaries*. The objects of law are rights and wrongs. Rights are either rights of persons or rights of things. Wrongs are either public or private. These four headings form respectively the subjects of the four books of the *Commentaries*.

Blackstone was by no means a scientific jurist. He has only the vaguest possible grasp of the elementary conceptions of law. He evidently regards the law of gravitation, the law of nature, and the law of England, as different examples of the same principle—as rules of action or conduct imposed by a superior power on its subjects. He propounds in terms the doctrine that municipal or positive laws derive their validity from their conformity to the so-called law of nature or law of God. "No human laws," he says, "are of any validity if contrary to this." His distinction between rights of persons and rights of things, implying, as it would appear, that things as well as persons have rights, is attributable to a misunderstanding of the technical terms of the Roman law. In distinguishing between private and public wrongs (civil injuries and crimes) he fails to seize the true principle of the division. Austin, who accused him of following slavishly the method of Hale's *Analysis of the Law,* declares that he "blindly adopts the mistakes of his rude and compendious model; missing invariably, with a nice and surprising infelicity, the pregnant but obscure suggestions which it proffered to his attention, and which would have guided a discerning and inventive writer to an arrangement comparatively just." By the want of precise and closely-defined terms, and his tendency to substitute loose literary phrases, he falls occasionally into irreconcilable contradictions. Even in discussing a subject of such immense importance as equity, he hardly takes pains to discriminate between the legal and popular senses of the word, and, from the small place which equity jurisprudence occupies in his arrangement, he would scarcely seem to have realized its true position in the law of England. Subject, however, to these strictures, the completeness of the treatise, its serviceable if not scientific order, and the power of lucid exposition possessed by the author demand emphatic recognition. Blackstone's defects as a jurist are more conspicuous in his treatment of the underlying principles and fundamental divisions of the law than in his account of its substantive principles.

Blackstone by no means confined himself to the work of a legal commentator. It is his business, especially when he touches on the framework of society, to find a basis in history and reason for all the most characteristic English institutions. There is not much either of philosophy or fairness in this part of his work. Whether through the natural conservatism of a lawyer, or through his own timidity and subserviency as a man and a politician, he is always found to be a specious defender of the existing order of things. More undeniable than the political fairness of the treatise is its merits as a work of literature. It is written in a most graceful and attractive style, and although no opportunity of embellishment has been lost, the language is always simple and clear. Whether it is owing to its literary graces, or to its success in flattering the prejudices of the public to which it was addressed, the influence of the book in England has been extraordinary. Not lawyers only, and lawyers perhaps even less than others, accepted it is an authoritative revelation of the law. It performed for educated society in England much the same service as was rendered to the people of Rome by the publication of their previously unknown laws. It is more correct to regard it as a handbook of the law for laymen than as a legal treatise; and as the first and only book of the kind in England it has been received with somewhat indiscriminating reverence. To this day Blackstone's criticism of the English constitution probably expresses the most profound political convictions of the majority of the English people.

Although Blackstone has been much criticized for his superficiality and lack of the historical sense he showed signs of the recognition of the duty of research. His two volumes of *Law Tracts* (1762) give a better impression of him as a student than the more eloquent *Commentaries* and seem to be the outcome of deeper learning and thought. But his inability to place himself in the position of legislators of remote times and his habit of justifying everything as reasonable come out very markedly in his treatment of the famous rule of the *bastard eigné* and *mulier puisné*. In the *Commentaries* themselves his account of the Revolution of 1688 exhibits these defects in the most pronounced form, as in his optimistic description of Edward VI. as an amiable prince, in "the short sunshine" of whose reign England enjoyed a peculiar felicity. And his shallowness appears in his justification of the penal laws or apology for them. Instead of condemning them he says: "these laws are seldom exerted in their utmost rigour and indeed if they were it would be very difficult to excuse them." He did, however, go so far as to say in his first edition that he was not sure that some of the secretaries did not hold principles which made them as dangerous as the papists themselves, but in deference to an outbreak of indignation from the secretaries he softened or got rid of this expression in subsequent editions.

In the English law institutional writers are not recognized. The most famous and approved treatises have no such rank as is accorded for instance in Scotland to the works of Stair, of Bell and the like. Consequently Blackstone is seldom or never referred to as an authority. His *Commentaries* are recommended for their literary value, and they have experienced the singular fate of being used as the framework upon which all the additions made to the law by statutes or decisions since his day have been attached for the use of students preparing for examinations, his original text being printed with the new matter interpolated in successive layers, producing in the result text books swollen out of all proportion into portents of ugliness. These monstrosities now, happily, are failing to attract as of old. And there is a reaction in favour of regarding Blackstone's great work from the standpoint of true historical and literary criticism as a complete work of art of the greatest literary merit, inadequate in deep learning, unscientific in arrangement, often mistaken in very elementary matters, but a genuine outcome of 18th century culture and a true exposition of the 18th century standpoint. This reaction is really the just tribute to Blackstone's greatness.

But the fame of Blackstone is greater in the United States than it is in his native land, and bids fair to continue to be, and justly so. After the Declaration of Independence and indeed before, the *Commentaries* were the chief, and in many parts of the country almost the only, source of the knowledge of English law for the great commonwealth of the West. A book which in the old country was and is a text book became in the new an oracle of law, until as years went on the great students of the law in the United States began those deeper studies which have added such wonderful stores of learning and thought to legal literature. But the greatness of Blackstone's renown through two English-speaking continents was most clearly revealed in July 1924, on the memorable joint visit of the American and Canadian law associations to England, when the American lawyers presented to the law courts of London a statue of Blackstone to be executed in marble. The aim of the gift was declared to be "to mark the influence which the great commentator had had over American jurisprudence." It was only the giant plaster model which was unveiled in 1924. The marble itself, the work of Paul Bartlett, who did not live to see the statue in its final perfection, it being finished by the sculptor's wife, was placed in its position in June 1928, in the great hall of the royal courts of justice.

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Life (1781); *The Biographical History of Sir William Blackstone* (1782), by a Gentleman of Lincoln's Inn (Dr. Douglas); Henry Roscoe, *Lives of Eminent British Lawyers* (1830); *A Comment on the Commentaries: A Criticism,* by Jeremy Bentham, ed. by C. W. Everett (1928). (F. SH.)

BLACKSTRAP, the crudest molasses of sugar manufacture.

BLACK VARNISH, the general term used to cover a large range of varnishes which have asphalt or bitumen as their essential and characteristic constituent. The different varieties, however, vary greatly in their properties.

The general process used in the manufacture of black varnishes consists in heating asphaltums or pitches, with a proportion of linseed oil and driers consisting of red lead, litharge, and manganese dioxide, at a temperature of about 450° F until the whole becomes stringy. The mass is then allowed to cool sufficiently to enable it to be thinned with turpentine to a suitable consistency.

Coachbuilders' black japan is the highest grade of black varnish manufactured.

The best asphaltums and pitches only are used, and a proportion of hard drying copal varnish is incorporated during the process of manufacture.

Berlin black is the name given to a black varnish which dries with a flat or eggshell finish, and is made by adding vegetable black to the ordinary quick-drying black varnishes.

Black stoving or baking enamels are special types of black varnishes used in the cycle and bedstead trades, and are usually applied by dipping and spraying.

BLACK WATCH, THE (ROYAL HIGHLANDERS), the title of a famous British Highland regiment. The origin of the corps dates from 1729 when a number of loyal Highlanders were embodied forming six independent companies, and constituted a part of the regular army. They continued to wear the dress of their country, a tartan of sombre appearance which gained for them the gaelic appellation of "Freicudan Du" (or "Am Freiceadan Dubh"), *i.e.,* "Black Watch," in contradiction to regular troops who wore scarlet coats, waistcoats and breeches, and were called "Seidaran Dearag," or "Red Soldiers." These companies were first employed in enforcing the disarming act in Scotland which required a constant *watching* of rival clans to prevent plunder and reprisals. The *Black Watch* were known by that title for a number of years, before it was changed to the "Highland Regiment." In 1751 they were the "42nd," or the "Highland Regiment," but later reverted to their original title.

BLACKWATER, the name of several streams in England, Scotland and Ireland. The Blackwater in Essex rises near Saffron Walden and flows about 40m. to the North Sea. The Blackwater in Southern Ireland rises in the border-hills of Cork and Kerry, and flows east to Cappoquin, where it turns abruptly southward and discharges through an estuary into Youghal bay.

BLACKWATER FEVER. So far this disease, which occurs in all tropical countries and occasionally elsewhere, and is often classed with malaria, has defied the efforts of research to trace its cause. Its geographical distribution covers tropical Africa, where it is perhaps most prevalent, parts of Asia, the West Indies, the southern United States, Greece, Sicily, and Sardinia. Its range is not co-extensive with malaria since it is found in places where malaria is unknown or infrequent. According to Webster it is "a malarial fever marked by bloody urine." It is characterized by irregular febrile paroxysms, accompanied by rigors, bilious vomiting, jaundice and haemoglobinuria, the victim being anaemic in proportion to the severity of the case. The kidneys are clogged, the urine being more discoloured in some cases than in others.

The association of blackwater fever with malaria (*q.v.*) is a question which still divides expert opinion. Dr. J. G. Thomson in his *Report on Southern Rhodesia* has pointed out that blackwater fever occurs principally among persons living in houses unprotected and careless about mosquito nets, and he supports his case by statistics given by Stephens, Nakayawi and Hoctori with percentages of 73, 85 and 96 in which malarial parasites were found in blackwater fever cases. Some authorities, including Koch, have believed that excessive use of quinine taken to combat malaria was responsible. If that were correct, one would expect blackwater fever to be regularly prevalent in malarial countries and more or less co-extensive with the use of quinine, which is not the fact. Moreover Thomson says cases of blackwater fever have occurred among Europeans who are known never to have taken quinine. The modern school of tropical parasitology rejects both theories, and regards blackwater fever as a specific disease due to a protozoal parasite akin to that which causes the redwater fever of cattle.

Yet Dr. Andrew Balfour, the great authority on hygiene, in his *Health Problems of the Empire* (British Empire Series), argues that the view now "most generally held" is that blackwater fever is "merely a concomitant of malaria" and continues: "If so, it is a most serious complication, which has slain many a pioneer of empire. Even if, as some believe, blackwater fever is a disease *sui generis* and due to a parasite of its own, yet there can be little doubt that it is in some way or other associated with malarial infection. Perhaps malaria renders the red blood cells more fragile so that they are readily acted upon by some other poison, and so yield up their colouring matter, which, set free in the blood, is voided in the urine. It colours this secretion a shade of red, varying from that of a light claret to that of dark port wine, and it is this change, striking and fear-inspiring, which has given the condition its name of blackwater."

See J. G. Thomson *Preliminary Report on the Results of Investigations into the Causation of Blackwater Fever in Southern Rhodesia* (1923). (C. H.; E. S.)

BLACKWELDER, ELIOT (1880–), American geologist, was born in Chicago, Ill., on June 4, 1880. He graduated at the University of Chicago in 1901 and in 1914 received the degree of doctor of philosophy from that institution. From 1902 until 1919 he was instructor or professor in the universities of Chicago, Wisconsin and Illinois and was a member of the U.S. geological survey. In 1922 he became professor of geology in Stanford university.

Among his publications are *Elements of Geology* (with H. H. Barrows, 1911) and *Regional Geology of the United States* (1912).

BLACKWELL, ELIZABETH (1821–1910), the first woman doctor of medicine, was born at Counterslip, Bristol, Feb. 3, 1821. The daughter of a sugar refiner, who emigrated to New York in Aug. 1832, Elizabeth sought admission in vain to the medical schools of Philadelphia and New York, and eventually secured admission to the medical class at Geneva, Western New York State, graduating M.D. in 1849. She then came to England, and after studying at St. Bartholomew's Hospital and on the continent she returned to America, and in spite of much opposition, established in New York in May 1857, a hospital entirely staffed by women and in due course succeeded in founding there a full course of medical education for women. Sophia Jex-Blake was among the first students. Dr. Blackwell returned to England in 1857 to practise. By a bill passed in 1858 a General Medical Council was established to keep a register of duly qualified medical practitioners. Dr. Blackwell had practised in London some little time before the register was compiled, and when she applied for her name to be included, it was found she could not be refused, and thus an important precedent was established. She died at Hastings on May 31, 1910.

See her *Pioneer Work: Autobiographical Sketches* (1895).

BLACKWELL, THOMAS (1701–57), Scottish classical scholar, was born at Aberdeen on Aug. 4 1701, and was principal of the Marischal college from 1748 till his death in 1757. His first work, *An Inquiry into the Life and Writings of Homer,* published anonymously in 1735 (reprinted 1736), shows considerable research but lacks method. His other works were *Letters Concerning Mythology* (1748), and *Memoirs of the Court of Augustus* (1755–64).

BLACKWELL, a city of Kay county (Okla.), U.S.A., midway between Oklahoma City and Wichita, 13 mi. from the Kansas state boundary. It is on federal highway 177 and state highway 11; the Frisco and the Santa Fe railways; bus lines; and the lighted airway from Chicago to Dallas. It has an intermediate landing field. Pop. (1940) 8,537. Blackwell is surrounded by productive gas and oil fields. Stock raising, poultry raising and agri-

culture are also important industries. It has grain elevators, oil refineries, a zinc smelter, and glass factories. It was settled and incorporated in 1893, following the opening of the Cherokee Strip. It has a commission form of government.

BLACKWOOD, WILLIAM (1776–1834), Scottish publisher, founder of the firm of William Blackwood and Sons, was born of humble parents at Edinburgh on Nov. 20, 1776, and died there on Sept. 16, 1834. In 1804, he opened a shop in South Bridge street, Edinburgh, for the sale of old, rare and curious books. He undertook the Scottish agency for John Murray and other London publishers, and gradually drifted into publishing on his own account, removing in 1816 to Princes street. On April 1, 1817, was issued the first number of the *Edinburgh Monthly Magazine,* which, on its seventh number, bore the name of *Blackwood's* as the leading part of the title. "Maga," as this magazine soon came to be called, was the organ of the Scottish Tory party, and round it gathered a host of able writers. William Blackwood was succeeded by his two sons, Alexander and Robert, who added a London branch to the firm.

A younger brother, JOHN BLACKWOOD (1818–1879), succeeded to the business; four years later he was joined by Major William Blackwood, who continued in the firm until his death in 1861. In 1862 the major's eldest son, William Blackwood (b. 1836), was taken into partnership. It was in the pages of John Blackwood's magazine that George Eliot's first stories, *Scenes of Clerical Life,* appeared. He also inaugurated the "Ancient Classics for English Readers" series. On his death Mr. William Blackwood was left in sole control of the business. With him were associated his nephews George William and J. H. Blackwood, sons of Major George Blackwood, who was killed at Maiwand in 1880.

See *Annals of a Publishing House; William Blackwood and his Sons* . . . (1897–98), the first two volumes of which were written by Mrs. Oliphant; the third, dealing with John Blackwood, by his daughter, Mrs. Gerald Porter.

BLADDER, the membranous sac in animals which receives the urine secreted from the kidneys. The word is also used for any similar sac, such as the gall-bladder, the swim-bladder in fishes, or the small vesicle in various seaweeds.

BLADDER AND PROSTATE DISEASES. (*See* also URINARY SYSTEM and UROLOGY.)

DISEASES OF THE BLADDER

Cystitis, or inflammation of the bladder, which may be acute or chronic, is due to the invasion of the mucous lining by micro-organisms, which gain access either from the urethra, the kidneys or the blood-stream.

Any condition leading to disturbance of the function of the bladder, such as enlargement of the prostate, stricture of the urethra, stone, or injury, may cause cystitis by preparing the way for bacillary invasion. The bacilli of tuberculosis and of typhoid fever may cause it by passing into the bladder from the kidneys with the urine, or invade it by the urethra. Frequently bacteria are introduced by way of catheterization. The first effect of inflammation is to render the bladder irritable, so that as soon as a few drops of urine have collected, the individual has intense or uncontrollable desire to micturate. The effort may be very painful and may be accompanied by bleeding from the overloaded blood-vessels of the inflamed membrane. In addition to blood, pus is likely to be found in the urine, which by this time is alkaline and ammoniacal, and teeming with micro-organisms. As regards *treatment,* bed, hot baths, milk diet and abstinence from alcohol are indicated, while frequent washing out of the bladder with weak antiseptics is necessary if the urine is foul.

Chronic cystitis is the condition left when the acute symptoms have passed away, but it is liable at any moment to resume the acute condition. If the cystitis is very intractable, refusing to yield to hot irrigations, and to washings with nitrate of silver lotion, it may be advisable to open the bladder from the front, and to explore, treat, drain and rest it.

Tuberculous cystitis is a late manifestation of tuberculosis in kidney, prostate or epididymis and is very intractable.

Calculi and Gravel.—Uric acid is deposited from the urine either as small crystals resembling cayenne pepper or, in combination with soda and ammonia, as an amorphous "brickdust" deposit, which, on cooling, leaves a red stain on the bottom of the vessel, soluble in hot water. These substances are derived from the disintegration of nitrogenized food taken in excess of demand, and from the breaking down of the human tissues. They occur therefore in fevers, in wasting diseases, and in the normal subject after excessive muscular exercises, especially if accompanied with much perspiration. If the uric acid débris continue to be excessive, renal or vesical calculi may be formed. In an alkaline urine, *e.g.,* where a stone has led to cystitis, phosphates of ammonia and magnesium are deposited.

A stone in the bladder causes a constant desire and need for micturition and the urine contains mucus and blood. Lastly, cystitis occurs, and the urine contains foetid pus. A stone in the bladder gives rise to pain at the end of the penis, and it is apt suddenly to stop the flow of urine during micturition.

Treatment.—Usually the stone is crushed within the bladder by a lithotrite and the fragments flushed out through a hollow metal catheter. But if the stone is very hard or large or other conditions contra-indicate, lithotrity must be replaced by a cutting operation (*lithotomy*).

The treatment of vesical calculi by other means than operative surgery is of little value. Attempts to dissolve them by internal remedies, or by the injection of chemical agents into the bladder have invariably been found worthless for removing calculi once actually formed.

Rupture of the bladder may be caused by a kick or blow over the upper part of the abdomen, or by a wheel passing over it; or it may be a complication of fracture of the pelvis. The great danger is supervention of septic cellulitis, but if thorough drainage and asepsis be carried out and the rent be sewn up recovery is not impossible.

New Growths.—The most frequent non-malignant growth is "villous tumour" which springs from the floor of the bladder and floats in the urine like seaweed. When portions of the filaments are broken off the urine contains blood. The growth may be removed surgically, but often recurs (*see* TUMOUR).

Malignant disease of the bladder is almost always the warty form of cancer known as epithelioma. It springs as a sessile growth from the mucous membrane of the floor near the opening of one of the ureters, and is one of the severest forms of cancer owing to the local changes it produces and its tendency to cause a fistulous opening between bladder and rectum in the male or vagina in the female. Though it may be primary, cancer of the bladder is usually due to extension of growth from the uterus or rectum.

Hypertrophy and Dilatation.—When there is long-continued obstruction to the flow of urine, as in stricture of the urethra, or enlargement of the prostate, the bladder-wall becomes much thickened, the muscular fibres increasing both in size and number. Hypertrophy may be accompanied by *dilatation* when the voiding of contents is not complete and is of long standing; when obstruction is complete, dilatation alone occurs.

Paralysis of the bladder may result from injuries whereby the spinal cord is lacerated or pressed upon. The result may be either retention or incontinence of urine; sometimes there is at first retention, which later is followed by incontinence. Paralysis is also met with in certain nervous diseases, as in locomotor ataxia, and in various cerebral lesions, as in apoplexy.

Atony of the bladder is a partial paralysis. It is due to a want of tone in the muscular fibres, and is frequently the result of over-distension, such as may occur in cases of enlargement of the prostate. The patient is unable to empty the bladder, and the condition of atony gets increasingly worse.

Incontinence of urine may occur in the adult or in the child, but is due to widely different causes in the two cases. In the child it may be simply a bad habit, but more frequently there is a want of control in the micturition-centre, so that the child passes its water unwittingly, especially during the night. In adults the water which passes is the overflow from a too full reservoir.

It is usually caused by an obstruction external to the bladder, *e.g.*, enlarged prostate, calculus, or stricture of the urethra. In the child an attempt must be made to improve the tone of the micturition-centre by the use of belladonna or strychnine internally, and of a blister or faradism externally over the lumbar region, and every effort should be made to train the child to pass water at stated times and regular intervals. In the adult the cause which produces the over-distension must be removed if possible; but, as a rule, the patient has to be provided with a catheter, which he can pass before the bladder has filled to overflowing.

Retention of urine may occur in paralysis of the bladder, or in conditions where the patient is suffering from an illness which blunts the nervous sensibility, such as apoplexy, concussion of the brain, or typhoid fever. It is, however, more commonly due to obstruction anterior to the bladder, as in stricture of the urethra or enlargement of the prostate.

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DISEASES OF PROSTATE GLAND

The prostate gland may become acutely inflamed as the result of the backward extension of gonorrhoeal inflammation of the urethra; it may also be attacked by the germs of ordinary suppuration or by *B. tuberculosis*. As a result micturition and defaecation are difficult, painful or impossible. If abscess forms, it should be incised from the perineum; if allowed to run its course it may burst into the bladder, urethra or rectum, and set up serious complication. *Chronic prostatitis* is a legacy from gonorrhoea. The enlargement gives a feeling of weight and fullness in the perineum, irritability of the bladder, and a urethral discharge.

Enlargement of the prostate exists in a considerable proportion of men of about 60 years of age and onward. It consists in formation of an adenoma in the gland or overgrowth of the normal muscular, glandular or fibrous tissue. In either case the passage of urine is impeded, hypertrophy and dilatation of bladder supervene and the organ cannot be emptied completely. If putrefactive organisms gain access to this stagnant urine, cystitis and perhaps renal disease and stone may follow. The seriousness of enlargement of the prostate depends mainly upon the inability of the patient to empty his bladder completely. Surgical removal of the enlarged mass is successful in many cases.

Malignant disease of the prostate is distinguished from senile enlargement by the rapidity of its growth, by the freeness of the bleeding which is associated with the introduction of a catheter, and by the marked wasting which the individual undergoes. Unfortunately, by the time that the cancerous nature of the disease is definitely recognized, the prospect of relief being afforded by operation is small. Some success has followed radium treatment.

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BLADDER-WORM: *see* TAPEWORMS.

BLADDER-WORT: *see* UTRICULARIA.

BLADEN, THOMAS (1698–1780), governor of Maryland, was born in Annapolis, Md., in 1698. He was educated in England and remained there until 1742, when he was appointed proprietary governor of Maryland. As governor he was responsible for negotiating a treaty with the Six Nations Indians under which Maryland peacefully acquired substantial sections of land and for settling with the Indians and the Pennsylvania government Maryland's western boundary. In 1747 he was relieved of his office and returned to England, where he became a member of parliament. He died there in 1780. Bladensburg, Md., (*q.v.*) was named for him.

BLADENSBURG, a suburb of Washington, D.C., N.E. of the capital in Prince Georges county, Md., about 32 mi. S.W. of Baltimore. Pop. (1940) 1,220, mostly government employees. It is at the junction of U.S. highways 1 and 50 and is a freight depot on the Baltimore and Ohio railroad. The Anacostia river flows through the town.

The site of Bladensburg was originally a trading post known as Garrison's Landing, located at the northern end of the navigable portion of the Anacostia. In 1742 Bladensburg was founded and named after Thomas Bladen, then governor of Maryland. The town achieved early prosperity because of its position on the river and on the main north-south highway through the colonies, but by the middle of the 19th century the Anacostia had become too shallow for large ships and the road was supplanted in importance by railroads; in addition, Washington, only a few miles away, had become the national capital. These circumstances combined to deprive Bladensburg of its early prominence.

During the War of 1812 it was the site of the battle of Bladensburg, in which an outnumbered army of British soldiers on Aug. 24, 1814, defeated an American force, which retreated leaving Washington undefended. The British marched on the capital and sacked it, burning many important buildings. Just outside Bladensburg is the Bladensburg duelling field, where Washingtonians of the early 19th century, in order to avoid the stringent anti-duelling laws of the District of Columbia, fought their duels. Commodore Stephen Decatur was killed there in 1820.

BLADES, WILLIAM (1824–90), English printer and bibliographer, was born at Clapham, London, Dec. 5, 1824, and died at Sutton, Surrey, April 27, 1890. In 1840 he was apprenticed to his father's printing business in London, and was subsequently taken into partnership. His *Life and Typography of William Caxton, England's First Printer,* was published in 1861–63, and the conclusions which he set forth were arrived at by a careful examination of types in the early books, each class of type being traced from its first use to the time when, spoiled by wear, it passed out of Caxton's hands. Some 450 volumes from the Caxton press were compared and classified in chronological order.

BLAENAVON, urban district, Monmouthshire, England. Pop. (est. 1938) 9,844. Area, 7.2 sq.mi., in a cul-de-sac on the northeast edge of the South Wales coalfield, near the source of the Avon Llwyd. It is served by the G.W. and L.M.S. railways. Owing to its situation on the ironfield of the northern outcrop of the coalfield, Blaenavon, like Merthyr and Dowlais, became an important iron smelting region soon after the industrial revolution, famous for its iron, steel and tin-plate works.

BLAESILLA (d. 384) was the eldest daughter of Paula, who was a friend and patron of Jerome and his critic during the preparation of the Roman Vulgate Bible. Blaesilla lost her husband Camillus, a friend of Jerome, after a marriage of seven months, whereupon Jerome wrote urging her to remain a widow. A dangerous fever led to her persuasion and she became known throughout Rome for her excessive austerities. A relapse of illness brought her to the grave at the age of 20. Many Romans blamed her premature death on her fanaticism and Jerome, as her spiritual adviser, came in for severe censure. In a letter to Paula he offered sympathy in her grief, prophesying that in his writings Blaesilla's name would never die.

She was brilliant in conversation, and spoke Greek and Hebrew without accent. At her solicitation Jerome wrote the commentaries on Ecclesiastes. In letters of later years he referred to her study of the Greek commentaries, particularly Origen's, and to her entreaties that he make a Latin version of Origen's work on the Gospels of Matthew, Luke and John.

BLAGOVESHCHENSK ("Annunciation"). (1) A town in the Far Eastern Area of Russian Soviet Federated Socialist Republic, on the left bank of Amur river, near its confluence with the Zeya. Lat. 50° 20′ N., Long. 127° 30′ E. Pop. (1939) 58,761. It was established in 1856 by Muravieff, and re-named by him in 1858 after the successful treaty of Aigun. The town is a natural halting place for steamers, the river becoming impassable above it, but flowing with a gentle gradient (400 ft. in 1,300 mi.) below it. Steamers may turn off here and traverse the Zeya river for 300 mi. to the gold mines. The trade is mainly in tea, cattle, grain and

gold and in the products of its flour mills and ironworks. The town has educational institutes, a museum, a public library and an opera house.

(2) A monastery near Nijni-Novgorod (*q.v.*).

(3) A town in the Ufa province of the Bashkir Autonomous Socialist Soviet Republic. Lat. 55° 0′ N., Long. 56° 0′ E. Pop. 6,899.

BLAIKIE, WILLIAM GARDEN (1820–1899), Scottish divine, was born on Feb. 5 1820, at Aberdeen, and was one of the 474 ministers who signed the deed of demission and gave up their livings at the time of the Disruption. He was Free Church minister at Pilrig, between Edinburgh and Leith, from 1844 to 1868, when he became professor of apologetics and pastoral theology at New college, Edinburgh. In 1870 he was one of two representatives chosen from the Free Church of Scotland to attend the united general assembly of the Presbyterian Churches of the United States. A prolonged visit to America, followed by a similar tour in Europe, fitted him to become the real founder of the Presbyterian Alliance. In 1892 he was elected to the chairmanship of the general assembly, the last of the moderators who had entered the church before the disruption. In 1897 he resigned his professorship, and died on June 11 1899.

Blaikie was an active and intelligent temperance reformer. He raised £14,000 for the relief of the Waldensian churches. Among his works is *After Fifty Years* (1893), an account of the Disruption Movement in the form of letters of a grandfather.

BLAINE, JAMES GILLESPIE (1830–1893), American congressman, U.S. senator and secretary of State, one of the succession of Americans whose ability and political acumen have led them close to the presidency of the United States, only to be defeated. In American political history Blaine was known, devotedly or derisively, as "the Plumed Knight," from an oratorical metaphor of Robert G. Ingersoll (*q.v.*), American orator and agnostic, in his presentation of Blaine for the nomination to the presidency in the Republican convention in 1876.

James Gillespie Blaine was born on Jan. 31, 1830, in West Brownsville, Pa., the son of Ephraim Lyon Blaine and Maria Gillespie (Blaine). He was the great-grandson of Col. Ephraim Blaine, commissary general of the American Revolutionary army during the Revolutionary War. After graduating from Washington college in Washington, Pa., in 1847, Blaine engaged in teaching for six years, first as an instructor in mathematics in a military school at Blue Lick Springs, Ky., and later in the Pennsylvania institution for the instruction of the blind at Philadelphia, Pa. He was married, in 1850, to Harriet Stanwood, and in 1854 moved to Augusta, Me., the capital of that State, and Mrs. Blaine's native city. He became editor-in-chief and part owner of *The Kennebec Journal* and from this date, 1854, onward devoted himself to journalism and politics. In 1856 he attended the first national convention of the new Republican party in Philadelphia and in 1858 was elected on the Republican ticket to the Maine State legislature. A student of parliamentary usage, he was elected, after two years' service as a member, to the office of speaker of the house of representatives of the Maine legislature. This honour he held for two subsequent years, until his election to the 38th Congress of the United States in 1862.

Blaine served in the U.S. House of Representatives from Dec. 1863 to Dec. 1876, and was then in the U.S. Senate until 1881 when he resigned to become secretary of State. In 1869, he was elected speaker of the House of Representatives, at that time one of the most powerful positions in the American Government, in which capacity he served for three terms or six years. In 1876 Blaine was the leading candidate for the Republican nomination for the presidency and entered the convention with very nearly enough votes for the nomination on the first ballot. The Democrats had previously charged him with using his high office as speaker of the House of Representatives to obtain a personal profit through the sale of bonds of the Little Rock and Fort Smith railway, and this issue was brought up in the nominating convention of 1876 and clearly militated against Blaine's obtaining the additional votes needed for nomination. In addition, Blaine suffered a sunstroke on the eve of the convention and rumours of his illness, even of his death, were circulated freely. After continuous balloting, Rutherford B. Hayes was nominated by a majority of 28 votes over Blaine.

Blaine entered the U.S. Senate as a result of an executive appointment to fill a vacancy. His subsequent election for the succeeding six-year term is unique in American history in that he was chosen by the unanimous vote of the State legislature, Republicans and Democrats uniting in his choice. In 1880 Blaine was again a candidate for the presidential nomination but was defeated by his friend, James A. Garfield (*q.v.*). Blaine, however, wholeheartedly supported Garfield and was active throughout the campaign. Upon President Garfield's inauguration Blaine was named secretary of State, resigning from the Senate to accept. During the brief period of Garfield's administration, prior to his assassination on July 2, 1881, Blaine had time to plan and draw up invitations for the Latin-American countries to meet with the United States in Washington the following year, for the purpose of discussing, only, the methods of preventing war between the nations of America. At that time Chile, Peru and Bolivia were engaged in the bloody war of the Pacific; Guatemala was fearful of invasion from Mexico; Brazil and Uruguay, Argentina and Brazil, and Argentina and Chile were believed to be in danger of war. The invitation was actually issued by Chester A. Arthur (*q.v.*), who succeeded Garfield, but following Blaine's retirement from the office of secretary of State, his successor (Frederick L. Frelinghuysen) withdrew the invitations and the proposed Pan-American conference was postponed until Blaine again became secretary of State under President Harrison in 1889. In his few months as secretary of State in 1881, Blaine also took up with Great Britain the question of the modification of the Clayton-Bulwer treaty of 1850 (which provided that Great Britain and the United States should have equal control of any canal across the Isthmus of Panama). Blaine's diplomacy sought to reach an agreement by which an entirely American canal might be built under a modification of the Treaty of 1850. His plans in this matter were not to be realized until the Hay-Pauncefote treaty, 20 years later.

Blaine was finally nominated for the presidency at the Republican convention in 1884. His campaign was brilliant and his victory was expected until the very last days preceding the election when he began "storming" the State of New York, the native ground of his Democratic opponent, Grover Cleveland. The presidency slipped from Blaine's grasp, in the end, by the loss (by 1,149 votes) of the State. Blaine, himself, as well as many others, attributed his defeat to the loss of the Roman Catholic vote following the enunciation of the phrase, "Rum, Romanism and Rebellion" used by the Rev. Dr. Samuel D. Burchard in describing the Democratic party in a speech made in Blaine's presence at the Fifth Avenue hotel, New York city, on Oct. 29. Blaine in his reply failed to disavow Mr. Burchard's allegation and the opposition made ready capital of Blaine's alleged endorsement of the bracketing of Roman Catholicism with the liquor traffic and sedition.

For a time after this Blaine and his family lived in Europe and he declined to have his name used in connection with the presidential nomination in 1888. He returned to the United States to take active part in the electoral campaign of Benjamin Harrison and following Harrison's election was again appointed secretary of State. In the four years that followed, Blaine brought into realization his broad foreign policy, with particular reference to Latin-America. He called what was later to be known as the first Pan-American conference to meet in Washington in 1889 and laid the foundations for the ideals of arbitration between the American countries and for the type of commercial activities which have characterized the Pan-American movement since that date. Blaine sought common American support of measures encouraging the building of a railway for the length of the American hemisphere; for the signing of copyright and trade-mark agreements, a uniform system of customs dues, weights and measures and currency, and finally an agreement looking toward the arbitration of all international questions between the American nations.

From the beginning of his career in Congress Blaine had been an enthusiastic advocate of reciprocity between the United States

and Latin-American countries. The Pan-American congress of 1889 placed itself on record for reciprocity between all the countries of the Western hemisphere and Blaine definitely shaped his foreign commercial policies on this foundation. The period was one of tariff controversies, the Democrats being insistent upon "free trade" and the Republicans on a high tariff. Blaine, while an ardent Republican and supporter of Republican tariff principles, held to the ideal of reciprocity with the neighbouring nations of Latin-America as a matter of foreign policy and as of great economic value to the American manufacturing interests which were being protected by the high tariff against European manufactured goods.

Blaine faced, during his second term as secretary of State, the strained relations of the United States and Chile, growing out of the killing of American sailors in the streets of Valparaiso in 1891. The issue was a complicated one, and a question of policy as well as of diplomatic arrangement. The attack on the American sailors was in part due to the memory of Blaine's alleged partisanship for Peru in the War of the Pacific during his previous service as secretary of State in 1881. The first lively controversies on seal fishing in Bering sea, which were later settled by arbitration between Great Britain and the United States, came up under Blaine's secretaryship in Harrison's administration. He prepared the ground at that time for the later adjustment of the seal fisheries issue, one of the notable examples of successful arbitration of a highly complicated economic issue. Blaine resigned as secretary of State under President Harrison on June 4, 1892, as a direct result of the unauthorized activity of his partisans, who sought to use his name in the Republican convention of that year in the face of his failing health and in spite of his membership in the cabinet of President Harrison who was himself a candidate for re-election. When Blaine resigned he had been absent from his office almost continuously for many months owing to his poor health, and following a series of deaths in his immediate family in which he lost two sons and a daughter in less than two years, Blaine himself died at Washington, D.C., on Jan. 27, 1893.

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BLAINVILLE, HENRI MARIE DUCROTAY DE (1777–1850), French naturalist, was born at Arques, near Dieppe. In 1812 he was aided by Cuvier to obtain the chair of anatomy and zoology in the Faculty of Sciences at Paris, but subsequently an estrangement grew up between the two men and ended in open enmity. In 1825 Blainville was admitted a member of the Academy of Sciences; and in 1830 he was appointed to succeed J. B. Lamarck in the chair of natural history at the museum. Two years later, on the death of Cuvier, he obtained the chair of comparative anatomy, which he held for 18 years.

He wrote *Prodrome d'une nouvelle distribution méthodique du règne animal* (1816); *Ostéographie ou description iconographique comparée du squelette, etc.* (1839–64); *Faune française* (1821–30); *Manuel de malacologie et de conchyliologie* (1825–27); *Histoire des sciences de l'organisme* (1845).

BLAIR, FRANCIS PRESTON (1791–1876), American journalist and politician, was born at Abingdon, Va., on April 12, 1791. He graduated from Transylvania university in 1811, took to journalism, and was a contributor to Amos Kendall's paper, the *Argus,* at Frankfort. In 1830, having become an ardent follower of Andrew Jackson, he was made editor of the Washington *Globe,* the recognized organ of the Jackson party. In this capacity, and as a member of Jackson's "Kitchen Cabinet," he long exerted a powerful influence. The *Globe* was the administration organ until 1841, and the chief Democratic organ until 1845. Blair ceased to be its editor in 1849. In 1848 he actively supported Martin Van Buren, the Free Soil candidate, for the Presidency, and in 1852 he supported Franklin Pierce, but soon afterwards helped to organize the new Republican Party and presided at its preliminary convention at Pittsburgh, Pa., in Feb. 1856.

He was influential in securing the nomination of John C. Fremont, 1856, and of Abraham Lincoln in 1860. After Lincoln's re-election in 1864 Blair thought that his former close personal relations with the Confederate leaders might aid in bringing peace, and with Lincoln's consent he went unofficially to Richmond and induced President Jefferson Davis to appoint commissioners to confer with representatives of the United States. This resulted in the futile "Hampton Roads Conference" of Feb. 3, 1865 (*see* Lincoln, Abraham). After the Civil War, Blair became a supporter of President Johnson's reconstruction policy, and eventually rejoined the Democratic Party. He died at Silver Spring, Md., on Oct. 18, 1876.

His son, Montgomery Blair (1813–83), politician and lawyer, was born in Franklin county, Ky., on May 10, 1813. He graduated at West Point in 1835, but after a year's service in the Seminole War, left the army, studied law, and began practice at St. Louis, Mo. After serving as U.S. district attorney (1839–43), as Mayor of St. Louis (1842–43), and as judge of the court of common pleas (1843–49), he removed to Maryland (1852), and devoted himself to law practice, principally in the Federal Supreme Court. He was U.S. solicitor in the court of claims from 1855 until 1858, and was associated with George T. Curtis as counsel for the plaintiff in the Dred Scott case in 1857. In 1860 he took an active part in the presidential campaign on behalf of Lincoln, in whose cabinet he was postmaster-general from 1861 until Sept. 1864, when he resigned as a result of the hostility of the Radical Republican faction, who stipulated that Blair's retirement should follow the withdrawal of Fremont's name as a candidate for the presidential nomination in that year. Under his administration the establishment of free city delivery, the adoption of a money order system and the use of railway mail cars were instituted. Differing from the Republican Party on the reconstruction policy, Blair gave his adherence to the Democratic Party after the Civil War. He died at Silver Spring, Md., on July 27, 1883.

Another son, Francis Preston Blair, Jr. (1821–75), soldier and political leader, was born at Lexington, Ky., on Feb. 19, 1821. After graduating from Princeton in 1841 he practised law in St. Louis, and later served in the Mexican War. He served from 1852 to 1856 in the Missouri legislature as a Free Soil Democrat, in 1856 joined the Republican Party and in 1857–62 was a member of Congress. Immediately after South Carolina's secession, Blair, believing that the Southern leaders were planning to carry Missouri into the movement, worked actively and successfully to prevent it. Blair was promoted to the rank of brigadier-general of volunteers in Aug. 1862, and a major-general in Nov. 1862. In Congress as chairman of the important military affairs committee his services were of the greatest value. He commanded a division in the Vicksburg campaign and in the fighting about Chattanooga, and was one of Sherman's corps commanders in the final campaigns in Georgia and the Carolinas. In 1866, like his father and brother, he opposed the Congressional reconstruction policy, and on that issue left the Republican Party. In 1868, he was the Democratic candidate for vice-president on the ticket with Horatio Seymour. In 1871–73, he was a U.S. senator from Missouri. He died in St. Louis on July 8, 1875.

See George Baber, *The Blairs of Kentucky* (Register of the Kentucky Historical Society, vol. xiv.); C. G. Bowers, *The Party Battles of the Jacksonian Period* (1922); J. S. Bassett, *The Life of Andrew Jackson* (vol. ii., 1916); C. W. Dahlinger, *Abraham Lincoln in Pittsburg and the Birth of the Republican Party* (in Western Pennsylvania Historical Magazine, vol. iii., No. 4, 1920); American Nation Series, vol. 19 and 21 (1906 and 1907); *The Martin Van Buren Papers* (ms. Library of Congress).

BLAIR, HUGH (1718–1800), Scottish Presbyterian divine, was born on April 7, 1718, at Edinburgh, and educated at the university there. After holding various preferments he became pastor of the High Church, Edinburgh, the most important charge

in Scotland. In 1762 he became the first occupant of the chair of rhetoric and belles-lettres in Edinburgh university, with a salary of £70 a year. He published in 1763 a laudatory *Dissertation* on Macpherson's *Ossian*. His *Sermons* (1777–1801) were praised by Samuel Johnson, and were translated into almost every language of Europe. In 1780 George III. conferred upon Blair a pension of £200 a year. In 1783 he retired from his professorship and published his *Lectures on Rhetoric*, which have been frequently reprinted. He died on Dec. 27, 1800.

See J. Hall, *Account of Life and Writings of Hugh Blair* (1807).

BLAIR, ROBERT (1699–1746), Scottish poet, was educated at Edinburgh university and in Holland, and in 1731 was appointed to the living of Athelstaneford in East Lothian. He died at Athelstaneford Feb. 4 1746. His only considerable work, *The Grave* (1743), is a poem written in blank verse, and is much less conventional than its gloomy subject might lead one to expect. It inspired William Blake to undertake a series of 12 illustrative designs, which were engraved by Louis Schiavonetti, and published in 1808.

See the biographical introduction prefixed to his *Poetical Works*, by Dr. Robert Anderson, in his *Poets of Great Britain*, vol. viii. (1794).

BLAIR ATHOLL (Gael. *blair*, a plain), village and civil parish, Perthshire, Scotland, $35\frac{1}{4}$ mi. N.W. of Perth by the L.M.S.R., at the confluence of Tilt and Garry. Pop. (1931) 1,557. The oldest part of Blair castle, a seat of the duke of Atholl, dates from 1269; it was restored and enlarged in 1869–72. It was occupied by the marquess of Montrose prior to the battle of Tippermuir in 1644, stormed by the Cromwellians in 1653, and garrisoned on behalf of James II in 1689. The Young Pretender stayed here in 1745, and the duke of Cumberland in 1746. Viscount Dundee, killed at Killiecrankie, was buried in the church of Old Blair, in which a monument was erected to his memory in 1889 by the 7th duke of Atholl. The village's electricity is supplied from Blair castle. In September a great display of Highland games is held. The fine falls of Bruar are 4 mi. W. of Blair Atholl.

BLAIRGOWRIE AND RATTRAY, a small burgh, Perthshire, Scotland, on the Ericht, terminus of a branch line of the L.M.S.R., 16 mi. N.E. of Perth by road. Pop. (est. 1938) 4,789. Area, 1 sq.mi. The town is modern, and owes progress to water power supplied by the Ericht for flax-spinning works. It is a summer resort, and strawberries, raspberries and other fruits are largely grown in the neighbourhood. On the opposite bank of the Ericht is Rattray with flax and jute mills.

Four miles west of Blairgowrie, on the road to Dunkeld, lies Loch Clunie, and on a crannog in the lake are the ruins of a small castle supposed to be the home of James ("the Admirable") Crichton; the large mound near the loch was the site of the castle in which Edward I lodged.

BLAKE, EDWARD (1833–1912), Irish-Canadian statesman, whose father, W. H. Blake, chancellor of Ontario, settled in Canada in 1832, was born on Oct. 13 1833 at Adelaide, Ontario. Blake was called to the bar in 1856, and in 1867 became a member, both of the Dominion parliament and of the legislature of Ontario. He was Liberal prime minister of Ontario in 1873, also a member of Alexander Mackenzie's Dominion cabinet, though without portfolio. In 1875 he became minister of justice and took the chief part in drafting the constitution of the Canadian supreme court. From 1880–87 he led the Liberal Opposition. He was then succeeded by Sir Wilfred Laurier. After his resignation he returned to Ireland, to take an active part in Irish politics. In fact, he did very little, although he sat for Longford as a Nationalist in the British House of Commons. Blake returned to Canada and died at Toronto on March 1, 1912.

BLAKE, ROBERT (1599–1657), English parliamentarian and admiral, was born at Bridgwater, Somersetshire, the eldest son of a well-to-do merchant, and was educated at Bridgwater grammar school and at Oxford, where he was entered at St. Alban's hall, but afterwards removed to Wadham college. He remained at the university till 1625. Nothing is known of his life with certainty for the next fifteen years. An anonymous Dutch writer in the *Hollandische Mercurius* (1652) represents him as saying that he had lived in Schiedam "for five or six years" in his youth. He was elected to represent his native borough in the "Short Parliament" of 1640. At the outbreak of the Civil War, Blake declared for the Parliament, and served under Sir John Horner. He was one of the defenders of Bristol (1643) against Prince Rupert, and in 1644 he gained high distinction by the resolute defence of Lyme. The siege was raised on May 23, and on July 8 Blake took Taunton by surprise, and held the town for the Parliament against two sieges by the Royalists until July 1645, when it was relieved by Fairfax. In 1645 he re-entered parliament as member for Taunton.

In Feb. 1649 he was appointed, with Colonels Dean and Popham, to the command of the fleet, under the title of general of the sea. In April he was sent against Prince Rupert's fleet at Kinsale. There he blockaded the prince for six months; and when Rupert slipped through the blockade and reached the Tagus Blake followed him and again blockaded him for some months. The king of Portugal refusing permission for Blake to attack his enemy, the latter made reprisals by falling on the Portuguese fleet, richly laden, returning from Brazil. He captured 17 ships, burnt three, and brought his prizes home without molestation. After revictualling his fleet, he sailed again, captured a French man-o-war, and then pursued Prince Rupert, who had been asked to go away by the Portuguese and had entered the Mediterranean. In Nov. 1650 Blake destroyed the bulk of the Royalist squadron near Cartagena. The thanks of parliament were voted to Blake, and he received a grant of £1,000. He was continued in his office of admiral and general of the sea; and in May following he took, in conjunction with Ayscue, the Scilly Islands. He was soon after made a member of the council of state.

In 1652 war broke out with the Dutch, and in March command of the fleet was given to Blake for nine months. In the middle of May the Dutch fleet of 45 ships, led by their great admiral Tromp, appeared in the Downs. Blake, who had only 20 ships, sailed to meet them, and the battle took place off Dover on May 19. The Dutch were defeated in an engagement of four or five hours, lost two ships, and withdrew under cover of darkness. Attempts at accommodation were made by the States, but they failed. Early in July war was formally declared, and in the same month Blake captured a large part of the Dutch fishery-fleet and the 12 men-of-war that formed their convoy. On Sept. 28 Blake and Penn again encountered the Dutch fleet, now commanded by De Ruyter and De Witt, off the Kentish Knock, defeated it, and chased it for two days. The Dutch took refuge in Goree. A third battle was fought near the end of November. By this time the ships under Blake's command had been reduced in number to 40, and nearly half of these were useless for want of seamen. Tromp, who had been reinstated in command, appeared in the Downs, with a fleet of 80 ships besides ten fireships. Blake, nevertheless, risked a battle off Dungeness, but was defeated and withdrew into the Thames. The English fleet having been refitted, put to sea again in Feb. 1653; and on the 18th Blake, at the head of 80 ships, encountered Tromp in the channel. The Dutch force, according to Clarendon, numbered 100 ships of war, but according to the official reports of the Dutch, only 70. The battle lasted three days; the Dutch then retreated and took refuge in the shallow waters off the French coast. In this action Blake was severely wounded. The three English admirals put to sea again in May; and on June 3 and 4 another battle was fought near the North Foreland. On the first day Dean and Monk were repulsed by Tromp; but on the second day the scales were turned by the arrival of Blake, and the Dutch retreated to the Texel.

Ill health now compelled Blake to retire from the service for a time, and he did not appear again on the seas for about 18 months; meanwhile he sat as a member of the Little Parliament (Barebones'). In Nov. 1654 he was selected by Cromwell to conduct a fleet to the Mediterranean to exact compensation from the duke of Tuscany, the knights of Malta, and the piratical states of North Africa, for wrongs done to English merchants. This mission he executed with his accustomed spirit and with complete success. Tunis alone dared to resist his demands, and

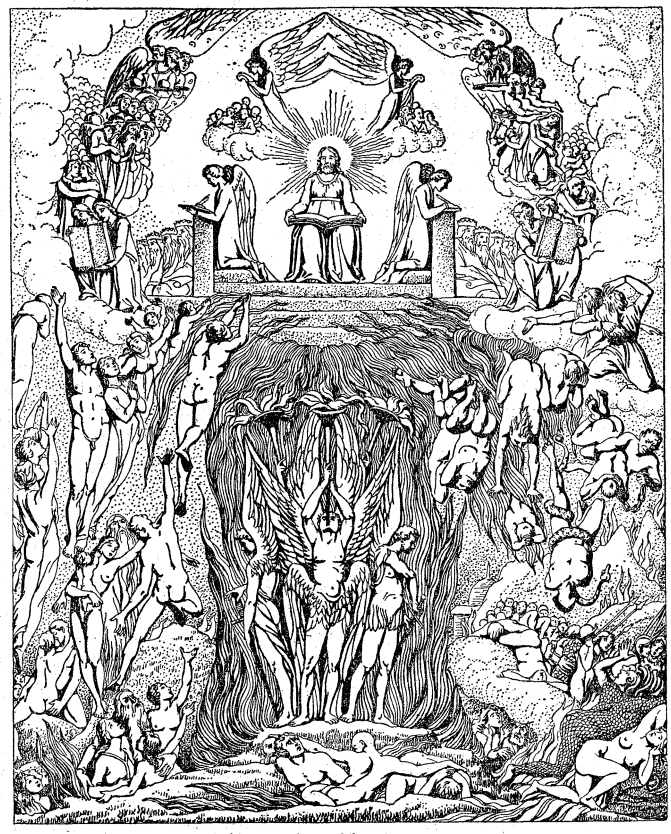
Tunis paid the penalty of the destruction of its two fortresses by English guns. In the winter of 1655–56, war being declared against Spain, Blake was sent to cruise off Cadiz and the neighbouring coasts, to intercept the Spanish shipping. One of his captains captured a part of the Plate fleet in Sept. 1656. In April 1657 Blake, then in very ill health, suffering from dropsy and scurvy, heard that the Plate fleet lay at anchor in the bay of Santa Cruz, in the island of Teneriffe. The position was a very strong one, defended by a castle and several forts with guns. Under the shelter of these lay a fleet of 16 ships drawn up in crescent order. Captain Stayner was ordered to enter the bay and fall on the fleet. This he did. Blake followed him. Broadsides were poured into the castle and the forts at the same time, and soon nothing was left but ruined walls and charred fragments of burnt ships. The wind was blowing hard into the bay; but suddenly, and fortunately for Blake, it shifted and carried him safely out to sea. "The whole action," says Clarendon, "was so incredible that all men who knew the place wondered that any sober man, with what courage soever endowed, would ever have undertaken it; and they could hardly persuade themselves to believe what they had done; while the Spaniards comforted themselves with the belief that they were devils and not men who had destroyed them in such a manner." The English lost one ship and 200 men killed and wounded.

After again cruising for a time off Cadiz, his health failing more and more, he was compelled to make homewards before the summer was over. He died at sea, but within sight of Plymouth, on Aug. 17, 1657. His body was brought to London and embalmed, and after lying in state at Greenwich House was interred with great pomp and solemnity in Westminster Abbey. In 1661 Charles II. ordered the exhumation of Blake's body, with those of the mother and daughter of Cromwell and several others. They were cast out of the Abbey, and were reburied in the churchyard of St. Margaret's. "But that regard," says Johnson, "which was denied his body has been paid to his better remains, his name and his memory. Nor has any writer dared to deny him the praise of intrepidity, honesty, contempt of wealth, and love of his country." Clarendon bears the following testimony to his excellence as a commander: "He was the first man that declined the old track, and made it apparent that the science might be attained in less time than was imagined. He was the first man that brought ships to contemn castles on the shore, which had ever been thought very formidable, but were discovered by him to make a noise only, and to fright those who could be rarely hurt by them."

BIBLIOGRAPHY.—A life of Blake is included in the work entitled *Lives, English and Foreign.* Dr. Johnson wrote a short life of him, and in 1852 appeared Hepworth Dixon's fuller narrative, *Robert Blake, Admiral and General at Sea. See* also *Letters and Papers Relating to the First Dutch War,* edited by S. R. Gardiner for the Navy Records Society (1898–99); C. R. B. Barrett, *The Missing Fifteen Years (1625–1640) in the life of Robert Blake* (1917).

BLAKE, WILLIAM (1757–1827), English mystic, poet and artist, born in London, Nov. 28, 1757. His father, James Blake, of whose family and origin nothing is known, was a hosier, living at 28 Broad Street, Golden Square. His mother's maiden name has not been recorded. The family consisted of four sons and a daughter. William was the second son, and the only one to achieve distinction. The eldest, James, succeeded his father in the hosiery business. The third, John, died young, after a life of dissipation. The youngest, Robert, who shewed considerable capabilities as an artist, was greatly loved by his brother William, and was nursed by him through the illness of which he died at the age of 25.

William began to show his artistic leanings at an early age. His father wisely decided to encourage this side of his nature, and sent him at the age of ten to Par's drawing school in the Strand. He also gave him casts to draw from and allowed him to buy prints after the old masters at the sale rooms. In 1771 he was apprenticed to Basire the engraver and served his time faithfully in learning the conventional style of engraving. He also made drawings of the monuments in Westminster Abbey and these were engraved for Gough's *Sepulchral Monuments.* His mind was profoundly influenced by the surroundings in which he worked, and the Gothic style was to him the ideal, the "living form," for ever after. At the same time he was cultivating his mind in other ways and is known to have read Burke, Locke, Bacon and Fuseli's translation of Winckelmann. His creative faculty found its outlet in these early years in poetry, some of which has survived in the thin volume of *Poetical Sketches,* printed for Blake by his friends in 1783. These pieces were composed between his twelfth and



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

THE DAY OF JUDGMENT, A DRAWING BY BLAKE PUBLISHED IN 1813
This is one of an enormous series of drawings by Blake, to illustrate his mystical philosophy. Each figure has an especial significance

twentieth years. Although they show the influence of contemporary poetry, notably Ossian, they owe something too, to the Elizabethans and the poets of the later seventeenth century; yet they have a pure strain of lyrical inspiration which sets them apart as a landmark in English literature. They remained unknown and so had no influence on the poetry of their time, but nevertheless were the forerunners of the freer age in poetry which began some twenty years later.

In 1778 Blake had completed his apprenticeship, and at the age of twenty-one set out to earn his living as a professional engraver. He executed many commissions for the booksellers and publishers, and during the next twenty years supported himself largely by this means. His circle of friends about the year 1780 included Stothard, Flaxman and Fuseli, all of whom played a large part in the course of his later life. In this year he first exhibited pictures at the Royal Academy, where they gained the admiration of Romney.

In 1781 he met his future wife, Catherine Boucher, the daughter of a Battersea market-gardener. They were married in August 1782, and lodged at first at 23 Green Street, Leicester Fields. The name of Catherine Blake will go down to posterity as that of an almost perfect wife. She learnt to draw and paint well enough to be able to help Blake in his work. She remained childless, and survived her husband only four years, dying in 1831.

During the years 1783–87 Blake met a number of distinguished people at the house of a Mr. Mathews, who had helped him to print the *Poetical Sketches;* but this society soon disgusted him, and he ridiculed it in a crude satire, now known as *An Island in the Moon,* which was written about 1787. The chief interest of

the ms. now lies in the fact that it contains early drafts of three of the *Songs of Innocence*. In 1784 Blake had started a print shop in partnership with a former fellow apprentice, Parker, at 27 Broad Street, but this did not succeed and was soon abandoned. Meanwhile he was earning a livelihood by engraving ordinary copper-plates for the publishers, and about 1787 he began to experiment with a new method of printing from etched copper-plates. It is related that the secret of this process was revealed to him in a vision by the spirit of his brother Robert. More probably he had received a hint of it some time before from his friend, George Cumberland of Bristol, who had been working on it as early as 1784. Both words and decorations were drawn on the copper-plate with an impervious medium, and the copper was then etched with acid. Text and design remained in relief and could be printed in any tint that pleased the artist. The print could then be left plain or be coloured by hand with water colours or some other medium. The first results of this process were the small dogmatic works, *There is No Natural Religion,* and *All Religions are One.* It developed further with the production of the poetical volume, *Songs of Innocence,* which consisted of lyrical poems etched on copper with decorations coloured by hand. The volume was finished in 1789 and was sold for a few shillings. This was the prelude to the remarkable series of books in "illuminated printing" which occupied Blake in some degree for the remainder of his life. Blake was now living in Hercules Road, Lambeth, and here he completed the works entitled *The Book of Thel,* 1789, *The Marriage of Heaven and Hell,* 1793, *Songs of Experience,* 1794 (a companion volume to *Songs of Innocence*), *America,* 1793, *Visions of the Daughters of Albion,* 1793, *Europe,* 1794, *Urizen,* 1794, *The Book of Los,* 1795, *The Book of Ahania,* 1795, and *The Song of Los,* 1795. In these books his lyrical impulse gradually gave way before a strong mystical tendency which ultimately became the dominant note in his life. In *Songs of Innocence* and *Songs of Experience* the lyrical and mystical elements were intimately mingled. This book had been preceded by *Thel,* and by a prose work, *The Marriage of Heaven and Hell,* in which mysticism and philosophy began to gain the upper hand. In the succeeding works Blake's visionary powers overwhelmed him, and they were wholly devoted to an elaboration of his mystical and metaphysical systems, which have proved a stumbling block to most of his readers up to the present time. They are written in an irregular verse form which entitles Blake to be regarded as the forerunner of the *vers libre* of recent times.

Meanwhile Blake's output as an artist was very large. About the year 1795 he produced his stupendous series of large colour-prints, which can scarcely be matched in the whole history of art for imaginative content and magnificence of colouring. These include "Nebuchadnezzar," "The Elohim creating Adam," and "Newton." By 1797 he had completed his series of 537 water-colour designs for Young's *Night Thoughts.* He had also made numerous separate water-colour paintings, and engraved copper-plates for the publishers.

Blake's circle of friends had widened somewhat, and now included Captain Butts, Muster-master General, who was for thirty years Blake's faithful admirer and customer. It was chiefly Butts' patronage which enabled Blake to earn a livelihood while expending much time and energy on his mystical works, which never produced any adequate return by their sales. He even laboured at a long mystical poem which never was, and was never intended to be, published in its original form. This was *Vala* or *The Four Zoas,* a poem of the greatest significance for the understanding of Blake, though the manuscript was not properly transcribed and edited until 1925, nearly a century after the author's death. The poem was begun about 1795 and was elaborately revised five years later. Some passages from it were used in later works, but none of the drawings in it were ever used again.

During the seven years 1793 to 1800 his creative output was almost greater than can be believed. Periods of mental and physical exhaustion were the inevitable result, and it was probably a very fortunate event that in 1800 introduced Blake to the notice of William Hayley in order that he might execute copper-plates for various works on which Hayley was engaged. As a result of this introduction, brought about by Flaxman, Blake paid a visit in the early part of 1800 to Hayley at Felpham in Sussex, and later in the year he rented a cottage in the village, so that he might work under Hayley's eye at the engravings for the projected *Life of Cowper.* Blake removed to Felpham with his wife and sister, intending to stay there for an indefinite period. Three years later he returned with a great sense of relief to London. At first he had been able to work happily enough at Felpham, but as time passed he became increasingly irritated by Hayley's patronizing ways and lack of understanding, and his feelings found relief in the scurrilous doggerel and epigrams scribbled in his notebook. At length he realized that the best way of keeping Hayley's friendship was to leave his company, so he returned to London. Part of the three years at Felpham were charged with spiritual discomfort. Blake obtained no respite from the visions which crowded ceaselessly upon him. He was forced to lead a double life, pandering on the surface to Hayley's vanities and forced to develop in secret his own mystical and visionary faculties. The Felpham period saw therefore a strangely mixed output of second-rate engravings for Hayley, of fine water-colour paintings, and of mystical poetry of great power, which was mostly embodied in the poem *Milton.* Thomas Butts bought most of Blake's paintings, and to this faithful friend he confided his difficulties in his letters. An additional trouble was the well known incident which resulted in his trial at Chichester sessions for treason. This was owing to a misunderstanding with a soldier, John Scofield, whom Blake forcibly turned out of the garden of his cottage. Scofield afterwards fabricated evidence against Blake, accusing him of using treasonable words against the King. He was triumphantly acquitted of this charge in Jan. 1804.

After his return to London he lived at 17 South Molton Street, determined to devote his life to art without further hindrance from the outside. He believed that he had learned from Hayley the way to obtain worldly success and riches as a publisher of his own works, but in this he was disappointed, and he found the means of livelihood more precarious than ever. Butts continued to buy his pictures and he was given some work as an engraver, but for his own books he was unable to find a market. He refused, however, to be for long discouraged, and in 1805 he entered with zest into a scheme with the engraver Cromek for the production of a series of engravings for Blair's *Grave.* Here he was again deceived. Cromek paid him a small sum for the designs, and then contrary to his agreement employed another to engrave them. The book containing them was published in 1808. Blake, already embittered by neglect, became still more embittered by incidents such as this, and suffered from fits of depression. He reacted, however, about 1808 when he decided to hold an exhibition of his works at the house of his brother James in Broad Street, Golden Square. Sixteen pictures only were exhibited, including his large painting of Chaucer's Canterbury Pilgrims, and each visitor to the house received for his entrance fee of 2/6 a copy of the now celebrated *Descriptive Catalogue.* The exhibition was opened in May 1809, and attracted very little notice, the only criticism of it, which appeared in Leigh Hunt's *Examiner,* being spiteful and unfair. The few visitors included Henry Crabb Robinson, barrister and diarist, who has left a valuable account of his acquaintanceship with Blake during his later years. Blake was again disappointed of the recognition which he knew he merited, and was further ruffled by what he believed to be dishonesty on Stothard's part concerning his picture of the Canterbury Pilgrims. Probably the knavery was Cromek's, who, having seen Blake's design, suggested the idea to Stothard and so made him an innocent plagiarist. Stothard's commonplace picture was a popular success, and Blake could scarcely recover from this cruel blow to his pride.

During the years following his exhibition Blake sank into an obscurity from which it has been difficult to disinter the bare facts of his existence. For the years 1810–1817 only a few scattered references remain, and it is uncertain how he found the means of earning his living. It has even been suggested that for part of this time he was confined in an asylum. Recent researches, however, have shown that there is no foundation for this rumour. Some of Blake's acquaintances, such as Robert Southey, who had

visited him in 1811, certainly did regard him as insane. But the testimony of his more intimate friends is of greater value, and they have repeatedly stated their conviction that he was anything but mad. Samuel Palmer, a close friend of his later years, wrote of him as "the most practically sane, steady, frugal and industrious" man he ever knew. Moreover there are facts enough to show that Blake was living from 1810 to 1817 merely in retirement, having accepted his fate like the wise man that he was. Throughout this period he was occasionally selling copies of his illuminated books. In 1812 he showed several pictures at the last exhibition of the Associated Artists in Water Colour. In 1815 he called on the Rev. Thomas Dibdin, probably in connection with some illustrations to Milton which he had made. During most of these years he was still executing engravings for various employers, and these included a number of plates for Josiah Wedgwood the younger. Finally it was in the years 1808–1818 that he was engaged upon the hundred etched plates of his greatest symbolical poem, *Jerusalem*. This magnificent work can have brought him very little financial return, as only six copies issued by him are known to exist, and the only one of these that he coloured was still in his possession in 1827.

In the year 1818 Blake entered upon the last phase of his life, and until his death in 1827 was probably happier in his friends and in his work than he had been at any other period. This was due primarily to his friendship with John Linnell, portrait and landscape painter, to whom he was introduced by his old friend, George Cumberland. Blake was still living in South Molton Street, and under Linnell's guidance began to move more freely in society. He was enabled to obtain more work, and became the centre of a circle of young artists who regarded him with affection and veneration. The chief of these were Palmer, Calvert, Richmond, Finch, Walter and Tatham, some of whose names are still well known. Frederick Tatham is of little note as an artist, but is remembered as the author of a short life of Blake, and as the owner of most, perhaps also the destroyer of some, of his effects after the death of Mrs. Blake in 1831. Another friend introduced by Linnell, was John Varley, the water colourist. He was greatly interested in astrology, and at his instigation Blake drew his Visionary Heads of historical personages, an occupation which was clearly much less serious to him than to Varley.

In 1821 Blake moved from South Molton Street to 3 Fountain Court, Strand, and here he executed his greatest work in creative art, the illustrations to the Book of Job. He had previously made twenty water-colour paintings which had been bought by Thomas Butts. Linnell commissioned a duplicate set, and later suggested that he should make engravings of these subjects. The initial expense was borne by Linnell, and the copper-plates were engraved in the years 1823–1825, the book of twenty-one prints being published in March 1826. Though superficially illustrations of the Bible story, the engravings actually form one of the most important of Blake's symbolical books. This has been realized only in recent years, and their mystical content has not prevented the designs from being the most widely known and generally appreciated of Blake's works. From about 1824 Blake had been suffering from symptoms of the gallstones which eventually caused his death. He was a frequent visitor at Linnell's country home at Hampstead, but as time passed he found it increasingly difficult to make the journey thither. He was still, however, to make one more stupendous effort in his art. In October 1825, Linnell commissioned him to make illustrations to Dante's *Divine Comedy*, and to engrave them. He completed a hundred water-colour designs, of which seven were engraved, and was still at work upon these when he died on Aug. 12, 1827. He was buried in an unmarked grave in Bunhill Fields, the approximate place being now indicated by a tablet which was placed there on Aug. 12, 1927.

Blake had lived for nearly seventy years and for more than fifty had worked unremittingly as creative artist and as journeyman engraver. His position in the history of the art of this country is peculiar owing to his double achievement as poet and as painter. It is moreover impossible to determine his place in either poetry or painting separately, the two being interdependent both in his own mind and in the forms he used for their expression. His impulse as a lyrical poet had shown itself before the age of 14 and was not quite exhausted until more than thirty years later. It is seen at its best in the volume of *Poetical Sketches*, printed in 1783, in the *Songs of Innocence* and *Songs of Experience*, published in the years 1789 to 1794, and in some of the later poems from manuscripts and letters, and this part of his writings has justly been the chief source of his present popularity. Gradually this faculty gave way, as his mind developed, before a rising tide of mysticism which strove to find expression through an increasingly complex system of symbolism. In the *Songs* some symbolism and simple pictorial designs were added to lyrical poetry. In his latest poems, *Milton* and *Jerusalem*, the symbolism became predominant and its pictorial representation more elaborate. As a painter he was entirely uninterested in realism, his favourite subjects being taken from the Bible or from writers such as Shakespeare and Milton. He sought to express in a picture the things of the mind as much as in a poem, and it is to the mind of the observer that they appeal. It is useless therefore to look in Blake's pictures for accuracy of detail. He laid great store by firmness of outline, but abhorred copying Nature. His pictures live by their qualities of design, colouring and imaginative content, and his mystical poetry by the vigour of the intellect which produced it.

It cannot be disputed that Blake suffered from the defects of his qualities. His mind was never systematically cultivated, just as his hand was never intensively trained to draw from the living model. He was therefore apt to be intolerant through ignorance, and inaccurate through lack of observation. It is doubtful, however, whether he would have achieved more or have had a greater influence at the present time if he had possessed the academic virtues. His qualities isolated him from his contemporaries and drove his mind in upon itself, so that the precise interpretation of his message to mankind has become a matter of great uncertainty. But through all his mental turmoil and difficulties in dealings with his fellow men he kept his intellectual integrity, and he never prostituted his art. Throughout his life he sought to exalt the things of the mind, and for him the imagination was man's highest faculty. Ceaselessly he fought against materialism and attempted to gain his own spiritual regeneration through struggles against self. He was deeply religious, though in no conventional sense. In his later years Christ became identified in his mind with Art, and this fact provides many clues for the understanding of his doctrines. In his symbolical writings his own mental experiences were described without regard to the difficulties of his readers. Late in his life he made some attempt to embody his view of Christianity in more direct language, but his poem *The Everlasting Gospel*, written about 1818, was never finished, and exists now only in disconnected fragments. Perhaps the most illuminating revelation of his mind for most readers are the aphorisms and didactic statements which he engraved about the year 1820 around a representation of the Laocoön Group.

It is not surprising therefore that Blake was incomprehensible to his contemporaries. He influenced them as little as he was influenced by them, and for many years after his death his name was unknown. His first full biography, written by Alexander Gilchrist, was published in 1863, and was reprinted under the supervision of D. G. Rossetti in 1880. Since that time his power and originality, have gained fuller recognition, and he now holds a position as one of the greatest figures in English poetry and art.

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(G. L. K.)

BLAKELOCK, RALPH ALBERT (1847–1919), American painter, was born in New York city on Oct. 15, 1847. He graduated at the College of the City of New York in 1867. In art he was self-taught, original and, until ill-health necessitated the abandonment of his profession, a prolific worker. His subjects included pictures of North American Indian life, and landscapes—notably such canvases as "The Indian Fisherman"; "Tawo-koka, or Circle Dance"; "Silvery Moonlight"; "A Waterfall by Moonlight"; "Solitude"; and "Moonlight on Long Island Sound." In 1916 the Toledo Art Museum paid $20,000 for his "Brook by Moonlight." Because of insanity he was kept under restraint during the last 18 years of his life. He died near Elizabethtown (N.Y.), in the Adirondacks, on Aug. 9, 1919.

BLAKENEY, WILLIAM BLAKENEY, BARON (1672–1761), British soldier, was born at Mount Blakeney in Limerick in 1672. In 1747 George II. made him lieutenant-general and lieutenant-governor of Minorca. The governor of that island never set foot in it, and Blakeney was left in command for ten years. In 1756 the Seven Years' War was preluded by a swift descent of the French on Minorca. Fifteen thousand troops under marshal the duc de Richelieu, escorted by a strong squadron under the marquis de la Gallisonnière, landed on the island on April 18, and at once began the siege of Fort St. Philip, where Blakeney commanded at most some 5,000 soldiers and workmen. The defense, in spite of crumbling walls and rotted gun platforms, had already lasted a month when a British fleet under Vice-Admiral the Hon. John Byng appeared. La Gallisonnière and Byng fought, on May 20, an indecisive battle, after which the relieving squadron sailed away and Blakeney was left to his fate. A second expedition subsequently appeared off Minorca, but it was then too late, for after a heroic resistance of 71 days the old general had been compelled to surrender the fort to Richelieu (April 18–June 28, 1756). Only the ruined fortifications were the prize of the victors. Blakeney and his little garrison were transported to Gibraltar with absolute liberty to serve again. Byng was tried and executed; Blakeney, on his return to England, found himself the hero of the nation, and received a peerage. He died Sept. 20, 1761.

See Memoirs of General William Blakeney (anon., 1757).

BLAMIRE, SUSANNA (1747–1794), English poet, daughter of a Cumberland yeoman, was born at Cardew hall, near Dalston and led an uneventful life in her native county. Her poems were published in 1842 by Henry Lonsdale as *The Poetical Works of Miss Susanna Blamire,* "the Muse of Cumberland," with a memoir by Patrick Maxwell. Some of her songs rank among the best of north-country lyrics. "And ye shall walk in silk attire" and "What ails this heart o' mine" are well known, and were included in Johnson's *Scots' Musical Museum.*

BLANC, (JEAN JOSEPH CHARLES) LOUIS (1811–1882), French politician and historian was born Oct. 29, 1811, at Madrid, where his father held the post of inspector-general of finance under Joseph Bonaparte. Failing to receive aid from Pozzo di Borgo, his mother's uncle, Louis Blanc studied law in Paris, living in poverty, and became a contributor to various journals. In the *Revue du progrès,* which he founded, he published in 1839 his study on *L'Organisation du travail.* The principles laid down in this famous essay form the key to Louis Blanc's whole political career. He attributes all the evils that afflict society to the pressure of competition, whereby the weaker are driven to the wall. He demanded the equalization of wages, and the merging of personal interests in the common good—"*à chacun selon ses besoins, de chacun selon ses facultés.*" This was to be effected by the establishment of "social workshops," a sort of combined co-operative society and trade-union, where the workmen in each trade were to unite their efforts for their common benefit. In 1841 he published his *Histoire de dix ans, 1830–1840,* an attack upon the monarchy of July. It ran through four editions in four years.

In 1847 he published the two first volumes of his *Histoire de la Révolution Française* (finished 1862). Its publication was interrupted by the revolution of 1848, when Louis Blanc became a member of the provisional government. On his motion, on Feb. 25, the government undertook "to guarantee the livelihood of the workers by work"; and, though his demand for the establishment of a ministry of labour was refused, he was authorized to call together an assembly of Paris workers' delegates (the famous *Commission du Luxembourg*) to prepare a plan for the permanent elimination of unemployment. This body, in form an anticipation of the Russian Soviet, became an arbiter in trade disputes and a centre of Socialist propaganda. The alarm and indignation of the employing class was intense and, on the meeting of the National Assembly at the beginning of May, Blanc was not re-elected to his post in the Government, and the plan of the Luxembourg Commission was ignored. Furthermore, the Government had already set up as a rival organization the "National workshops" (*q.v.*) conducted on a parody of Blanc's principles, intended to fail, and under the supervision of Marie, one of his political enemies. Blanc was forced to fly to England after the defeat of the workers in the revolt of June 1848, and did not return till after the fall of the empire in 1871. He was elected deputy, and, though he did not join the Communards, in Jan. 1879 introduced into the chamber a proposal for their amnesty, which was carried. He died at Cannes on Dec. 6, 1882.

Louis Blanc possessed a picturesque and vivid style and considerable power of research; his political and social ideas have had a great influence on the development of Socialism in France. His *Discours politiques* (1847–81) was published in 1882. His most important works, besides those already mentioned, are *Lettres sur l'Angleterre* (1866–67); *Histoire de la Révolution de 1848* (1870–80); *Dix années de l'histoire de l'Angleterre* (1879–81); and *Questions d'aujourd'hui et de demain* (1873–84).

BIBLIOGRAPHY.—*See* L. Fiaux, *Louis Blanc* (1883); I. Tchernov, *Louis Blanc;* R. W. Postgate, *Revolution from 1789 to 1906* (1920, bibl.).

BLANC, MONT, the culminating point (15,782 ft.) of the mountain range of the same name which lies within French, Swiss and Italian territory. The summit is wholly French and is the loftiest peak in the Alps, and in Europe also, if certain peaks in the Caucasus be excluded. It divides the valley of Chamonix from that of Courmayeur. Among the great glaciers which radiate from this centre are those of Bossons, and Taconnaz (northern slope) and of Brenva and Miage (southern slope). The first ascent was made in 1786 by two Chamonix men, Jacques Balmat and Dr. Michel Paccard, and the second in 1787 by Balmat with two local men. Later in 1787 H. B. de Saussure made the third ascent, and was followed a week later by Col. Beaufoy, the first Englishman to gain the top. These ascents were all made from Chamonix, but since then routes have been forced up the peak from nearly every side, those on the Italian side being much steeper than that from Chamonix. The ascent from Chamonix is now frequently made in summer (rarely in winter also), but, owing to the great height of the mountain, the view is unsatisfactory, though very extensive (Lyons is visible). There is an inn at the Grands Mulets (9,909ft.). In 1890 M. Vallot built an observatory and shelter hut (14,312ft.) on the Bosses du Dromadaire (north-west ridge of the mountain), and in 1893 T. J. C. Janssen constructed an observatory just below the very summit. Both no longer exist.

See C. E. Mathews, *The Annals of Mont Blanc* (1898); L. Kurz and X. Imfeld, *Carte de la chaîne du Mont Blanc* (1896, new ed. 1905); Ch. Vallot, L. W. Collet, J. Vallot, *Guide du Massif du Mont Blanc* (1924).

BLANCHARD, SAMUEL LAMAN (1804–45), British author and journalist, was born at Great Yarmouth May 15 1804. In 1828 he published *Lyric Offerings,* dedicated to Charles Lamb. He had a very varied journalistic experience, and from 1841 till his death he was connected with the *Examiner.* In 1846 Bulwer-Lytton collected a number of his prose essays under the title *Sketches of Life,* to which a memoir of the author was prefixed. His verse was collected in 1876 by Blanchard Jerrold. He died by his own hand Feb. 15, 1845.

BLANCHARD, THOMAS (1788–1864), an American inventor, was born in Sutton, Mass., on June 24, 1788. At 18 he contrived a machine for making tacks. Later he made one for

turning and finishing gun-barrels in a single operation, an invention which has been developed to produce a great variety of irregular shapes. He interested himself also in steam-power and invented a trackless locomotive, as well as various improvements for railroads; his steamboats, designed for use in swift river-currents, were put into service in various parts of the United States. Timber-bending, mortising and envelope-making devices were among his other achievements as an inventor. He died in Boston on April 16, 1864.

See D. Goddard, *Eminent Engineers* (1906) and G. Iles, *Leading American Inventors* (1912).

BLANCHE, JACQUES ÉMILE (1862–1942), French painter and author, born in Paris on Feb. 1. His art is refined, sometimes super-elegant, but full of character. Among his chief works are his portraits of his father, of Pierre Louÿs, the Thaulow family, Aubrey Beardsley, Yvette Guilbert and Thomas Hardy. His publications include *Portraits of a Lifetime* (2 vols., 1937–38). He died Oct. 3, 1942.

BLANCHE OF CASTILE (1188–1252), wife of Louis VIII. of France, third daughter of Alphonso VIII., king of Castile, and of Eleanor of England, daughter of Henry II., was born at Valencia. In consequence of a treaty between Philip Augustus and John of England, she was betrothed to the former's son, Louis, and was brought to France, in the spring of 1200, by John's mother, Eleanor. On May 22, 1200, the treaty was finally signed, John ceding with his niece the fiefs of Issoudun and Graçay, together with those that André de Chavigny, lord of Châteauroux, held in Berry, of the English crown. The marriage was celebrated the next day, at Portmort, on the right bank of the Seine, in John's domains, as those of Philip lay under an interdict.

Blanche first displayed her great qualities in 1216, when Louis, who on the death of John claimed the English crown in her right, invaded England, only to find a united nation against him. Philip Augustus refused to help his son, and Blanche was his sole support. The queen established herself at Calais and organized two fleets, one of which was commanded by Eustace the Monk, and an army under Robert of Courtenay; but all her resolution and energy were in vain. Although it would seem that her masterful temper exercised a sensible influence upon her husband's gentler character, her rôle during his reign (1223–26) is not well known. Upon his death he left Blanche regent and guardian of his children. Of her 12 or 13 children, six had died, and Louis, the heir—afterwards Saint Louis—was but 12 years old. Blanche had to bear the whole burden of affairs alone, to break up a league of the barons (1226), and to repel the attack of the king of England (1230). But her energy and firmness overcame all dangers. She gained over one of the confederate nobles, Thibaut, comte de Champagne, protected him from the attacks of his former allies, and when he inherited the throne of Navarre, obtained from him the counties of Blois, Chartres and Saucerre. By judicious marriage treaties she secured to the royal house Toulouse and Provence. Saint Louis owed his realm to his mother, but he himself always remained somewhat under the spell of her imperious personality. After he came of age (1236) her influence upon him may still be traced. In 1248 she again became regent, during Louis IX.'s absence on the crusade, a project which she had strongly opposed. In the disasters which followed she maintained peace, while draining the land of men and money to aid her son in the East. She fell ill at Melun in Nov. 1252, and was taken to Paris, but lived only a few days.

Besides the works of Joinville and William of Nangis, *see* Élie Berger, "Histoire de Blanche de Castille, reine de France," in *Bibliothèque des écoles françaises d'Athènes et de Rome,* vol. lxx. (1895); Le Nain de Tillemont, "Vie de Saint Louis," ed. by J. de Gaulle for the *Société de l'histoire de France* (1847–51); and Paulin Paris, "Nouvelles recherches sur les moeurs de la reine Blanche et de Thibaud," in *Cabinet historique* (1858).

BLANCH FEE or **BLANCH HOLDING,** an ancient tenure in Scottish land law, the duty payable being in silver or white money in contradistinction to gold. The phrase was afterwards applied to any holding of which the quit-rent was merely nominal.

BLANDFORD or **BLANDFORD FORUM,** municipal borough in the northern parliamentary division of Dorsetshire, England, on the river Stour, where the ancient road from Salisbury to Dorchester crosses the road and rail routes following the river from northwest to southeast. Pop. (1938) 3,316. Area, about .4 sq.mi. The town is an old foundation but with the exception of six houses was completely destroyed by fire in 1731, a fate that has overcome other settlements in this region of thatched houses and wooden barns. The town thus has a singularly uniform appearance. Remnants of a 14th century mansion, Damory court, are to be seen in a farmhouse. The chalk hills of the neighbourhood are rich in Roman and British remains as well as prehistoric camps and barrows. Lace making was a former industry.

BLANDRATA or **BIANDRATA, GIORGIO** (*c.* 1515–1588), Italian physician and polemic, was born at Saluzzo. He studied at Montpellier in 1533, and specialized in the functional and nervous disorders of women. He attended the English wife (Jane Stafford) of Count Celso Massimiliano Martinengo, preacher of the Italian church at Geneva, and fostered anti-trinitarian opinions in that church. In 1558 he found it expedient to remove to Poland, where he became a leader of the heretical party at the synods of Pinczów (1558) and Ksionzh (1560 and 1562). His point was the suppression of extremes of opinion, on the basis of a confession literally drawn from Scripture. He obtained the position of court physician to the queen dowager, the Milanese Bona Sforza. In 1563 Blandrata transferred his services to the Transylvanian court. He revisited Poland (1576) in the train of Stephen Báthory, whose tolerance permitted the propagation of heresies; and when (1579) Christopher Báthory introduced the Jesuits into Transylvania, Blandrata found means of conciliating them. In Transylvania, Blandrata co-operated with Francis Dávid (d. 1579), the anti-trinitarian bishop, but in 1578 two circumstances broke the connection. Blandrata was charged with "Italian vice." Dávid renounced the worship of Christ. To influence Dávid, Blandrata sent for Faustus Socinus from Basle. Socinus was Dávid's guest, but the discussion between them led to no result. At the instance of Blandrata, Dávid was tried and condemned to prison at Déva (in which he died) on the charge of innovation. Having amassed a fortune, Blandrata returned to the communion of Rome. His end is obscure. According to the Jesuit, Jacob Wujek, he was strangled by a nephew (Giorgio, son of Alphonso) in May 1588. He published polemical writings, some in conjunction with Dávid.

See Malacarne *Commentario delle Opere e delle Vicende di G. Biandrata* (Padova, 1814); Wallace *Anti-trinitarian Biography,* vol. ii. (1850). (A. Go.)

BLAND-SUTTON, SIR JOHN (1855–1936), British surgeon, was born at Enfield Highway, Middlesex, in 1855. He studied medicine and surgery at Middlesex hospital from 1878 onwards, and from 1881–86 made systematic examinations of animals dying in the gardens of the Zoological Society, London. This work formed the substance of a series of lectures delivered at the Royal College of Surgeons 1886–91. He subsequently carried out much valuable work on hysterectomy and the diseases of women. He was president of the Medical Society of London in 1914, of the Royal Society of Medicine 1921–22, of the Royal College of Surgeons in 1923, and was also consulting surgeon to Middlesex hospital. He received many British honours, being knighted in 1912 and made a baronet in 1925. He died Dec. 20, 1936.

His published works include *Ligaments, their Nature and Morphology* (1887); *Evolution and Disease* (1890); *Surgical Diseases of the Ovaries, etc.* (1891); *Tumours, Innocent and Malignant* (1893); *Diseases of Women* (1897); *Surgery of Pregnancy and Labour, complicated with Tumours* (1901); *Gall Stones and Diseases of the Bile Ducts* (1907); *Man and Beast in Eastern Ethiopia* (1911); *Fibroids of the Uterus* (1913); *Selected Lectures and Essays* (1920); *Orations and Addresses* (1924).

BLANE, SIR GILBERT (1749–1834), Scottish physician, was born at Blanefield, Ayrshire, on Aug. 29, 1749. He was educated at Edinburgh university, and shortly after his removal to London became private physician to Lord Rodney, whom he accompanied to the West Indies in 1779. He improved the health of the sailors by attention to the diet and by enforcing due sanitary precautions, and it was largely through him that in 1795 the use of lime-juice was made obligatory throughout the navy as a

preventative of scurvy. He was made a baronet in 1812 in reward for the services he rendered in connection with the return of the Walcheren expedition. He died in London on June 26, 1834.

See F. H. Garrison, *History of Medicine* (1929).

BLANFORD, WILLIAM THOMAS (1832–1905), English geologist and naturalist, was born in London. He was on the staff of the Geological Survey of India and was later engaged in the coalfield near Talcher, where boulders considered to have been ice-borne were found in the Talcher strata—a discovery confirmed by subsequent observations of other geologists.

Biography, with bibliography and portrait, in *Geological Magazine*, Jan. 1905.

BLANK, a word used in various senses based on that of "left white," *i.e.*, requiring something to be filled in (Fr. *blanc*, white); thus a "blank cheque" requires the amount to be inserted, an insurance policy in blank lacks the name of the beneficiary, "blank verse" (*q.v.*) is unrhymed verse, a "blank cartridge" contains only powder and no ball or shot. The word is also used for a ticket in a lottery or sweepstake which does not carry a number or the name of a horse running, or for an unstamped metal disc in coining.

BLANKENBERGHE, seaside resort, West Flanders, Belgium, 12 mi. N.E. of Ostend. Pop. (1939) 7,931. There is a small fishing port and a considerable fishing fleet. Zeebrugge lies 2 mi. north.

BLANKENBURG, a town and health resort of Germany, in the *Land* of Brunswick, lying at the northern foot of the Harz mountains, 12 mi. S.W. of Halberstadt. Pop. (1939) 14,282. It was in large part rebuilt after a fire in 1836, and possesses a castle, a museum of antiquities, an old town hall and churches. In the vicinity is a cliff called Teufelsmauer (Devil's wall), from which fine views are obtained across the plain and into the deep gorges of the Harz mountains.

BLANKENESE, a town on the Elbe in the Prussian province of Schleswig-Holstein, Germany, west of and almost suburban to Altona. Pop. 14,000. Boatbuilding is carried on.

BLANKETEERS, the nickname given to some 5,000 operatives who on March 10, 1817, met in St. Peter's Field, near Manchester, to march to London, each carrying blankets or rugs. Their object was to see the Prince Regent and lay their grievances before him. The Habeas Corpus act was suspended, and the leaders were seized and imprisoned. The few stragglers who persisted in the march were intercepted by troops and treated with considerable severity.

BLANK INDORSEMENT or **INDORSEMENT IN BLANK:** *see* BILL OF EXCHANGE.

BLANK VERSE, the unrhymed measure of iambic decasyllable in five beats which is usually adopted in English epic and dramatic poetry. The epithet is due to the absence of the rhyme the ear expects at the end of successive lines. In the beginning of the 16th century, however, certain Italian poets made the experiment of writing decasyllables without rhyme. The tragedy of *Sofonisba* (1515) by Trissino (1478–1550) was the earliest work completed in this form; it was followed in 1525 by the didactic poem *Le Api* (The Bees), of Giovanni Rucellai (1475–1525), who announced his intention of writing *"Con verso Etrusco dalle rime sciolto,"* in consequence of which expression this kind of metre was called *versi sciolti* or blank verse. In a very short time this form was largely adopted in Italian dramatic poetry, and the comedies of Ariosto, the *Aminta* of Tasso and the *Pastor Fido* of Guarini are composed in it. The iambic blank verse of Italy was mainly hendecasyllabic, not decasyllabic, and under French influences the habit of rhyme soon returned.

Before the close of Trissino's life, however, his invention had been introduced into another literature, where it was destined to enjoy a longer and more glorious existence. Towards the close of the reign of Henry VIII., Henry Howard, earl of Surrey, translated two books of the *Aeneid* into English rhymeless verse, "drawing" them "into a strange metre." Surrey soon found an imitator in Nicholas Grimoald, and in 1562 blank verse was first applied to English dramatic poetry in the *Gorboduc* of Sackville and Norton. By the year 1585 it had come into almost universal use for theatrical purposes. In Lyly's *The Woman in the Moon* and Peele's *Arraignment of Paris* (both of 1584) we find blank verse struggling with rhymed verse and successfully holding its own. The earliest play written entirely in blank verse is supposed to be *The Misfortunes of Arthur* (1587) of Thomas Hughes. Marlowe now immediately followed, with the magnificent movement of his *Tamburlaine* (1589), which was mocked by satirical critics as "the swelling bombast of bragging blank verse" (Nash) and "the spacious volubility of a drumming decasyllable" (Greene), but which introduced a great new music into English poetry. Except, however, when he is stirred by a particularly vivid emotion, the blank verse of Marlowe continues to be monotonous and uniform.

Shakespeare, after having returned to rhyme in his earliest dramas, particularly in *The Two Gentlemen of Verona,* adopted blank verse conclusively about the time that the career of Marlowe was closing, and he carried it to the greatest perfection in variety, suppleness and fullness. He released it from the excessive bondage that it had hitherto endured; as Robert Bridges has said, "Shakespeare, whose early verse may be described as syllabic, gradually came to write a verse dependent on stress." In comparison with that of his predecessors and successors, the blank verse of Shakespeare is essentially regular, and his prosody marks the admirable mean between the stiffness of his dramatic forerunners and the laxity of those who followed him. The ease and fluidity of his prosody were abused by his successors, particularly by Beaumont and Fletcher, who employed the soft feminine ending to excess; in Massinger dramatic blank verse came too near to prose, and in Heywood and Shirley it was relaxed to the point of losing all nervous vigour.

The later dramatists gradually abandoned that rigorous difference which should always be preserved between the cadence of verse and prose, and the example of Ford, who endeavoured to revive the old severity of blank verse, was not followed. But just as the form was sinking into dramatic desuetude, it took new life in the direction of epic, and found its noblest proficient in the person of John Milton. The most intricate and therefore the most interesting blank verse which has been written is that of Milton in the great poems of his later life. He reduced the elisions, which had been frequent in the Elizabethan poets, to law; he admitted an extraordinary variety in the number of stresses; he deliberately inverted the rhythm in order to produce particular effects; and he multiplied at will the caesurae or breaks in a line. *Paradise Lost* is full of instances of Milton's exquisite art in ringing changes upon the metrical type of ten syllables, five stresses and a rising rhythm, so as to make the whole texture of the verse respond to his poetical thought. Writing many years later in *Paradise Regained* and in *Samson Agonistes,* Milton retained his system of blank verse in its general characteristics, but he treated it with increased dryness and with a certain harshness of effect.

After the Restoration, and after a brief period of experiment with rhymed plays, the dramatists returned to the use of blank verse, and in the hands of Otway, Lee and Dryden, it recovered much of its magnificence. In the 18th century, Thomson and others made use of a very regular and somewhat monotonous form of blank verse for descriptive and didactic poems, of which the *Night Thoughts* of Young is, from a metrical point of view, the most interesting. With these poets the form is little open to licence, while inversions and breaks are avoided as much as possible. Since the 18th century, blank verse has been subjected to constant revision in the hands of Wordsworth, Coleridge, Shelley, Keats, Tennyson, the Brownings, Swinburne, E. A. Robinson, and Robert Frost, but no radical changes, of a nature unknown to Shakespeare and Milton, have been introduced into it.

See Ed. Guest, *A History of English Rhythms* (1882); J. Motheré, *Les Théories du vers héroïque anglais* (1886); J. Schipper, *Englische Metrik* (1881–88); Robert Bridges, *Milton's Prosody* (1894); J. A. Symonds, *Blank Verse* (1895); Walter Thomas, *Le Décasyllabe romain et sa fortune en Europe* (1904); G. Saintsbury, *A History of English Prosody* (1906–10).

BLANQUI, JEROME ADOLPHE (1798–1854), French economist, brother of L. A. Blanqui, the revolutionary, was born

at Nice. He was a pupil of J. B. Say, whom he succeeded in the chair of political economy at the Conservatoire des Arts et Métiers in 1833. He was, from 1830 to his death, head of the École de Commerce in Paris. Blanqui practically devoted the whole of his life to an examination of the condition of the working classes in different countries. His *Histoire de l'économie politique en Europe, depuis les anciens jusqu'à nos jours* (1838, 1842, and 1845), was translated into several languages.

BLANQUI, LOUIS AUGUSTE (1805–1881), French revolutionary, was born on Feb. 1, 1805, at Puget Théniers, where his father was sub-prefect. He studied both law and medicine, but early became interested in politics. He fought in the revolution of 1830, receiving a decoration for his services. He was rapidly disillusioned by the conduct of the new Government of Louis Philippe, and was active in the formation and direction of secret Republican societies. He was twice imprisoned, but in 1838 organized a new "Society of the Seasons" with Armand Barbès and Martin Bernard as colleagues. Its attempt at insurrection on May 12, 1839, was a fiasco, and Blanqui, with his colleagues, was arrested and sentenced to death commuted to imprisonment for life. He was later granted a formal pardon in the belief that he was dying, but he was not able to leave the prison hospital until just before the revolution of Feb. 1848. He now found himself the chief Republican club-leader, and continually pressed the Government to follow a more Socialist and Jacobin policy. As the most skilled tactician, he might have momentarily succeeded in this object had not Barbès ruined his influence by sponsoring a baseless charge of treachery. He was unable to prevent the senseless attack on the assembly on May 15, but suffered its consequences, being sentenced to ten years' imprisonment. During these years he thought out his political philosophy, becoming a Socialist and the first public advocate of the dictatorship of the proletariat (exercised through Paris) as the only means of achieving Communism. He resumed his organization of secret societies on his release in 1859, but after a second imprisonment directed operations from Belgium. By 1870 he was at the head of a secret armed and drilled force of about 4,000 men in Paris; he also had many adherents who were not included in his army. On the news of the disaster of Sedan the Blanquist army formed the "hard centre" which directed the energies of the indignant crowd, so that the downfall of the Empire was secured. It was not, however, able to influence the composition of the new Government except by forcing the inclusion of Henri Rochefort.

Blanqui, who was ardently patriotic, was infuriated by the slackness of the Government left behind in Paris by Gambetta to conduct the war. He believed, possibly truly, that it was more hostile to the "red" battalions of the National Guard than to the Prussians. On Oct. 31, 1870, the battalions which followed his lead came into conflict with the orthodox regiments, and for a few hours Blanqui was at the head of a provisional Government: he came, however, to an arrangement with the expelled Government and withdrew. On the signing by Thiers of the armistice of Jan. 27, 1871, Blanqui retired to the department of the Lot to recover his health, broken by exertion and disappointment. Here he was arrested by order of Thiers on the eve (March 17) of the latter's *coup d'état manqué,* which led to the Commune (*q.v.*). Though elected to a seat on this body, which was chiefly led by his followers, he was held a close prisoner until after its defeat, when he was again sentenced to imprisonment for life. As a result of considerable agitation, culminating in his election as deputy for Bordeaux, he was released in 1879, and ended his life in peaceful propaganda. The Blanquist Party was absorbed in the French Unified Socialist Party by negotiation in 1904–05.

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BLANTYRE, a town in the Blantyre district, Nyasaland Protectorate, 15° 47′ S., 35° 3′ E., and about 3,500 ft. above sea-level in the Shiré Highlands, 335 mi. by rail from the port of Beira. Pop. in 1939 was about 10,000 Africans, 350 Europeans. Blantyre is the principal commercial centre of Nyasaland with air service to Salisbury and to Beira. An all-weather road connects with Salisbury via Tete and Mtoko. Although Zomba is the administrative centre, Blantyre is the headquarters of the missionary societies. The town has a hospital, schools and a few hotels; the chief building is the Church of Scotland mission.

BLANTYRE (Gaelic, "the warm retreat"), civil parish, Lanarkshire, Scotland, S.E. of Glasgow. It contains the villages of High Blantyre, Blantyre Works (or Low Blantyre) and Stonefield. Pop. (1931), 17,015. The whole district is rich in coal. Blantyre Works was the birthplace of David Livingstone (1813–73) and his brother Charles (1821–73), who as lads were both employed as piecers in a local cotton-mill. The village has decayed since the closing of the dye-works. Scanty remains of Blantyre Priory (13th century), stand on the left bank of the Clyde, almost opposite the beautiful ruins of Bothwell Castle. High Blantyre and Blantyre Works are connected with Glasgow by the L.M.S. railway. Stonefield, the most populous place in the parish, entirely occupied with mining, lies between High Blantyre and Blantyre Works. Calderwood Castle on Rotten Calder Water, near High Blantyre, is picturesque.

BLARNEY, a castle and town in County Cork, Eire, 5 mi. northwest of the City of Cork on the Great Southern railway. Pop. (1936) 723. It manufactures tweed. The castle, built, *c.* 1446, by Cormac McCarthy, has walls as much as 18 ft. thick. The "Blarney Stone" in the castle is reputed to confer eloquence on those who kiss it; and the fame of the castle is also bound up with the civil history of the county and the War of the Great Rebellion.

BLASCO-IBÁÑEZ: *see* IBÁÑEZ, VICENTE BLASCO.

BLASHFIELD, EDWIN HOWLAND (1848–1936), American artist, was born Dec. 15, 1848 in New York city. He was a pupil of Bonnat in Paris, and became (1888) a member of the National Academy of Design in New York. For some years a genre painter, he later turned to decorative work, marked by rare delicacy and beauty of colouring. He painted mural decorations for a dome in the manufacturers' building at the Chicago exposition of 1893; for the dome of the Congressional library, Washington; for the capitols at St. Paul (Minn.), and Madison (Wis.); for the Baltimore court-house; in New York city for the Appellate court-house; the grand ballroom of the Waldorf-Astoria hotel; the Lawyers' club; and the residences of W. K. Vanderbilt and Collis P. Huntington; and in Philadelphia for the residence of George W. Drexel; and for the chancel of St. Saviour's. With his wife he wrote *Italian Cities* (1900), edited Vasari's *Lives of the Painters* (1896), published *Mural Painting in America* (1913), and was well known as a lecturer and writer on art. He became president of the society of mural painters, and of the society of American artists, and in 1915–16 was president of the national institute of arts and letters. He also served as vice-president of the American federation of arts, and president of the national academy of design. For his mural work in the court-house at Youngstown (O.) and in the State capitol of South Dakota, he received (1911) the gold medal of the architectural league.

BLASIUS or **BLAISE, SAINT,** bishop of Sebaste or Sivas in Asia Minor, martyred under Diocletian on Feb. 3, 316. The Roman Catholic Church keeps his festival on Feb. 3, the Orthodox Feb. 11. He is said to have been torn with woolcombers' irons before he was beheaded, and this seems to be the reason for his becoming the patron saint of woolcombers. In England St. Blaise was popular, and the council of Oxford in 1222 forbade all work on his festival. Owing to a miracle which he is alleged to have worked on a child suffering from a throat affection, St. Blaise's aid was held sovereign against throat and lung diseases.

See William Hone, *Every Day Book,* i. 210.

BLASPHEMY, literally, defamation or evil speaking, but more peculiarly restricted to an indignity offered to the Deity

by words or writing. By the Mosaic law death by stoning was the punishment for blasphemy (Lev. xxiv. 16). The 77th Novel of Justinian assigned death as the penalty, as did also the Capitularies.

In England before the Restoration blasphemy, in common with atheism and heresy, was cognizable in the Ecclesiastical Courts only, unless it was in any way political; and since it was not easy to distinguish scurrilous language against religion from heretical opinions, the blasphemer not seldom went to the stake. The last burnings *pro salute animae* were in 1612, and it was not until 1677 that the writ of *de haeretico comburendo* with all process thereon and all punishment of death was swept away by 29 Car. 2. C. 9. Blasphemy as distinguished from false doctrines, however, remained cognizable by the Ecclesiastical Courts, but spiritual censures had lost their sting, and since the Star Chamber and Court of High Commission, which formerly dealt with blasphemy on the political side, were extinct, the King's Bench claimed jurisdiction. The common law doctrine was first laid down by Hale C. J. in *Tayler's Case* in 1675, where the indictment was for words only (1 Vent. 298). "Although," said the Chief Justice, "such words were of ecclesiastical cognisance, yet the allegation that religion is a cheat tends to the dissolution of all government, and such kind of wicked and blasphemous words were not only an offense against God and religion but a crime against the law, State and Government and therefore punishable in this court. An indictment lay for saying the Protestant religion was a cheat, for [by] taking away religion all obligations to Government by oaths, etc., ceaseth, and Christian religion is part of the law itself." Tayler was found guilty and, as part of his punishment, stood in the pillory in Westminster Palace yard with a paper on his head inscribed with the charge, "For blasphemous words tending to the subversion of all government." *Woolston's Case* (1 Fitzg. 64) in 1728 completes the doctrine. "We do not," said Lord Raymond, "meddle with any difference of opinion, we interfere only where the very root of Christianity is itself struck at." This view was confirmed by Lord Mansfield in *Evans* v. *Chamberlain of London* (1762) (2 Burn's Ecc. Law, 207), when he said: "The common law of England knows no prosecution for mere opinions," and by Mr. Justice Erskine in *Shore* v. *Wilson* (1842) (9 Cl. and Fin. 534), when he said: "It is indeed still blasphemy, punishable at common law, scoffingly or irreverently to ridicule or impugn the doctrine of the Christian faith; yet any man may, without subjecting himself to any penal consequences, soberly and reverently examine and question the truth of those doctrines which have been essential to it." In his directions to the jury in *Reg.* v. *Bradlaugh* and *Reg.* v. *Ramsay and Foote* (1883) (15 Cox C. C. 217 and 230), Lord Coleridge C. J. declared that it is no longer true to say that "Christianity is part of the law of the land." To maintain that merely the denial of the truth of Christianity is indictable is absolutely untrue. If the decencies of controversy are observed, even the fundamentals of religion may be attacked without a person being guilty of blasphemous libel. He was followed by Phillimore J. in *R.* v. *Boulter* (1908) (72 J.P. 189) who said: "A man is free to speak and to teach what he pleases as to religious matters, though not as to morals, . . . but if, not for the sake of argument, he were to make a scurrilous attack on doctrines which the majority of people hold to be true, in a public place where passers-by may have their ears offended, and where young persons may come, he will render himself liable to the law of blasphemous libel." Here the defendant had become a public nuisance. In *Bowman* v. *Secular Society Ltd.* (1917), A.C. 406, Lord Sumner in an exhaustive review of the law doubted whether the maxim that Christianity is part of the law of the land was ever regarded to such an extent as to make any attack upon it, apart from scurrility, a criminal offence. It was held by the House of Lords that assuming the objects of the defendants to involve a denial of Christianity, (1) they were not criminal, inasmuch as the propagation of anti-Christian doctrines, apart from scurrility or profanity, did not constitute the offence of blasphemy; and (2) they were not illegal in the sense of rendering the Society incapable of acquiring property by gift, which was accordingly valid.

Profane cursing and swearing is made punishable by the Profane Oaths Act 1745, which directs the offender to be brought before a justice of the peace, and fined 5s., 2s., or 1s., according as he is a gentleman, below the rank of gentleman, or a common labourer, soldier, etc.

By the law of Scotland the penalty for blasphemy was death, but by an Act of 1825, amended in 1837, blasphemy was made punishable by fine or imprisonment or both.

In the United States the statutes of the several States on blasphemy did not abrogate the common law in all cases, but provided for particular proceedings and punishment. (H. H. L. B.)

BLASS, FRIEDRICH (1843–1907), German classical scholar, was professor at Kiel 1876–92, and at Halle 1892–1907.

Blass is chiefly known for his works in connection with the study of Greek oratory: *Die griechische Beredsamkeit von Alexander bis auf Augustus* (1865); *Die attische Beredsamkeit* (1868–80; 2nd ed., 1887–98), his greatest work; editions for the Teubner series of Andocides (1880), Antiphon (1881), Hypereides (1881, 1894), Demosthenes (Dindorf's ed. 1885), Isocrates (1886), Deinarchus (1888), Demosthenes (Rehdantz's ed., 1893), Aeschines (1896), Lycurgus, *Leocrates* (1902); *Die Rhythmen der attischen Kunstprosa* (1901); *Die Rhythmen der asianischen und römischen Kunstprosa* (1905). Among his other works are editions of Eudoxus of Cnidus (1887), the *Ἀθηναίων πολιτεία* (4th ed., 1903), a work of great importance and Bacchylides (3rd ed., 1904); *Grammatik des neutestamentlichen Griechisch* (1902; Eng. trans. by H. St. John Thackeray, 1905); *Hermeneutik und Kritik* and *Paläographie, Buchwesen, und Handschriftenkunde* (vol. i. of Müller's *Handbuch der klassischen Altertumswissenschaft,* 1891); *Über die Aussprache des Griechischen* (1888; Eng. trans. by W. J. Purton, 1890); *Die Interpolationen in der Odyssee* (1904); contributions to Collitz's *Sammlung der griechischen Dialektinschriften;* editions of the texts of certain portions of the New Testament (Gospels and Acts). His last work was an edition of the *Choephori* (1906). *See* notices in the *Academy,* March 16, 1907 (J. P. Mahaffy); *Classical Review,* May 1907 (J. E. Sandys), which contains also a review of *Die Rhythmen der asianischen und römischen Kunstprosa.*

BLAST FURNACE. The discovery that metallic iron can be reduced from the natural iron mineral with the aid of carbon and heat is lost in the mists of antiquity. In the middle ages iron was made in furnaces of relatively small size, in which pure ore was reduced to a pasty mass by means of charcoal, and this was subsequently hammered to get rid of the impurities. About the 15th century the type of furnace was altered by the addition of an upper portion, or stack, in which primary preparation of the materials took place. This revision made possible the melting of the metallic product, so freeing it from earthly impurities and giving a material, pig-iron, altogether different from the forged metal formerly made. Thus the blast furnace first came into use.

Up to the 18th century charcoal only had been used as the furnace fuel, but the depletion of the forests began to give cause for grave alarm. The difficulty was overcome by employing coke in place of charcoal, and the former is now used almost exclusively. The exact date of the introduction of coke is uncertain, as also is the name of the pioneer who first used it, but there is no doubt that Darby had established coke-smelting of iron in England on a commercial scale as early as 1709. Progress since then has been continuous, but slow, until the dawn of the 20th century. During the subsequent period the increase in number of furnaces and in the producing capacity of the units has been rapid. The outputs of the six principal iron producing countries and the world total are given below:

	1924 tons	1925 tons
United States	31,406,000	36,700,566
Germany	7,707,000	9,927,000
France	7,569,000	8,336,000
British Isles	7,307,000	6,262,000
Belgium	2,798,000	2,502,000
Luxembourg	2,123,000	2,325,000
World total	66,690,000	75,081,000

Theory of the Process.—Iron ores are distributed widely in nature in various forms, the principal being the oxides, ferrous oxide (FeO), the magnetic or black oxide (Fe_3O_4) and ferric oxide (Fe_2O_3). The bulk of the ore used is ferric oxide which is composed of two atoms of iron combined with three atoms of oxygen. Means therefore have to be provided to abstract the oxygen, thus leaving the metallic iron. The reducing agent

Examples of Furnace Operation in Various Parts of the World

OPERATING DATA.					
TECHNICAL DETAILS		England. The Carnforth Hematite Iron Co. (1915) Ltd. Carnforth	Germany. Bochumer Verein für Bergbau und Gusstahlfabrikation Bochum	U.S.A. Woodward Iron Co. Woodward Alabama	Japan. The Imperial Steel Works Yawata
Height of furnace from tuyeres to stockline—feet		63′ 6″	64′ 3″	67′ 2″	61′ 3″
Diameter of hearth—feet		13′ 0″	12′ 9″	17′ 6″	15′ 5″
Output of furnace—tons of iron per day		215 tons	640 tons	500 tons	270 tons
Quality of iron made		Hematite	Basic	Foundry	Acid-Bessemer
Analysis of Iron	Carbon	4·0%	3·97%	3·85%	3·98%
	Silicon	1·5% to 3·5%	0·58%	1·9%	1·57%
	Phosphorus	Up to 0·035%	0·128%	..	0·098%
	Sulphur	Up to 0·035%	0·035%	0·035%	0·04%
	Manganese	Up to 1·5%	2·96%	0·25%	1·13%
Iron content of burden excluding coke		45%	49%	37%	39%
Weight of coke charged per ton of iron made—lb.		2,576 lb.	1,760 lb.	2,649 lb.	2,318 lb.
Weight of slag per ton of iron made—lb.		1,120 to 1,680 lb.	1,235 lb.	2,700 lb.	1,482 lb.
Analysis of Slag	Silica	30% to 32%	33·05%	35·5%	33·52%
	Lime	49% to 54%	45·5%	49·02%	47·90%
	Magnesia.	3% to 4%	4·89%	0·56%	1·78%
	Alumina	8% to 10%	8·16%	12·54%	14·21%
	Oxides of:—iron, sulphur, manganese, phosphorus, etc.	Up to 10%	8·4%	2·38%	2·59%
Volume of air blast per ton of iron made—cu.ft.		142,340 cu.ft.	88,200 cu.ft.	147,430 cu.ft.	113,310 cu.ft.
Pressure of air blast—lb. per sq.in.		9 lb./sq.in.	11 lb./sq.in.	22·5 lb./sq.in.	9 lb./sq.in.
Temperature of air blast.—°F.		1,100°	1,040°	1,343°	1,157°
No. of air blast tuyeres		10	8	12	12
Dia. of air blast tuyeres		5·0in.	8·0in.	7·0in.	5·125in.
Volume of exit gas made per ton of iron 18 to 20hr. cu.ft.		181,050 cu.ft.	116,060 cu.ft.	206,640 cu.ft.	157,620 cu.ft.
Observed time materials are in furnace		18 to 20hr.	10hr.	12hr.	12 to 15hr.

is carbon, used under suitable temperature conditions. These conditions are readily ensured because the combination of carbon and oxygen, the ordinary process of combustion, results in the liberation of ample heat. Iron oxide, however, is never found in a pure state in nature. The ore always contains a proportion of gangue composed of silica, lime, alumina, magnesia, etc., which have to be removed in the process. At sufficiently high temperatures lime and silica combine along with the other earthy materials, and form a liquid slag which is lighter than the liquid iron. The slag therefore separates from the metal and floats on the top.

Pig-iron is by no means pure iron, the latter representing only about 91·0% of the total. With the iron are combined varying amounts of carbon, silicon, manganese, sulphur, and phosphorus, each constituent having an important effect on the quality of the pig-iron. In order that the product should be the quality required it is evident that the mass of material, or "burden" as it is called technically, from which the pig-iron is made must contain, in addition to iron, the requisite proportions of the other constituents mentioned. There is charged into the furnace therefore, (a) The burden which includes the ironstone, fluxes for forming the slag, and any other additions, *e.g.*, manganese ore or phosphoric rock, needed to give the proper manganese and phosphorus contents; (b) The fuel, which is generally coke, though charcoal is still employed for making special quality iron; (c) The air blast, which is injected above the hearth of the furnace to burn the fuel and maintain a sufficiently high temperature to render both metal and slag freely molten.

The section of a modern furnace is shown in fig. 1, the parts of the interior known as the stack, bosh and hearth respectively being indicated. The solid materials are charged into the top of the furnace whilst the air blast is blown through tuyeres into the hearth where the highest temperature (about 3,200° F) is generated. The oxygen of the air combines with the carbon of the coke, momentarily forming carbon dioxide, but as the hearth is full of incandescent coke, a reverse reaction rapidly takes place, the carbon dioxide being converted into carbon monoxide which is a powerful reducing agent. The hot gases composed of the carbon monoxide and the nitrogen of the air, along with some hydrogen derived from the dissociation of the moisture carried in the air, pass upwards through the column of solid materials, their temperature being progressively reduced as a result of direct contact and chemical reaction, until they leave the top at about 460° F. The constituents of the burden pass through the furnace in 14 to 18 hours. When charged they immediately come in contact with the hot gases and any moisture is quickly driven off. As they slowly descend the stack, the temperature increases and the carbon monoxide in the gases combines with the oxygen of the iron oxide to form carbon dioxide, leaving metallic iron in a finely divided form, or as iron sponge. The non-ferrous materials are mixed intimately with the reduced iron, and separation does not take place until near the top of the bosh, where both the iron and the slag begin to melt. The coke passes through the furnace with little change, except a constant increase in temperature, until it reaches the tuyere zone, where intense combustion takes place with the oxygen of the air blast. The bosh and hearth however are filled with coke and, as the slag and iron melt, the liquids trickle down until they reach the well formed in the bottom of the hearth, where they slowly accumulate and separate, the slag layer being on the top. The iron and slag are tapped from the furnace through separate tap boiler at intervals timed in accordance with the capacity of the furnace. The difference in the nature of the slag as compared with iron is apparent to experienced operators who skim the slag from the liquid stream into ladles placed to receive it. A large volume of gases, sufficiently rich in combustibles to be of value, is produced during the process. The combustible gases are the carbon monoxide and hydrogen, but the major volume is composed of the non-combustibles, nitrogen and carbon dioxide.

Furnace Construction.—The furnace shown is composed of a firebrick lining encased in a steel shell. Everything is of a substantial nature since it has to withstand strenuous work. The weight of the materials in the furnace may approach 400 tons

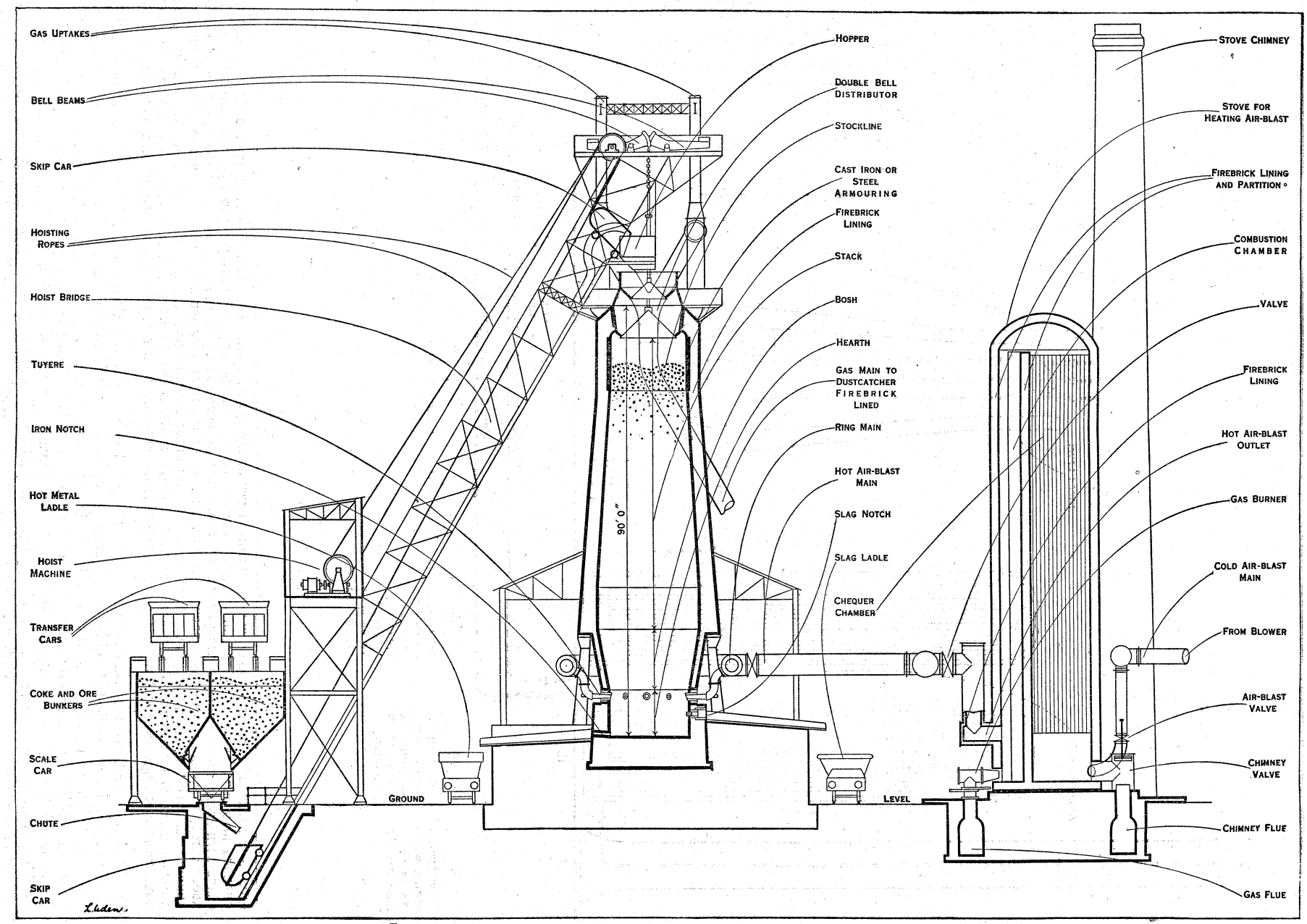


FIG. 1.—DIAGRAMMATICAL SKETCH OF A SECTION OF A MODERN BLAST FURNACE

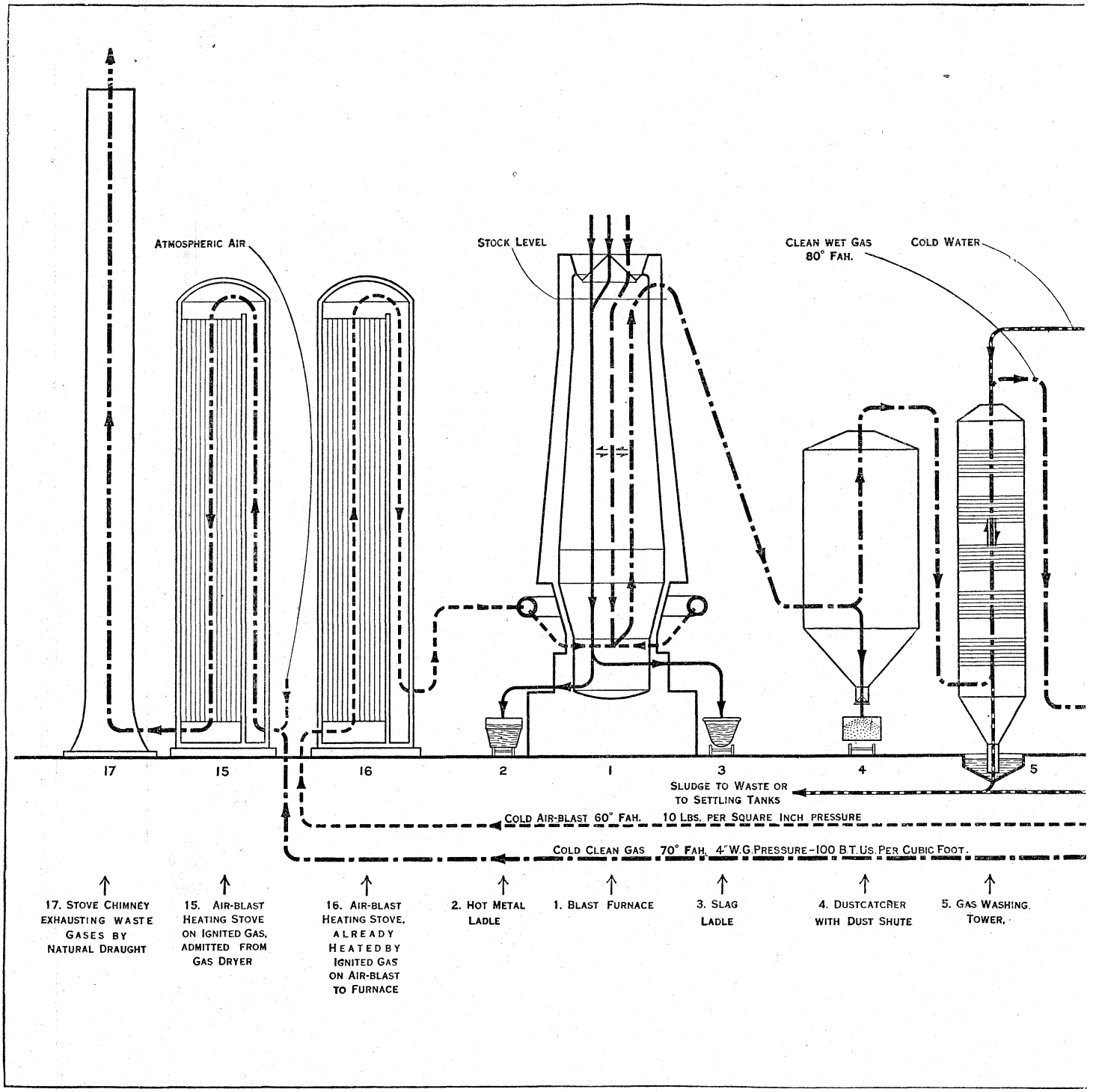
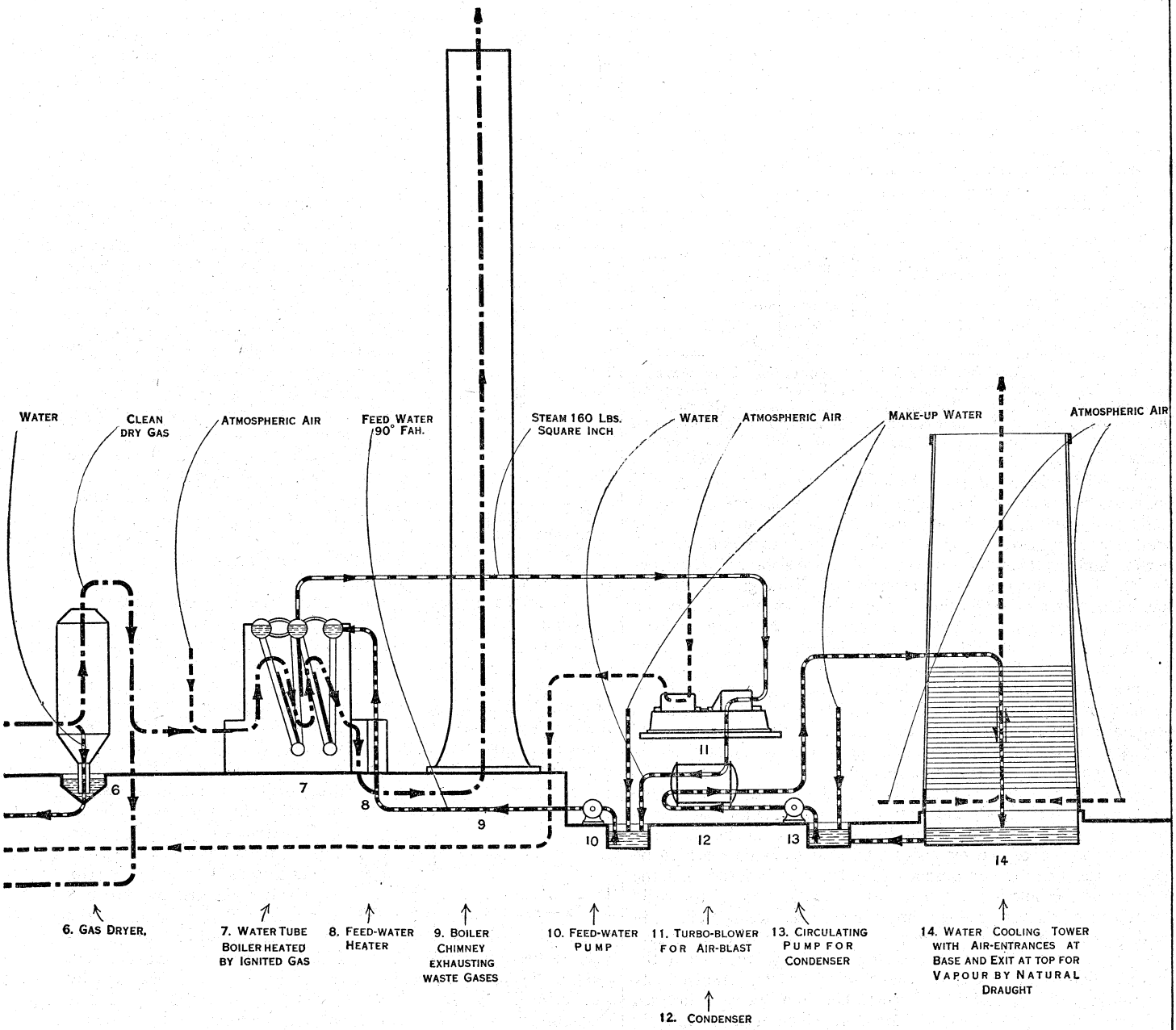


FIG. 2.—DIAGRAM OF A BLAST FURNACE PLANT, SHOWING FLOW OF AIR BLAST, WATER AND GASES. ORE, FLUX AND COKE (FUEL) ARE CHARGED INTO FURNACE (1) FROM TOP, UP TO STOCK LEVEL. AS THE BURDEN DESCENDS THERMAL AND CHEMICAL INTERCHANGE TAKES PLACE WITH ASCENDING GASES UNTIL THEY ARRIVE AT HEARTH IN A REDUCED FORM. METAL AND SLAG ARE MELTED BY COMBUSTION (TEMP. ABOUT 3,200° F) OF COKE BURNT WITH PREHEATED AIR (TEMP. ABOUT 1,400° F) SUPPLIED BY STOVES (15 AND 16) WHICH ARE HEATED BY BURNING BLAST-FURNACE GAS. THE STOVES ARE ON GAS AND AIR BLAST ALTERNATELY; AND A STEADY SUPPLY OF AIR PASSES THROUGH A HEATED STOVE TO THE TUYERES OF FURNACE. THE MOLTEN METAL (TEMP. ABOUT 2,650° F) AND SLAG (TEMP. ABOUT 2,770° F) TRICKLE DOWN TO FURNACE HEARTH WHERE THEY SEPARATE NATURALLY, THE SLAG BEING ON TOP. THEY ARE TAPPED OUT THROUGH SUITABLE HOLES

whilst that of the lining and structure is about 1,200 tons. Those parts of the furnace which are subjected to high temperatures are protected by water cooling. The life of a furnace lining is about five years, during which a quantity of iron up to one million tons may be made. The raw materials are discharged from trucks into bins, from which they are drawn as required into a scale car. After weighing they are emptied into a skip which is hoisted electrically on an inclined track to the top of the furnace, where it is automatically tipped and stopped. The materials are received on a bell which is capable of being mechanically revolved to any point in the complete circle, and after moving to the proper position are lowered on to a second and larger bell. When the latter is fully loaded by a series of deliveries from the upper bell, it is lowered and the materials slide into the furnace. The level of the solids is about eight feet below the large bell, and the intention of the arrangement described is to distribute the incoming charge evenly over the stock line without allowing any gases to escape to atmosphere through



AND TROUGHS INTO LADLES (2 AND 3). MEANWHILE GASES (TEMP. ABOUT 450° F) FORMED BY COMBUSTION OF THE COKE, AFTER PASSING THROUGH AND INTERACTING WITH THE BURDEN, LEAVE THE FURNACE INTO A GRAVITY DUSTCATCHER (4); THENCE INTO WASHER (5), WHERE THEY ARE CLEANED WITH WATER, AND ULTIMATELY INTO DRYER (6). A PORTION OF THE CLEAN GAS (TEMP. ABOUT 80° F) IS USED FOR FIRING BOILERS (7) IN WHICH IS GENERATED STEAM FOR TURBO-BLOWER (11). THE BLOWER WHICH MAY BE A STEAM-DRIVEN RECIPROCATING ENGINE, A STEAM-DRIVEN TURBO-BLOWER OR A GAS-DRIVEN RECIPROCATING ENGINE, WHICH FORCES AIR AT A SUITABLE PRESSURE TO HEATING STOVES, WHILST EXHAUST STEAM FROM THE TURBINE IS CONDENSED AND RETURNED TO BOILER. A PART OF THE REMAINING FURNACE GAS IS USED IN HEATING STOVES WHILST SURPLUS IS AVAILABLE FOR USE IN OTHER PROCESSES

the furnace top. Air blast at the pressure requisite for the circumstances is provided by a blower, which may be a steam-driven reciprocating engine, a steam-driven turbo-blower, or a gas-driven reciprocating engine. In any case the blast furnace gases are used as the source of motive power.

Neilson in 1829 discovered that increasing the temperature of the air blast before entry into the furnace resulted in a marked fuel economy, and air blast temperatures up to 1,800° F are now employed. Cowper stoves are used for heating the air blast, and each unit is composed of a mass of brickwork, arranged as chequer work, contained in a steel casing. The temperature of the brickwork is raised to the required intensity by the combustion of blast furnace gases. The gases are then shut off and the air blast allowed to pass through the stove on its way to the furnace. Two or more stoves are therefore required in order that the process may be continuous. The gases leaving the furnace are passed through primary dust-catchers and ultimately through towers where they are washed with water before use in the Cowper

stoves. The remainder of the gases are utilized in raising steam, or as direct fuel in blast furnace gas-driven engines. The distribution of the available gases is approximately as follows:—

Cowper stoves	= 27%
Power for air blast	= 15
Wastage	= 3
Available for other purposes	= 55
	100%

The diagram in fig. 2 shows a skeleton arrangement of a blast furnace plant and the data for typical practice are indicated.

Furnace Operation.—Many different qualities of pig-iron are made, representative examples being as follows:—

Class of iron.	Grade.	Analysis %				
		Total carbon.	Silicon.	Sulphur.	Phosphorus.	Manganese.
Hematite	No. 3	3·9	2·0	0·04	0·02-0·04	0·3
Foundry	No. 3	3·12	3·76	0·055	1·48	1·34
Basic	No. 3	3·25	1·8	0·03	1·8	1·8

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BLASTING, the process of rending or breaking apart a solid body, such as rock, by exploding within it or in contact with it some explosive substance. The explosion is accompanied by the sudden development of gas at a high temperature and under a tension sufficiently great to overcome the resistance of the enclosing body, which is thus shattered and disintegrated. Before the introduction of explosives, rock was laboriously excavated by hammer and chisel, or by the ancient process of "fire-setting," *i.e.*, building a fire against the rock, which, on cooling, splits and flakes off. To hasten disintegration, water was often applied to the heated rock, the loosened portion being afterwards removed by pick or hammer and wedge. In modern times blasting has become a necessity for the excavation of rock and other hard material, as in open surface cuts, quarrying, tunnelling, shaft-sinking and mining operations in general.

For blasting, a hole is generally drilled to receive the charge of explosive. The depth and diameter of the hole and the quantity of explosive used are all variable, depending on the character of the rock and of the explosive, the shape of the mass to be blasted, the presence or absence of cracks or fissures, and the position of the hole with respect to the free surface of the rock. The shock of a blast produces impulsive waves acting radially in all directions, the force being greatest at the centre of explosion and varying inversely as the square of the distance from the charge. This is evidenced by the observed facts. Immediately surrounding the explosive, the rock is often finely splintered and crushed. Beyond this is a zone in which it is completely broken and displaced or projected, leaving an enveloping mass of more or less ragged fractured rock only partially loosened. Lastly, the diminishing waves produce vibrations which are transmitted to considerable distances. Theoretically, if a charge of explosive be fired in a solid material of perfectly homogeneous texture and at a proper distance from the free surface, a conical mass will be blown out to the full depth of the drill hole, leaving a funnel-shaped cavity. No rock, however, is of uniform mineralogical and physical character, so that in practice there is only a rough approximation to the conical crater, even under the most favourable conditions. Generally, the shape of the mass blasted out is extremely irregular, because of the variable texture of the rock and the presence of cracks, fissures and cleavage planes. The ultimate or resultant useful effect of the explosion of a confined charge is in the direction where the least resistance is presented. In the actual work of rock excavation it is only by trial, or by deductions, based on experience, that the behaviour of a given rock can be determined and the quantity of explosive required properly proportioned.

Blasting, as usually carried on, comprises several operations: (1) drilling holes in the rock to be blasted; (2) placing in each hole the charge of explosive, with its fuse; (3) tamping the charge, *i.e.*, compacting it and filling the remainder of the hole with clay or fine rock cuttings, to prevent the charge from blowing out without breaking the rock; (4) igniting or detonating the charge; (5) clearing away the broken material. Drill holes ordinarily vary in diameter from 1 to 3in., and in depth from a few inches up to 15 or 20ft. or more. The deeper holes are made only in surface excavation of rock, the shallower, to a maximum depth of say 12ft., being suitable for tunnelling and underground mining.

Hand Drilling.—The work is either "single-hand" or "double-hand." In single-hand drilling, the miner wields the hammer with one hand, and with the other holds the drill or "bit," rotating it slightly after every blow in order to keep the hole round and prevent the drill from wedging fast; in double-hand work, one man strikes, while the other holds and rotates the drill. For large and deep holes, two hammer men are sometimes employed.

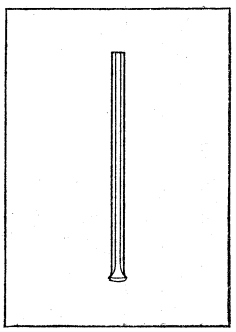


FIG. 1.—MINER'S DRILL. OCTAGONAL IN CROSS-SECTION

A miner's drill is a steel bar, occasionally round but generally of octagonal cross-section, one end of which is forged out to a cutting edge (fig. 1). The edge of the drill is made either straight, like that of a chisel, or with a convex curve, the latter shape being best for very hard rock. For hard rock the cutting edge should be rather thicker and blunter, and therefore stronger, than for soft rock. Drills are made of high grade steel, as they must be tempered accurately and uniformly. The diameter of drill steel for hand work is usually from $\frac{3}{4}$ to 1in., and the length of cutting edge, or gauge, of the drill is always greater than the diameter of the shank, in the proportion of from 7:4 to 4:3. Holes over 10 or 12in. deep generally require the use of a set of drills of different lengths and depending in number on the depth required. The shortest drill, for starting the hole, has the widest cutting edge, the edges of the others being successively narrower and graduated to follow each other properly, as drill after drill is dulled in deepening the hole. Thus the hole decreases in diameter as it is made deeper. The miner's hammer (fig. 2) ranges in weight from $3\frac{1}{2}$ to $4\frac{1}{2}$lb. for single-hand drilling, up to 8 or 10lb. for double-hand. If the hole is directed downward, a little water is poured into it at intervals, to keep the cutting edge of the drill cool and make a thin mud of the cuttings. From time to time the hole is cleaned out by the "scraper" or "spoon," a long slender iron bar, forged in the shape of a hollow semi-cylinder, with one end flattened and turned over at right angles. If the hole is directed steeply upward and the rock is dry, the cuttings will run out continuously during the drilling; otherwise the scraper is necessary, or a small pipe with a plunger like a syringe is used for washing out the cuttings. The "jumper" is a long steel bar, with cutting edges on one or both ends, which is alternately raised and dropped in the hole by one or two men. In rock work the jumper is rarely used except for holes directed steeply downward, though for coal or soft shale or slate it may be employed for drilling holes horizontally or even upward. Other tools used for rock-drilling are the pick and gad.

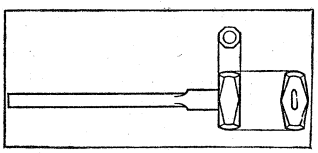


FIG. 2.—MINER'S SLEDGE-HAMMER

Holes drilled by hand usually vary in depth from say 18 to 36in., according to the nature of the rock and purpose of the work; though deeper holes are often made. For soft rock, single-hand drilling is from 20 to 30% cheaper than double-hand, but this difference does not hold good for the harder rocks. For these double-hand drilling is preferable, and may even be essential, to secure a reasonable speed of work.

Machine Drills.—The introduction of machine drills in the latter part of the 19th century exerted an important influence on the work of rock excavation in general, and especially on the art of mining. By their use many great tunnels and other works

involving rock excavation under adverse conditions have been rapidly and successfully carried out. Before the invention of machine drills such work progressed slowly and with difficulty.

General Classification.—(1) *e.g.*, Compressed-air reciprocating or piston drills; (2) hammer drills; (3) electric auger drills; (4) electric reciprocating drills; (5) hydraulic drills. Type (1) has become nearly obsolete having been almost entirely supplanted by type (2). Type (3) is largely used in coal mining. The others are of minor importance.

Although PISTON DRILLS (fig. 3) are now rarely listed by makers, some are still in service, and a brief description of them will lead to a better understanding of the hammer drill. They are operated by compressed air (or, for surface excavation, often by steam). The drill bit is firmly clamped to the piston rod and delivers a rapid succession of strong blows (300–400 per min.) on the bottom of the hole. The force of the blow is the resultant of the weight of the reciprocating parts, the length of stroke (both depending on the size of the drill cylinder), and the air pressure. These factors, together with the speed of stroke, determine the rate of advance, or drilling speed. Air pressures are commonly from 70 to 100lb. per sq. in. Practice has tended toward the higher pressures; but, though faster drilling may be done in some rocks by pressures above 90lb., the life of the drill is shortened and the repair cost increased. The softer rocks do not require pressure above, say, 80lb. Piston-drill cylinders are usually from 2½ to 3½in. diameter, though they have been made in smaller and larger sizes; normal length of stroke, 4 to 6in. The admission of compressed air, and therefore the speed and force of the blow, are controlled by a hand valve in the air pipe, close to the valve-chest of the drill. The piston works in a cylinder, provided with a valve motion somewhat similar to that of a steam-engine, together with a rifle-bar, working in the rear end of the piston, for producing the necessary rotation of the drill bit, to keep the hole round and prevent the bit from wedging. The machine is mounted on a tripod (fig. 3); or, if underground, sometimes on an iron column or bar, firmly wedged in position between the roof and floor, or side walls, of the tunnel or mine working.

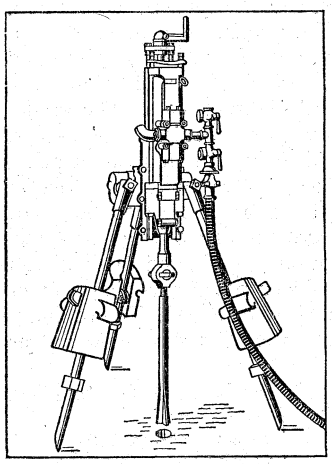
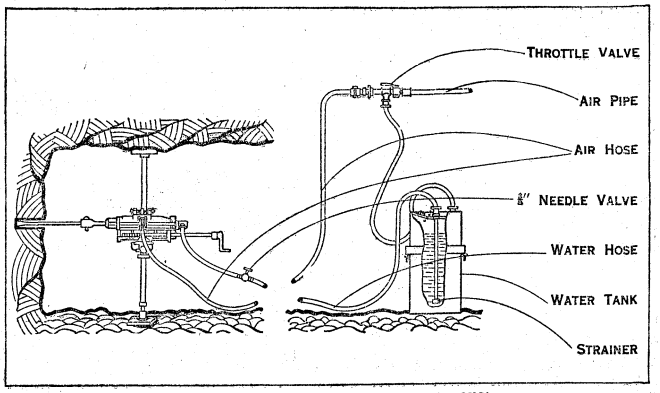


FIG. 3.—PISTON DRILL
The drill bit is rotated automatically. The piston is actuated by compressed air

While at work, the entire drill head is fed forward by a long, hand-operated screw, as the hole is deepened. When it has advanced as far as the length of the screw and supporting parts permit, the drill is stopped and a longer bit inserted. If the feed is faster than the hole is being deepened the stroke shortens, because the bit strikes the bottom before the full length of stroke is reached; conversely, with too slow a feed, the piston will strike the front cylinder head. Thus, by regulating the feed, the force of the blow is varied to suit the conditions. When starting a hole, the stroke should be short, until the bit has adjusted itself to the shape of the bottom of the hole. For hard rock, a short, rapid stroke, is best; a longer stroke for soft or tough rock. The cutting edge of the bit is usually cross or X-shaped.

Hammer Drills.—These first appeared about 1890, but were little used until the beginning of the 20th century. Since about 1910 they have almost entirely replaced piston or reciprocating drills for both surface and underground rock excavation, and are made in a great variety of forms and sizes. They weigh less, are more mobile and drill faster than reciprocating drills. Their principle was first applied in pneumatic riveters, and tools for chipping and other machine-shop work. They are best adapted to drilling holes directed steeply upward or downward, but can be used also for tunnelling and similar horizontal work.

Classification of Hammer Drills.—(1) Drills designed for tripod or column mounting (fig. 4), usually of the larger sizes, and comparable in their field of work to the old reciprocating machines; (2) drills with either a cross or D shaped handle (fig. 5), chiefly for holes directed steeply downward, the weight of the drill resting on the bit itself; (3) drills supported by an

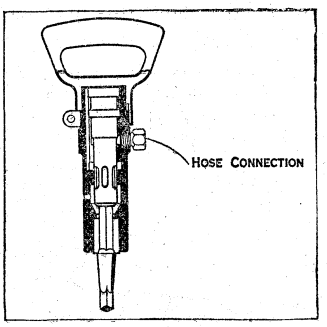


FROM PEELE, "MINING ENGINEERS' HANDBOOK" (JOHN WILEY & SONS)

FIG. 4.—MOUNTED HAMMER DRILL, CLASS 1, IN WHICH THE DRILL IS FED FORWARD BY A HAND-OPERATED FEED SCREW

automatic air-feed standard, primarily for holes directed upwards. They may be used for holes on the horizontal (fig. 6).

Details.—The bit of the hammer drill does not reciprocate; its shank projects into the forward end of the cylinder, where it is held loosely, and is struck a rapid succession of blows by the piston-like hammer. The cutting edge of the bit is in constant contact with the bottom of the hole, except during the slight rebound caused by each blow of the hammer. In machines of class (1) rotation of the bit is automatic, as in the old reciprocating drills. In classes (2) and (3) the bit is rotated by turning the drill on its axis by hand; though, in many of the later designs, a rifle-bar produces automatic rotation, as in class (1). To aid in keeping the hole round and true, the bit is commonly of the star or rosette shape, with six or eight radial cutting edges. As the bit does not reciprocate, it is evident that, for holes directed downwards, some automatic means must be provided for removing the drill dust or sludge; for, if the bottom of the hole is not kept clean, the useful effect of the hammer blows is decreased. To accomplish this a hollow bit is generally used, having a small-diameter hole longitudinally through its centre. By injecting through this hole a jet of water, the drillings are displaced and the bit is kept cool. The water, supplied from a small tank, in which water is kept under pressure by admitting compressed air from the air pipe, is delivered to the hollow bit by a small tube, passing through the rifle-bar and hammer, in the axis of the drill. When an air jet is used, it passes through a similar axial tube, the rear end of which is connected with the air supply; or, compressed air may be led directly to the bit from the valve chest. Details of the valve motion, for causing movements of the hammer, are too varied and technical to be described here (*see* Peele's *Compressed Air Plant*, 4th ed., 1925).



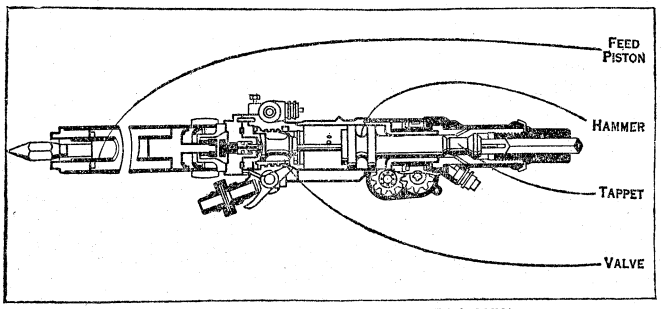
FROM PEELE, "MINING ENGINEERS' HANDBOOK" (JOHN WILEY & SONS)

FIG. 5.—D-HANDLE HAMMER DRILL
This type needs no mechanical feed. The weight of the drill rests on the bit in down holes; for holes in other directions the drill is pushed forward by the operator

As regards the feed of hammer drills, class (1) drills (fig. 4) are fed forward as the hole is deepened by a hand-operated feed screw, as in reciprocating drills (fig. 3). Class (2) drills (fig. 5) require no mechanical feed; the weight of the drill rests on the bit in down holes, and, for holes in other directions, the drill is simply pushed forward by the operator. Class (3) drills (fig. 6), chiefly for holes directed steeply upward, are supported by a long

telescopic air-feed standard, to which compressed air is admitted, thus automatically forcing the bit against the bottom of the hole.

Electric-driven Drills.—Referring again to the general classification of drills, electric auger drills (type 3) are useful in collieries, for boring in coal or soft shale. A twist bit, resembling a carpenter's wood auger, is driven by a diminutive electric motor, the whole being usually mounted on a light bar, set firmly between the roof and floor of the mine working. Electric



FROM ROBERT PEELE, "MINING ENGINEERS' HANDBOOK," (WILEY & SONS)

FIG. 6.—HAMMER DRILL WITH AIR-FEED STANDARD. CLASS 3. USED CHIEFLY FOR HOLES DIRECTED STEEPLY UPWARDS

percussion drills, although they have been on the market for many years, are not yet entirely successful in competition with compressed-air machines. The oldest, working on the solenoid principle, is difficult to lubricate, owing to the heat generated in the wire coils. Others, in which the reciprocations are produced mechanically by a small motor, have generally exhibited structural weakness, causing short life and high repair cost.

Hydraulic Drills.—These drills (type 5 of the general classification) are now represented by only one machine, the Brandt drill, which has been successfully used in Europe for driving several important railway tunnels. The pressure water is supplied by a pump to a pair of small hydraulic cylinders, which rotate slowly (at 6–8 revolutions per min.) a hollow bit having a serrated cutting edge. Under a pressure of 800 to 1,000 lb. per sq. in., the bit is forced against the bottom of the hole, thus crushing and grinding the rock, instead of chipping it. The hole is kept clean and the bit cooled by a stream of water through the hollow bit shank. Owing to its size and weight, this machine is not suitable for ordinary rock excavation, nor for mine work.

Whatever may be the method of drilling, after the hole has been completed to the depth required, it is finally cleaned out by a scraper or swab; or, when compressed-air drills are used, by a jet of air directed into the hole by a short piece of pipe connected through a flexible hose with the compressed-air supply pipe. The hole is then ready for the charge.

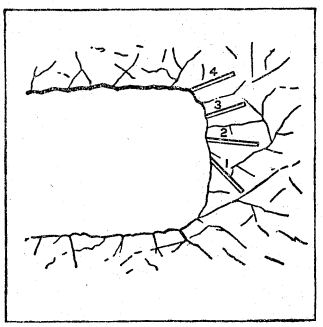


FIG. 7.—POSITIONS OF HOLES IN HAND-DRILLING
The holes are drilled in the succession of 1, 2, 3, 4

Location and Arrangement of Holes.—For hand drilling in mining the position of the holes is determined largely by the character and shape of the face of rock to be blasted. The miner observes the joints and cracks of the rock, placing the holes to take advantage of them and so obtain the best result from the blast. In driving a tunnel or drift, as in figs. 7 and 8, the rock joints can be made of material assistance by beginning with hole No. 1 and following in succession by Nos. 2, 3 and 4. Frequently the ore, or vein matter, is separated from the wall-rock by a thin and soft layer of clay (fig. 8). This would act almost as a free face, and the first holes of the round would be directed at an angle towards it, for blasting out a wedge; after which the positions of the other holes would be chosen.

When machine drills are employed, less attention is given to natural cracks or joints, chiefly because when the drill is once set up several holes at different angles can be drilled in succession by merely swinging the cylinder of the machine into a new position with respect to its mounting. According to one method, the holes are placed with some degree of symmetry, in roughly concentric rings, as shown by figs. 9 and 10. The centre holes are blasted first, and are followed by others in one or more volleys as indicated by the dotted lines. Another method is the "centre-cut," in which the holes are drilled in parallel rows on each side of the centre line of the tunnel, drift or shaft. Those in the two rows nearest the middle are directed towards each other, and enclose a prism of rock, which is first blasted out by heavy charges, after which the rows of side holes will break with relatively light charges.

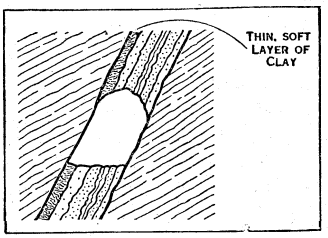
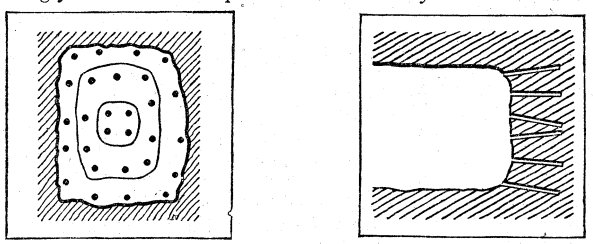


FIG. 8.—A CASE OF HAND-DRILLING IN WHICH THE ORE IS SEPARATED FROM THE WALL-ROCK BY A THIN LAYER OF CLAY

Explosives.—Up to 1864, gunpowder was the only available explosive, but in that year Alfred Nobel first used nitroglycerin for blasting, and in 1867 invented dynamite. This name was originally applied to his mixture of nitroglycerin with kieselguhr, but now includes also other mechanical mixtures or chemical compounds which develop a high explosive force as compared with gunpowder. Besides the dynamites there are flameless or safety explosives, used in dusty collieries or where inflammable gases are given off from the coal.

Gunpowder, or black powder, is seldom used for rock-blasting, except in quarrying building-stone, where a slow explosive of relatively low power is desirable to avoid shattering the stone, and in such collieries as do not require the use of safety explosives. Black powder is exploded by deflagration, by means of a fuse, and exerts a comparatively slow and rending force. The high explosives, on the other hand, are exploded by detonation, through the agency of a fuse and fulminating cap, exerting a quick, shattering, rather than a rending force. Dynamites and flameless explosives are made in a variety of strengths, and are packed in waterproofed cartridges of different sizes. The grades of dynamite most commonly employed are "straight" dynamites, which contain from 35 to 60% of nitroglycerin, and the gelatins, containing a maximum of about 93% of nitroglycerin gelatin. The stronger grades are used for tough rock or deep holes, or for holes unfavourably placed in narrow mine workings, as sometimes in shaft-sinking or tunnelling. When of good quality high explosives are safer to handle than black powder as they cannot be ignited by sparks and are not so easily exploded. The ordinary dynamites used in mining are about four times as powerful as black powder.

Nitroglycerin in its liquid form is rarely used for blasting,



FIGS. 9 AND 10.—SHOWING THE METHOD OF DRILLING FOR BLASTING IN CONCENTRIC RINGS, THE CENTRAL HOLE BEING BLASTED FIRST

partly because its full strength is not often necessary, but chiefly because of the difficulty and danger of transporting, handling and charging it. If employed at all, it is charged in thin tinned plate cases or rubber-cloth cartridges.

Blasting with Black Powder.—The powder is coarse-grained, usually from $\frac{1}{8}$ to $\frac{3}{16}$ in. in size, and is charged in paper cartridges, 8 to 10in. long and of a proper diameter to fit loosely in the drill hole. A piece of fuse, long enough to reach a little beyond the mouth of the hole, is inserted in the cartridge and tied fast. For wet holes paraffined paper is used, the miner water-

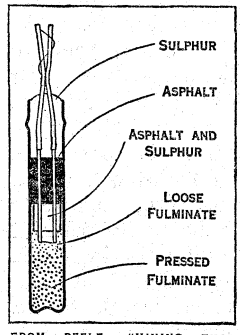
proofing the joints with grease. When more than one cartridge is required for the blast, that which has the fuse attached is usually charged last. The cartridges are carefully rammed down by a wooden tamping bar and the remainder of the hole filled with tamping. This consists of finely broken rock, dry clay or other comminuted material, carefully compacted by the tamping bar on top of the charge. The fuse is a cord, having in the centre a core of gunpowder, enclosed in several layers of linen or hemp waterproofed covering. It is ignited by the miner's candle or lamp, or by a candle end so placed at the mouth of the hole that the flame must burn its way through the fuse covering. As the fuse burns slowly, at the rate of 2 or 3ft. per minute, the miner uses a sufficient length to allow him to reach a place of safety. For blasting in coal, "squibs" instead of fuses are often used. A squib is simply a tiny paper rocket, about $\frac{1}{8}$in. diameter by 3in. long, containing fine gunpowder and having a sulphur slow-match at one end. It is fired into the charge through a channel in the tamping. This channel may be formed by a piece of $\frac{1}{4}$in. gas pipe, tamped in the hole and reaching the charge; or a "needle," a long taper iron rod, is laid longitudinally in the hole, with its point entering the charge, and after the tamping is finished, by carefully withdrawing the needle a little channel is left, through which the squib is fired. In this connection it may be noted that for breaking ground in grassy collieries several substitutes for explosives have been used to a limited extent, *e.g.*, plugs of dry wood driven tightly into a row of drill holes, and which, on being wetted, swell and split the coal; quicklime cartridges, which expand powerfully on the application of water; simple wedges, driven by hammer into the drill holes; multiple wedges, inserted in the holes and operated by hydraulic pressure from a small hand force-pump.

Blasting with High Explosives.—High explosives are fired either by ordinary fuse and detonating cap or by electric fuse. Detonating caps of ordinary strength contain 10 to 15 grains of fulminating mixture. The cap is crimped tight on the end of the fuse, embedded in the cartridge, and on being exploded by fire from the fuse detonates the charge. The number of cartridges charged depends on the depth of hole, the length of the line of least resistance, and the toughness and other characteristics of the rock. Each cartridge should be solidly tamped, and, to avoid waste spaces in the hole, which would reduce the effect of the blast, it is customary to split the paper covering lengthwise with a knife. This allows the dynamite to spread under the pressure of the tamping bar. The cap is often placed in the cartridge preceding the last one charged, but it is better to insert it last, in a piece of cartridge called a "primer." Though the dynamites cannot be exploded by sparks, they should nevertheless always be handled carefully. It is not so essential to fill the hole completely nor so thoroughly to compact the tamping, as in charging black powder, because of the greater rapidity and shattering force of the explosion of dynamite; tamping, however, should never be omitted, as it increases the efficiency of the blast. In exploding dynamite, strong caps, containing not less than 15 grains of fulminating powder, produce the best results. Weaker caps are not economical, as they do not cause complete detonation. This is specially true if the weather be cold. Dynamite then becomes less sensitive, and the cartridges should be gently warmed before charging to a temperature of not more than 80° F. Poisonous fumes are often produced by the explosion of the nitroglycerin compounds. These are probably largely due to incomplete detonation, by which part of the nitroglycerin is vaporized or merely burned. This is most likely to occur when the dynamite is chilled, or of poor quality, or when the cap is too weak. There is generally but little inconvenience from the fumes, except in confined underground workings, where ventilation is imperfect.

Like nitroglycerin, the common dynamites freeze at a temperature of from 42° to 46° F. They are then comparatively safe, and so far as possible should be transported in the frozen state. At very low temperatures dynamite again becomes somewhat sensitive to shock. When it is frozen at ordinary temperatures even the strongest detonating caps may fail to develop the full force. In thawing dynamite, care must be exercised. The fact that a small quantity will often burn quietly has led to the dangerously mistaken notion that mere heating will not cause explosion. It is chiefly a question of temperature. If the quantity ignited by flame be large enough to heat the entire mass to the detonating point (say 360°) before all is consumed, an explosion will result. Furthermore, dynamite, when even moderately heated, becomes extremely sensitive to shocks. There are several accepted modes of thawing dynamite: (1) In a water bath, the cartridges being placed in a vessel surrounded on the sides and bottom by warm water contained in a larger enclosing vessel. The warm water may be renewed from time to time, or the water bath placed over a candle or small lamp, *not* on a stove. (2) In two vessels, similar to the above, with the space between them occupied by air, provided the heat applied can be definitely limited, as by using a candle. (3) When large quantities of dynamite are used a supply may be kept on shelves in a wooden room or chamber, warmed by a stove, or by a coil of pipe heated by exhaust steam from an engine. Live steam should not be used, as the heat might become excessive. Thawing should always take place slowly, never before an open fire or by direct contact with a stove or steam pipes and care must be taken that the heat does not rise high enough to cause sweating or exudation of liquid nitroglycerin from the cartridges, which would be a source of danger.

For the storage of explosives at mines, etc., proper magazines must be provided, situated in a safe place, not too near other buildings, and preferably of light though fireproof construction. Masonry magazines, though safer from some points of view, may be the cause of greater damage in event of an explosion, because the brick or stones act as projectiles. Isolated and abandoned mine workings, if dry, are sometimes used as magazines.

Firing Blasts by Electricity.—This has a wide application for both surface and underground work. An electrical fuse (fig. 11) consists of a pair of fine, insulated copper wires, several feet long and about $\frac{1}{40}$ of an inch in diameter, with their bare ends inserted in a detonating cap. For firing, the fuse wires are joined to long leading wires, connected with some source of electric current. By joining the fuse wires in series or in groups, any number of holes may be fired simultaneously, according to the current available. A round of holes fired in this way, as for driving tunnels, sinking shafts, or in large surface excavations, produces better results, both in economy of explosive and effect of the blast, than when the holes are fired singly or in succession. Also, the miners are enabled to prepare for the blast with more care and deliberation, and then to reach a place of safety before the current is transmitted. Another advantage is that there is no danger of a hole "hanging fire," which sometimes causes accidents in using ordinary powder fuses.



FROM PEELE, "MINING ENGINEERS' HANDBOOK"

FIG. 11.—ELECTRIC BLASTING CAP

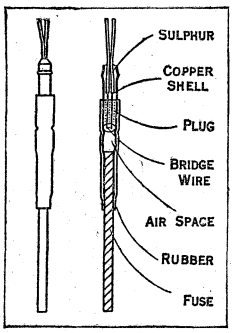
Hanging fire may be due to a cut, broken or damaged powder fuse, which may smoulder for some time before communicating fire to the charge. "Misfires," which also are of not infrequent occurrence with both ordinary fuse and electric fuses, are cases where explosion from any cause fails to take place. After waiting a sufficient length of time before approaching the charged hole, the miner carefully removes the tamping down to within a few inches of the explosives and inserts and fires another cartridge, the concussion usually detonating the entire charge. Sometimes another hole is drilled near the one which has missed. No attempt to remove the old charge should ever be made.

Low-tension electricity is now always used. It is generated by a small, portable, hand-operated dynamo, or taken from any convenient electric circuit. High-tension machines are too fragile and the detonators are more apt to deteriorate. The end of the fuse wires in the low-tension cap are connected by a fine platinum filament (fig. 11), embedded in loose fulminate on top of a compressed fulminating mixture, and explosion results from the

heat generated by the resistance opposed to the passage of the current through the filament. Blasting machines are made in several sizes, the smaller ones being capable of firing simultaneously from 10 to 20 holes. Fuses must be of uniform electrical resistance, to ensure that all the connected charges will explode simultaneously. The premature explosion of any one fuse would break the circuit.

Delay electric blasting caps are for firing groups of holes in two or three volleys, with one application of the electric current. The cap shell is extra long. Between the fulminate and the priming ignited by the current is a short piece of slow-burning ordinary powder-fuse. Hence there is an appreciable interval between the passage of the current and the detonation of the cap.

These caps cannot be used in series with ordinary electric caps. They require a special "no-delay" detonator, because first- and second-period delay-action caps are less sensitive to ignition. The entire round of holes is wired as for simultaneous firing. When current is transmitted, about one second elapses before the first-delay caps detonate, and the same interval between these and the second-delay. Delay caps are specially useful in tunnelling and shaft-sinking, as they enable the blaster to fire an entire round of holes without returning to the working place.



FROM PEELE, "MINING ENGINEERS' HANDBOOK"
FIG. 12.—ELECTRIC FUSE IGNITER

Electric fuse igniters serve the same purpose; they light simultaneously powder fuses of different lengths. Electric squibs, for firing black powder, are useful in coal mining. For further details of electric blasting, *see* Peele's *Mining Engineer's Handbook* (2nd ed., 1927).

Definite rules for the proportioning of blasting charges are rarely observed, and although the blasts made by a skilful miner seldom fail to do their work, too much, rather than too little, explosive is often used. High explosives are specially liable to be wasted, probably through lack of appreciation of their power as compared with that of black powder. Among the indications of excessive charges are the production of much finely broken rock or of crushed and splintered rock around the bottom of the hole, and excessive displacement or projection of the rock broken by the blast. In beginning any new piece of work, such waste may be avoided or reduced by making trial shots with different charges and depths of hole, and noting the results; also by letting contracts under which the workmen pay for the explosive. In surface rock excavation the location and determination of the depth of the holes and the quantity of explosive used are occasionally put in charge of one or more skilled men, who direct the work and are responsible for the results obtained.

Blasting in surface excavations and quarries is sometimes done on an immense scale—called "mammoth blasting." Shafts are sunk, or tunnels driven, in the mass of rock to be blasted, and, connected with them, a number of chambers are excavated to receive the charges of explosive. The preparation for such blasts may occupy months, and many tons of black powder or dynamite may be exploded simultaneously, breaking or dislodging thousands of tons of rock. This method is adopted for getting stone cheaply, as for building macadamized roads, dams and breakwaters, obtaining limestone for blast furnace flux, and occasionally in excavating large railway cuttings. It is also applied in submarine blasting for the removal of reefs obstructing navigation, and sometimes for loosening extensive banks of partly cemented gold-bearing gravel, preparatory to washing by hydraulic mining.

BIBLIOGRAPHY.—For further information on drilling and blasting *see* Daw, *The Blasting of Rock* (1898); Foster, *Text-book of Ore and Stone Mining* (1900); Hughes, *Text-book of Coal Mining* (1901); Gillette, *The Excavation of Rock* (1904); Peele, *Mining Engineer's Handbook* (2nd ed., 1927), sections 4, 5, 6, 7, 10 and 15. Also *Proc. Inst. Civ. Eng.* (London), vol. lxxxv. p. 264; *Trans. Inst. Min. Eng.* (England), vols. xiv.–xvi. (arts. by W. Maurice), vol. xxvi. pp. 322, 348, vol. xxiv. p. 526; *Trans. Amer. Soc. Civ. Eng.*, vol. xxvii. p. 530; *Trans. Amer. Inst. Min. Eng.*, vol. lxvii. p. 213, lviii. p. 3, lxvi. p. 743, lxviii. p. 216, lxiv. p. 271, lxxi. p. 1248, lxxiv. pp. 512 and 690; *Trans. Inst. Min. and Met.*, vol. xxxii. p. 115, xxxv. p. 390; *Eng. and Min. Jour.*, serial, Aug. 17, 1921, p. 340 to Oct. 1, 1921, p. 538, Jan. 21, 1922, p. 104, March 18, 1922, p. 446, April 14, 1923, p. 670, Nov. 29, 1924, p. 845, Feb. 2, 1924, p. 197, July 10, 1926, p. 44, Nov. 20, 1926, p. 804, Dec. 4, 1926, p. 897; *Iron and Coal Trades Rev.*, Jan. 15, 1926, p. 100; *Coll. Eng.*, July 1925, p. 323; *Coal Age*, Dec. 24, 1925, p. 881; *U.S. Bur. of Mines*, Tech. Papers 210, 294 and 364; *Coll. Guardian*, Nov. 27, 1925, p. 1279, Dec. 4, 1925, p. 1341. (R. PE.)

BLAST LAMP: *see* BLOWPIPE.

BLASTOCOELE, the name applied to the "segmentation cavity" formed in the fertilized ovum by its division into numerous cells. In the blastula (*q.v.*) the blastocoele is often large, particularly in eggs without much yolk; in heavily-yolked eggs there may be no blastocoele visible. On the formation of the gastrula the blastocoele is largely obliterated and the remains of it become filled up with mesoderm. *See* EMBRYOLOGY.

BLASTOMERE, the term used to denote any of the cells resulting from the segmentation of the fertilized egg (zygote, *q.v.*). *See* EMBRYOLOGY.

BLASTULA, the stage in the development of the fertilized egg before invagination (in-pushing of one end) or epiboly (overgrowth of one pole by the cells from the other) have produced a gastrula. The blastula of lightly-yolked eggs contains a large segmentation cavity, the blastocoele (*q.v.*). *See* EMBRYOLOGY.

BLAVATSKY, HELENA PETROVNA (1831–1891), was born at Ekaterinoslav. She was the daughter of Col. Peter Hahn de Rottenstein-Hahn (of a noble family of Mecklenburg, settled in Russia), and, on her mother's side, was granddaughter of the Princess Helena Dolgorouki. She married, in her 17th year, a man much her senior, Councillor of State Nicephore Blavatsky, but separated from him after a few months, and for many years travelled in various parts of the world, visiting Canada, the U.S.A., Texas, Mexico, and India. In 1852 she made an unsuccessful attempt to enter Tibet, but succeeded in doing so in 1856. She afterwards returned to Russia, but in 1864 she again travelled in Europe, and was associated with the forces of Garibaldi at the battle of Mentana. In 1873 she went to New York, where she became associated with many prominent persons who were then investigating the phenomena of spiritualism. She showed them that she could herself produce many of the phenomena without the aid of the "spirits," or "spooks" as she called them. Among those who were interested in these phenomena was Col. H. S. Olcott, a U.S.A. Government official; and with his aid, and that of Wm. Q. Judge and others, Madame Blavatsky founded in New York, on Nov. 17, 1875, the Theosophical Society. In 1877 she published *Isis Unveiled,* containing startling theories concerning the evolution of humanity and of religion. This immediately attracted an enormous amount of attention and criticism.

In 1879 she and Col. Olcott went to India, and there reorganized the Theosophical Society on the basis of the three objects for which it has nominally existed: (1) to form a nucleus of the universal brotherhood of humanity, (2) to promote study of comparative religion, philosophy and science, (3) to investigate the unexplained laws of nature and the powers latent in man. The headquarters of the society were established at Adyar, a suburb of Madras, and whilst in India Madame Blavatsky exhibited many phenomena which were accepted by many, and often discredited by those who had not witnessed them; every effort was made in certain quarters to bring her work and teaching into disrepute. Notwithstanding this opposition, and a very adverse report on her phenomena by a member of the Society for Psychical Research, who went out to India to investigate, but never saw any phenomena himself, Madame Blavatsky had in 1891 nearly 100,000 acknowledged followers in all parts of the world. She died on May 8, 1891; and this day is commemorated by her followers as "White Lotus Day."

BIBLIOGRAPHY.—In addition to *Isis Unveiled,* Madame Blavatsky published in exposition of her teachings *The Secret Doctrine* (1888), *The Key to Theosophy* (1889), *The Voice of the Silence* (1889), and a *Glossary of Theosophical Terms* (1890–91), besides several less important works. *See* A. P. Sinnett, *Incidents in the Life of Madame Blavatsky* (1913); A. L. Cleather, *H. P. Blavatsky, her Life and Work for Humanity* (Calcutta, 1922); *Letters of H. P. Blavatsky to A. P. Sinnett, ed.* A. T. Barker, (1925).

BLAYDES, FREDERICK HENRY MARVELL (1818–1908), English classical scholar, was born at Hampton Court Green, Sept. 29 1818. He was vicar of Harringworth, Northamptonshire (1843–86) and died at Southsea on Sept. 7 1908. His editions and philological papers are remarkable for bold conjectural emendations.

His works include: Aristophanes: *Comedies and Fragments,* with critical notes and commentary (1880–93); *Clouds, Knights, Frogs, Wasps* (1873–78); *Opera Omnia,* with critical notes (1886); Sophocles: *Oedipus Coloneus, Oedipus Tyrannus* and *Antigone* (in the Bibliotheca Classica, 1859); *Philoctetes* (1870), *Trachiniae* (1871), *Electra* (1873), *Ajax* (1875), *Antigone* (1905); Aeschylus: *Agamemnon* (1898), *Choephori* (1899), *Eumenides* (1900), *Adversaria Critica in Comicorum Graecorum Fragmenta* (1890); *in Tragicorum Graec. Frag.* (1894), *in Aeschylum* (1895), *in Varios Poetas Graecos et Latinos* (1898), *in Aristophanem* (1899), *in Sophoclem* (1899), *in Euripidem* (1901), *in Herodotum* (1901); *Analecta Comica Graeca* (1905); *Analecta Tragica Graeca* (1906).

BLAYDON, urban district and manufacturing town, Durham, England, on the Tyne, 4 mi. W. of Newcastle by the L.N.E. Ry. Pop. (1938) 30,790. Area 14.6 sq.mi. Its situation very frequently involved it in border warfare. Nearby is the beautiful old mansion of Stella, and below it Stellaheugh, to which the victorious Scottish army crossed from Newburn, on the Northumberland bank, in 1640, afterwards occupying Newcastle. Blaydon developed with the Northumberland and Durham coal-field. Half the male population is normally engaged in coal-mining, but a feature of this region and of Blaydon in particular is the development of by-products based on coal. The town has extensive coke ovens, while the iron foundries, and the manufactures of machinery, tools, fire-bricks and to some extent bottle glass, are of great importance.

BLAYE-ET-STE. LUCE, town in France, capital of an arrondissement in the department of Gironde, on the right bank of the Gironde (here over 2 mi. wide), 35 mi. N. of Bordeaux by rail. Pop. (1936), 2,858. In ancient times Blaye (*Blavia*) was a port of the Santones. As a crossing-place of the Gironde the site, avoiding the double crossing of the Dordogne and Garonne, was specially important on the Pilgrim Way (*La Route St. Jacques*) from Brittany to Roncevaux and Compostella. Tradition states that the hero Roland was buried in its basilica, sacrificed with other old buildings to make room for Vauban's citadel (1685). Blaye played an important part in the wars against the English and in the Religious Wars. The citadel, on a rock near the river, includes the ruins of an old Gothic château. Fort Pâté on an island in the river and Fort Médoc on its left bank, are 17th-century fortifications. The town is the seat of a sub-prefect, and has tribunals of first instance and of commerce.

BLAZE, a fire or bright flame (A.S. *blaese,* a torch). The use of the word for the white mark on the face of a horse or cow, and the American use for a mark made on a tree by cutting off a piece of the bark is akin to the Ger. *blass,* pale or white. The word "to blaze" in the sense of to noise abroad, comes from the A.S. *blaesan,* to blow, *cf.* the Ger. *blasen;* in sense, if not in origin, it is confused with "blazon" in heraldry.

BLAZING STAR, various plants with conspicuous flowers, especially the button snakeroot, colic-root and devil's-bit, all from North America; and the South African plants of *Tritonia.*

BLAZON, a heraldic shield, a coat of arms properly "described" according to the rules of heraldry, hence the proper heraldic description of such a coat. The O.Fr. *blason* seems originally to have meant a shield for self defence, but this is difficult to reconcile with the generally accepted derivation from the Ger. *blasen,* to blow, proclaim; English "blaze," to noise abroad, to declare.

BLEACHERS, an American term given to the uncovered tiers of benches surrounding the outfield of a baseball diamond. The name probably originated in the fact that the seats are not protected from the sun, with the result that their occupants literally go through a bleaching process while watching a baseball game. Despite their inconveniences the bleachers are popular with the baseball fans. They are cheaper than the more sheltered seats of the boxes and covered stands, and this fact compensates for the heat and sun-burn which invariably go with them.

BLEACHING. This term implies the whitening of objects or depriving them of colour. In its industrial application, however, the term signifies not only the removal of the natural colour but other impurities from cotton, linen, wool, silk and other fibres, paper-pulp, bees' wax, and some oils. The removal of colours which have been acquired by dyeing textiles is called "stripping," and the local bleaching of parts of a coloured piece in printing silk or calico is termed "discharging." Flour, sugar, and many other substances are decolourized in the course of their preparation for the market.

The art of bleaching textile fabrics, such as linen and wool, is of great antiquity and seems to have been familiar to all the civilizations of the world. Egyptians, Phoenicians, Greeks, and Romans are known to have produced white linen goods, but little is known of the methods which they employed. Pliny refers to the use of plants and the ashes of plants, mentioning especially the "Struthium," which was probably the plant *Saponaria officinalis.* Information about bleaching in Europe was difficult to obtain until after the last of the crusades, when the Dutch established a great reputation as linen bleachers, and retained almost a monopoly of that industry down to the middle of the 18th century. Bleaching grounds are said to have existed near Manchester, England, as early as 1322, and there was a bleachworks at Southwark, near London, in the middle of the 17th century, but the bulk of the brown linen manufactured in Scotland was sent to Holland to be bleached. It was sent to the neighbourhood of Haarlem in the month of March, and was not returned till the end of October. In 1728 the Scottish Board of Manufactures accepted a proposal made by James Adair of Belfast to establish a bleachfield in Galloway, and devoted £2,000 as premiums for the establishment of bleachfields throughout the country. With the assistance of the same Board, R. Holden in 1732 set up a bleachfield at Pitkerro, near Dundee, where he used a method of bleaching with kelp.

The British bleachers (who were sometimes called whitsters) appear to have been taught, or to have copied, the methods of the Dutch, which consisted in steeping the linen in alkaline lyes for several days, washing it clean, and spreading it on the grass for some weeks. These processes, called respectively bucking and crofting, were repeated alternatively for five or six times. The cloth was then steeped in sour milk or butter milk for some days, washed clean, and again crofted. The processes were repeated until the material had acquired the requisite whiteness. In 1736 an act was passed in England which permitted cotton to enter into the composition of cloth and this gradually resulted in the manufacture of larger quantities of material, and consequently a greater demand for bleaching.

A very effective means of shortening the time of bleaching was the substitution of sour milk by dilute sulphuric acid. This method of "souring" was suggested by Dr. Francis Home, of Edinburgh, who in 1756 published a scientific work on bleaching. It was found that water acidulated with sulphuric acid would bring about an effect in 12 to 24 hours which could be obtained only after steeping for six to eight weeks in sour milk. This reduction in the time of bleaching rendered it possible for the merchant to dispose of goods so much sooner and consequently to trade with less capital.

A far reaching change in the character of the bleaching industry commenced in the year 1787. In that year chlorine, discovered in 1773 by Scheele, was used in the works of Macgregor, of Glasgow, where its application had been suggested by James Watt, who was the son-in-law of the owner. Watt had gained his information about oxygenated muriatic acid, as chlorine was then called, from Berthollet, who was the first to record the effect of the gas in bleaching the natural colour of linen. In a paper read before the Academy of Sciences at Paris, in 1785, and published in the *Journal de Physique* (vol. xxvi. p. 325) Berthollet mentioned that he had found the gas to answer perfectly in the bleaching of cloth. Further work was recorded in the *Journal de Physique* (1786). Thomas Henry, of Manchester, was the first to bleach with chlorine in the Manchester district. At this period, the bleacher made his own chlorine and exposed the fabric in

chambers to the action of the gas, or steeped them in an aqueous solution. The process was inconvenient, disagreeable and, worst of all, detrimental to the health of the workers, so it was not surprising that, in spite of the rapid bleaching action, the method did not gain great favour. Considerable improvement was effected by the introduction, in 1792, of eau de Javel, which was made near Paris by absorbing chlorine in a solution of potash (one part) in water (eight parts) until effervescence began. In 1799 Charles Tennant, of Glasgow, successfully prepared bleaching powder by passing chlorine over lime and was able to supply the bleacher with a reagent in solid form, which contained up to one-third of its weight of available chlorine. The pleasant fields, where the industrious farmer could spread his cloth in the summer sun, were soon covered with buildings, and that part of the process which was formerly left to light, air, and moisture was carried out by the aid of calcium hypochlorite—the active constituent of bleaching powder solution. Attempts to replace bleaching powder have met with little success, except where cheap electrical power is available for the manufacture of sodium hypochlorite from common salt. Improvements in the bucking process were most marked about 1823, when sodium carbonate was substituted for potash. (*See* ALKALI MANUFACTURE.)

BLEACHING OF COTTON

Cotton is bleached in the raw state (loose cotton) as yarn (cops, hanks, or warps) and in the piece. The aim of the bleacher is to remove as far as possible all the impurities present in the cotton without injuring the fibre, and thus obtaining pure cellulose in the form of complete fibres. In the raw state, and in the form of yarn, only the natural impurities have to be considered. These include cotton wax, fatty acids, pectic substances, colouring matters, albuminoid and mineral matter, amounting together to about 5% of the weight of the material. There are also fragments of the cotton seed husk (motes). The bleaching of cloth involves, in addition to these, the removal of the sizing materials with which the manufacturer strengthens the warp before weaving. In all cases three main operations are involved: boiling (bowking), chemicking, and souring. Much depends on the condition of the material and the use to which it is subsequently to be put as to the extent to which these operations are carried out. In the case of piece bleaching they are generally supplemented by additional processes. *Loose cotton* is rarely bleached before spinning in England, but some American firms who carry all the textile processes through in one works find it convenient to do so. It is certainly never subjected to drastic treatment with boiling alkali, which would tend to cause the fibres to mat together and to remove the cotton wax which seems to be a valuable assistant in spinning. The three processes can be applied when the material is to serve for the manufacture of cotton wool, or of gun cotton, in which instances the boiling operation is very important, as it helps to remove the wax and to render the material easily wetted with water. For such purposes good wetting out is of greater importance than a particularly good white. *Cotton yarn* is first boiled with an alkali such as 3 to 4% soda ash or 2% caustic soda, with or without the addition of soap, in a boiler which is known as a "kier" working at low pressure (up to 10lb.) for six to eight hours. The yarn is then washed in the kier and transferred to a stone cistern provided with a false bottom. Bleaching liquor 1 to 2° Tw. is drawn by means of a centrifugal pump, from a well situated below the floor line, to the top of the cistern and is showered over the yarn. The liquor falls through the goods and back again to the well and is caused to circulate in this way for about one and a half to two hours. After rinsing with water, the goods are steeped in hydrochloric or sulphuric acid of 2° Tw. in another circulating cistern, and are then washed thoroughly. If the yarn is intended for the market to be sold as white it is often tinted with a little blueing material such as a suspension of ultramarine in weak soap solution, or a very little Victoria blue 4R or acid violet. During the boiling process most of the impurities, with the exception of some of the cotton wax and the colouring matters, are removed. The removal of the wax is more thorough if some form of soap is employed in the boiling process, and it has been shown that resin soap is very effective in this respect. In the second operation the calcium hypochlorite of the bleaching powder—to some extent by direct action, but also owing to the fact that it decomposes on coming into contact with the carbon dioxide of the air yielding chlorine (R. L. Taylor)—destroys the colouring matter by oxidation. At the same time the motes, which were swelled up by the alkali, are removed. The souring operation has for its object the removal of lime deposited by the bleaching liquor and the attack and solution of any metallic oxides.

The rinsing which follows souring is of great importance in order to ensure the removal of the acid, which would otherwise cause the yarn to become tender.

The largest bulk of cotton is bleached in the *piece,* in which condition it is necessary not only to remove the natural impurities, but also such materials as starch, paraffin wax, soap, zinc chloride, magnesium chloride, which may be present as constituents of the size, as well as dust, dirt, and mineral oil, which may have become incorporated with the fibre during the manufacture of the cloth. In bleaching for whites ("market bleaching") it is essential that the white should be as perfect as possible, and the goods are invariably blued after bleaching; but probably the most thorough process is that which is commonly employed in the case of goods intended for calico printing. The ordinary process is carried out as follows:—

The pieces are first examined for faults and marked in gas tar with distinctive letters and numbers. They are then sewn end to end with a machine in chain stitch, which is easily removed after the bleaching is complete. Unless the cloth is intended for flannelette or other raised cloth, it is usual to remove the "nap," that is, the ends of the cotton fibres which project on the surface of the cloth, by "singeing." The operations may be effected in three different ways: (1) plate singeing, (2) revolving roller singeing, (3) gas singeing. The first method (fig. 1) consists in running the cloth at full width over a couple of arched copper

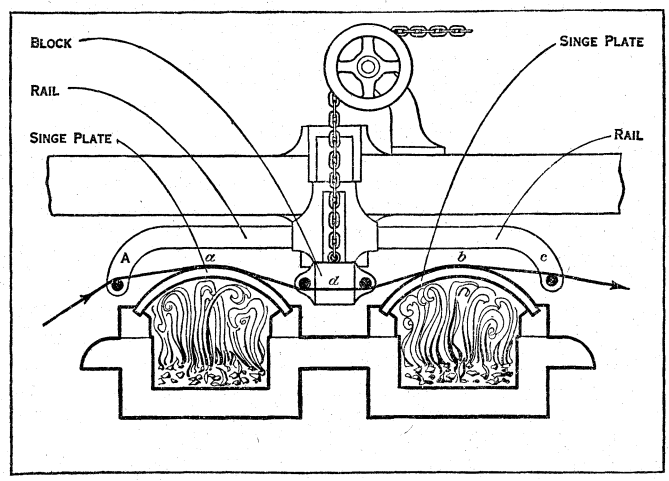


FIG. 1.—SINGE-STOVE, FOR THE REMOVAL OF NAP FROM COTTON PIECES BEFORE BLEACHING. PIECES ARE PASSED IN DIRECTION OF ARROW
The first singe plate dries the pieces, and the second, heated to a higher temperature, singes the nap. The singe plates are heated over coal fuel fires

plates (*a* and *b*) heated to a full red heat by being mounted over the flues of a coal fire. As a rule one plate is considerably hotter than the other and the cloth goes over the hotter one last, where the singeing actually takes place. The first plate dries the cloth, and between the two a block (*d*) carrying two rails is arranged so that the pressure of the cloth on the plates can be regulated or if necessary entirely removed. This process has the disadvantage that owing to irregular heating the singeing may be uneven or "stripey" and show corresponding defects in the finished cloth.

In revolving roller singeing a cast iron cylinder is heated by causing the flame of a fire to be drawn through it. The roller in this process revolves in the reverse direction to the cloth, which passes over it.

Gas singeing (fig. 2) is more convenient, economical, and also more effective, and can be applied to figured as well as to plain goods. It consists in running the goods over a non-luminous gas flame, the breadth of which slightly exceeds that of the piece. After singeing the goods are passed through hot water or through sulphuric acid 2–3° Tw. They are allowed to lie in a pile overnight but are never allowed to dry. The operation has the effect

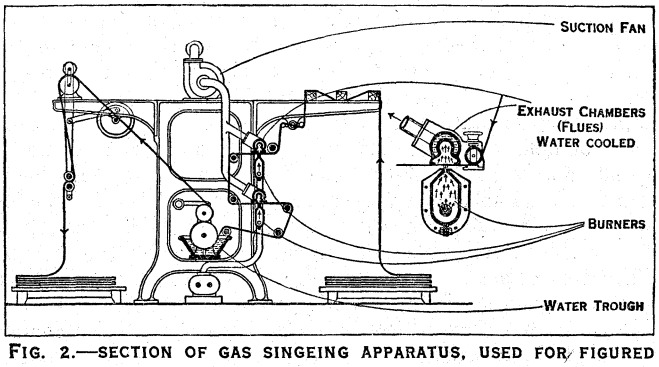


FIG. 2.—SECTION OF GAS SINGEING APPARATUS, USED FOR FIGURED PIECES THAT HAVE AN UNEVEN SURFACE
A gas flame removes the nap as the pieces pass the burners in direction of arrows. After singeing, pieces pass through a trough of water. This method, being cleaner, has largely replaced plate singeing

of hydrolysing starchy material. Some bleachers submit cloth to a treatment with malt extract, with the same object in view. After rinsing in water the cloth is subjected to the action of boiling alkali. For calico intended for printing it is found best to carry out the lime boil, but in recent methods of bleaching this is omitted. After saturating the goods with milk of lime in a similar machine to that used for washing they pass, in what is known as rope form, into the kier and are carefully plated down. The amount of lime (CaO) with which they are impregnated is about 4% of their weight and the rope formation is given by passing the goods through smooth porcelain rings (pot-eyes) before entering the kier.

It is of the greatest importance that the goods should be evenly packed, for, if channels or loosely-packed places are left, the liquor circulating through the kier, when boiling is subsequently in progress, will follow the line of least resistance, and the result is an uneven treatment. Of the numerous forms of kier in use, the injector kier is the one most generally adopted. This consists of an egg-ended cylindrical vessel constructed of stout boiler plate, and shown in sectional elevation in fig. 3. The kier is from 10 to 12ft. in height and from 6 to 7ft. in diameter, and stands on three iron legs, riveted to the sides but not shown in the figure. The bottom exit pipe E is covered with a shield-shaped false bottom of boiler plate, or (and this is more usual) the whole bottom of the kier is covered with large rounded stones from the river bed, the object in either case being simply to provide space for the accumulation of liquor and to prevent the pipe E being blocked. The cloth is evenly packed up to within about 3 to 4ft. of the manholes M, when lime water is run in through the liquor pipe until the level of the liquid reaches within about 2ft. of the top of the goods. The manholes are then closed, and steam is turned on at the injector J by opening the valve V. The effect of this is to suck the liquor through E and to force it up through pipe P into the top of the kier, where it dashes against the umbrella-shaped shield U and is distributed over the pieces, through which it percolates, until, on arriving at E, it is again carried to the top of the kier, a continuous circulation being thus effected. As the circulation proceeds the steam condensing in the liquor rapidly heats the latter to the boil, and as soon as, in the opinion of the foreman, all air has been expelled the blow-through tap is closed and the boiling is continued for periods varying from six to 12 hours under 20–60lb. pressure. Steam is then turned off, and by opening the valve V the liquor, which is of a dark-brown colour, is forced out by the pressure of the steam it contains.

The pieces are then run through a continuous washing machine, which is provided with a plentiful supply of water. The machine, which is shown in fig. 4, consists essentially of a wooden vat, over which there is a pair of heavy wooden (sycamore) bowls or squeezers. The pieces enter the machine at each end, as indicated by the arrows, and pass rapidly through the bowls down to the bottom of the vat, over a loose roller, thence between the first pair of guide pegs through the bowls again, and travel thus in a spiral direction until they arrive at the middle of the machine, when they leave at the side opposite to that on which they entered. The same type of machine is used for liming, chemicking, and souring.

The next operation is the "grey sour," in which the goods are run through a washing machine containing hydrochloric acid of 2° Tw. strength, with the object of dissolving out the lime, which

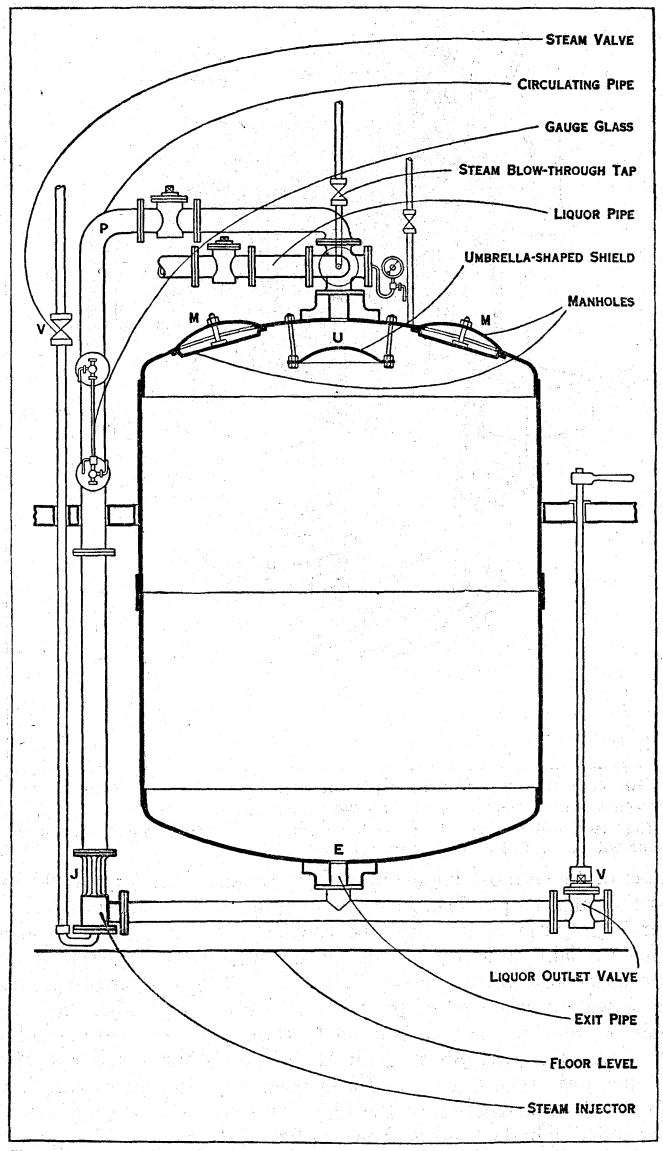


FIG. 3.—SECTIONAL ELEVATION OF HIGH-PRESSURE BLOW-THROUGH KIER
The cotton pieces, after passing through a lime wash, are packed in the kier, and lime water is added. Steam is turned on and the process, called "bowking," is continued for 6–12 hours, after which the pieces are removed and washed in a machine (see fig. 4.)

the goods retain in considerable quantity after the lime boil. The goods are then well washed and are boiled again in the ash bowking kier, which is similar in construction to the lime kier, with soda ash (3%) and a solution of resin (1½%) in caustic soda (1¼%) for eight to ten hours. For white bleaching the resin soap is omitted, soda ash alone being employed.

The pieces are then washed free from alkali and the bleaching proper or "chemicking" follows. This operation may be effected in various ways, but the most efficient is to run the goods in a washing machine through bleaching powder solution at ½°–1° Tw.,

and allow them to lie loosely piled over night, or in some cases for a longer period. They are then washed, run through dilute sulphuric or hydrochloric acid at 2° Tw. ("white sour") and washed again. Should the white not appear satisfactory at this stage (and this is usually the case with very heavy or dense materials), they are boiled again in soda ash, chemicked with bleaching powder at $\frac{1}{8}$° Tw., or even weaker, soured, and washed.

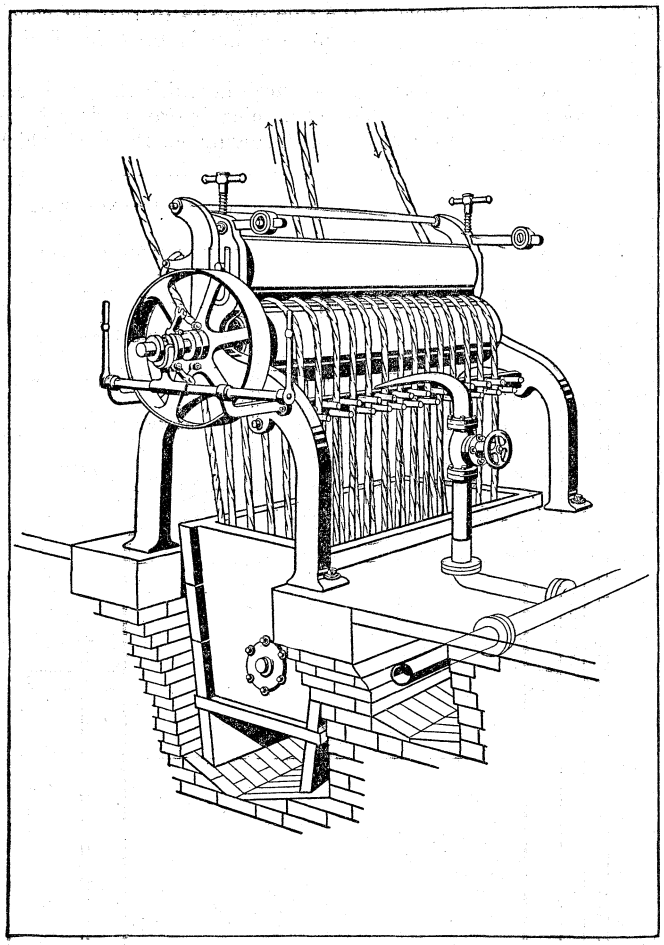


FIG. 4.—ROLLER WASHING MACHINE, CONSISTING OF A WOODEN VAT OVER WHICH THERE IS A PAN OF WOODEN ROLLERS
The pieces enter in the direction indicated and, passing through the rollers and vat in a spiral direction, emerge washed

It is of the utmost importance that the final washing should be as thorough as possible, in order to remove the acid completely, for if only small quantities of the latter are left in the goods they are liable to become tender in the subsequent drying, through formation of hydrocellulose. The best known, and probably the most widely practised of processes which dispense with the lime boil, is one which was worked out by the late M. Horace Koechlin in conjunction with Sir William Mather, and this differs from the former process not only in the sequence of the operations but also in the construction of the kier. This consists of a horizontal egg-ended cylinder, and is shown in fig. 5.

The goods to be bleached are packed in two wagons W outside the kier, and when filled these are pushed home into the kier, so that the pipes *p* fit with their flanges on to the fixed pipes at the bottom of the kier. The heating is effected by means of steam pipes at the lowest extremity of the kier, while the circulation of the liquor is brought about by means of the centrifugal pump *p* which draws the liquor through the pipes *p* from beneath the false bottoms of the wagons and showers it over distributors D on to the goods. By this mode of working a considerable economy is effected in point of time, as the kier can be worked almost continuously; for as soon as one lot of goods has been boiled the wagons are run out and two freshly-packed wagons take their place. The following is the sequence of operations:—The goods are first steeped over-night in dilute sulphuric acid, after which they are washed and run through old kier liquor from a previous operation. They are then packed evenly in the wagons, which are pushed into the kier, and, the door having been closed, they are boiled for about eight hours at 7–15lb. pressure with a liquor containing soda ash, caustic soda, resin soap, and a small quantity of sulphite of soda. The rest of the operations (chemicking, souring, and washing) are the same as in the old process.

A somewhat different principle is involved in the Thies-Herzig process. In this the kier is vertical, and the circulation of the liquor is effected by means of a centrifugal or other form of pump, while the heating of the liquor is brought about outside the kier in a separate vessel between the pump and the kier by means of indirect steam. The sequence of operations is similar to that adopted in the Mather-Koechlin process, differing chiefly from the latter in the first operation, which consists in running the goods, after singeing, through very dilute boiling sulphuric or hydrochloric acid, containing in either case a small proportion of hydrofluoric acid, and then running them through a steam box, the whole operation lasting from 20 to 60 seconds.

Open Width Bleaching.—For bleaching goods which contain *effect threads,* especially when these are dyed with vat colours, or are composed of artificial silk, the process of full width bleaching has been greatly improved, and is to be recommended. After singeing the goods are run through a steaming chamber (to put out any fire) impregnated with caustic soda at 2° Tw. on a batching machine in which the cloth is wound perfectly straight on to one of the two batch rollers of the kier until the batch is 3ft.–3ft. 6in. in diameter. The two rollers are driven into the kier on a batch carriage (fig. 6), where they are kept at a constant distance apart by means of an oscillating drum, which remains in contact with the two batches although they are continually increasing and decreasing in size as the winding proceeds. The carriage automatically couples with driving and reversing gear

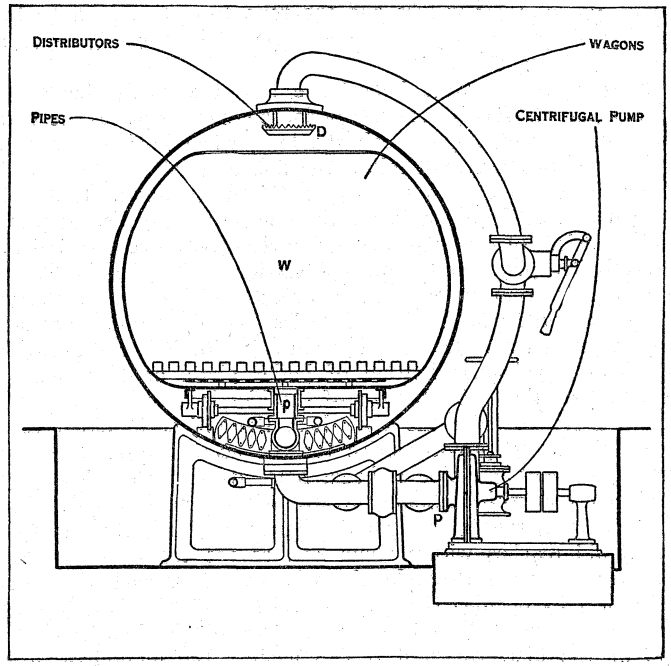


FIG. 5.—DIAGRAM OF A CROSS SECTION OF THE MATHER KIER
This kier is used in most modern processes of bleaching cotton-pieces. Its use dispenses with the lime boil and a considerable economy is effected

at the back of the kier, so that the cloth is continually wound off one roller and on to the other during the boiling process. The caustic soda liquor is entered boiling and is circulated by means of a pump. After two or three hours the cloth is removed from the kier to a special machine for chemicking. This process may also be applied with advantage in the bleaching of gauze and bandage cloths, sateens, reps, poplins, canvas, and gaberdines.

Defects.—As shown by the late Charles O'Neill, carefully bleached cotton ought to be stronger than the same cotton in the

unbleached condition. Tendering may occur through the presence of air in the kier during boiling, or by the excessive action of bleaching liquor. Cotton which has been affected in this manner is said to contain oxycellulose. Such cotton readily becomes yellow and more tender on boiling with a dilute solution of caustic soda (about 10° Tw.). It also dyes lighter with a direct colour, such as chlorazol sky blue, than does ordinary cotton, but after boiling with caustic soda it dyes normally. This test distinguishes oxycellulose tendering from the tender product which is formed when dilute sulphuric acid is dried into cotton, for in the latter case light dyeing with chlorazol sky blue is observed even after boiling with caustic soda. Both kinds of tendered cotton dye darker with basic colour than does ordinary well bleached cotton. Hydrochloric acid tendered cotton does not show such differences in dyeing. Any free acid which is left in cotton can be detected by testing the aqueous extract with a drop of methyl orange, which, in the presence of acid, is turned pink.

BLEACHING OF LINEN

The bleaching of linen is a much more complicated and tedious process than the bleaching of cotton. This is due in part to the fact that in linen the impurities amount to 20% or more of the weight of the fibre, whereas in cotton they do not usually exceed 5%. Furthermore, these impurities, which include colouring matter, intracellular substances, and a peculiar wax known as "flax wax," are more difficult to attack than those which are present in cotton, and the difficulty is still further enhanced in the case of piece goods, owing to their dense or impervious character.

The methods used for bleaching of linen resemble those used in cotton bleaching, but require to be frequently repeated, while an additional operation, which is a relic of the old-fashioned process, viz., that of "grassing" or "crofting," is still essential for the production of the finest whites. Considerably more care has to be exercised in linen bleaching than is the case with cotton, and the process consequently necessitates a greater amount of manual labour. The practical result of this is that, whereas cotton pieces can be bleached and finished in less than a week, linen pieces require at least six weeks. Many attempts have naturally been made to shorten and cheapen the process, but without success. The use of stronger reagents and more drastic treatment, which would at first suggest itself, incurs the risk of injury to the fibre, not so much in respect to actual tendering as to the destruction of its characteristic gloss; while if too drastic a treatment is employed at the beginning the colouring matter is liable to become set in the fibre, and it is then almost impossible to remove it. Among the many modern improvements which have been suggested, mention may be made of the use of hypochlorite of soda in place of bleaching powder; the use of oil in the first treatment in alkali (Cross & Parkes), while de Keukelaere suggests the use of sodium sulphide for this purpose. With the object of dispensing with the operation of grassing, which, besides necessitating much manual labour, is subject to the influences of the atmospheric conditions, Siemens & Halske, of Berlin, have suggested exposure of the goods in a chamber to the action of electrolytically prepared ozone. Jardin seeks to achieve the same object by steeping the linen in dilute nitric acid.

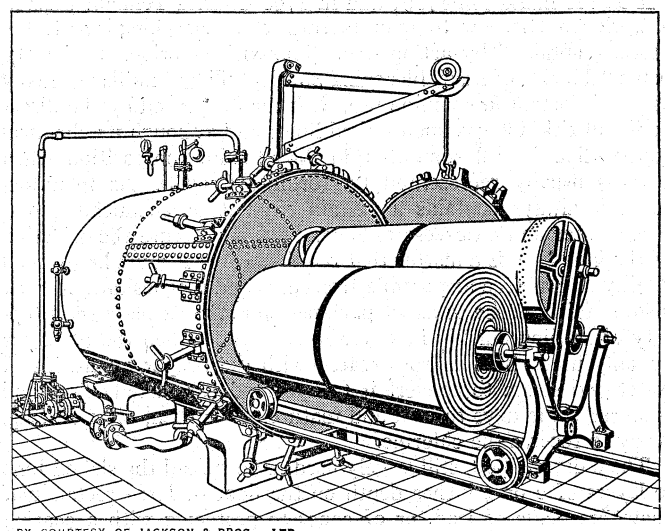
Since the qualities of linen which are submitted to the bleacher vary considerably, the mode of treatment has to be varied accordingly. Linen is bleached in the yarn and in the piece. Special features of linen bleaching, apart from the repetition of processes, are:—Rubbing between boards with soft soap after kier boiling (scalding); exposure of the goods to air during the treatment with bleaching liquor; marking with thread dyed with Turkey red instead of stamping.

BLEACHING OF OTHER VEGETABLE FIBRES

China grass is bleached like cotton, and hemp like linen, but the latter fibre is seldom bleached. In the case of jute severe treatment with alkali is avoided, and the goods are subjected to chemicking with sodium hypochlorite and souring only. Straw is bleached by steeping in fairly strong hydrogen peroxide for periods varying from 12 hours to several days, followed by exposure to the action of sulphurous acid. Artificial silk prepared by the viscose process is obtainable in a condition which is known as "unbleached"—this product has a cream colour resembling that of grey cotton and an opalescent lustre. This characteristic appearance is due to the presence of sulphur, for when this is removed the whiteness and silky lustre appear immediately.

BLEACHING OF WOOL

In the case of woollen goods it is not possible to obtain the degree of whiteness which is characteristic of well bleached cotton or linen, but considerable improvement in the appearance is



BY COURTESY OF JACKSON & BROS., LTD.

FIG. 6.—HORIZONTAL KIER WITH BATCH ON CARRIAGE, USED FOR BLEACHING GOODS CONTAINING "EFFECT" THREADS

effected either by treating the wool with sulphurous acid or by means of hydrogen peroxide. The first method, which is technically known as "stoving," consists in exposing the washed goods in a damp condition to the action of the fumes of burning sulphur. After being scoured yarn is hung, wetted, and slightly blued, and the cloth is passed slowly up and down over a number of rollers in a room in which the sulphur dioxide is produced. The goods are left overnight. This is the process which is generally adopted and which is also employed in bleaching many other kinds of animal hair, including bristles. In the case of wool, it is possible to obtain a bleach by steeping the goods in a fairly strong solution of bisulphite of soda. Whether sulphurous acid or bisulphite of soda is used for bleaching, the natural colour of the wool returns on washing with soap. A more permanent bleach can be obtained by the action of hydrogen peroxide (one part of a 12-volume solution being diluted with three parts of water), rendered slightly alkaline with ammonia or silicate of soda. Black or brown wool cannot be bleached white, but assumes a golden colour which is often desired in human hair.

BLEACHING OF SILK AND OTHER FABRICS

Raw silk has a comparatively dull appearance, which is due to the coating of sericine or silk gum, which is present to the extent of about 19–25%. This is removed by treating the silk with 30% of its weight of soap dissolved in water and heated to a temperature just below the boiling point for about three hours. The gum is ultimately dissolved and leaves the fibre substance (fibroin) with the characteristic lustre. The silk is then rinsed in weak soda solution and is suitable for dyeing, but if it is to be sold as white the material in the hank form is tied with tape and put into coarse linen bags and boiled in soap solution half as strong as the first. Whitening is effected by stoving, as in the case of wool, but blueing or otherwise tinting is effected after stoving. Bleaching with hydrogen peroxide is only adopted for certain kinds of spun silk and tussore.

Ornamental feathers are best bleached by steeping in hydrogen peroxide rendered alkaline with a little ammonia, and the same

treatment is applied to the bleaching of ivory. Hydrogen peroxide is a very efficient bleaching agent, and can be applied with safety to both animal and vegetable substances. It is the active constituent (or is produced in solution) of a number of preparations sold in powder form for household bleaching. The more extensive application of hydrogen peroxide is largely a matter of cost.

(E. Hi.)

BLEACHING POWDER. It has long been known that chlorine and certain chlorine compounds possess the property of bleaching. A solution of chlorine in water was prepared for this purpose in 1785; a solution made by passing chlorine into sodium or potassium carbonate, and known as "eau de Javelle," was put on the market in 1789; and in 1798 Charles Tennant erected a works in Glasgow to manufacture, as a bleaching agent, the product obtained by acting upon lime with chlorine. Under the name "chloride of lime" bleaching powder will be familiar to many as a disinfectant in common use. It is manufactured by the direct action of chlorine gas upon slaked lime; and although its chemical constitution is still somewhat in dispute, its composition when pure is usually represented by formula $CaOCl_2$. As manufactured it always contains a certain amount of chemically combined water and an excess of lime. In manufacture the selection of the lime used is a matter that requires care; it must be of good quality and as free as possible from iron and magnesium; it must also be fairly dense to assist packing, and it must have the property of settling quickly in water to save time when the bleach is actually used. The lime is treated with the proper quantities of water and steam to convert it to hydrated (or slaked) lime and is stored some days to cool and mature. It is then, after sieving, ready to receive the chlorine.

The older method, still largely used, is to spread the slaked lime in layers of 2 or 3 inches depth on the floor of large rectangular chambers made of lead, or of concrete protected with a coating inside of tar; these chambers are from 6 to 7ft. high, 10 to 20ft. wide, and up to 100ft. long. The lime is raked into ridges in order to increase the surface exposed to the gas. The chamber, or series of chambers, is then closed and chlorine admitted. The gas is readily absorbed, and if it be concentrated so much heat may be generated by the reaction that in hot climates cooling coils are necessary in the floor of the chambers to prevent decomposition of the bleaching powder. A more recent method dispenses with chambers and employs mechanical means to propel the lime through a horizontal tube or series of tubes. The gas is fed into the plant in a direction opposite to that in which the lime travels.

Bleaching powder is a somewhat unstable substance; moisture, sunlight and undue temperature all cause it to decompose rapidly; and this tends to limit its usefulness, especially in tropical countries where, as a disinfectant, it is so valuable. Attempts to produce a more stable form have engaged the attention of chemists for many years and no doubt the problem will be eventually solved. In spite of the increasing competition of liquid chlorine, which can replace bleaching powder in many respects, the world output of the latter reaches many hundreds of thousands of tons yearly. Most of it is consumed in the paper and textile industries for the purpose denoted by its name. As an alternative to the powder there are manufactured solutions of sodium and calcium hypochlorites which have advantages under certain conditions. Sodium hypochlorite, for example, is particularly suited for the bleaching of fine cotton goods, and is, incidentally, a most powerful germicide.

For the method of using bleaching powder *see* article Bleaching.

(A. E. H.)

BLEAK (*Alburnus lucidus*), a small, slender, silvery fish of the Cyprinid family, found in the rivers of Europe. The scales are used in the manufacture of artificial pearls, especially in France.

BLEEK, FRIEDRICH (1793–1859), German biblical scholar, professor of theology at Bonn from 1829 to 1859, was born on July 4 1793, at Ahrensbök, in Holstein. He studied in Berlin from 1814 to 1817, under De Wette, Neander and Schleiermacher. From 1818–19 he was *Repetent* in theology under De Wette, and published two dissertations in Schleiermacher's and G. C. F. Lücke's Journal (1819–20, 1822); one on the origin and composition of the Sibylline Oracles and another on the authorship and design of the Book of Daniel. In 1823 he received the appointment of professor extraordinarius.

In 1829 he accepted Lücke's chair in the recently founded University of Bonn. In 1843 he was raised to the office of consistorial councillor, and was selected by the university to hold the office of rector. He died of apoplexy on Feb. 27 1859.

Bleek's works belong entirely to the departments of biblical criticism and exegesis. His views on questions of Old Testament criticism were "advanced" for his own day; but with respect to the New Testament his position was conservative, and he was an opponent of the Tübingen school. His greatest work, his commentary on the epistle to the Hebrews (*Brief an die Hebräer erläutert durch Einleitung, Übersetzung, und fortlaufenden Commentar,* 3 pts. 1828–40, abridged ed. 1868) won praise from men like De Wette and Fr. Delitzsch. In 1846 he published his contributions to the criticism of the gospels (*Beiträge zur Evangelien Kritik,* pt. i.) which contained his defence of St. John's gospel.

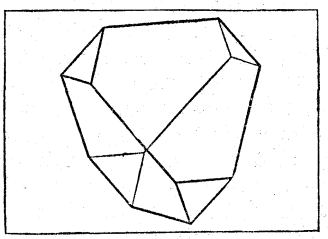
Bleek's other works include *Einleitung in das Alte Testament* (3rd ed. 1869, Eng. trans. by G. H. Venables from 2nd ed. 1869); in 1878 a new edition (the 4th) appeared under the editorship of J. Wellhausen, who made extensive alterations and additions; *Introduction to the New Testament* (3rd ed., W. Mangold, 1875, Eng. trans. from 2nd German ed. by William Urwick 1869–70); *Synoptische Erklärung der drei ersten Evangelien* (Eng. trans., 1862); *Vorlesungen über die Apokalypse* (Eng. trans. 1875); *Lectures on Colossians, Philemon and Ephesians* (1865).

See Herzog-Hauck, *Realencyklopädie;* F. Lichtenberger's *Histoire des idées religieuses en Allemagne,* vol. iii; Diestel's *Geschichte des Alten Testamentes* (1869); and T. K. Cheyne's *Founders of Old Testament Criticism* (1893).

BLEEK, WILHELM HEINRICH IMMANUEL (1827–1875), German philologist, studied at Bonn and Berlin, where he first noted the philological peculiarities of the South African languages. In his Doctor's dissertation (Bonn, 1851), *De nominum generibus linguarum Africae Australis,* he endeavoured to show that the Hottentot language was of North African descent. Towards the close of 1856 he settled at Cape Town, and in 1857 was appointed interpreter by Sir George Grey, who appointed him librarian of the Sir George Grey collection in 1860. He introduced into European philology the word Bantu.

His works are *Vocabulary of the Mozambique Language* (1856); *Handbook of African, Australian and Polynesian Philology* (Cape Town and London, 1858–63); *Comparative Grammar of the South African Languages* (vol. i., 1869); *Reynard the Fox in South Africa, or Hottentot Fables and Tales* (1864); *Origin of Language* (1869).

BLENDE or **SPHALERITE,** a naturally occurring zinc sulphide, ZnS, and an important ore of zinc. The name blende was used by G. Agricola in 1546, and is from the German, *blenden,* to blind, or deceive, because the mineral resembles lead-ore in appearance but contains no lead, and was consequently often rejected as worthless. Sphalerite, introduced by E. F. Glocker in 1847 has the same meaning (Gr. σφαλερός, deceptive), and so have the miners' terms "mock ore," "false lead" and "black jack."



SIMPLE CRYSTAL OF BLENDE OR ZINC SULPHIDE FROM THE BINN VALLEY, SWITZERLAND
Usually, crystals of blende are much more complex and difficult to decipher

Crystals of blende are cubic with inclined hemihedrism, and have no centre of symmetry. The basic form is the tetrahedron. A common form is a combination of two tetrahedra, in which the four faces of one tetrahedron are larger than the four faces of the other: further, the two sets of faces differ in surface characters: those of one set being dull and striated, while those of the other set are bright and smooth. An important character of blende is the perfect dodecahedral cleavage, there being six directions of cleavage parallel to the faces of the rhombic dodecahedron, the angles between which are 60°.

When chemically pure, which is rarely the case, blende is colourless and transparent; usually, however, the mineral is yellow, brown or black, and often opaque, the depth of colour and degree

of transparency depending on the amount of iron present. The streak, or colour of the powder is brownish or light yellow, rarely white. The lustre is resinous to adamantine, and the index of refraction high (2·369 for sodium-light). The substance is usually optically isotropic. The specific gravity is 4·0, and the hardness 4.

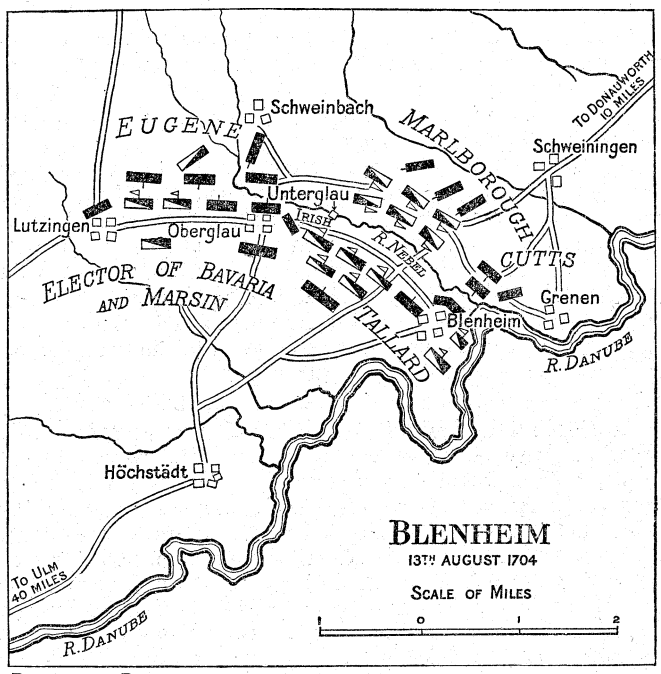
A few varieties of blende are distinguished by special names, these varieties depending on differences in colour and chemical composition. A pure white blende from Franklin furnace in New Jersey is known as cleiophane. Black blende containing ferrous sulphide in amounts up to 15 or 20% isomorphously replacing zinc sulphide, is known as marmatite (from Marmato in Colombia, South America) and christophite (from St. Christophe mine at Breitenbrunn in Saxony).

Blende occurs in metalliferous veins, often in association with galena, also with chalcopyrite, barytes, fluorspar, etc. In ore deposits containing both lead and zinc, such as those filling cavities in the limestones of the north of England and of Missouri, the galena is usually found in the upper part of the deposit, the blende not being reached until the deeper parts are worked. Blende is also found sporadically in sedimentary rocks. (L. J. S.)

BLENHEIM (Ger. *Blindheim*), a village of Bavaria, Germany, in the district of Swabia, on the left bank of the Danube, 30m. N.E. from Ulm by rail, a few miles below Höchstädt. Pop. 700. It was the scene of the defeat of the French and Bavarians under Marshals Tallard and Marsin, on Aug. 13, 1704, by the English and the Austrians under the duke of Marlborough and Prince Eugene. In consideration of his military services and especially his decisive victory, a princely mansion was erected by parliament for the duke of Marlborough near Woodstock in Oxfordshire, England, and was named Blenheim palace after this place.

The battle of Blenheim is also called Höchstädt, but the title accepted in England has the advantage that it distinguishes this battle from that won on the same ground a year previously, by the elector of Bavaria over the imperial general Styrum (Sept. 9–20, 1703), and from the fighting between the Austrians under Krag and the French under Moreau in June 1800. (*See* FRENCH REVOLUTIONARY WARS.) The battle of 1704 was the culmination of Marlborough's surprise march to the Danube. (*See* SPANISH SUCCESSION, WAR OF.) The ground between the hills and the marshy valley of the Danube forms a defile through which the main road from Donauwörth led to Ulm; parallel streams divide the narrow plain into strips. On one of these streams, the Nebel, the French and Bavarians (somewhat superior in numbers) took up their position facing eastward, their right flank resting on the Danube at Blenheim, their left in the under-features of the hilly ground, and their front covered by the Nebel—a position of great natural strength. The imperialist army of Eugene and the allies under Marlborough (52,000 strong) encamped 5m. to the eastward along another stream, their flanks similarly protected. On Aug. 12–13, 1704, Eugene and Marlborough set their forces in motion towards the hostile camps; several streams had to be crossed on the march, and it was seven o'clock (five hours after moving off) when the British of Marlborough's left wing, next the Danube, deployed opposite Blenheim, which Tallard thereupon garrisoned with a large force of his best infantry, aided by a battery of 24-pounder guns. The French and Bavarians were taken somewhat by surprise, and were arrayed in two separate armies, each with its cavalry on the wings and its foot in the centre. Thus the centre of the combined forces consisted of the cavalry of Marsin's right and of Tallard's left.

Here was the only good ground for mounted troops, and Marlborough followed Tallard's example when forming up to attack, but it resulted from the dispositions of the French marshal that this weak point of junction of his two armies was exactly that at which decisive action was to be expected. Tallard therefore had a few horse on his right between the Danube and Blenheim, a mass of infantry in his centre at Blenheim itself, and a long line of cavalry supported by a few battalions forming his left wing in the plain, and connecting with the right of Marsin's army. This army was similarly drawn up. The cavalry right wing was in the open, the French infantry near Oberglau, which was strongly held, the Bavarian infantry next on the left, and finally the Bavarian cavalry with a force of foot on the extreme left in the hills. The elector of Bavaria commanded his own troops in person. Marlborough and Eugene on their part were to attack respectively Tallard and Marsin. The right wing under Eugene had to make a difficult march over broken ground before it could form up for battle, and Marlborough waited, with his army in



BATTLE OF BLENHEIM, ONE OF MARLBOROUGH'S GREATEST VICTORIES
In Aug. 1704, Marlborough and Prince Eugene attacked the French and Bavarian forces in their position behind the Nebel river near Blenheim. While Eugene engaged the Bavarian left, under Marsin, Lord Cutts attacked Blenheim, and Marlborough drove through the centre. This battle broke the long sequence of French victories

order of battle between Unterglau and Blenheim, until his colleague should be ready. At 12.30 the battle opened. Lord Cutts, with a detachment of Marlborough's left wing, attacked Blenheim with the utmost fury. A third of the leading brigade (British) was killed and wounded in the vain attempt to break through the strong defences of the village, and some French squadrons charged upon it as it retired, but a Hessian brigade in second line drove them back. After the repulse of these squadrons, Cutts again moved forward, using a fresh brigade. The second attack, though pressed even more fiercely, fared no better than the first, and the losses were heavier than before. The duke then ordered Cutts to observe the enemy in Blenheim, and concentrated all his attention on the centre. Here, between Unterglau and Blenheim preparations were being made, under cover of artillery, for the crossing of the Nebel, and farther up-stream a corps was sent to attack Oberglau. This attack failed completely, and it was not until Marlborough himself, with fresh battalions, drove the French back into Oberglau that the allies were free to cross the Nebel.

In the meanwhile the first line of Marlborough's infantry had crossed lower down and the first line of cavalry, following them across, had been somewhat severely handled by Tallard's cavalry. The squadrons under the Prussian general Bothmar, however, made a dashing charge, and achieved considerable temporary success. Eugene was now closely engaged with the elector of Bavaria, and both sides were losing heavily. But Eugene carried out his *fixing* attack successfully. Marsin dared not reinforce Tallard to any extent, and the duke was preparing for the decisive stroke. His whole force, except the detachment of Cutts, was now across the Nebel, and he had formed it in several lines with the cavalry in front. Marlborough himself led the cavalry; the French squadrons received the attack at the halt, and were soon broken. Marsin's right swung back towards its own army. Those squadrons of Tallard's left which retained their order fell back towards

the Danube, and a great gap was opened in the centre of the defence through which the victorious squadrons poured. Wheeling to their left the pursuers drove hundreds of fugitives into the Danube, and Eugene was now pressing the army of Marsin towards Marlborough, who re-formed and faced northward to cut off its retreat. Tallard was already a prisoner, but in the dusk and confusion Marsin slipped through between the duke and Eugene. General Charles Churchill, Marlborough's brother, had meanwhile, with the infantry, passed through the central gap, and, swinging left, surrounded the French garrison of Blenheim. After one or two attempts to break out, 24 battalions of infantry and four regiments of dragoons, many of them the finest of the French army, surrendered.

The losses of the allies are stated at 4,500 killed and 7,500 wounded (British 670 killed and 1,500 wounded). Of the French and Bavarians 11,000 men, 100 guns and 200 colours and standards were taken; besides the killed and wounded, the numbers of which were large but uncertain—many were drowned in the Danube. Marsin's army, though it lost heavily, was drawn off in good order; Tallard's was almost annihilated. With the retreat of the French survivors, the sun began to sink on a decade-long tradition of French military triumph.

See Winston Churchill, *Marlborough* (Vol. II, "Blenheim"), (1941).

BLENNERHASSETT, HARMAN (1765–1831), Irish-American lawyer, was born on Oct. 8, 1765. He was educated at Trinity college, Dublin, and in 1790 was called to the Irish bar. In 1796 he married his niece, Margaret Agnew. Ostracised by their families the couple came to America, where Blennerhassett in 1798 bought an island in the Ohio river about 2 mi. below Parkersburg, West Virginia. Here in 1805 he received a visit from Aaron Burr (*q.v.*), in whose conspiracy he became interested, furnishing funds for its support, and offering his island as a rendezvous for the gathering of supplies and the training of volunteers. When the conspiracy collapsed, Blennerhassett fled, was twice arrested and remained a prisoner until after Burr's release. He became in turn a cotton planter in Mississippi and a lawyer (1819–22) in Montreal, Canada. After returning to Ireland, he died in the island of Guernsey on Feb. 2 1831.

BIBLIOGRAPHY.—*See* William H. Safford, *Life of Harman Blennerhassett* (Cincinnati, 1853); W. H. Safford (editor), *The Blennerhassett Papers* (Cincinnati, 1864); and "The True Story of Harman Blennerhassett," by Therese Blennerhassett-Adams, in the *Century Magazine* for July 1901, vol. lxii.

BLENNY, a name generally given to any fish of the Blennioid group, in which the pelvic fins are jugular in position and have the rays reduced in number. The wolf-fish, like the viviparous blenny (*Zoarces*) and the kelp-fishes (Clinidae), is a blennioid. The family Blenniidae contains numerous small species in tropical and subtropical seas, mostly shore-fishes that lurk under stones and weeds in shallow pools. The shanny (*Blennius pholis*) is the commonest British species.

BLERA (mod. BIEDA), ancient Etruscan town on the Via Clodia, about 32m. N.N.W. of Rome. It is on a long, narrow tongue of rock at the junction of two deep glens. Two ancient bridges both belong to the Via Clodia; many rock-hewn tombs imitate houses, with beams and rafters represented in relief (*see* Koch, von Mercklin, Weickert, in *Römische Mitteilungen* (1915), 161 *seq.*). There was another Blera in Apulia, on the Via Appia between Venusia and Tarentum.

BLESBOK, an African antelope (*Damaliscus albifrons*) allied to the hartebeest (*q.v.*). *See* ANTELOPE.

BLESSINGTON, MARGUERITE, COUNTESS OF (1789–1849), Irish novelist and miscellaneous writer, daughter of Edmund Power, a small landowner, was born near Clonmel, Co. Tipperary, Ireland, on Sept. 1, 1789. Her childhood was made unhappy by her father's character and poverty, and her early womanhood wretched by her marriage at the age of 15 to a Captain Maurice St. Leger Farmer, whose drunken habits brought him at last as a debtor to the king's bench prison, where, in Oct. 1817, he died. His wife had left him some time before, and in Feb. 1818 she married Charles John Gardiner, earl of Blessington. Of rare beauty, charm and wit, she was no less distinguished for her generosity and for the extravagant tastes which she shared with her husband, which resulted in encumbering his estates with a load of debt. In the autumn of 1822 they went abroad, spent four months of the next year at Genoa in close intimacy with Byron, and remained on the Continent till Lord Blessington's death in May 1829. Some time before this they had been joined by Count D'Orsay, who in 1827 married Lady Harriet Gardiner, Lord Blessington's only daughter by a former wife. D'Orsay, who had soon separated from his wife, now accompanied Lady Blessington to England and lived with her till her death. Lady Blessington was for some years editor of *The Book of Beauty* and *The Keepsake,* popular annals of the day. In 1834 she published her *Conversations with Lord Byron.* Her *Idler in Italy* (1839–40), and *Idler in France* (1841) were popular for their personal gossip. Early in 1849, Count D'Orsay left Gore House to escape his creditors; Lady Blessington joined the count in Paris, where she died on June 4, 1849.

BLETCHLEY, before 1911 called Fenny Stratford, a market town and urban district in Buckingham parliamentary division of Buckinghamshire, Eng., 47¾ mi. N.W. by N. of London on Bedford branch of the L.M.S. railway. Pop. (est. 1938) 7,442. Area 4,463 ac. It lies in an open valley on the west (left) bank of the Ouzel, where the Roman Watling street crosses the stream, and is 1 mi. E. of Bletchley junction. The church of St. Martin was built (1730) at the instance of Browne Willis, an eminent antiquary (d. 1760), buried here. A custom instituted by Willis on St. Martin's Day (Nov. 11) includes the firing of some small cannon called the "Fenny Poppers," and other celebrations.

BLICKLING HOMILIES, an Anglo-Saxon ms. of the time of Aelfred and Aelfric, consisting of sermons and legends. The originals are at Blickling Hall, Aylsham, Norfolk, England; they were edited for the Early English Text Society by Richard Morris.

BLIDA, a town of Algeria, in the department of Algiers, 32 mi. by railway S.W. from Algiers, on the line to Oran. Pop. (1936) 25,871. It lies surrounded with orchards and gardens, 630 ft. above the sea, at the base of the Atlas, on the south edge of the fertile plain of the Mitidja, and the right bank of the Wad-el-Kebir affluent of the Chiffa, which provides power for large corn mills and several factories, and also supplies the town, with its numerous fountains and irrigated gardens. Blida is surrounded by a wall with six gates, and is further defended by Fort Mimich, on a steep hill left of the river. The present town is French in character and has a flourishing trade, chiefly in oranges and flour. It is one of the pleasantest spots in Algeria. In the vicinity are the villages of Joinville and Montpensier, which owe their origin to military camps established in 1838.

Blida, i.e., *boleida,* diminutive of the Arab word *belad,* city, occupies the site of a Roman military station, but the present town appears to date from the 16th century. A mosque was built by order of Khair-ed-din Barbarossa, and under the Turks the town was of some importance. In 1825 it was nearly destroyed by an earthquake, but was speedily rebuilt. It was not till 1838 that it was finally held by the French, though they had held it eight years before. Blida is the chief town of a commune of the same name, pop. (1936) 44,043. Before 1942 an important French military air-base was established here. It was seized by the Allies on Nov. 9, 1942.

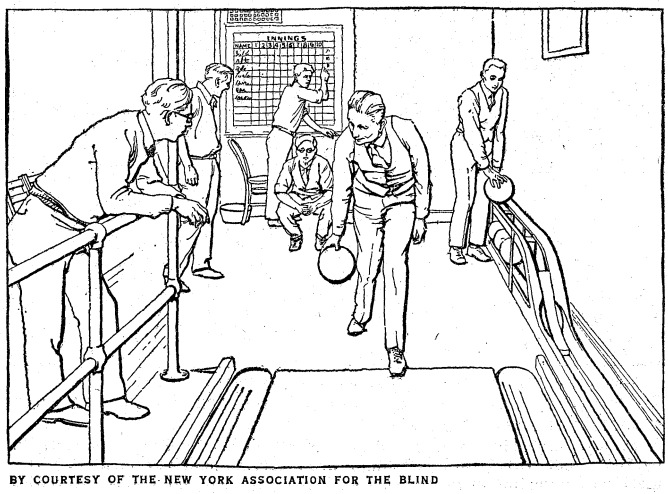
BLIGH, WILLIAM (1754–1817), English admiral, accompanied Captain Cook (*q.v.*) in his second expedition (1772–74), as sailing master of the "Resolution." He was nicknamed "bread-fruit Bligh" because of the discovery of the fruit on the voyage, and was sent in 1787 in H.M.S. "Bounty" to the Pacific, to fetch bread-fruit for introduction to the West Indies. On his return from Otaheite a mutiny broke out (1789) on the "Bounty," and Bligh, with 18 others, was set adrift. The mutineers settled on Pitcairn Island. Bligh eventually landed at Timor in the East Indies, having made a voyage of about 4,000 miles in an open boat. He returned to England, and ultimately introduced the bread-fruit tree into the West Indies. Bligh fought at Copenhagen (1801), and from 1805–08 was governor of New South Wales. There his soldiers mutinied against him, and he was a prisoner until 1810. He died in London in 1817. The mutiny on the "Bounty" inspired Lord Byron's "The Island." (*See* "BOUNTY," MUTINY OF THE.)

BLIND, MATHILDE (1841–1896), English author, was born at Mannheim, on March 21, 1841. Her father was a banker named Cohen, but she took the name of Blind after her stepfather, the political writer, Karl Blind (1826–1907), one of the exiled leaders of the Baden revolt in 1848–49. Mathilde wrote three long poems, "The Prophecy of St. Oran" (1881); "The Heather on Fire" (1886), an indignant protest against the evictions in the Highlands, and "The Ascent of Man" (1888), which was to be the epic of the theory of evolution. She wrote biographies of George Eliot (1883) and Madame Roland (1886), and translated D. F. Strauss's *The Old Faith and the New* (1873–74) and the *Memoirs of Marie Bashkirtseff* (1890). She died on Nov. 26, 1896, bequeathing her property to Newnham College, Cambridge.

A complete edition of her poems was edited by Mr. Arthur Symons in 1900, with a biographical introduction by Dr. Richard Garnett.

BLIND, TRAINING AND WELFARE OF THE. Section 69 of the English Education Act, 1921, defines the word "blind" as meaning "too blind to be able to read the ordinary school books used by children." In 1927 there were 2,554 blind children between the ages of 5 and 16 in England and Wales. Besides these it was estimated that there were nearly 7,000 partially-blind children. The total accommodation in schools in England and Wales for blind and partially-blind children is 4,514. The number of blind children under 5 years of age was 258, and the total number of registered blind persons was 46,822 of whom 31,667 were employable. Statistics show that the number of cases of blindness is on the decrease.

Attempts at Reform.—In 1910, an organization of blind workers, the National League of the Blind, began to direct public opinion to the need for a more systematic solution of the problem than could be secured by the piecemeal action and insufficient resources of voluntary institutions. The institutions had been in the main opposed to government assistance for the adult blind. The alternative plan, proposed by workshop authorities, was to secure government contracts for brushes, baskets, etc. Contracts were secured, but unfortunately could not be executed except at a loss. Because of the failure of this line of approach the institution authorities swung round in favour of state assistance.



BY COURTESY OF THE NEW YORK ASSOCIATION FOR THE BLIND

BOWLING AT AN INSTITUTION FOR THE BLIND

Modern development in education has succeeded in alleviating many of the handicaps suffered by the blind. Throughout the world there are now established centres where those afflicted with loss of sight are taught to engage in activities for a healthy physical condition

The number of blind men and women employed in British workshops was only 2,300. About 200 young persons were completing their technical training annually, and for these practically no provision was being made. Wages paid were inadequate and, owing to lack of funds, in most institutions little could be added thereto. As far back as the days of the Royal Commission on the Blind, 1885, the blind workers had been in favour of a state subsidy of wages in one form or another, but their petitions had gone unheeded. Now the matter came again to the front and, along with the demand for municipal workshops, a measure before Parliament stipulated for an adequate wage. Institutions were thus driven to produce a measure of their own. In December 1910 an attempt was made to bring the two competing measures into line. An agreed bill secured its first reading in May 1914, but it got no further, probably because of the outbreak of war.

The forward step came by another route. W. Wardle, Labour M.P. for Stockport, initiated in March 1914 a debate on the conditions of the blind. In May the government set up a departmental committee "to consider the present condition of the blind in the United Kingdom, and the means available for (a) their industrial and professional training and (b) their assistance, and to make recommendations." The committee's report was published in Aug. 1917 and contained a suggestion that a central authority should be set up "in the Ministry of Health, whenever such a ministry should be created, and in the meantime in the Local Government Board, for the general care and supervision of the blind." This central authority was to have funds provided by the Exchequer and to be guided as to policy by an advisory committee.



BY COURTESY OF THE NEW YORK ASSOCIATION FOR THE BLIND

BLIND BOYS LEARNING CAMP COOKING

Scouting is another activity the blind boy is now able to enjoy. Under capable instruction, he soon learns to know the woods and outdoor life almost as thoroughly as his more fortunate brothers

Grants and Pensions.—In August 1919 the Ministry of Health issued regulations explaining the services in respect of which grants would be paid. In 1921–2 the grants paid totalled £69,886, while in 1926–7 the total had increased to £112,510. In 1920 the Blind Persons Act was passed. This provided in Section 1 for the grant of Old Age Pensions to blind persons at the age of 50 instead of at the age of 70. Section 2 places a duty on local authorities to promote the welfare of blind persons, ordinarily resident in their area. They are given power to provide and maintain or contribute towards the provision and maintenance of workshops, hostels, homes or other places for the reception of blind persons, and, with the approval of the Minister of Health, to do such other things as may appear to them desirable for the purpose. Section 3 provides for the registration of charities for the blind. Local authorities have gradually increased their contributions towards this service since 1920. The amount was £14,671 in 1921–2 while for 1926–7 it was £173,828. In 1927 there were 17,232 registered blind persons in England and Wales between the ages of 50 and 70, and no less than 84 per cent were in receipt of an old age pension. The Public Health Act of 1925 gave local authorities further powers for measures for the prevention of blindness.

The World War.—During the years 1914–18 more than 10,000 soldiers and sailors lost their sight on active service. To this total the British Commonwealth contributed nearly 2,000, and Germany 3,000. In Britain these blinded men were cared for at St. Dunstan's in London, and Newington House in Edinburgh. There they were given fresh hope and were taught useful occupations. In Germany, an effort was made to find occupation for them in particular sections of industry. Messrs. Siemens led the way, and about 450 were employed at the close of 1925.

Education.—The first state action in England and Wales towards the education of the blind was taken in 1885, when a Royal Commission was appointed to consider the condition of the blind. The commission reported in 1889 and its report resulted in the passing of the Elementary Education (Blind and Deaf Children) Act, 1893. This Act provided for the compulsory attendance at school of all blind children between the ages of 5 and 16.

Blind children under 5 years of age are eligible for admission to one of the three nursery schools or "Sunshine Homes," estab-

lished by the National Institute for the Blind at Chorley Wood, Southport and Leamington. From 5 to 16 years of age they are admitted to day and residential schools for the blind. There are two secondary schools, one for blind boys at Worcester, and one for blind girls at Chorley Wood. Students are trained at the Royal Normal College for the Blind, Upper Norwood, London, for the careers of school-teachers, musicians and typists. There are about 300 teachers engaged in teaching blind children in special schools.

After the age of 16 the blind are provided with further education and training. The responsibility for this training is placed by the Education Act, 1921, on the local education authority for higher education, namely, a county or county borough council. Section 2 (6) of the Blind Persons Act, 1920, provides that the local education authority shall secure adequate and suitable provision for the technical education of blind persons, ordinarily resident within their area, who are capable of receiving and being benefited by such education. Only those blind persons are admissible on the completion of their training to workshops for the blind who are "too blind to perform work for which eyesight is essential" (Blind Persons Act, 1920). In 1927 there were 1,704 students over 16 years of age in training in vocational courses held throughout the country. Students between 16 and 21 years of age, as well as being taught a trade, receive instruction in general subjects, commercial knowledge, singing, physical education and hygiene. The period of training may occupy from 2 to 4 years according to the trade. Vocational training is available for older blind persons who have become blind after leaving school.

Scotland.—The welfare of the blind in Scotland is similar to that in England and Wales. On April 1, 1927, there were 6,939 known blind persons in Scotland, of whom 340 were of or under school age. In 1926–27 grants were paid by the Scottish Board in respect of services provided for the welfare of the blind amounting to £16,033/15/0.

France.—The education of blind children in France is compulsory. The Education Act of 1882 stipulated that a standing order of the *administration publique* should settle the special conditions under which blind children should be educated. There is a National Institution in Paris which accommodates 230 boys and girls. This is State supported with some help from local authorities. There are a number of schools maintained by the Departments of Loire, Nord and Seine, and by the city of Lyons, and 26 private schools not under the control of the State. The age of admission of blind children to the schools varies from 3 to 10 years.

Denmark.—The care of the blind in Denmark was begun in 1811 when a private institution was founded. In 1858 this institution was taken over by the Government. There are schools for primary and technical education and these are State aided.

Spain.—Education of blind children in Spain is not compulsory. Only one blind school, the National College for the Deaf and Blind, in Madrid, is maintained by the State. There are two other schools in Madrid and these are maintained by the City authorities. Some blind schools are maintained in various places by provincial authorities, others by cities, and others by private societies. In the National College in Madrid the period of instruction is from 6 to 16 years of age.

Hungary.—Education of the blind is compulsory. Children are admitted to school at the age of 5. From 14 to 25 uneducated blind persons are admitted into schools for the young blind, but over the age of 25 they are sent to schools for the blind where they receive trade instruction.

Italy.—The education of blind children has been compulsory by law for years, but the law was not carried out by anyone until under the present Fascist Government, it was re-enacted on Dec. 31, 1923. Instruction is given as far as possible in institutions for the blind, but blind children can, if desired, enter schools for seeing children, unless they are mentally defective. Institutions whose activities are mainly educational have gradually passed from the care of the Ministry of the Interior to that of the Ministry of Public Education. Blind schools are maintained partly by the Provinces and Communes and partly by money from charitable sources. The age of admission is generally 6 and the period of instruction usually lasts for 10 years. There are institutions for the blind at Torino, Milan, Trieste, Rome, Naples, etc.

Switzerland.—The education of the blind is not compulsory, and is not maintained by the public authorities, but only by private charity, with the exception of the Cantonal school at Zurich. Blind children are usually admitted from the age of 6 years.

Finland.—Education of blind children is compulsory in schools directed and maintained by the State. Children are admitted to school at 8 years of age, the highest age of admission being 11 years. Pupils usually remain at school for 10 years. Training establishments for the blind are provided and maintained by the society *Das Blindas Vanner* (Friends of the Blind), which receives a yearly grant from the State.

Czecho-Slovakia.—From 1869 when Czecho-Slovakia still formed part of the Austrian monarchy, education of blind children has been compulsory. Schools are maintained by the State and municipal authorities as well as by private endowment. The age of admission to schools is from 3 to 6 years. After the school period, trades are taught.

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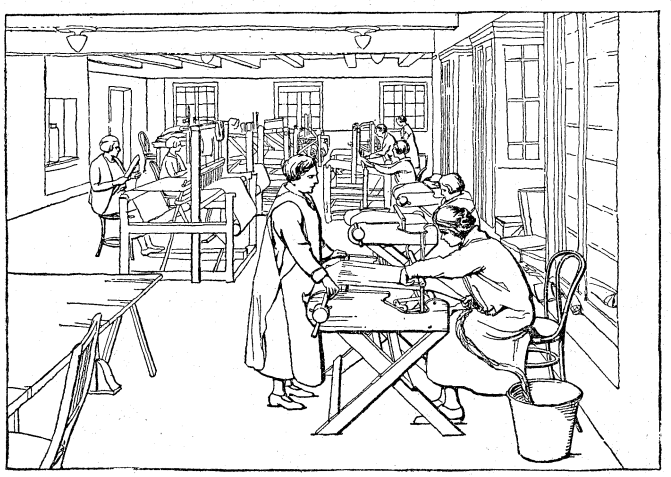
The United States.—Official provision is made for the education of the blind in the United States. After 21 years of agitation a bill to promote such education was passed in 1879 when the Federal Government appropriated $10,000 annually for printing embossed books to be distributed to State schools; which appropriation was increased in 1927 to $75,000. Each State Government holds itself financially responsible to place its blind either in its State school, of which there are 39 in the country, or to place blind children in outside institutions at its expense. Great progress has been made.



BY COURTESY OF THE NEW YORK ASSOCIATION FOR THE BLIND

WEAVING DEPARTMENT IN THE HANDICRAFT CLASS OF THE NEW YORK ASSOCIATION FOR THE BLIND

Weaving is probably the most widely practised of all handicrafts engaged in by the blind. Others are sketching, wood carving and toy making. The practical application of these trades enables many men and women, otherwise dependent on charity, to earn their own living

The first school for the blind in the United States was founded in Boston, Mass., chiefly through the efforts of Dr. John D. Fisher, a young physician. It was incorporated in 1830, and in honour of T. H. Perkins (1764–1854) who gave his mansion to the institution, was named the Perkins Institution and Massachusetts Asylum (now School) for the Blind. Aid was granted by the State from the beginning. In 1831 Dr. Samuel G. Howe (*q.v.*) was appointed director, and held that position for nearly 44 years, being succeeded by his son-in-law Michael Anagnos (d. 1906), who

established a kindergarten for the blind at Jamaica Plain, in connection with the Perkins Institution. One of Dr. Howe's most notable achievements was the education of Laura Bridgman (*q.v.*) who was deaf, dumb and blind, and this has since led to the education of Helen Keller and other blind deaf-mutes. The New York institution was incorporated in 1831, and the Pennsylvania institution was founded at Philadelphia by the Society of Friends in 1833. The Ohio institution was founded at Columbus in 1837, the Virginia at Staunton in 1839, the Kentucky at Louisville in 1842, and the Tennessee at Nashville in 1844. The Pennsylvania Institution at Overbrook, Pa., and the Perkins Institution, Watertown, Mass., were pioneers in making provision for children of kindergarten age.

Readers for the blind desirous of university education are provided in nine States, beginning with New York State in 1907, and Missouri in 1913, where $300 per annum is expended for each student. The training of teachers for work with the blind is encouraged and in 1921 Harvard University Graduate School of Education opened a course for them. Since then eight other universities and colleges have opened similar courses. Day school classes where blind children are taught to participate in regular work with other children, are conducted in 11 States. They were first established in Chicago in 1900, followed by Cincinnati, 1905, and Milwaukee, 1907. New York and Cleveland instituted them in 1909, since when they have spread over the country.

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BLINDAGE, a temporary wooden screen faced with earth for protection against the effect of projectiles (from Fr. *blinder,* to blind).

BLIND HOOKEY, a game of chance, played with a full pack of cards. The deal, which is an advantage, is decided as at whist, the cards being shuffled and cut as at whist. The dealer gives a parcel of cards to each player including himself. Each player puts the amount of his stake on his cards, at which he must not look. The dealer has to take all bets. He then turns up his parcel, exposing the bottom card. Each player in turn does the same, winning or losing according as his cards are higher or lower than the dealer's. Ties pay the dealer. The cards rank as at whist. The suits are of no importance, the cards taking precedence according to their face-value.

BLINDING, a form of punishment anciently common in many lands. It was resorted to by the Roman emperors in their persecution of the Christians. The method of destroying the sight varied. Sometimes a mixture of lime and vinegar, or barely scalding vinegar alone, was poured into the eyes. Sometimes a rope was twisted round the victim's head till the eyes started out of their sockets. In the middle ages the punishment seems to have been changed from total blindness to a permanent injury to the eyes, amounting, however, almost to blindness, produced by holding a red-hot iron dish or basin before the face. Under the forest laws of the Norman kings of England blinding was a common penalty.

BLINDNESS. The World War gave an impetus to the movement for the emancipation of the blind that had begun in the 18th century. Every country involved in the holocaust was driven to face the problem presented by a number of vigorous citizens, normal in every way but deprived of sight. These men of every rank of life were unconscious pioneers and leaders of the blind. As the number of those stricken through the wars of the Crusades brought about the establishment of the first public institution for the assistance of the blind 600 years before (*see* FRANCE), so these 20th century warriors have made their presence felt in legislative and other spheres.

Blind men and women have made positions for themselves in the past in isolated cases, but to-day there is hardly an avenue of life in which a man or woman without sight is not succeeding. The way has been opened in literature, the arts, the Church, law, politics, commerce, trade, agriculture and sport. Even the unemployable blind are not left destitute.

Since the beginning of history there have been individual blind persons gifted with exceptional initiative or enterprise, or who,

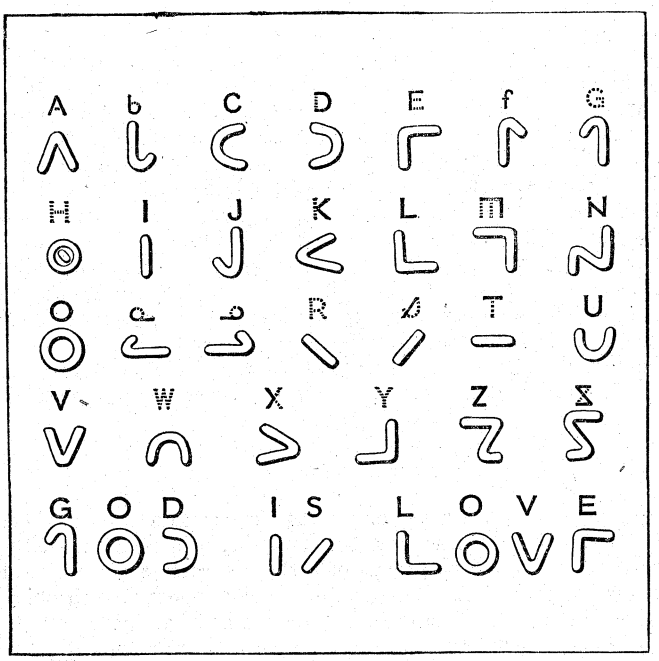

FIG. 1.—READING FOR THE BLIND ACCORDING TO DR. MOON'S ALPHABET WHICH IS BASED ON ROMAN LETTERS

having had the advantage of a good education, have burst the bonds of affliction and led useful and interesting lives. The blind community as a whole, however, is and has always been poor, and it was not until private and public efforts were made to secure education and training for them that any opportunity for even the slightest degree of progress from a condition of absolute dependence was afforded. Inability to read was the greatest handicap, and the development of methods whereby this became possible was the first great step forward in the education of the general blind community.

Systems of Reading.—The earliest authentic records of tangible letters for the blind describe a plan of engraving the letters upon blocks of wood, the invention of Francesco Lucas, a Spaniard. In 1640 a writing-master in Paris cast a movable leaden type for the use of the blind. Pins inserted in cushions were next tried, and large wooden letters. Cast metal letters followed, and in Germany R. Weissembourg made use of letters cut in cardboard, and afterwards pricked maps in the same material. By this method he taught Mlle. Paradis, the talented blind musician and the friend of Valentin Haüy. To Haüy belongs the honour of being the first to emboss paper as a means of reading for the blind; his books were embossed in large and small italics, from movable type set by his pupils. Haüy's first pupil, François Lesueur, was sorting the papers on his teacher's desk and came across a card strongly indented by the types in the press. The blind lad showed his master he could decipher several letters on the card. Immediately Haüy traced with the handle of his pen some signs on paper. The boy read them, and the result was printing in relief, the greatest of Haüy's discoveries.

The first book for the blind produced in the United Kingdom was by James Gall, of Edinburgh, in 1827; it was printed in a triangular modification of the common alphabet. Five years later the Scottish Society of Arts offered a prize of £20 for the best alphabet for the blind, and a Dr. Fry of London carried off the prize from 16 competitors. Gall's publication and the move made by the Society of Arts had attracted attention. Overseas visitors

came to Scotland to investigate progress, among them Dr. Howe of Boston, who went home to set up a printing press, while John Alston of Glasgow launched an appeal for a printing fund and printed a Bible for the blind in Fry's type.

At the beginning of the 19th century 23 different methods of embossed printing were in existence. The best known are Lucas's, Frere's, Moon's and Braille's. The Moon type invented by Dr. Moon of Brighton in 1847, which partly retains the roman outlines, is easily learnt by those who have become blind late in life (fig. 1).

The Braille system is now in world-wide use, even having been adapted to Chinese by Dr. Murray, a Scottish missionary, and a Braille magazine is published in Esperanto. Louis Braille (1809–1852) was born near Paris, and became blind when three years of age. He was a pupil and instructor at the Institution Nationale des Jeunes-Aveugles, Paris, and adapted the system that bears his name from that invented by Captain Charles Barbier, a young French cavalry officer. Louis Braille published his system in 1829 and developed it further five years later. It was not given official recognition in Paris until two years after Braille's death. The Braille alphabet consists of varying combinations of six dots in an oblong, the vertical side containing three dots and the horizontal two. There are 63 possible combinations of these six dots, and after the letters of the alphabet have been supplied, the



remaining signs are used for punctuation, contractions, etc. (fig. 2). For writing, a ruler is used, consisting of a metal bed either grooved or marked by groups of little pits, each group consisting of six; over this bed is fitted a brass guide, punched with oblong holes whose vertical diameter is three-tenths of an inch, while the horizontal diameter is two-tenths. The pits are arranged in two parallel lines, and the guide is hinged on the bed in such a way that when the two are locked together the openings in the guide correspond exactly to the pits in the bed. The brass guide has a double row of openings, which enables the writer to write two lines; when these are written, he shifts his guide downwards until two little pins, which project from the under surface at its ends, drop into corresponding holes of a wooden board; then two more lines are written, and this operation is repeated until the bottom of the page is reached. The paper is introduced between the frame and the metal bed. The instrument for writing is a blunt awl,

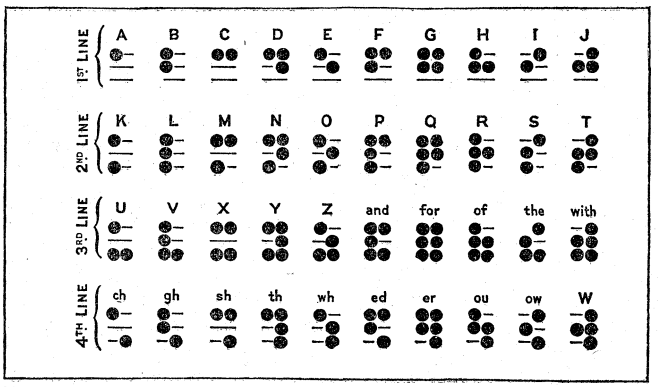

FIG. 2.—THE BRAILLE ALPHABET, ONE OF THE MOST WIDELY USED ALPHABETS FOR THE BLIND

which carries a little cap of paper before it into the grooves or pits of the bed, thereby producing a series of little pits in the paper on the side next the writer. When taken out and turned over, little prominences are felt, corresponding to the pits on the other side. The reading is performed from left to right, consequently the writing is from right to left; but this reversal presents no practical difficulty as soon as the pupil has caught the idea that in reading and writing alike he has to go *forwards* (fig. 3).

The first ten letters, from "a" to "j" are formed in the upper and middle grooves; the next ten, from "k" to "t," are formed by adding one lower back dot to each letter of the first series; the third row is formed from the first by adding two lower dots to each letter; the fourth row, similarly, by adding one lower front dot.

The first ten letters, when preceded by the prefix for numbers stand for the nine numbers and the cipher. The same signs, written in the lower and middle grooves, instead of the upper and middle, serve for punctuation. The seven last letters of each series

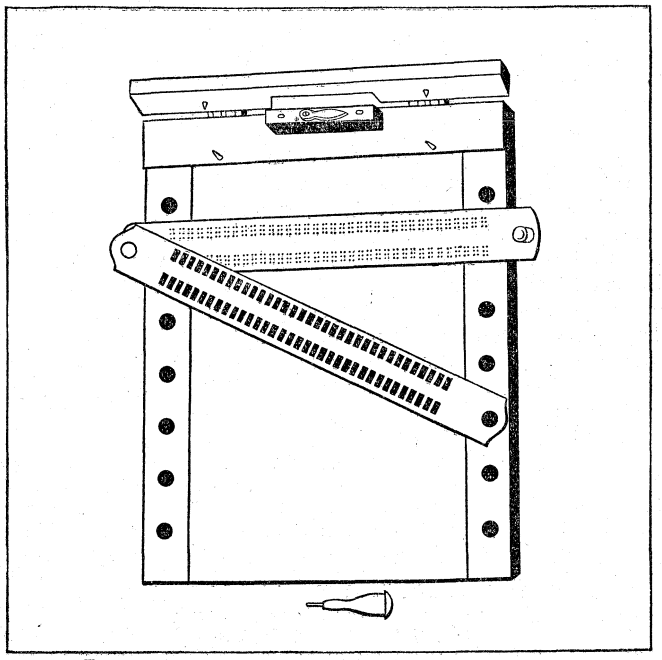

FIG. 3.—APPARATUS EMPLOYED IN WRITING BRAILLE

stand for the seven musical notes—the first series representing quavers, the second minims, the third semibreves, the fourth crotchets. Rests, accidentals and every other sign used in music can be readily and clearly expressed without having recourse to the staff of five lines which forms the basis of ordinary musical notation, and which, though it has been reproduced for the blind, can only be considered as serving to give them an idea of the method employed by the seeing, and cannot, of course, be written. By means of this dotted system, a blind man is able to keep memoranda or accounts, write his own music, emboss his own books from dictation and carry on correspondence.

The first complete copy of the Bible (English) in Braille was in 39 large foolscap volumes. It was produced between 1877–90, and every dot was punched out by the hand of one man. Invention of the stereotype-machine by Frank Hall (U.S.A.) in 1893 led to a tremendous increase in the production of Braille books. The National Institute for the Blind can print 6,000 pages an hour with its electrically driven press.

Music and Broadcasting.—Music as a profession and recreation plays a very important part in the life of the blind. Numbers of blind persons make a living or augment their income as organists, singers, instrumentalists and teachers. In recent years music, through broadcasting, has contributed enormously to the happiness of the blind of all classes. Listening to broadcasting is such an ideal pastime and means of self-education for blind people that considerable efforts have been made through voluntary agencies to supply a wireless set to all who cannot afford to buy one.

Apparatus.—Much ingenuity has been displayed by blind persons and others in the adaptation and development of apparatus which mitigates the handicap of blindness. There are frames for guiding hand writing, hand frames and styles for writing Braille letters and notes, machines for carrying out the same function more rapidly and machines for writing a system of Braille shorthand at a great speed which enables work comparable to that of a stenographer to be done. Embossed carriage scales in place of the ordinary engraved scales are attached to standard typewriters enabling the blind to use these machines for private or business purposes with great efficiency. Many types of watches have been

devised with open face, stout hands and embossed figures or dots at quarter hour or five minute intervals. These are commonly in use amongst the blind of all classes.

Many games such as chess, draughts, dominoes, have been adapted for the use of the blind, and most card games can be played with cards upon which Braille characters are embossed to indicate suits and values. Some blind people are extremely expert

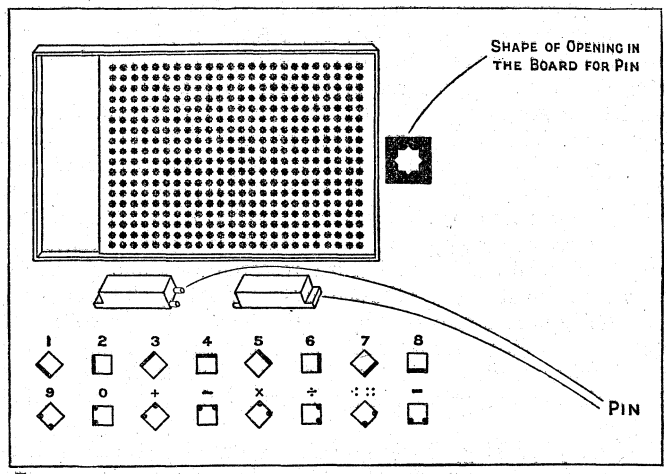

FIG. 4.—ARITHMETIC BOARD FOR THE BLIND, USED FOR THE MOST COMPLICATED ARITHMETICAL CALCULATIONS
Each pin can be placed so as to represent one of the 16 different characters illustrated. Special pins are also available representing algebraical symbols

at chess and bridge, and hold their own in competition with sighted players.

Many boards have been constructed to enable the blind to work arithmetical problems. The one which is most used was invented by the Rev. W. Taylor (fig. 4). The board has star-shaped openings in which a square pin fits in eight different positions. The pin has on one end a plain ridge and on the other a notched ridge; 16 characters can be formed with the two ends. The board is also used for algebra, other type furnishing the algebraic symbols.

Numerous forms of exercise and recreation can be enjoyed by the blind, usually with some sighted assistance and sometimes with special apparatus or methods. These include horse-riding, rowing and sculling, swimming, skating, dancing and walking. Successful efforts have been made to organize field sports, including modified forms of running, goal kicking, jumping, putting-the-weight, tug-of-war, etc.

Independence.—Blind people must rely very largely upon sighted assistance in the foregoing and many other matters such as the reading of correspondence, current newspapers, etc. Great efforts have, however, been made by all classes having the requisite opportunity and education to acquire a degree of independence so far as this is attainable. Much success has attended these efforts, and those amongst the blind community who are not prevented by physical or mental affections have developed a high degree of skill in attending to their own personal wants, amusing themselves, getting about alone in and out of doors, etc. The blind do not develop a special sense to replace the lost sense of sight, but the remaining primary senses and possibly many secondary and little-used senses acquire added keenness and usefulness with practice. The sense of hearing becomes keener mentally rather than physically, and numerous audible indications of what is going on around him are correctly interpreted by a trained and educated blind man. Sounds of all kinds, echo, and possibly air pressure, contribute to the endowment of a blind person with the power of discerning obstacles which make it possible for him to walk alone, especially in familiar surroundings, but even sometimes in entirely strange places. Some blind people in the ordinary course of their daily avocation travel many miles alone on foot or by means of the common transport services.

The Mind of the Blind Child.—Those who are charged with the education of the blind, especially children, should give particular attention to instruction in the attainment of personal independence.

As more sensations are received through the eye than through any other organ, the mind of a blind child is vacant, and the training should begin early or the mind will degenerate. Indirectly the loss of sight results in inaction. If no one encourages a blind child to move, he will sit quietly in a corner, and when he leaves his seat will move timidly about. This want of activity produces bad physical effects, and further delays mental growth. The blind are often injured, some of them ruined for life, through the ignorance and mistaken kindness of their friends during early childhood. They should be taught to walk, to go up and down stairs, to wash, dress and feed themselves. They should be carefully taught correct postures and attitudes, and to avoid making grimaces. They should be told the requirements of social conventions which a seeing child learns through watching his elders. They have no consciousness that their habits are disagreeable, and the earlier unsightly mannerisms are corrected the better. Blind children have a stronger claim upon the public for education than other children, because they start at a disadvantage in life, they come mostly of poor parents, and without special instruction and training they are almost certain to become a public charge during life.

THE BLIND IN GREAT BRITAIN

Two departments of State are responsible to parliament for the welfare of the blind; the Ministry of Health, which administers grants payable out of moneys voted by parliament and is the central authority for all matters relating to the blind under the Blind Persons Act; and the Board of Education. Both these departments keep in touch with local authorities, local committees and institutions for the blind by means of inspectors.

Under the Blind Persons Act, 1920, a blind person is "one so blind as to be unable to perform any work for which eyesight is essential." The definition according to the Education Act, 1921, is wider, and signifies a child "too blind to be able to read the ordinary school-books." It is therefore possible for a child to be educated as "blind" and yet remain ineligible for benefits under the Blind Persons Act, 1920.

The number of blind persons stated to exist in any country depends upon the definition of blindness, its interpretation and the extent to which registers are kept. It will be understood, therefore, that statistics of this kind relating to various countries may not be strictly comparable.

The Blind Persons Act, 1920, provides for the keeping of a register of the blind within each area. The operation of the act has led to the discovery of a number of blind persons hitherto unknown. The return of the blind for 1927 gave the total number of blind persons in England and Wales as 46,822. In 1927 there were 44,010 blind over 16 years of age. Of these 9,160 were employed; 635 trained but unemployed; 1,704 under training; 844 not under training but trainable; and 31,667 unemployable. Over 67·6% of the total number of blind in England and Wales are classed as unemployable.

Voluntary Institutions.—The first institution for the blind in England was founded in Liverpool in 1791 as the result of the initiative of two blind men, Edward Rushton, a bookseller, and James Christie, a musician. Rushton (b. 1756) was travelling to Dominica when malignant ophthalmia broke out in the cargo of slaves on his ship. He was then about 19 and his life had been saved, some years before, by a negro who had sacrificed himself. Rushton went into the hold to help the sufferers, and contracted their disease, becoming totally blind. Sixteen years later he brought about the establishment of the School for the Indigent Blind in Liverpool.

Other institutions were founded in quick succession, many as the result of the efforts of those who had become blind. Scotland took a step in 1793, the interest of several people having been aroused by the translation of *Education of the Blind* by Valentin Haüy, as made by Thomas Blacklock, a blind Scottish poet and scholar, and the Edinburgh asylum for the relief of the indigent and industrious blind was established by the Rev. David Johnston, D.D. It now has 465 beneficiaries on the roll, in addition to a number of outdoor pensioners. Dublin followed Scotland's example 17 years later (Richmond asylum, Dublin, 1810).

In 1853 Miss Elizabeth Gilbert (b. 1826), daughter of the bishop of Chichester, who had lost her sight when three years of age, began to make enquiries as to the position of her fellows. There were then about 30,000 blind people in the United Kingdom; 27,000 of these were regarded as "adults" and 1,000 of them drew pensions averaging £10 per annum from various charities. The remainder were either supported by relatives, or gained a precarious living as best they might. Of the 3,900 under 21 years of age about half were receiving training in schools and institutions, but no provision being made for after-care or supervision, these, on discharge, frequently found themselves unable to work at the trades they had been taught. Miss Gilbert saw the need, and determined to establish an out-workers scheme. So the Association for Promoting the General Welfare of the Blind was born (1856), its modest beginning a cellar rented at eighteenpence a week, and six employees—"men who for want of work have been compelled to solicit alms, or who may be likely to be tempted to do so." In 1927 there were 163 blind men and women working in the association and 41 who were too old to work who were receiving pensions. Goods were sold to the value of £32,176.

By 1923, 1,286 blind workers were employed permanently by 25 workshops in England and Wales. These drew £65,255 in wages, and a slightly higher sum in supplement (£65,454). Goods sold realized £268,926; trade deficit per blind person was £22; augmentation, £51 per blind person; loss to agencies £73 per blind person.

About 1860 Dr. T. R. Armitage, then on the threshold of a promising medical career, was threatened with blindness. Renouncing his profession, he devoted himself to work in connection with those who had lost their sight. Having reorganized the Indigent Blind Visiting Association he founded the British and Foreign Blind Association for promoting the education and employment of the blind (1868) ultimately to develop into the National Institute, and brought the Braille system into use in England. Four years later Dr. Armitage, as the result of a meeting with Mr. (later Sir Francis) Campbell, was to be instrumental in establishing the Royal Normal College and Academy of Music for the Blind, of which Dr. Campbell became director.

The Royal Normal College accepts pupils of both sexes from the ages of five to 21. A good general education and physical training are given, and particular attention is paid to the teaching of music, pianoforte tuning, etc., as a means of earning a livelihood. Stenography and typewriting are also taught, and good posts have been found for many ex-pupils. Before the establishment of the college it was a rare thing for a blind person to follow a musical profession or avocation with financial success. Since its foundation many scores of musicians and piano-tuners have found it possible to earn a living, and degrees and diplomas of high merit, including several Mus.Bac., F.R.C.O., L.R.A.M., etc., have been secured by ex-pupils of the college. The college is recognized as a teachers' training college by the Board of Education.

The National Library for the Blind was to come into being in 1882 through the instrumentality of two women, Miss Arnold and Mrs. Dow, the former being blind. With slates and styles they set themselves to work to produce books in Braille and, aided by a grant of £25, opened a "library" from which books were hired out to a small circle of readers at a charge of one penny per week. Two years after its inception an annual report shows the income to be £58. To-day the National Library ranks with the National Institute for the Blind as one of the great national factors serving the blind community as a whole. It has 137,337 volumes on its shelves, and a daily circulation of 800 books. Its income for the current year (1927) is £13,624, and a northern branch was opened in Manchester in 1918. The service is free to all blind readers and the General Post Office delivers an average volume, some 5 lb. in weight, for a penny. In certain cases the library pays this charge. Books are sent not only to readers in Great Britain, but also overseas. When the heavy volumes become worn or pass out of general circulation they are used for the benefit of those suffering from contagious diseases. Some go to leper settlements. The library supplies books on philosophy, psychology, the natural sciences, history, biography and travel, in addition to lighter reading. New novels are occasionally transcribed within a month of publication; one of average length runs into five Braille volumes. An expert will transcribe a volume in about ten days. Braille can be read at speeds ranging from 50 to 150 words a minute.

Although the foundation of the National Institute for the Blind was laid when the British and Foreign Blind Association came into being under the direction of Dr. T. R. Armitage, it was not until 46 years later (1914) that the title of the organization was changed, the work under the inspiration of Sir Arthur Pearson, Bt., having grown too wide for the original name to be truly descriptive. The institute publishes books, music and periodicals tending to raise the standard of education among the blind. In 1927 the total publications (in embossed types) were: Books, bound volumes, 24,213; magazines, periodicals, newspapers, instruction cards, etc., 372,903. The institute also undertakes the establishment of a students' library, research work and the placement of the blind amongst the sighted in factories; offers facilities for training in massage; runs homes for blind babies, a college to provide blind girls with a public school education, supplies blind home-workers with raw materials and markets their goods, and also maintains homes for the aged blind and a hostel for blind workers.

Generally speaking, the work of the institute is national in character, and it has become since Sir Arthur Pearson was its president in 1914 and introduced new methods of appealing for funds, an important factor in the finances of blind institutions throughout the country. From 1914 to the present time a gradual process of co-ordination of the activities of blind institutions, with the object of avoiding overlapping both in public collections and administration, has taken place, with the National Institute occupying a central position of great influence and power. An effort to unify the collecting activities of the blind institutions throughout the country has progressed satisfactorily until by 1927 the majority of important agencies have been brought to operate together and to issue but one appeal to the public.

St. Dunstan's.—St. Dunstan's (*q.v.*) founded by Sir Arthur Pearson in 1915, as a hostel and organization for the training, settlement and welfare of soldiers, sailors and airmen blinded in the World War is the only important national agency which conducts its appeals and works independently.

Worcester College for the Blind is an endowed public school for the education of blind boys, run, as far as possible, on normal public school lines. It owes its foundation to the Rev. H. Blair, formerly a master at King's school, Worcester, who saw the need for such a college when a totally blind boy who hoped to enter Trinity college, Dublin, was sent to him as a pupil. The boy ultimately took his M.A. degree, and carried off six open prizes. About 50% of the scholars are totally blind, and the remainder have too little sight to permit of their education being carried on in the usual way. Boys are accepted from the age of eight. Various scholarships and exhibitions are available for students whose parents are unable to afford the usual fees, and there are several valuable leading scholarships tenable at the universities. The college has educated and equipped for life over 240 blind students. About 100 have graduated at the universities, and many have obtained high honours. Over 30 have taken holy orders, and many are successful as solicitors, barristers, musicians, schoolmasters, lecturers or business men. A noteworthy figure in connection with Worcester College for the Blind is that of Sir A. W. G. Ranger, D.C.L. Himself a pupil of the college he was for over a quarter of a century honorary secretary of the board of governors. Before his retirement from public life in 1922 he was chairman of the National Institute for the Blind, and vice-chairman of St. Dunstan's. Sir Washington Ranger was one of the first to make an outstanding success as a solicitor, though handicapped by blindness from early youth. He was knighted in 1918 for his public service.

A college and association of teachers of the blind has been formed to promote and encourage the training of teachers of the blind, and to raise the status of such teachers.

A number of voluntary organizations have been established for the benefit of the blind in addition to those already mentioned. One of the largest is Gardner's Trust, created as the result of a bequest of £300,000 left in 1879. It has founded scholarships for men and women at the universities, administers a scholarship fund for blind boys for Worcester college students, and in addition to helping these towards a professional career, including music, applies a definite portion of its income towards providing instruction in handicrafts and trades. It also pensions certain unemployable blind.

The Cordwainers' Company is another doing excellent work. It was founded by the effort of John Came in 1796, who left £37,000 for the benefit of certain deserving classes, including the blind. The number of pensioners in the last category has steadily increased. Two blind sisters who had been pensioners for several years augmented the charity to a small degree by surrendering their pensions when they inherited property and donating £100 to the company "in gratitude for kindness shown."

Hetherington's Charities for Aged Blind, administered by Christ's Hospital, was founded in 1774 by a clergyman "in the hope that his example would be followed by others." The governors now pay out over £8,000 a year in pensions to blind persons from 50 to 70 years of age.

Others of the great guilds, including the Clothworkers' Company, the Drapers' and the Goldsmiths', dispense funds to much the same effect for the benefit of various classes of those without sight.

A number of institutions carry on the technical training of the blind, manage workshops, home-workers' schemes and home-teaching services, some of which confine their attentions to the unemployable. In addition county associations have been formed in most parts of England; these are usually the agents for the county council in their work in the welfare of the blind in rural areas and in towns where no agency is already working. These have been united into a Union of Counties Associations.

The blind community includes two trades unions—the National Union of the Professional and Industrial Blind, and the National League of the Blind. The former is a general association for promoting the welfare of its members, and includes a number of blind persons engaged in professional pursuits. The latter engages principally in propaganda with the object of increasing the extent to which the blind are cared for by the state and the municipality, as opposed to charitable agencies.

Government Service.—The earliest legislation in England concerning the welfare of the blind was the Act for the Relief of the Poor of Queen Elizabeth's day (1601). This laid the responsibility for the support of blind people together with destitute persons, upon their relatives, and failing these on the overseers.

Spasmodic regulations concerning the establishment of special schools and the education of blind adults followed at wide intervals of time, and nearly three hundred years later a royal commission was appointed (1886) "to investigate and report upon the condition of the blind . . . the various systems of education, elementary, technical and professional, at home and abroad, and the existing institutions for that purpose; the employments open to and suitable for the blind, and the means by which education may be extended so as to increase the number of blind persons qualified for such employment." At that date there were 32,296 blind persons in the United Kingdom according to the last census, but the accuracy of those figures was questioned. The blindness of 30% of the inmates of asylums was due to purulent ophthalmia and might have been prevented. There were 61 institutions for the blind, and a few board school classes in the larger towns, but owing to the unsatisfactory state of the law some blind children were receiving no education at all, since compulsory attendance was not enforced. Of those who had been trained in various institutions only 58% were following the trades they had been taught, and 15% of these were earning under 5s. per week. The main occupation followed was basket-making, while music and piano-tuning, brush, mat and mattress making, chair-caning, rope and twine spinning and weaving were also taught. Earnings amounted to but a few shillings a week, though those engaged in musical occupations earned twice as much as the craftsmen, and the highest earnings of all were recorded by Scripture readers, visitors, teachers and collectors. No provision other than the workhouse was made for aged blind.

The commission reported in 1889 and its report resulted in the passing of the Elementary Education (Blind and Deaf Children) Act, 1893, which provided for the compulsory attendance at school of all blind children between the ages of five and 16, and for the provision of special schools. A clause in the Education Act of 1902 empowered the education authorities to make further provision for the blind over the age of 16.

In March 1914, as a result of a resolution of the House of Commons, a departmental committee was set up to enquire into the general welfare of the blind. The report of this committee, which was delayed owing to the war, appeared in 1917, and at the end of that year an advisory committee on the welfare of the blind was appointed by the president of the Local Government Board. This body has issued a series of valuable reports, which register what has been done and is being done for the blind.

In August 1919 the Ministry of Health issued regulations and rules governing grants out of public monies to be distributed in aid of certain services carried on for the welfare of the blind, and so enabled the work to be developed. These public monies are voted annually by parliament as part of the vote of the Ministry of Health, and provide for grants to agencies for the welfare of the blind. Under the Board of Education (Special Services) Regulations, 1925, grants are also made in aid of the education, training and maintenance of blind children and students, at the rate of 50% in the case of students nominated by education authorities, and at a lower rate in the case of students nominated by boards of guardians or private persons, etc. Local authorities are also empowered to make maintenance grants to blind students attending institutions of higher education.

Under the Blind Persons Act, 1920, blind persons are entitled to receive the old age pension at 50 instead of 70 years of age. In March 1927, 14,562 persons in England and Wales between 50 and 70 were in receipt of this pension.

The same act imposed the duty of making arrangements for the welfare of the blind, to the satisfaction of the minister of health, on the council of every county and county borough. Each was required to submit a scheme outlining their plans for the exercise of their new powers. Before the end of 1927 all the 147 councils had prepared schemes. In general they made provision for: (1) children under school age; (2) education and training of (*a*) children and (*b*) young persons and adults; (3) employment either in workshops or as home-workers; (4) hostels for blind workers; (5) homes; (6) unemployable blind; (7) home-teaching; (8) registration.

Under the Maternity and Child Welfare Act it is possible to have blind children between the ages of two and five who may be found to be living under unsatisfactory conditions sent to one of the special schools certified by the Board of Education.

The responsibility for the education of children between the ages of five and 16 who are too blind to be able to read ordinary school books rests on the local education authority under the supervision of the Board of Education (Education Act, 1921).

It has been found that further education beyond the school-leaving age (16 for blind children) is essential for those who are to be prepared for remunerative employment. The responsibility for the provision of this training rests on the local education authority for higher education, namely a county or county borough council. Special training courses at a number of training institutions have been recognized by the Board of Education and grants are paid to these on account of the trainees they receive.

Training is provided not only for children, but for those who have become blind in later life, provided that the authorities are satisfied that the adult is trainable and, when trained, will be a blind person within the meaning of the regulations of the Ministry of Health entitling him or her to employment under the workshops or home-workers schemes. In practice it has been proved that those who become blind after 50 can rarely be trained for remunerative employment.

When a blind person has been trained for a manual occupation and lives within reach of a workshop for the blind he will normally be employed there. Failing such a centre arrangements can be made for him to follow his trade as a home-worker.

There are 57 workshops in England and Wales in receipt of a grant from the Ministry of Health. Some are small, employing only 10 to 20 workers; the largest has one hundred and eighty employees on its books.

Men's trades are usually basket, mat and brush making, bedding, upholstery, cabinet making, cane-furniture making, chair seating and boot-repairing. Women's trades are hand and machine knitting, light baskets, bedding, chair seating, wiredrawn brush making, rug-making and, in one or two instances, hand loom-weaving.

Ministry of Health regulations provide that "the recognized standards of the trade in which the workshop employees are engaged, so far as they relate to rates of pay, bonus, hours of labour, and holidays, must be observed." But few persons handicapped by blindness can earn a living wage on a commercial basis, therefore certain schemes of augmentation of wages have been introduced.

The most recent act for the benefit of the blind was the Wireless Telegraphy (Blind Persons' Facilities) Act, 1926. This gave the privilege of a free wireless licence to blind persons within the meaning of the act. Within a year of the passage of this act (December, 1927) 10,125 free licences had been taken out.

Other privileges exclusively enjoyed by the blind include the right to keep a dog, as a guide, without a licence, and concessions under which a blind person and a sighted guide may travel on certain railways, tramways, omnibuses, etc., at half rates.

Prevention of Blindness.—The Royal Commission 1886–89 found that a high percentage of blindness was preventable and the same conclusion was reached by the departmental committee on the causes and prevention of blindness which issued its final report in 1922.

As ophthalmia neonatorum was accountable for 20–30% of children in blind schools the committee examined with special care figures supplied by the Ministry of Health from 78 county boroughs, since 1915 when ophthalmia neonatorum was made notifiable throughout England and Wales.

Per 1,000 births	1915	1916	1917	1918	1920
. . .	14·39	15·93	16·72	16·95	17·84

A final opinion as to the increase or decrease of the incidence of the disease was difficult to reach but a more thorough and extensive training of midwives in connection with this disease, and the importance of prompt diagnosis, was recommended.

Recommendations were also made as to the educational provision for children with impaired vision, and the education of medical students in ophthalmology, and in connection with the development of works and safety committees with regard to the prevention of accidents in industrial life.

Since the publication of the final report (1922) a clause in the Public Health Act of 1925 has empowered local authorities, with the consent of the minister of health, "to make such arrangements as they may think desirable for assisting in the prevention of blindness, and in particular for the treatment of persons resident in their areas suffering from disease of or injury to the eyes."

Scotland.—Following on the recommendation of the departmental committees on the welfare of the blind which reported in 1917 and recommended the establishment in the Local Government Board, London, of a special department whose function should be the general care and supervision of the blind in England and Wales, and the appointment of an advisory committee, the cabinet authorized the establishment of a special department in the Local Government Board for Scotland, and the appointment of a separate advisory committee for the northern kingdom.

Accordingly a Scottish advisory committee was appointed. This acted in close co-operation with the English advisory committee and made its first report to the president of the Scottish Board of Health for the period 1918–20. Substantial effect was given to the committee's recommendations in the Blind Persons Act of 1920.

It was advised that legislative action should be taken in regard to (1) the provision of maintenance for children below school age; (2) the provision of technical education and vocational education for adolescents and adults; (3) maintenance for the unemployable blind; (4) the provision of residential homes; (5) workshop accommodation on adequate lines; (6) provision for the regulation of collections on behalf of the blind.

The State, local authorities and voluntary agencies are now responsible for the welfare of the blind in Scotland and in the years 1919–26 the sum of £83,902 has been paid by the board to voluntary agencies.

Figures supplied by the Scottish Board of Health to 1927 give the total number of blind in Scotland as 6,939, 62·7% of whom are unemployable. Over 2,000 are in receipt of the old age pension.

Northern Ireland.—Though in Northern Ireland, as in England and Wales, the care of the blind is the concern of the councils of counties and county boroughs, under the Blind Persons Act, 1920, only the Belfast county borough has (1927) put into operation a scheme for the welfare of the blind. In other parts blind persons are dependent upon friends, the poor law or district councils or eight philanthropic institutions, of which one is a training institution and workshop, one undertakes educative work for the blind, deaf and dumb, two are homes for the blind and the remaining four are hospitals which have special departments for caring for those who are blind. In September 1927 there were 1,758 persons in Northern Ireland in receipt of pensions under the Blind Persons Act, 1920. Northern Irish ex-service men blinded in the World War are under the care of St. Dunstan's (*q.v.*).

THE BLIND OF THE BRITISH EMPIRE

Canada.—Canada has a widely scattered blind population estimated at from 5,000 to 7,000. Until the World War attracted attention to the needs of the war-blinded, little was done for civilians. Four schools had been established for juveniles and two industrial institutions which employed under 50 workers. No accurate statistical record had been attempted.

The Canadian National Institute for the Blind which, since 1916 had become a powerful organization owing to the practical interest taken in the work for the blind by several blinded Canadian soldiers on their return from a period of training at St. Dunstan's, obtained its federal charter in 1918, its object being to "ameliorate the condition of the blind, and to prevent blindness." Federal grant covers administrative expenses while contributions and provincial government grants finance the practical work which extends from sea-board to sea-board and covers Newfoundland. Home-workers are encouraged, but institute factories have been opened. Raw material is supplied at cost and goods not sold locally may be sent to the central salesroom. In the first year of operation 9,000 dollars' worth of goods were sold through the institute; by the ninth year the value had increased to $466,000. Placement work is undertaken and an arrangement has been effected with the Workmen's Compensation boards in certain provinces by which the institute pays the premiums on blind persons placed in general industry.

Through the National Council for Child Welfare and similar agencies the National institute locates blind infants and watches over their development. Treatment at birth, to lessen the risk of ophthalmia neonatorum is compulsory in six provinces (1927). From seven to 20 years of age juveniles come under the educational authorities of Canada. Sight-saving classes for those with impaired vision have been started in several centres and some provincial governments make special grants to local schools which provide these. Technical training as well as educational instruction is provided in the Canadian schools for the blind and a few scholarships are awarded to particularly promising students.

Training in institute industries is offered to those who lose their sight between the ages of 21 and 50.

Two out of the nine provinces have adopted a pensions scheme somewhat similar to that in force in England, under which the blind benefit as others, receiving the pension at 70. The National Institute provides relief in necessitous cases below this age.

Australia.—The Commonwealth made special provision for the permanently blind under the Old Age and Invalid Pensions Act 1920, by which a pension not exceeding £39 per annum may be paid to a blind applicant, provided that his income, together with the pension, does not exceed £221 per annum "or such other amount as is declared a basic wage." Each individual State provides for the education and welfare of the blind on institutional lines. The Victorian and New South Wales schools and institutes for the blind offer particular opportunities for gifted pupils to pass on to the University Conservatorium of Music, while industrial departments provide employment for blind workers in such activities as broom- and mat-making. In several of the States, as also Tasmania, Braille writers' associations have been organized for the transcription of books as an adjunct to libraries. In Hobart an active Blind Mutual Progress Society is in being.

South Africa.—There is no relief granted by the Government of the Union of South Africa to persons afflicted with blindness except ex-service men who lost their sight as the result of war service.

There is an institution at Worcester, Cape Province, founded by a blind man, which conducts excellent work in the education of the blind. This institution receives liberal grants from the local education authority. A South African library for the blind was established in 1920 at Grahamstown, and is gradually extending its work of supplying both English and Afrikaans Braille books to blind people in the Union, while recently (1927) the Athlone blind school has been opened for non-European blind children in Capetown, and there are several other small organizations carrying out social work for the blind in various centres.

New Zealand.—In New Zealand institutes for the blind are financed by the government and through voluntary sources. They educate, train and employ blind persons. As a result of a considerable fund collected in 1922 in memory of Sir Arthur Pearson, the Jubilee Institute for the Blind, Auckland, which was founded in 1890, was enabled greatly to extend its work and make provision for the training and welfare of the blind of all ages and both sexes, throughout the dominion. Here, as in Canada, the return of blinded ex-soldiers after the World War caused a great revival of interest in the blind.

In 1924 a Blind Pensions Act came into operation which entitles those born blind, or who have become blind whilst permanently resident in New Zealand, whose relatives are unable to provide maintenance, to a pension payable at the rate of £45 10s. per annum, provided the applicant be "of good character." The pension is not payable to inmates of institutions, nor to those absent from the country. A notable feature of the act is that a blind person who is employed in any occupation may draw an additional weekly allowance equal to 25% of his total receipts, provided that these do not exceed £3 12s. 6d. per week.

India.—The total number of blind persons in India (census 1921) is 479,637 (including the Indian States). In British India alone there are 73,000 blind and deaf mute children between the ages of five and 15. Thirteen schools for the blind have been established at which the registered attendance is 1,183. These teach basket-making, mat-weaving and music. At the most advanced schools Braille is taught.

The number of blind who earn a livelihood in India is small. One of the most lucrative professions is that of Koran instructor in mosques.

The greater part of the work for the blind is carried on through missionary societies, but the Ministry of Development and district boards make grants to certain schools where an industrial as well as elementary education is in operation, and offer opportunities to those who train as teachers.

A company of blind Boy Scouts was formed in India in 1923, and an establishment of Girl Guides is in contemplation. The Bombay Blind Relief Association is taking preventative and remedial measures through field-workers in the villages.

Burma.—Out of a population of 13,000,000, about 25,000 are blind. Until the Mission to the Blind of Burma was formed no attempt was made to train these people. The mission gives educational and technical instruction to boys and girls, fitting them for industrial life, and selects the more intelligent to be trained as teachers or for the professions. All pupils are taught to read and write in Braille.

THE BLIND OF OTHER OLD WORLD NATIONS

The first effort towards organized help for the blind in Europe was made by Christians. St. Basil opened a hospice for the blind in Cappadocia during the 4th century; a Syrian hermit Lymnaeus followed his example in the 5th. Two hundred years later a retreat was established in Jerusalem for those without sight and not long afterwards the movement struck roots in France, originated by St. Bertrand, Bishop of Le Mans.

In the 11th century William the Conqueror founded several hospices in Normandy. The 12th century saw the beginning made in Bavaria and in 1260 an asylum was founded in Paris by Louis IX. (St. Louis), known as the Hotel des Quinze-Vingts, which has endured to this day. It was not until the close of the 18th century that any real attempt was made to educate or train those without sight.

Valentin Haüy, the man to whom the title "Father and Apostle of the Blind" was afterwards given, had his attention attracted to the problem by the contrast afforded by the public performance of Theresa von Paradis and the spectacle presented by some untrained and illiterate blind persons who, tricked out in fantastic attire, were trying to attract custom by making mock music. Shortly afterwards he came across François Lesueur, a blind boy, begging in the streets, and resolved to make a practical beginning. Compensating the child for his lost earnings, Haüy began to train him, and almost by accident discovered a method of embossing letters that François could decipher. With fine courage Haüy opened the Institution National des Jeunes Aveugles, and a philanthropic society sent him 12 blind children as his first pupils. News of Haüy's success in teaching these children to read spread. The Academy of Science examined and approved his raised print, and he was received by the king. When the revolution broke out Haüy's school was taken over by the State and later incorporated with the Quinze-Vingts. In 1806 the emperor Paul of Russia invited Valentin Haüy to Russia there to establish a school on similar lines, which he did so successfully that others were opened in Finland and Poland. Sweden was quick to follow suit. Great Britain had opened her Liverpool school in 1791, and Vienna an establishment in 1804. Haüy also established a school in Berlin (1806) and within a short time institutions were opened in almost every German principality and throughout the Continent.

In the early years of the 19th century America began to move, and the New England Blind Asylum, later to be known as the Perkins Institution and Massachusetts School for the Blind, was founded as the direct outcome of a visit paid by an American doctor to the school founded by Valentin Haüy in Paris. The blind historian, William H. Prescott, was one of the organizers. A doctor, Samuel Howe, was sent abroad to study methods and returned bringing with him two blind teachers, one from France, and one from England.

Austria.—There were 5,359 blind people in Austria in 1924 and a number of schools have been opened for children without sight. There is no law making attendance at these compulsory, they are residential and accept pupils from eight to 18 years of age. Austria has established nine training institutions, one of which is financed by the State. There are also ten homes for the blind where the residents help to pay the cost of maintenance by working at trades, usually piano-tuning, chair-caning and brush-making. Additional funds are provided by voluntary contributions and grants from societies and municipalities. Workshops have been opened where employees are put on piece work and receive a small government subsidy. Five societies have federated and now have a central warehouse and purchasing system. A Health Insurance Act is in force under which come the blind, together with other workers. Insured persons are entitled to free medical and hospital service. Dismissal while certified as unfit is not permitted.

The 400 war-blinded come in a separate category and are dealt with by the societies organized for the benefit of disabled ex-service men. They have a preference on the application lists for work in tobacco shops, which are a state monopoly.

Belgium.—There are eight schools for the blind in Belgium, three for boys, two for girls, and three mixed. These are maintained by private enterprise and are not State-managed, though two are largely maintained by the Governments of the provinces in which they are situated. In the case of five of these schools they are managed and staffed by religious bodies. In 1927 the number of blind children at these schools was 403, various preventive measures by way of the education of the public and regulations in regard to conditions of child-birth, having in recent years greatly reduced the rate of infant blindness. The majority of blind people are trained as musicians or in occupations connected with this profession.

Owing to the country being over-run by the armies of the Central Powers during the greater part of the war Belgium was unable to make adequate arrangements for the care of her blinded soldiers until after 1918. A small, though noteworthy part of British effort to help Belgium in her difficulties, was the training and care of a number of Belgian blinded soldiers at St. Dunstan's (*q.v.*), London during 1915–18.

After the Armistice, Belgian blinded soldiers were trained and re-educated at an institute at Boitsfort, Brussels, but upon the completion of the training problem this was closed, and the Queen's fund for blinded soldiers founded, to assist former inmates of the Boitsfort institute with monetary grants, help in kind, advice, etc.

China.—Blindness is very prevalent in China owing to neglect in infancy, disease and cholera, but no Government statistics are available. There are over 20 centres for educating the blind, and these are supported by missionary societies or interested foreigners. At these the inmates are trained in basket-making, netting, etc. The Hill Murray school for boys, Peking, was the first to be established in 1874, followed by the David Hill school for boys, Hankow, in 1888, and a school for girls in Canton in 1891.

As blind people in China have established a reputation for the possession of occult powers many of the untrained gain a livelihood by exercising these, fortune-telling and begging. Small printing presses have been set up at Peking and Shanghai which issue books and a magazine. What is known as the "union system" of Braille is used, worked on a phonetic basis. The difficulty of producing Braille books in China is obvious since there are over 10,000 characters in the Chinese language.

Czechoslovakia.—The care of the blind in Czechoslovakia is in the hands of the State (as regards the provinces of Slovakia and Ruthenia), of the provincial authorities (in the provinces of Bohemia and Moravia), and of charitable institutions which are subsidized partly by the State and partly by the four individual provinces into which the country is divided for matters of administration. In Bohemia there are three institutions for children, and three for adults; in Moravia one provincial institute for the education of the blind at Brno, and three institutions for adults maintained by societies. In Slovakia one State institution for blind children, and an establishment for the congenital blind from the ages of 15 and 20 attached to the Red Cross. In Carpathian Ruthenia there is an establishment for blind children. There are a number of societies for the benefit of the adult blind, the most important being in Prague, where there are workshops and salerooms for the goods made, and hostels for the blind workers. There are no pensions for the aged civilian blind.

The Ministry of Social Welfare is responsible for activities for the blind. It arranges for education from the age of seven to 14 or 16, then drafts the pupils to industrial schools for training, after which the Ministry makes an endeavour to find employment for them.

The war blinded are, as in Germany, given preferential consideration in regard to employment in State-owned tobacco shops, are granted loans and provided with dog guides. The totally blind receive a State pension of 5,000 pangoes (equivalent to £30) per annum. Of the total estimated number of blind people in Czechoslovakia (about 5,000) 600 are blinded ex-service men.

France.—France has a blind population of approximately 29,000, including the war-blinded (3,000 in 1918) and to assist these she has 35 schools, 23 workshops and 19 homes.

The oldest society in France for the benefit of the blind is the Quinze-Vingts founded 600 years ago by "St. Louis" after his return from the Crusades. There is always a long waiting list of those hoping for admission. The fortunate ones are provided with rooms for themselves and families and a small pension; complete independence is maintained. Those on the original foundation used to earn money by offering up prayers. Annexed to the Quinze-Vingts is La Société d'Assistance aux Aveugles reconnue d'utilité Publique, which gives financial aid and finds employment.

The Valentin Haüy association stands high among the societies which give fine service to the blind. It has 15,000 names upon its register, undertakes the care of children, provides vocational re-education, supplies tools and raw materials, sells goods made by the blind, runs workshops, visits the sick and aged and offers help in lesser ways. Its branch, the Centre d'Approvisionnement Intellectuel is very active. The Bibliothèque Braille has 2,500 readers on its lists, to whom 56,000 volumes have been circulated.

The French Government supports one school for the blind, the famous Institution National des Jeunes Aveugles, which was founded by Valentin Haüy in 1784. It accommodates both boys and girls and is under the control of the Ministère du Travail et de l'Hygiène. The institute provides a general education with musical training for those qualified to receive it, places its pupils and undertakes after-care work. A Braille printing establishment publishes both French and foreign literature.

Outside this official organization there are many private organizations to which some funds are allotted by the departments and municipalities. Among the smaller establishments doing interesting work is that of the Blind Sisters of St. Paul (Les Soeurs Aveugles de St. Paul), which was founded in 1850 by Mère Bergunion. The community originally numbered 13 nuns of whom seven were blind.

A French blinded soldier draws 6,300 francs per annum in pension, which in special cases may be augmented to 10,000. There is a 10% increase for additional disability. The Government makes a children's allowance of 830 francs per annum. In 1924 France passed a compulsory Employment Act for the benefit of her handicapped citizens, but only those blind who lost their sight in the World War can claim the benefit of the act, and employers were given two years in which to make any necessary changes in their staffs. The number of places to be reserved in each particular industry is settled by the Ministry of Labour in consultation with the provincial authority for the war-disabled. Those reduced 80% in capacity (this includes the blind) are counted double in respect of the obligation of employment. The wage-rate is fixed by a State commission. Notice of discharge must not be less than two weeks for a workman and two months for a clerk. There are a number of voluntary institutions in France formed primarily for the benefit of the war-blinded. Among these should be mentioned the Union des Aveugles de Guerre which has raised a subscription emergency fund and runs a seaside home for the benefit of those needing rest. The Phare de France runs a guest house accommodating 50 men at a low rate, and Les Amis des Soldats Aveugles distributes gifts and funds. Through the French Red Cross the American Braille press distributes Braille papers to war-blinded men throughout France.

Germany.—The latest statistics from Germany are those of 1924, which give a total of 35,624 blind persons, of whom 2,724 are war-blinded. The first training establishments were organized by Dr. Zeune for the benefit of the 500 soldiers who were blinded in the Napoleonic wars. Almost all Germany's institutions are state-aided, and after-care work was begun in 1843. There is a separate employment exchange for the handicapped, which includes the blind. Registration of affected businesses at the employment bureau of the official general after-care department and the education of blind children are compulsory. A commission of State, the Ministry of Labour, Education and Welfare, is responsible for the well-being of the blind, and this official body works in conjunction with a voluntary society known as the Blind Relief Chamber. By decree of the Prussian Ministry of War, elementary re-education of blinded soldiers was undertaken by the hospitals, after which each patient had the opportunity of undergoing tech-

nical training offered by the State, the municipality or a voluntary body.

The most important move in connection with the blind in Germany was the passage of the Employment of the Handicapped Act enacted in 1919, amended in 1923. This makes compulsory the engagement of one disabled man if 20 normal workers are employed, with one additional for every further unit of 50. Disabled under the act means those 50% handicapped through the war or accident, and consequently pensioned. Employers are obliged to permit their businesses to be inspected in order that work may be found for disabled men and those who do not engage the requisite number are required to pay a redemption tax of six marks for every working day for every war-disabled man not so employed. A disabled man can be dismissed only after a month's notice and with the consent of the general after-care department, and the dismissed employee has the right of appeal to the commission of war-disabled which is formed at every general after-care department. A recalcitrant employer may be fined anything from one to 1,000 marks, while the privilege of the Handicapped Act may be temporarily withdrawn from a difficult employee. In all cases the war-blinded are given preference.

A committee for examination and adaptation of new professions and working possibilities for the blind, has been formed by blind experts and representatives of trade and industry, which has resulted in the discovery of 200 fresh avenues of employment. The possibility of factory work as a means of livelihood for those so handicapped came about by chance. A blinded soldier who had been a blacksmith vowed that he could never be happy at any work which did not enable him to touch iron. The founder of the Silex school for the blind obtained permission to search for possible work for this man in a munition factory, and succeeded so well that five began work there a few days later. At Siemens Town, near Berlin, 98 blind men have found employment. The earnings of a blind man average 70% that of a sighted person.

As a result of the united efforts of the Association of War Blinded Soldiers and the German Sheep Dog Society, a school for the training of dog-guides was opened soon after the war. These have proved successful in many cases and the German Government gives a small subsidy to every blind man provided with a dog to meet cost of upkeep. Applicants for dogs attend at the training school and dog and man complete the course together.

The German State pays an annual sum of approximately 22,671,000 marks for the support of her blinded soldiers.

The Leipzig library is the largest centre for the distribution of literature in Germany. It contains 26,000 books.

Italy.—In 1923 a decree making the education of the blind compulsory was approved by the council of ministers, acting on the advice of a commission. Those institutions whose activities are mainly educational have been transferred to the supervision of the Ministry of Public Instruction, and receive financial grants from the Government. A commission has been appointed to supervise the national Braille printing house. The first book calling attention to the blind was published in 1846. There are important institutions for the blind in Florence, Naples, Rome and Milan. At the last mentioned blind children are given free board and lodging and are trained in the Montessori system, being passed on to other institutions as they grow older, until a wage-earning capacity is attained.

Work for Italian war-blinded has been undertaken in various centres, including Milan, and in 1927 a workshop for the war-blinded was opened in Rome, and a home to house the workers who remain there is nearing completion.

Japan.—Interest in the blind was first aroused in Japan in the 9th century when Prince Hitoyasu, a son of the 54th emperor, went blind and became a priest. He developed a personal interest in those without sight and distributed his income among them. After his death successive rulers continued the prince's benefactions. And, in memory of Hitoyasu, his blind attendants were appointed to look after the welfare of the blind throughout Japan; these, showing capacity, brought about the appointment of other blind men to Government service. A number were appointed to memorize the history of the empire through remote ages, in chronological order, and transmit it from generation to generation, so forming a living library.

At this period there were two distinct classes of blind people in Japan, monks and laymen. The most famous of the former belonged to a Buddhist sect, and travelled the country playing musical instruments and offering up prayers. Of the laymen a few adopted literature, while the lesser educated practised acupunture, massaging and shampooing; professions which were reserved to them to a great degree, the gilds to which they belonged being powerful.

In 1870 many of the privileges of the blind, the Government posts, the levy and right of monopolization of certain professions, were swept away, those with sight being permitted to enter into competition with them. A few years later (1878) the first private school for the blind and dumb was opened by private enterprise. There are now 82 in all, one government, 28 public and 53 private schools in existence; two thirds of these are very small. The system is free, co-educational, vocational and residential. Voluntary contributions and Government grants defray expenses. There is no compulsory education for blind children, as the accommodation is inadequate. The Government subsidizes every student training as a teacher. So far no social work or after-care work has been organized for the blind in Japan. Both a daily and a weekly newspaper are published in Braille, each having a circulation of about 1,000. The number of blind in Japan is about 100,000.

Poland.—According to the census of 1921 the number of blind persons in Poland was 16,144, or 6·4 per 10,000 inhabitants. Laws passed by the republic in 1921 and 1923 lay down regulations for the care of the blind, particularly the war blinded, who are rendered financial and medical assistance, artificial eyes, the capitalization of rents, help in obtaining work, provision of tools, dog guides, etc. The Law of Social Welfare (1923) makes regulations for the care of blind civilians, the financial burden of which falls mainly upon communal unions, the State bearing expenditure where voluntary funds prove inadequate for maintenance, housing, clothing, training in handicrafts. There are five educational establishments for the blind in Poland and four workshops, maintained by voluntary contributions and subsidized by the State. Blind persons who are unemployable and without relatives are maintained in homes organized by municipalities and social societies. The education and instruction of blind children is under the care of the minister of religion and public instruction, the expenditure in connection with poor children being borne by the State Treasury. In 1926 there were four institutions, residential, accommodating 250 blind children. Special training facilities for the teachers of the blind are provided at the State Institute of Pedagogy for Special Schools, Warsaw, founded 1921. The first institution for the blind in Poland was established in 1817; since the establishment of the independent republic of Poland in 1918 the State has undertaken much responsibility for the blind and has fostered home industries, desiring that the blind should work at home or amongst normal workmen rather than be segregated in workshops devoted entirely to the blind. One of the workshops for the war-blinded—the Society for the Protection of the Blind, Warsaw—was founded by a young nun who had been blinded by accident a few years before the World War, and who had obtained special trained help from Paris for the re-education of herself and some other blind girls, with whom she subsequently founded a new order among which one-third of the sisters are blind.

Russia.—The original movement towards bettering the position of the Russian blind began in 1806, but the Revolution after the World War swept existing institutions into the melting pot. To-day no statistics are available.

There are schools for the blind in the principal cities; that in Moscow accommodated 180 pupils and a hostel or almshouse for women with 200 inmates. Leningrad (St. Petersburg) and Moscow have established labour homes or colonies, where the inhabitants work at basket and brush making and the pasting of paper bags. They are given free quarters and small wages. The whole control is in the hands of a committee of the blind. A college of music is in existence where blind soldiers are trained as cinema and concert performers, where they are paid at "standard rates."

The largest library in Russia contains about 3,000 volumes. The only press for Braille books is in Moscow where work is done on three small hand presses of a primitive kind. Braille typewriters have not been introduced, and there is a scarcity of handframes. A Pan-Russian union of the blind has been established to work in co-operation with the Government for the betterment of conditions.

Spain.—The most efficient of the organizations for the benefit of the blind in Spain is the Centro Instrutivo y Protector de Ciegos, a private institution founded in Madrid in 1894. The directors are blind; general care is taken of the 1,000 blind persons in Madrid; elementary education and instruction in music are given to about 350 boys and girls; a circulating library of embossed books was started in 1907; a small workshop for men and women engaged in brush and broom making and saddlery is maintained.

Although more than 200 institutions claim to care for the blind in Spain the majority are general homes and hospitals who make some small special provision for those blind people who happen to enter them.

Officially the care of the blind is the province of the Ministry of Public Instruction, which has established several institutions, the principal being the national college for the deaf and dumb and blind in Madrid founded in 1805, subsidized by the Government, which provides education for over 100 blind pupils from five to 20 years of age. The Ministry of the Interior (Official Charities section) also undertakes the supervision of private institutions for the blind, notably a college for the blind of Santa Catalina de los Donados in Madrid, which dates from the 15th century and provides a general education for a small number of pupils between eight and 14 years of age.

The very few soldiers blinded in the Moroccan wars are re-educated with other disabled soldiers, and no special provision is made for them.

It is interesting to note that official recognition of the necessity for educating the blind in Spain was not obtained until the latter end of the 19th century when the presentation to the queen of an intelligent and well educated blind girl aroused interest in the possible attainments of the blind. Before that date it had been regarded as an unnecessary luxury to train blind people to read.

Switzerland.—Switzerland has a blind population of 2,260 (census 1920) and the first society to concern itself with the welfare of this section of the population came into existence in 1802. A hundred and one years later (1903) a central organization was formed to co-ordinate the many societies then in being. One institution for the benefit of children under school age has been opened, and a kindergarten is to be opened shortly. Practically all other bodies are voluntary and local.

THE BLIND IN THE UNITED STATES

The census of 1920 estimates the sum total of the blind population of the United States at 75,000, approximately 50% being over 50 years of age. There is no Federal Pension law, but a few States give pensions and where these are in force the percentage of blind in receipt thereof is as high as 78%.

The Perkins Institute, originally the New England Asylum for the Blind, was established in 1830 and Laura Bridgman was among the first pupils. The printing of embossed books was begun and in 1879 Congress granted an annual subsidy of $10,000 (increased to $50,000 in 1919) to the American Printing House for the Blind in Kentucky. The American Braille press is a war-development. Its publications are in several languages and it prints music as well as literature. Through its branch in Paris the press serves European war-blinded with free publications. It has readers in every civilized country in the world.

Every blind American child depends on the State for its education, but each individual State has made different arrangements both official and voluntary. America spends $2,740,000 annually in educating her blind. (*See* BLIND, TRAINING AND WELFARE OF THE: *The United States.*)

Of the 24,000,000 children of school age 25% have some defect of vision. An Eyesight Conservation council has been formed to arouse public interest in eye-hygiene. This body has discovered that there are 200,000 eye accidents a year in American industry, and that in a single State a million dollars has been paid for damaged eyes in one year. A movement for special classes for the semi-sighted was organized on the British model, and the first class was opened in Boston in 1913; many States have followed the lead given. In some States the Board of Education carries through home teaching, the marketing of goods and distribution of books.

Factories absorb a large percentage of American blind; others engage in professional work, salesmanship, piano-tuning, caning, basket work, etc. The making of dolls' wigs is offering satisfactory employment to blind girls in one district. Men engaged in weaving are earning equal wages to those with sight. A correspondence school for blind students in one State has enrolled 1,500 students; the most popular course is life insurance.

The American Foundation for the Blind (publishes the *Outlook*, the chief journal) was established in 1921; it is national in scope, co-operates with the National Committee for the Prevention of Blindness and the Boards of Health and Education. The American Association of Workers for the Blind holds biennial conventions and contemplates international gatherings held in Europe.

Responsibility for the care and preliminary training of the four to five hundred Americans who lost sight while in military service, rested in the first place on the Surgeon-General of the U.S. Army, and then on the Federal Board for Vocational Training.

The Red Cross (this work of theirs being rendered possible by a grant from the Permanent Blind Relief Fund collected for the benefit of Allied soldiers and sailors) took up work for these men on their final discharge. The Federal Government made provision for the war-blinded through insurance, private company rates being prohibitive. Insurance was made compulsory, also for seamen in private employment entering the war zone, and the Treasury, through the Bureau of War Risk Insurance, took out policies for these on reasonable terms. Owners of American vessels were compelled to insure their crews.

MEN BLINDED IN THE WORLD WAR

Many thousands of young men were blinded in the World War. High explosive shells and hand grenades caused by far the largest number of casualties, but a few were the result of rifle and machine-gun bullets, explosions, etc. Various forms of chemical warfare caused tens of thousands of cases of temporary blindness, but extremely few were permanently disabled even in a small measure by this weapon. There were in addition a considerable number of men who became blind through hardship, exposure or disease contracted on service. In most of these cases the British Government recognized that their condition was aggravated by service and granted pensions.

The blinded soldiers, sailors and airmen of the British Imperial forces numbered in 1928 2,131. They receive pensions from the United Kingdom or Dominion Governments varying from £2 per week for a private in the United Kingdom army, with an addition of 10s. a week for his wife and 10s. a week attendant allowance, and allowances for children born before disablement, to the maximum of £5 under the alternative pension scheme (based on pre-war earnings of the individual) for a private soldier, with appropriate increases according to rank. Over 95% of these officers and men were trained at and receive the life-long care of St. Dunstan's Organization for Blinded Soldiers, Sailors and Airmen, London (*see* ST. DUNSTAN'S).

It is of interest to add that at the eleventh session (1927) of the League of Nations' health committee, at the instance of the British member, it was decided to utilize the machinery of the League for a general enquiry into the welfare of the blind.

FAMOUS BLIND PEOPLE

It may be interesting, in conclusion, to mention here some prominent blind people; biographies of others, such as Milton or Fielding, will be found under their names.

John Stanley (1713–1786), Mus.Bac.Oxon., was born in London in 1713. At seven he began to study music, and made such rapid progress that he was appointed organist of All-Hallows, Bread Street, at the age of eleven. He graduated as Mus.Bac. at Oxford when sixteen, and was organist of the Temple church at the age

of 21. He composed a number of cantatas, and after the death of Handel he superintended the performance of Handel's oratorios at Covent Garden. He received the degree of doctor of music, and was master of the king's band.

Marie Thérèse von Paradis (1759–1824), daughter of an imperial councillor in Vienna. She was a godchild of the empress Marie Thérèse, and as her parents possessed rank and wealth, no expense was spared in her education. Weissembourg, a blind man, was her tutor, and she learned to spell with letters cut out of pasteboard, and read words pricked upon cards with pins. She studied the piano with Richter (of Holland) and Kozeluch. She was a highly esteemed pianist, and Mozart wrote a concerto for her; she also attained considerable skill on the organ, in singing and in composition. She made a concert tour of Europe, visiting the principal courts and everywhere achieving great success.

Louis Braille (1809–1852). In 1819 he went to the school for the blind in Paris. He became proficient on the organ, and held a post in one of the Paris churches. While a professor at the Institution Nationale des Jeunes-Aveugles, he perfected his system of point writing.

Dr. T. R. Armitage (1824–1890). After spending his youth on the continent, he became a medical student, first at King's college, and afterwards at Paris and Vienna. His career promised to be a brilliant one, but at the age of 36 failing sight caused him to abandon his profession. For the rest of his life he devoted his time and fortune to the interests of the blind.

Elizabeth Gilbert (1826–85), daughter of the bishop of Chichester. She lost her sight at the age of three. She was educated at home, and took her full share of household duties and cares and pleasures. When she was 27, she began to consider the condition of the poor blind of London. She saw someone must befriend those who had been taught trades, someone who could supply material, give employment or dispose of the articles manufactured. In 1854 her scheme was started, and work was given to six men in their own homes, but the number soon increased. In 1856 a committee was formed, a house converted into a factory, and the Association for Promoting the General Welfare of the Blind was founded.

Sir Francis Joseph Campbell (1832–1914), was born in Tennessee, U.S.A. An acacia thorn pierced his eyeball during a childish game when he was about three years of age. Shortly afterwards the family fortunes suffered a reverse, and the household was removed to a mountain farm, on which all the children worked except the blind boy. He was urgent that a task should be given to him, but it was refused and it was only when he had proved his capability by chopping up a stack of firewood that his father was convinced that a niche could be found in the world for one without sight. He was sent to a school for the blind and took full advantage of his opportunities. Later, when a school was established in his native state, the duty of finding scholars was deputed to young Campbell, who with sighted friends, rode from border to border, climbing mountains, swimming rivers and bringing blind children in, sometimes strapped to his waist and riding pillion behind him. At 22 he was musical director in an educational establishment, but his abolitionist tendencies ruined him and he was forced to leave the town and start again. In 1861 he spent a year in Germany, and started homeward determined to found a conservatorium of music for the blind. At Liverpool he met Dr. Armitage. The foundation of the Royal Normal college was the result of the association of these two men and the generosity of the duke of Westminster and the general public. He wrote an article on blindness in the 11th ed. of the *Encyclopædia Britannica.*

Henry Fawcett was accidentally blinded when in his 25th year by stray shot from his father's gun. Courageous and ambitious, his first words were, "This shall make no difference." Fawcett returned to Cambridge and a year or so later became professor of political economy. He was elected member of parliament for Brighton and subsequently for Hackney. In 1880, he became postmaster general. So little was it realized that a blind man could be a normal human being that the committee of the Reform club hesitated to accept Fawcett as a member until persuaded by an eloquent speech from Thackeray, who asserted that Fawcett would soon make all forget his blindness. In later life, Germany and France, as well as England and Scotland, did him honour. Fawcett's monument in Westminster abbey was raised by public subscription. (*See* also FAWCETT, HENRY.)

Dr. William Moon (1818–1894) lost his sight in early manhood when preparing to enter the ministry, and henceforward devoted himself to missionary work among the blind. Having studied the various systems of embossed writing he evolved a simpler method to be known as the Moon type, by which the blind of all ages might learn to read, but the system though readable was not writeable. Backed financially by Sir Charles Lowther, also blind, and by grants from other sources, Dr. Moon was able to lay the foundations of a great work. The Moon society came into being in 1847 and more than 500,000 volumes and pamphlets and 170,000 book plates have been produced. The Moon society is now under the control of the National Institute for the Blind.

Sir (Cyril) Arthur Pearson, Bt., G.B.E. (1866–1921). Becoming blind between 1910 and 1913 after a life of unusual activity in the foundation and conduct of newspapers and periodicals, Arthur Pearson inspired a renaissance in the blind world. He established the National Institute for the Blind (1913–14) as at present constituted, and St. Dunstan's (*q.v.*) (1915). His personality and knowledge of affairs and publicity were a new factor in the blind world. The influence of his work at St. Dunstan's, through the blinded soldiers, spread throughout the empire and to many foreign countries where a new spirit invigorated existing work for the blind and new activities were started.

Henry Martyn Taylor, F.R.S. (1842–1927), became blind about 1894, and was elected to the Royal society 1898. He developed the Braille alphabet and devised amplifications which rendered possible the reproduction of mathematical formulae, figures and diagrams. He personally transcribed into Braille textbooks on geometry, algebra, conic sections, the foundations of mathematics, metaphysics, physiology, sound, music, mechanics, etc. He was instrumental in the establishment of the Embossed Scientific Books fund which has been accepted as a trust, administered by the Royal society. He was the author of many valuable treatises and wrote the *Encyclopædia Britannica* article on Newton.

(I. FR.)

Helen Keller (b. 1880), lost her sight and hearing through illness when she was 19 months old, and soon became dumb. Through the teaching of Anne Sullivan, who had been partially cured of blindness, Helen Keller learned to read, write and talk, and wrote many books. *See* KELLER, HELEN ADAMS.

Blind Musicians.—The number of blind musicians who have attained excellence and in some cases distinction in their art has been remarkable. The two greatest of all, Bach and Handel, are, it is true, hardly typical instances, since each of these masters lost his sight only at the end of his career. Both continued to compose notwithstanding, Handel continuing also to perform in public. Another notable case of the same period was that of Fray Pablo de Nasarre, the blind organist of Saragossa (1683–1724). More modern instances have been those of Alfred Hollins (1865–1942) and William Wolstenholme (1865–1931), distinguished English organists, who were blind from birth.

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BLINDNESS, CAUSES OF. The most reliable statistics which we possess deal with blindness in the first quarter of life. Here we find congenital anomalies causing 25% of blindness. These are unpreventable until the eugenic millennium is reached, but to an extent, useful vision may be obtained and preserved.

Ophthalmia neonatorum (gonorrheal ophthalmia of the newborn) causes approximately another 25%. This disease is almost entirely preventable in modern practice. The disease is curable without damage in almost every instance provided the baby is treated early enough. Blindness due to this is decreasing.

Syphilis, mostly congenital, probably causes 10% of blindness, mostly through interstitial keratitis and uveitis. It is entirely preventable; it is possible by modern treatment to reduce materially the amount of blindness caused.

Atrophy of the optic nerve, not over 5%, is largely, though not entirely, unpreventable. Myopia in its "pernicious" form, 3% of blindness, is controllable if taken early. Phlyctenular keratitis, 2%, largely dependent on tuberculosis and poor hygiene, is preventable and remediable.

To injuries may be ascribed from 5% to 8%. In a considerable group of diseases of the eye, cornea, uveal tract, retina and optic nerve leading to blindness, the cause factor is doubtful.

It will be seen that in this early age group a very large proportion of blindness is preventable. In later years of life, statistics of blindness are, in the main, very unreliable, and only facts will be given which seem reasonably certain.

Injuries, especially in men, cause 7% to 10% of blindness, largely preventable through protective devices. In connection with this group, sympathetic disease as a cause of blindness was almost negligible in the World War. If the war blind in Germany, France and England are counted among the injuries, at least 5% must be added.

Syphilis (acquired), largely through disease of the uveal coat and optic nerve, is responsible for 10% to 15% of blindness, which is largely preventable and remediable if treated early.

Myopia, the cause of blindness in 14%, is controllable if taken in childhood. Glaucoma is of slight importance in infancy, youth, and up to middle age, but after the age of 45 becomes the most important cause of blindness, amounting to from 25% to 35% in the latter half of life. The acute congestive type is amenable to operation in the early stages and thus remediable. The simple, non-congestive type and secondary glaucoma, if taken early, are remediable to a considerable degree. Untreated, glaucoma always leads to blindness.

Atrophy of the optic nerve, a common cause of blindness, is estimated as high as 18%. It is frequently due to syphilis and in that case preventable. Also preventable and remediable to a certain extent is blindness due to accessible tumors, etc.

Diseases of the uveal tract (iritis, cyclitis, choroiditis) are responsible for a considerable group of the blind. In part, these are caused by syphilis, tuberculosis, focal infections in various parts of the body, general disease, and unknown causes, and they are to a certain extent remediable. General systemic conditions, such as nephritis, diabetes and arterio-sclerosis may cause blindness in their terminal stages.

Trachoma probably causes 50% of blindness in certain parts of China; in Missouri, U.S.A., the figure is 25%. Generally it is an unimportant cause and the results are preventable. Smallpox is said to cause 20% of blindness in Mexico. (G. S. De.)

BLIND POOL, in the United States an arrangement by which several individuals, firms or corporations entrust their interests or their funds to the direction and management of one person, who is authorized to carry out a secret deal without instructions or interference from the others. Often the pool agreement provides that the members are not entitled even to any information from the manager until the expiration of the agreed upon period. Blind pools are usually organized for speculative purposes and the main advantages claimed for them are absolute secrecy and the efficiency with which the manager can operate because of his freedom from control of any kind. (*See* POOLS, IN INDUSTRY.)

BLIND SPOT, the place of entry of the optic nerve into the retina, an area insensitive to light with a diameter in man of about one-twelfth of an inch, lying about 15° from the middle of the yellow spot on the nasal side. In binocular vision the spot is not noticed, because the part of the visual field covered by the blind spot of one eye is covered by a sensitive area in the other. In monocular vision objects which fall entirely within its area are not seen.

BLIND STAGGERS, one of the diseases of domestic animals, especially horses and sheep, which affects their brain and spinal cord. Animals suffering from the disease are observed to have a staggering gait and seem to be blind. Horses become infected by feeding on toxic seleniferous plants. The term *blind staggers* is also used humorously to describe one who is very intoxicated.

BLINDWORM, the name applied in Great Britain to the legless lizard *Anguis fragilis* (*see* SLOWWORM).

BLINK MICROSCOPE, an auxiliary astronomical instrument. Two photographic plates of the same star-field taken at different epochs are placed in the machine and viewed one with one eye and the other with the other eye, and adjusted as in a stereoscope so that a single visual impression is given. An arrangement is provided by which the plates are alternately in rapid succession hidden from sight. Attention is at once called to any star image which has changed in the interval between the two epochs by the corresponding flicker. In this way variable stars and stars with large proper motion are detected.

Proper motions can also be detected without the flicker arrangement, since the displacement of the star-image gives a stereoscopic effect, the star appearing to stand out in relief in front of or behind the plane of the other stars. When used in this manner the instrument is called a stereocomparator.

BLISS, CORNELIUS NEWTON (1833–1911), American merchant and politician, was born at Fall River (Massachusetts), on Jan. 26, 1833. He was educated in his native city and in New Orleans, where he early entered his stepfather's counting-house. Returning to Massachusetts in 1849, he became a clerk, and subsequently a junior partner, in a prominent Boston commercial house. Later he removed to New York city to establish a branch of the firm. In 1881 he organized and became president of Bliss, Fabyan & Company, one of the largest wholesale dry-goods houses in the U.S.A. A consistent advocate of the protective tariff, he was one of the organizers, and for many years president, of the American Protective Tariff League. In politics an active Republican, he was chairman of the Republican State committee in 1887 and 1888, and contributed much to the success of the Harrison ticket in New York in the latter year. He was treasurer of the Republican national committee from 1892 to 1904, and was secretary of the interior in President McKinley's cabinet from 1897 to 1899. His lack of sympathy with Theodore Roosevelt's growing influence caused him to retire from politics; and he died in New York on Oct. 9, 1911.

BLISS, TASKER HOWARD (1853–1930), American soldier, was born at Lewisburg, Pa., on Dec. 31, 1853. He graduated at West Point military academy in 1875, and from 1885 to 1888 was professor of military science at the Naval War college. In 1897 he went to Madrid and was military attaché at the American legation. He served through the Porto Rican campaign during the Spanish-American War and from 1898 to 1902 was in charge of Cuban customs and collector for the port of Havana. In 1903 he became commandant of the Army War college. From 1903 to 1905 he was a member of the Joint Army and Navy board and also of the general staff. From 1905 to 1909 he held various commands in the Philippines. During the latter half of 1909 he was president of the Army War college, afterwards becoming assistant chief of the staff, to which post he returned in 1915 after four years' service in command of military departments. In 1917 he was made chief of staff and promoted to the rank of general, but he retired later in the year, having reached the age limit. He was a member of the Allied Conference (1917), of the Supreme War Council (1918) and of the International Peace Conference (1918–19).

His published writings include "European Conditions versus Disarmament," in *Foreign Affairs*, i., No. 3 (1923); "With the Earl of Birkenhead and P. H. Kerr," *Approaches to World Problems* (1924);

and "Disarmament and American Foreign Policy" in *International Conciliation,* No. 220 (1926).

BLISTER, a small vesicle filled with serous fluid raised on the skin by a burn, by rubbing on a hard surface, as on the hand in rowing, or by other injury; also used of a similar condition caused artificially, by the application of mustard, of various kinds of fly (*see* CANTHARIDES) and of other vesicatories. Similar small swellings, filled with fluid or air, on plants and on the surface of steel or paint, etc., are also called "blisters."

BLISTER RUST, or white pine blister rust, a destructive fungous disease of white (five-needle) pines, is so widespread in the United States at the present time that it threatens the preservation of forest reserves. It is caused by a parasitic fungus which spends part of its life cycle on the foliage of currant (particularly black currant) and gooseberry bushes, both wild and domestic, and attacks a white-pine tree through the needles or the young twigs; then, growing into the inner bark, it kills the tree by girdling. The presence of blister rust is detected by the appearance of orange-coloured blisters, which do not, however, appear until the spring of the third or fourth year after infection. They are about the size of a navy bean, and contain the spores or seeds of the disease. Being small and light in weight, they are often carried great distances by the wind, but the only place of germination is on the leaves of currant and gooseberry bushes. There they grow into the leaf tissue, producing currant rust, or the summer stage of the blister rust fungus. Currant rust is detected by the appearance of orange-coloured pustules containing spores on the under side of the leaf. The summer stage gives rise at last to spores which infect the winter host, *i.e.,* the white pine, thus completing the life cycle.

Blister rust is apparently of Asiatic origin, and was introduced into North America on white-pine planting stock imported from Europe. It was first discovered on the North American continent in 1906. The disease occurs throughout eastern United States south to Virginia, and in Wisconsin, Minnesota, Iowa, Montana, Idaho, Washington, Oregon, and California; in Canada, the following provinces: British Columbia, Ontario, Quebec, Prince Edward island, New Brunswick and Nova Scotia. In New England and New York, 10% of the white pines over large areas are infected, and in some smaller areas the infection ranges from 50 to 100%.

As is evident, blister rust has spread with such rapidity and to such an extent that its eradication is now practically impossible. The following practices are recommended for the control of blister rust: 1. Eradication of Ribes species, currants and gooseberries, from white pine stands and from a surrounding zone of at least 900 ft. 2. Silvicultural methods including selection of sites for new plantings as free as possible from Ribes species, and care of these young stands. 3. Surgical treatment of ornamental pines and the removal of Ribes within the danger zone. 4. The use of resistant strains of native pines or the introduction of exotic resistant species. The value of standing white pine in the U.S. is about $500,000,000; in Canada, $600,000,000. The white pine is a great national asset; its preservation is essential to future forestry development. To this end, the U.S. department of agriculture declared the growing of currants and gooseberries a public menace and recommended their elimination. The following states have passed laws concerning currants and gooseberries in relation to blister rust control: Connecticut, Idaho, Maine, Massachusetts, Minnesota, New Hampshire, New York, Oregon, Pennsylvania, Rhode Island, Vermont, Washington and Wisconsin. There are also federal and state quarantine regulations governing the movement of currant and gooseberry plants.

See U.S. Dept. Agr. *Bulletin 957* (Washington, 1922); U.S. Dept. Agr. Farmers' *Bulletin 1398* (Washington, 1924); U.S. Dept. Agr. Misc. *Circular, 40* (Washington, 1925); F. D. Heald, *Introduction to Plant Pathology,* 2nd ed., p. 274–284 (New York, 1943).

BLISTER STEEL, a special variety of steel made by the cementation process, in which, under great heat, iron is changed into steel by the penetration of carbon into its substance. Bars of wrought iron are brought into contact with charcoal in a closed furnace for a week or ten days and heated to about 1,000°C. In these conditions the carbon dissolves in the metal and penetrates it, changing the iron into steel. The name "blister steel" arises from the fact that as the carbon, diffusing in the iron, meets the particles of slag which are always present in wrought iron it forms carbonic oxide, which, unable to escape, puffs up the molten metal and causes blisters.

Blister steel is not a homogeneous product. Its special employment is in making crucible cast steel. (*See* IRON AND STEEL.)

BLIZZARD, a popular term, probably derived from the German "blitz", used especially in North America for a snowstorm accompanied by strong winds or winds blowing loose snow through the air along the ground. It is sometimes applied to any heavy snowstorm. (H. R. B.)

BLOCH, ERNEST (1880–), composer, was born at Geneva, Switzerland, July 24, 1880. He studied harmony under Jaques-Dalcroze, Geneva, the violin with Ysaye, Brussels, and composition under Ivan Knorr, Frankfort. His lyric drama *Macbeth* was performed at the Paris Opera Comique, 1911. He arrived in America in 1916, and was appointed director, Cleveland Institute of Music, 1920.

Bloch's compositions include *Hebraic Rhapsody* for 'cello and orchestra, a violin concerto, two symphonies, *Hiver Printemps* and *Vivre Aimer,* symphonic poems, suite for viola and pianoforte which won the Elizabeth Sprague Coolidge prize 1919, first performed at the Berkshire festivals, Pittsfield, Massachusetts, a violin sonata and a quintet.

In 1926 Bloch gave the music division, Library of Congress, the greater part of his finished manuscripts, sketches, correspondence and family papers.

BLOCH, MARK ELIEZER (*c.* 1723–1799), German naturalist, was born at Ansbach, of poor Jewish parents, and died at Carlsbad Aug. 6, 1799. After taking his degree as doctor at Frankfurt-on-Oder he established himself as a physician at Berlin. He is best known by his important work on fishes. Mark Eliezer Bloch was 56 when he began to write on ichthyological subjects. He wrote *Allgemeine Naturgeschichte der Fische* (1782–95, 12 pts., 432 coloured plates), and left an unfinished *Systema ichthyologiae* (ed. Schreiber, 1801). His collection of fishes was bequeathed to the Berlin Museum.

BLOCK, MAURICE (1816–1901), French statistician, was born in Berlin of Jewish parents Feb. 18 1816, and died in Paris Jan. 9 1901. He settled in Paris and became a naturalized Frenchman. Entering the ministry of agriculture in Paris in 1844, he was one of the heads of the statistical department from 1852 to 1862.

His principal works are: *Dictionnaire de l'administration française* (1856); *Statistique de la France* (1860); *Dictionnaire général de la politique* (1862); *L'Europe politique et sociale* (1869); *Traité théorique et pratique de statistique* (1878); *Les Progrès de l'économie politique depuis Adam Smith* (1890); he also edited from 1856 *L'Annuaire de l'économie politique et de la statistique,* and wrote in German *Die Bevölkerung des französischen Kaiserreichs* (1861); *Die Bevölkerung Spaniens und Portugals* (1861); and *Die Machtstellung der europäischen Staaten* (1862).

BLOCK, a piece of wood. The word is used in various senses, *e.g.,* the block upon which people were beheaded, the block or mould upon which a hat is shaped, a pulley-block, a printing-block, etc. From the sense of "obstruction" comes a "block" in traffic, a block in any proceedings. For the block system of signalling on railways, *see* RAILWAYS: *Railway Signalling.*

BLOCKADE has been defined as "an act of war carried out by the warships of a belligerent, detailed to prevent access to or departure from a defined part of the enemy's coast." It differs from a "pacific blockade" (*q.v.*) inasmuch as the latter is not strictly an operation of war and cannot rightly be enforced against neutrals. The former may be either "military" or "commercial." A "military blockade" is one undertaken to attain some specific military objective, *e.g.,* the capture of a naval port. A "commercial blockade" has no immediate military objective but is designed to cause the enemy to surrender or come to terms by cutting off all commercial intercourse by sea. A belligerent may, if he can, blockade the whole of the enemy's seaboard, but the mere proclamation of a blockade of the whole or any part of the enemy's coast, without anything more, is of no legal effect. Such

proclamations were formerly common and were known as "paper blockades." A belligerent may not blockade neutral territory unless it is in the actual control or occupation of the enemy, nor may he blockade enemy territory in such a way as to prevent access to neutral territory.

The common law of blockade rests mainly upon the principles laid down by the Anglo-American Prize Courts, the more important of which are summarized in the judgments of Dr. Lushington and of the Privy Council in *The Fransiska,* Spinks 111; 10 Moo. P.C. 37. In order, therefore, to render a blockade valid under the common law and to impose penalties upon neutral vessels for breach of it, the following facts must be proved.

(1) A blockade must be duly established, *i.e.,* it must be instituted under the authority of the belligerent Government. Usually the officer in command of the naval force institutes the blockade under express instructions, but if he does so without them—an unlikely occurrence in modern times—his action must be ratified by his Government. In either case, although in the British view an official notification is not necessary, neutral Powers are notified in practice through diplomatic channels and the blockade is officially proclaimed. The officer in command must also notify the local authorities and the foreign consuls. (2) It must be effective. Paper blockades were declared illegal by the Declarations of the Armed Neutralities of 1780 and 1800, and it was to suppress their subsequent continuance that Art. 4 of the Declaration of Paris 1856 (*q.v.*) provided that "blockades in order to be binding must be effective," *i.e.,* maintained by a force sufficient really to prevent access to the coasts of the enemy. The Continental view demanded a stricter standard of sufficiency than the Anglo-American. The latter, however, ultimately prevailed. (3) It must be continuously maintained and impartially enforced against all vessels alike. If interrupted—except when temporarily interrupted by adverse weather—it must be duly re-established. Certain classes of vessels are exempt from the latter part of this rule, viz., neutral warships and neutral vessels carrying distressed seamen of their own nationality sent home by the resident minister of the neutral State, and neutral vessels compelled by stress of weather, need of provisions or repairs to put into the blockaded port. Under the Anglo-American practice vessels which have received a special licence from the Government of the blockading State or the commander of the blockading force are also exempt. (4) There must be some violation either by egress or ingress by the vessel. At the London Naval Conference of 1909 it was generally agreed that there must be some notice, either actual or presumptive. In respect of egress the fact of blockade is sufficient. In respect of ingress, if the blockade has been officially notified notice will be presumed, if there has been sufficient time for the vessel to receive it, since it is the duty of the neutral Government to communicate such notice to its subjects. If the blockade is *de facto,* express notice must be given to the vessel by the blockading force and endorsed on the ship's papers. (5) There must be actual or constructive knowledge of the blockade by those responsible for the conduct of the vessel.

A blockade terminates (1) if it is expressly raised by the blockading Government or by the officer in command of the blockading force; (2) if it ceases to be effectively maintained; (3) if the blockaded place is actually occupied by the blockading State.

The penalty for breach of blockade was the loss of the ship in any event, and of the cargo if at the time of shipment the blockade was known or might have been known by the shipper: *The Panaghia Rhomba,* 12 Moo. P.C. 168; Scott, 951 (1858).

At the London Naval Conference, 1908, an attempt was made to codify the law of maritime warfare. The provisions in the Declaration of London, 1909, relating to blockade are substantially merely declaratory of the common law. Two important amendments, however, were made. By Art. 17 neutral vessels may only be captured for breach of blockade "within the area of the warships assigned to render the blockade effective." Under the customary law they are liable to capture during any part of the outward or return voyage. By Art. 19 the doctrine of continuous voyage was declared inapplicable to blockade. Although the Declaration had not been ratified by any State, it was, subject to some additions and modifications, adopted by all the belligerents at the commencement of the World War. On Feb. 4, 1915, Germany declared its submarine blockade against Great Britain, and on March 1, the British Government announced that it was the intention of the Allied Governments as a *retaliatory* measure "to seize all ships carrying goods of presumed enemy destination, ownership or origin." Although in effect blockades, neither of these measures was legally a blockade, since they did not conform to the provisions of the law of blockade. By the withdrawal of the Declaration and subsequent Orders by the Maritime Rights Order in Council, July 17, 1916, and by reliance upon the law of contraband, the situation was regularized for the Allied Governments.

For the controversy between Great Britain and the United States upon the so-called blockade of Germany, *see* Parl. Pap. (Cd. 7816), and (Cd. 8233), 1915. (H. H. L. B.)

IN NAVAL SCIENCE

In the last hundred years the methods of enforcing blockade have changed as much as ships themselves, but command of the sea is still the essential condition.

In the wars of the 17th and 18th centuries, blockade was enforced by maintaining squadrons in the vicinity of the enemy ports, the most notable example being the British blockade of the French and Spanish ports from the outbreak of war in 1803 to its close in 1814. This blockade foiled Napoleon's plans for the invasion of England, because it prevented Villeneuve from making a junction with the divisions in Brest and Rochefort, after he had slipped out of Toulon and drawn Nelson to the West Indies and back after him. On Villeneuve's return in August 1805 Napoleon at once recognized that his invasion plans had miscarried and on Sept. 1, the Grand Army, which he had concentrated on the heights above Boulogne, was marched off into Germany. It was not until Oct. 21 that the greater part of the combined French and Spanish fleet was destroyed at Trafalgar (*q.v.*), the remnant being locked up in harbour till the end of the war by the blockade.

Napoleon's fleet being disposed of, British sea-power entered on a desperate struggle with his land power expressed in terms of commercial blockade. This conflict eventually (1812) landed Britain in a war with the United States, and drew Napoleon into the expedition to Russia which caused his downfall. The points of similarity and contrast between that long economic struggle and the one in the World War afford an interesting study.

In the Russo-Japanese War (1904–05) the Japanese fleet did maintain a close blockade of Port Arthur, but suffered severely from submarine mines. There were then no submarines or aircraft.

A nation fighting for its existence and depending for success on its maritime superiority cannot afford to see one of the main objects for which its naval strength was developed largely discounted by neutrals who, ostensibly taking no part in the struggle, supply its enemy with the sinews of war.

The ultimate aim of a sea Power is to protect its own sea communications while denying oversea supplies to the enemy. The right of a belligerent to stop contraband of war from going to its enemy has always been admitted, but it is not unnatural that the weaker maritime Powers and neutrals should prefer that goods carried in neutral ships should be secure from capture, that is the principle that "the flag covers the goods" or "free ships, free goods." During the hundred years that followed Napoleon's downfall Great Britain was almost invariably a neutral and her own commercial interests found profit in this latter view. Her statesmen, who might have had longer vision, sacrificed this vital belligerent right by signing the Declaration of Paris in 1856. "I believe" said the late Lord Salisbury speaking in the House of Lords on March 6, 1871, "that since the Declaration of Paris, the fleet, valuable as it is for preventing an invasion of these shores, is almost valueless for any other purpose."

A further check on the use of Britain's sea-power for preventing supplies from going to the enemy was the Declaration of London. Of the two descriptions of articles enumerated in this instrument, the absolute contraband list was small, being confined to articles

of exclusive military value such as guns, explosives, etc. These were liable to capture when destined to the enemy in neutral ships either direct or through neutral territory and in this case the doctrine of continuous voyage was recognized.

The conditional contraband list was composed of articles necessary to the civil population as well as to the military forces, such as food, fuel and clothing. This was liable to capture only if shown to be destined for the armed forces or to a government department of the enemy State, and provided it went direct to an enemy port. It could not be touched if discharged in a neutral port for transmission by rail or inland waterway. The evidence required by the declaration to prove the innocence of a cargo could so simply be evaded as to render this class of goods practically immune from capture, and in this case even the doctrine of continuous voyage was disallowed.

New Conditions.—In the old wars land communications were bad and the enemy, when blockaded, could obtain comparatively little in the way of oversea supplies through the territory of neutral neighbours; but the advent of railways and motor transport and development of inland waterways have changed all that. In the case of Germany, especially, much of her seaborne trade normally passes through Dutch and Scandinavian ports while, owing to the mining of the approaches to the Baltic, England was able to interfere but little with her trade in that sea.

International law as it existed in 1914 only recognized blockade based on the conditions of a hundred years ago, so the closing of the outer seas to the shipping of the Central Powers and to absolute contraband as defined in the Declaration of London was of itself insufficient to affect them really seriously. Though the British Admiralty had given consideration to this matter of blockade the mechanism of modern seaborne commerce is too intricate to be controlled by naval means alone, and little provision had been made for building up an adequate organization. The Declaration of London had never been ratified by any Power, but it was adopted by Great Britain in agreement with France and Russia by Order in Council of Aug. 20, 1914. The absolute contraband list had indeed been enlarged and the doctrine of continuous voyage extended to conditional contraband. The method of consignment had also been rendered more strict, but even so Lord Salisbury's fears of 1871 proved to be only too well justified!

BLOCKADE IN THE WORLD WAR

Light torpedo craft, submarines, mines, and aircraft have made it impossible to maintain a close blockade as in old days, and in the World War Great Britain and her allies were compelled to find means of making their blockade effective with the squadrons at a safe distance. British and French cruiser squadrons patrolled the Channel, North Sea and Straits of Otranto but no blockade of Germany was declared. The rapid development of submarine activity led shortly to the substitution of a boarding squadron of small ships in the Straits of Dover for the cruisers in the Channel, and to the withdrawal of the northern force to the area between Iceland and the Scottish coast. The old cruisers originally forming this patrol were relieved by armed merchant cruisers as soon as they could be got ready and called the 10th Cruiser squadron. This squadron experienced great difficulty in carrying out visit and search according to the old-established ideas. It is practically impossible to do this at sea under modern conditions, and so neutral ships, under suspicion of carrying contraband, had to be sent into harbour. The delay thus caused acted as an additional deterrent to neutral owners from carrying goods of a suspicious nature.

Great Britain's most effective weapon was "Bunker Control." The world's shipping was at that time almost entirely dependent on British coal, and by withholding it from owners who were reluctant to comply with the requirements of the blockade she was able to bring great pressure to bear. The "Evidential System" for determining the real destination of goods from documentary evidence proved valueless, and in spite of all efforts it was obvious that supplies were pouring into Germany through Scandinavia, Holland and (at first) Italy. Germany herself, however, gave the Allies the opportunity of escaping from their difficulties.

The complete stoppage of her shipping was telling on her and the rapid development of submarine warfare induced her to issue the celebrated order of Feb. 1915 in which she declared the waters around Great Britain and Ireland a military area, and announced that every hostile merchant ship found therein would be sunk without regard to the safety of passengers or crew. Even neutral ships in that area would be in danger. That this callous renunciation of the laws of humanity and international maritime law was to be no empty threat was soon proved, and the sinking of the "Lusitania" produced a feeling of horror throughout the civilised world. Great Britain and France replied with what has come to be known as the "Reprisals Order," which empowered their naval forces to stop all ships of enemy origin, ownership, or destination, so that the allied navies were freed from the trammels of the Declarations of Paris and London.

The Reprisals Order brought Britain into sharp conflict with America, just as, previously, the declaration of 1806 had done. During the prolonged diplomatic correspondence which followed she used the term blockade, which was technically incorrect in view of the fact that the Reprisals Order affected neutral territory. Though the doctrine of continuous voyage was recognized, neutral territory was technically exempt from blockade and neutrals were thus given an opening for discussing measures which were perfectly sound and logical in themselves in view of modern conditions. Every means was adopted to ensure that the blockade should interfere as little as possible with legitimate trade, and in order to avoid unnecessary delay cargoes sent in for adjudication were first examined by a contraband committee before being sent to the prize court.

The American contention that their trade with neutrals was suffering as compared with pre-war conditions was shown by their own figures to be incorrect. Whereas before the War it had been steadily diminishing in volume for some years, a circular issued by the Department of Commerce at Washington on Jan. 23, 1915 gave the following figures (in millions of dollars) for America's foreign trade:

August	110
September	156
October	194
November	205
December	246

Further figures show that the trade with Scandinavia and Holland had increased by 300%. It was obvious that those countries' own requirements could not have risen to that extent, and that they must have been re-exporting to Germany.

That the Allies' blockade measures were interfering with neutral trade less than Germany's activities is shown by the fact that up to Jan. 3, 1915, out of 45 neutral ships which had been temporarily detained by the Allies only 8 had been placed in the prize court, while 25 had been reported as destroyed by mines scattered by Germany on the high seas.

America was however on firmer ground when she called attention to the magnitude of Britain's own exports to these same countries, figures produced proving conclusively that Britain herself was doing exactly what she was trying to prevent America from doing. The cry of "Business as usual" had largely governed her policy, no matter who the business was with, and, but for this, Germany must have succumbed long before she did.

The economic blockade involved an enormous amount of work, for dealing with which practically the only machinery existing before the War was the prize court. Various committees and departments were formed in London to deal with different sections of it, and these were amalgamated into the Ministry of Blockade under Lord Robert Cecil early in 1916. The contraband department of the Foreign Office was the nucleus round which the organization grew, the personnel being chiefly drawn from the Foreign Office, Admiralty and Board of Trade. The Foreign Office was particularly interested in relations with neutrals and smoothing over difficulties with them, the Admiralty strove to make the blockade as effective as possible, while the Board of Trade watched over commercial interests. It took England over two years of bitter experience to realize that modern war on a

large scale involves the whole nation, with all its interests and resources. Not until she realized that "Business as usual" is incompatible with a "Nation in arms" did she reap the full benefit from her sea power.

The British Government had first of all tried to persuade neutral Governments contiguous to Germany to prohibit the export to her of all goods which were declared contraband in London. This proved unworkable and a little experience showed that the Government would have to deal direct with neutral traders and shipping companies. The leading commercial magnates in the Netherlands, Denmark and Switzerland were induced to form themselves into trusts and were made the sole consignees of those goods which the British Government wished to prohibit from going into Germany, on condition that they would not re-export the goods consigned to them. The cardinal feature of the blockade, however, was what was called "rationing." This had been proposed in 1914 but was not adopted until 1915, as it was only slowly realized that it could be put into practice. The conception of rationing was that the imports for home consumption of the neutral countries contiguous to Germany were a true measure of the home requirements of those countries and that, therefore, if the Allies allowed such neutrals to import commodities on the scale of their pre-war imports, with a small margin for contingencies, their merchants would be unable to increase imports for the special purpose of selling to Germany. In 1915 rationing agreements were concluded with Switzerland, Holland and Denmark, and the Ministry of Blockade, when it was subsequently formed in 1916, adopted and actively pursued the policy.

Towards the end of 1914 the three Scandinavian Governments had held a conference at Malmö at which they agreed to suppress all trade statistics, so there was strong presumptive evidence of a big re-export trade; their rations were accordingly based on pre-war figures. With the United States a very successful arrangement known as "Letters of Assurance" was arrived at, by which American traders submitted to the British Embassy at Washington a complete list of the goods they wished to ship and their quantities, and applied for permission to pass them through the patrols. Thanks to an elaborate organization formed solely for the purpose of making the necessary investigations as rapidly as possible, the permit or refusal was generally telegraphed within 48 hours.

The "Blacklisting System" grew out of the postal and telegraph censorship, which disclosed the firms in America and Scandinavia mostly concerned in the organization of German trade. Bunker control enabled the Allies to deal satisfactorily with blacklisted firms. When the United States came into the war in April 1917 they passed measures for stopping all German trade and for making it impossible for adjacent neutrals to re-export to the Central Powers. Bunker control had already made it possible for England to withdraw the 10th Cruiser Squadron, so America was not called upon to assist in the naval side of the blockade; but in all else, blacklisting, export embargoes, postal and telegraph censorship, they acted far more drastically and severely than the other Allies.

Effects of the Blockade.—Germany was reduced to terrible distress in the winter of 1916, and it was only the conquest of Roumania and occupation of the Ukraine which saved a breakdown. The complete loss of all artificial fertilisers at a very early period was a severe blow, as without these the soil cannot produce its normal harvest, much less replace the lack of seaborne supplies. The loss of oils and fats was soon badly felt. Not only did the population suffer on account of it, but the lack of lubricants lowered the transporting capacity of the railways.

The meat imported from adjacent neutrals in 1915–16 never sufficed to fill the deficit caused by the British agreement with the American Meat Packers' Association, while the cattle killed at home in any year could not be replaced in the next owing to lack of fodder for raising the young stock.

This lack of the necessaries of life was most keenly felt in the industrial districts of the west and centre of Germany. In the autumn of 1919 it was officially reported to the British Government that "the nation of Germany is broken both in body and spirit." Austria felt the blockade even more than Germany. When the Armistice was signed the population of Vienna was in little better plight than that of Paris during the starvation period of the siege of 1871.

The economic blockade proved that modern States are interdependent to a degree unsuspected before the War. An industrial country cannot be isolated from the outer world and produce both machinery and food supplies; an agricultural country may possibly feed itself but cannot also provide arms and material for its armies. Even after the coalition of the Central Powers covered half Europe the lack of seaborne supplies created wants and deficits which in their turn created others, until in the end the entire population of Germany, Austria, Bulgaria, and Turkey broke down under the strain created by these progressive discomforts and sufferings. For further discussion of the Economic Blockade *see* RATIONING OF NEUTRALS (BLOCKADE); RESTRICTION OF ENEMY SUPPLIES DEPARTMENT; BLOCKADE, MINISTRY OF; WAR TRADE ADVISORY COMMITTEE.

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BLOCKADE: ECONOMIC: *see* RATIONING OF NEUTRALS (BLOCKADE); RESTRICTION OF ENEMY SUPPLIES DEPARTMENT; BLOCKADE, MINISTRY OF.

BLOCKADE, MINISTRY OF. This department, one of the many administrative improvisations of the World War, was created on February 23, 1916, when Lord Robert Cecil received his appointment as minister of blockade. The term is technically incorrect, for no general blockade, in the strict legal sense, had been declared, but it expresses the purpose of the ministry, which was to co-ordinate and tighten up the whole machinery by which economic pressure was brought to bear on the Central Powers. The war had already assumed the character of a struggle of exhaustion, and it was imperative to take further steps for cutting off the supplies that continued to reach Germany through neutral ports; but every additional turn of the screw involved fresh interference with neutral interests, and the whole "blockade" policy had to conform continuously to the diplomatic situation. These considerations dictated the form given to the ministry. Lord Robert Cecil was already an under-secretary of State for foreign affairs, and he retained that position. He worked, as minister of blockade, in the Foreign Office, and the contraband department of the Foreign Office formed his staff. As minister of blockade he received a seat in the cabinet, and became the responsible head of all those departments and committees—the war trade advisory committee, the war trade department, the blockade, contraband, licensing, and enemy exports committees, etc.,—which, whether within or without the Foreign Office, were directly concerned with the restriction of enemy supplies. Commander the Rt. Hon. F. Leverton Harris, R.N.V.R., M.P., became his parliamentary secretary, and he had the assistance of Vice-Admiral Sir D. de Chair, K.C.B., M.V.O., as naval adviser.

From the first, the new minister adopted as the keynote of his policy, the rationing principle, by which the imports of neutral countries contiguous to Germany were restricted to their normal, peace requirements. This principle had already been accepted by the Government, and many important rationing agreements with neutral importers had been concluded; but its application received a wide extension during 1916, through a long series of formal embargos laid on shipments of commodities which were being imported by the northern neutrals in excess of their home requirements. (*See* RATIONING OF NEUTRALS [BLOCKADE]; RESTRICTION OF ENEMY SUPPLIES DEPARTMENT; and WAR TRADE ADVISORY COMMITTEE.)

Two other weapons taken over and developed by the ministry were the "Navicert" system and the Black Lists. By the former, American exporters agreed to submit, in advance, particulars of all shipments to Scandinavia, receiving Letters of Assurance in respect of approved shipments, which entitled the ship to pass without detention. The Black Lists were used to deny British goods, and the assistance of British banks, accepting houses, and underwriters, to neutral firms engaged in enemy trade. The creation of a financial section of the ministry of blockade, in May 1916, was of great assistance both in the working of the Black Lists, and in restricting the enemy's financial operations abroad.

Throughout 1917 and 1918 the ministry of blockade remained the connecting link between the cabinet, the Foreign Office, and the numerous bodies, advisory or executive, engaged in weaving that intricate network of agreements and embargos, prohibitions and licences, on which the exertion of economic pressure came more and more to depend. Its task of adjusting the activities of these bodies to the exigencies of foreign policy was, of course, greatly facilitated by the entry of the United States into the war, and in the final stages of the conflict, it received the co-operation of the Allied Blockade committee, established in March 1918, with a rationing and statistical sub-committee, appointed in May of the same year. Even after the Armistice it continued to perform essential functions, for it was not until the signing of the Peace treaty with Germany, in June 1919, that the blockade was finally lifted.

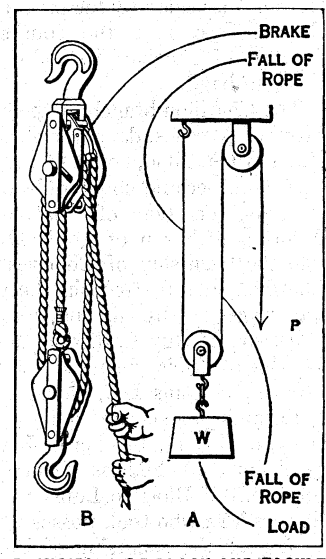
While the policy of the ministry followed, in the main, lines already laid down and partially adopted, there can be no question as to its service in increasing the stringency of the stranglehold on the Central Powers. The instruments of the blockade were so numerous and various, yet so intimately related to each other and to foreign policy that a central directing authority, in close and continuous touch with the Foreign Office itself, was absolutely essential to the full development of its powers.

(C. E. F.)

BLOCK AND TACKLE, one of the most useful and extensively applied of mechanical devices. The principle is represented at A in the diagram, showing the suspension of a load W by two "parts" or "falls" of rope, so that a weight of 1 lb. applied at P will pull a load of 2 lb. at W; this assumes friction to be absent, and the rope perfectly flexible. By increasing the number of pulleys and consequently falls of rope, in the manner shown at B, the mechanical advantage is increased, according to:—

$$W = nP$$

n being the number of parts of rope that spring from the movable block. If, for instance, there are three pulleys at the top, and two on the moving block, it will be evident that the weight is supported by five parts of rope, therefore a force of 120 lb. will hoist a load of 600 lb. Blocks are used for rigging, tightening guys, lifting loads, and hauling. The objection that the load is not held, as it is in the differential pulley-blocks, and worm-geared types, may be obviated by fitting a friction brake. The block B is of this self-sustaining form, the act of moving the hand-rope outwards or to one side applying the brake.



PRINCIPLES OF BLOCK AND TACKLE
A. Gain of power by having two "falls" of rope
B. Block and tackle with brake

BLOCKHOUSE, in fortification, a small roofed work serving as a fortified post for a small garrison. The word, common since 1500, is of uncertain origin, and was applied to what is now called a *fort d'arrêt,* a detached fort blocking the access to a landing, channel, pass, bridge or defile. The modern blockhouse is a building, sometimes of two storeys, which is loopholed on all sides. Blockhouses are built of wood, brick, stone, corrugated iron or any material available. During the South African War (1899–1902) they were often sent from England to the front in ready-made sections. Their use played an important part, in conjunction with "sweeping" operations by mobile columns, in the final subjugation of the Boers.

BLOCK PARTY, in the United States, a party held on the side-walks surrounding or the street between two city blocks. During World War I the custom of giving parties in the streets for the benefit of wartime activities arose in the cities of the United States. With the permission of the city authorities the street was closed to vehicular traffic. Coloured bunting and national flags were used as decorations on the fronts of the surrounding buildings; festoons of electric lights illuminated the street at night. A small admission fee was charged to those who wished to take part in the street party. The main feature of the nightly merriment was a band which played for dancing. The custom has persisted, and block parties are given by local political and social organizations, and by Church bodies. Summer resorts give them for the benefit of local organizations.

BLOEMAERT, ABRAHAM (1564–1651), Dutch painter and engraver, born at Gorinchem, the son of an architect, was first a pupil of Gerrit Splinter (pupil of Frans Floris) and of Joos de Beer, at Utrecht. He then spent three years in Paris, studying, and on his return to his native country received further training from Hieronymus Francken. He settled finally at Utrecht, where he became dean of the Gild of St. Luke. He painted and etched historical and allegorical pictures, landscapes, still-life, animal pictures, and flower pieces. Among his pupils are his four sons, Hendrick, Frederick, Cornelius and Adriaan (all of whom achieved considerable reputation as painters or engravers), the two Honthorsts, and Jacob G. Cuyp.

BLOEMEN, JAN FRANS VAN (1662–1740), Flemish painter, born at Antwerp, studied and lived in Italy. At Rome he was styled Orizonte, on account of his painting of distance in his landscapes, which are reminiscent of Gaspard Poussin. His brothers Pieter (1657–1719), styled Standaart (from his military pictures), and Norbert (1670–1746) were also painters.

BLOEMFONTEIN (bloom'fŏn-tin), capital of the Orange Free State, U. of S. Africa, 29° 7′ S., 26° 13′ E. 4,518 ft. above sea level. Distance by rail from Port Elizabeth 450 mi., from Durban 514, from Cape Town 750. Pop. (1936) with suburbs, 30,291 Europeans; 2,892 "coloured" (mixed); 31,042 natives and 8 Asiatics.

The climate in winter is bracing and healthy, and sharp frosts occur. The summers are hot, the mean maximum temperatures for December and January being over 86° F. The average rainfall is from 20 to 25 inches.

Bloemfontein is a clean, spacious town, lighted by electricity, and with a good water-supply from Mazelspoort (14 mi.) and from the Modder river at Sanna's Port (21 mi.). The town dates back to about 1852, and became a municipality in 1880. It is the trading centre for a large part of the Orange Free State, and also does a good deal of trade with Basutoland. The surrounding country is good for cattle and sheep, and the Bloemfontein stock fairs are among the largest in South Africa. Large irrigation schemes are being developed in the neighbourhood. Furthermore, the town has become an important educational centre; the University College of the Orange Free State, constituent college of the University of South Africa, lies on the western outskirts of the town; 14 mi. to the north is the Glen Agricultural college.

Owing to its central position in South Africa, Bloemfontein, in addition to being the provincial capital of the Orange Free State, has become a favourite centre for religious, political and educational conferences. It is the judicial capital of the Union, and there the court of appeal for the Union of South Africa was established in 1910. Bloemfontein is the seat of a bishopric of the English Church. An English and an Afrikaans daily newspaper are published. The native "location" is to the south of the main town. Its rectangular houses are of *pisé de terre,* and were built in most cases by their occupants, who are chiefly Basuto and Bechuana.

BLOET, ROBERT (d. 1123), English bishop, was chancellor to William I. and Rufus. From the latter he received the see of Lincoln (1093) in succession to Remigius. He administered his see with skill and prudence, built largely, and kept a magnificent household, which served as a training-school even for the sons of nobles. Bloet was active in assisting Henry I. during the rebellion of 1102, and became his justiciar. Latterly, however, he fell out of favour, and was impoverished by the fines which the king extorted from him. He was the patron of the chronicler Henry of Huntingdon, whom he advanced to an archdeaconry.

See Henry of Huntingdon (*Historia Anglorum*) and W. Malmesbury (*De Gestis Pontificum*), also E. A. Freeman, *William Rufus* (1882); Sir James Ramsay, *The Foundations of England*, vol. ii. (1898).

BLOIS, LOUIS DE (1506–1566), Flemish mystical writer, generally known under the name of BLOSIUS, was born at the Château of Donstienne, near Liége, of a noble family. He was educated at the court of the Netherlands with the future emperor Charles V. of Germany, who remained to the last his staunch friend. At the age of 14 he received the Benedictine habit in the monastery of Liessies in Hainaut, of which he became abbot in 1530. Charles V. pressed upon him the archbishopric of Cambrai but in vain.

Blosius's works, which were written in Latin, have been translated into almost every European language. The best editions of his collected works are the first edition by J. Frojus (Louvain, 1568), and the Cologne reprints (1572, 1587). His best-known works are: the *Institutio Spiritualis* (Eng. trans., *A Book of Spiritual Instruction*) (1900); *Consolatio Pusillanimium* (Eng. trans., *Comfort for the Faint-Hearted*) (1903); *Sacellum Animae Fidelis* (Eng. trans., *The Sanctuary of the Faithful Soul*) (1905); all these three works were translated and edited by Father Bertrand Wilberforce, O.P., and have been reprinted several times; and especially *Speculum Monachorum* (French trans. by Félicité de Lamennais, 1809; Eng. trans., Paris, 1676; re-edited by Lord Coleridge, 1871–72, and inserted in "Paternoster" series, 1901).

See Georges de Blois *Louis de Blois, un Bénédictin au XVIe. siècle* (1875), Eng. trans. by Lady Lovat (1878, etc.).

BLOIS, central France, capital of the department of Loir-et-Cher, 35 mi. S.W. of Orléans, on the railway between that city and Tours. Pop. (1936) 23,741. It is situated in a wooded district on the right bank of the Loire, stretching up the slopes of the hills on either side. Blois is first mentioned by Gregory of Tours in the 6th century, and increased in importance as the seat of a powerful countship (*see* BLOIS, COUNTSHIP OF). In 1196 Count Louis granted privileges to the townsmen. The oldest part of the château was built in the 13th century. In 1429 Joan of Arc made Blois her base of operations for the relief of Orléans. In the 16th century Blois was often the resort of the French court. Its inhabitants included many Calvinists, and struggles between them and Roman Catholics occurred (16th century). In 1814 Blois was for a short time the seat of the regency of Marie Louise, wife of Napoleon I. An 18th-century bridge unites Blois with the suburb of Vienne on the left bank of the river. The streets of the higher and older part of the town are narrow and steep.

The famous château of the family of Orléans (*see* RENAISSANCE ARCHITECTURE), a fine example of Renaissance architecture, stands on the more westerly of the two hills. It has three main wings and a fourth smaller one, and is built round a courtyard. The north-west wing was erected by Francis I, and contains the room where Henry, duke of Guise, was assassinated by order of Henry III. The striking feature of the interior façade is the celebrated spiral staircase tower, the bays of which, with beautifully sculptured balustrades, project into the courtyard. The north-east wing, in which is the entrance to the castle, was built by Louis XII and is called after him; it contains picture-galleries and a museum. Opposite is the Gaston wing, erected by Gaston, duke of Orléans, brother of Louis XIII, which contains a majestic domed staircase. In the north corner of the courtyard is the Salle des États, which, together with the Donjon in the west corner, survives from the 13th century. The cathedral of St. Louis (17th century), but in Gothic style, is surpassed in interest by St. Nicholas, once the church of the abbey of St. Laumer (12th and 13th centuries). The Renaissance Hôtel d'Alluye is one of the best of many mansions. The town is a market for the agricultural and pastoral regions of Beauce and Sologne, and has a considerable trade in grain, the wines of the Loire valley, brandy and timber. It manufactures boots and shoes, biscuits, chocolate, furniture, machinery and vinegar. Blois is the seat of a bishop (17th century), a prefect and a court of assizes. It has a tribunal of first instance, a tribunal of commerce and a board of trade arbitrators.

BLOIS, COUNTSHIP OF. From 865 to about 940 the countship of Blois was held in fee by the margrave of Neustria, Robert the Strong, and by his successors, the abbot Hugh, Odo (or Eudes), Robert II. and Hugh the Great. It then passed to a new family, at first vassals of the dukes of France, but after 987 the direct vassals of the crown. These new counts were originally very powerful. With the countship of Blois they united, from 940 to 1044, that of Touraine, and from about 950 to 1218, and afterwards from 1269 to 1286, the countship of Chartres remained in their possession.

Their line began with Theobald I., the Cheat, who became count about 940. He was succeeded by his son, Odo I., about 975. Theobald II., eldest son of Odo I., became count in 996, and was succeeded by Odo II., younger son of Odo I., about 1005. Odo II. was one of the most warlike barons of his time. With the already considerable domains which he held from his ancestors, he united the heritage of his kinsman, Stephen I., count of Troyes. In 1033 he disputed the crown of Burgundy with the emperor, Conrad the Salic, and perished in 1037 while fighting in Lorraine. He was succeeded in 1037 by his eldest son, Theobald III., who was defeated by the Angevins in 1044, and was forced to give up the town of Tours and its dependencies to the count of Anjou. In 1089 Stephen Henry, eldest son of Theobald III., became count. He took part in the first crusade, fell into the hands of the Saracens, and died in captivity; he married Adela, daughter of William I., king of England. In 1102 Stephen Henry was succeeded by his son, Theobald IV. the Great, who united the countship of Troyes with his domains in 1128. In 1152 Theobald V. the Good, second son of Theobald IV., became count; he died in 1191 in Syria, at the siege of Acre. His son Louis succeeded in 1191, took part in the fourth crusade, and after the taking of Constantinople was rewarded with the duchy of Nicaea. He was succeeded by his son, Theobald VI. the Young, who died childless. In 1218 the countship passed to Margaret, eldest daughter of Theobald V., and to Walter (Gautier) of Avesnes, her third husband.

The Chatillon branch of the counts of Blois began in 1230 with Mary of Avesnes, daughter of Margaret of Blois and her husband, Hugh of Chatillon, count of St. Pol. In 1241 her brother, John of Chatillon, became count of Blois, and was succeeded in 1279 by his daughter, Joan of Chatillon, who married Peter, count of Alencon, fifth son of Louis IX, king of France. In 1286 Joan sold the countship of Chartres to the king of France. Hugh of Chatillon, her first-cousin, became count of Blois in 1293, and was succeeded by his son, Guy I., in 1307. In 1342 Louis II., eldest son of Guy I., died at the battle of Crécy, and his brother, Charles of Blois, disputed the duchy of Brittany with John of Montfort. Louis III., eldest son of Louis II., became count in 1346, and was succeeded by John II., second son of Louis II., in 1372. Guy II., brother of Louis III. and John II., succeeded in 1381, but died childless. Overwhelmed with debt, he had sold the countship of Blois to Louis I., duke of Orleans, brother of King Charles VI., who took possession of it in 1397.

In 1498 the countship of Blois was united with the crown by the accession of King Louis XII., grandson and second successor of Louis I., duke of Orleans.

See Bernier, *Histoire de Blois* (1682); La Saussaye, *Histoire de la ville de Blois* (1846). (A. Lo.)

BLOK, ALEXANDER (1880–1921), Russian poet, was born in St. Petersburg (Leningrad). His father was professor of mathematics at Warsaw. In 1903 he married the daughter of the Russian scientist Mendeleyev. His first book of poems, *Songs to the Belle Dame* (1904), shows the influence of the mystic poet and philosopher V. Soloviev. Later his romantic style was changed to one of bitter irony and his works show deep disillusionment conflicting with a national idealistic inspiration. "The

Scythians" is representative of this latter phase. All these alternating motives, expressing the eternal contrast between the real and the ideal, form the vast scope of Blok's greatest poetry. The Bolshevist revolution inspired him to write his famous poem "The Twelve"—English translations by C. E. Bechhofer (1920), and B. Deutch and A. Yarmolinsky, New York (1920). The poem is an apologia for the revolution. One of the finest lyric poets of modern Russia, he ranked with the great masters of the past. His outstanding qualities are the depth of feeling manifested in his poetry, the rich melody of his verse, his extremely varied rhythm, and the blending of an exquisite lyrical style with the raciness of speech of the masses.

Blok's principal poems, besides those already mentioned, are "The Unexpected Joy" (1907), the lyric drama *The Fair Booth,* "The Earth under Snow," "Hours of the Night," "The Hoary Morning" and the romantic drama *The Rose and the Cross.*

BLOK, PETRUS JOHANNES (1855–1932), Dutch historian, was born Jan. 10, 1855 at Helder, Holland. After holding a professorship in Groningen university, he became, in 1894, professor of Dutch history in the University of Leyden, a position which he retained until 1925. His most important work is *Geschiedenis van het Nederlandsche Volk* (*History of the Dutch People*) (1892). Among his other historical books are *Eene Hollandsche Stad in de Middeleeuwen* (*A Dutch Town in the Middle Ages*) (1882); *Willem de Eerste Prins Van Oranje* (*Prince William the First*) (1919–1920).

BLOMEFIELD, FRANCIS (1705–1752), English topographer of the county of Norfolk, was born at Fersfield in that county. On leaving Cambridge he was ordained, becoming in 1729 rector of Hargham, Norfolk, and immediately afterwards rector of Fersfield, his father's family living. In 1733 he mooted the idea of a history of Norfolk, for which he had begun collecting material at the age of 15, and shortly afterwards, while collecting further information for his book, discovered some of the famous *Paston Letters.* By 1736 he was ready to put some of the results of his researches into type. Two volumes of his compilation, the *History of Norfolk,* were published during his lifetime, and part of a third was left in ms. at his death. This, with two further volumes by the Rev. C. Parkin, was published at Lynn (1769–75), and the whole was republished in 11 vols. in 1805–10.

BLOMFIELD, SIR ARTHUR WILLIAM (1829–1899), English architect, son of Bishop C. J. Blomfield, was born on March 6, 1829, and educated at Rugby and Trinity, Cambridge. He was articled to P. C. Hardwick. He became president of the Architectural Association in 1861, and a fellow (1867) and vice-president (1886) of the Royal Institute of British Architects. In 1887 he became architect to the Bank of England, and designed the law courts branch in Fleet street, and he was associated with A. E. Street in the building of the law courts. In 1889 he was knighted. He died on Oct. 30, 1899. His two sons, Charles J. Blomfield and Arthur Conran Blomfield, also became architects. Sir Arthur Blomfield's work at St. Saviour's, Southwark, is a notable example of his use of revived Gothic. He was highly esteemed as a restorer.

See R. T. Blomfield, *Notes on the Life of Sir A. W. Blomfield* (1901).

BLOMFIELD, CHARLES JAMES (1786–1857), English divine, was born on May 29, 1786, at Bury St. Edmunds, and educated there at the grammar school and at Trinity college, Cambridge, of which he became a fellow in 1809. In 1828 he became bishop of London, where he reigned for 28 years. He took a leading part in that movement of Church reform which led to the ecclesiastical commission, and did much for the extension of the colonial episcopate; and his genial and kindly nature made him a mediator in the controversies arising out of the tractarian movement. Newman, indeed, described him as "an active and open hearted man . . . engaged for years in diluting the high orthodoxy of the Church," but the bishop's policy was really comprehensive and conciliatory, and, being a warm admirer of Newman himself, he wished to appoint him to a Whitehall preachership. He died on Aug. 5, 1857. He is sometimes cited as the typical "Greek-play Bishop," on account of the many excellent editions of Greek classics which he produced in his earlier years.

See *Memoirs of Charles James Blomfield, D.D., Bishop of London, with Selections from his Correspondence,* ed. by his son, Alfred Blomfield, (1863); G. E. Biber, *Bishop Blomfield and His Times* (1857).

BLOMFIELD, EDWARD VALENTINE (1788–1816), English classical scholar, was born at Bury St. Edmunds. He became a fellow and lecturer of Emmanuel college, Cambridge, and is chiefly known by his translation of Matthiae's *Greek Grammar* (1819), which was prepared for the press by his brother.

See "Memoir of Edward Valentine Blomfield," by Bishop Monk, in *Museum Criticum,* No. vii.

BLOMFIELD, SIR REGINALD (1856–1942), English architect and author, was born on Dec. 20, 1856 at Aldington in Kent, where his father was rector, and was educated at Haileybury and at Exeter college, Oxford. He worked for three years under his uncle, Sir Arthur Blomfield, and studied in the Royal Academy school of architecture, where he was largely influenced by Norman Shaw. The Gothic and Mediaeval tradition of his uncle's office had but little effect on his work as an architect, which rather follows the classical spirit and the inspiration derived from the later Renaissance architecture of England. This is shown in his country houses, among which are Moundmere, Basingstoke; Wyphurst, Cranleigh; and Uretham hall, Norfolk. He also carried out alterations at Brocklesby park, Lincs.; Apethorpe, Northants.; Chequers court, Bucks., and elsewhere. Among his London work are the United University club, Pall Mall; the Goldsmiths' college, New Cross; and Paul's cross, St. Paul's Churchyard. At Oxford he built the new buildings for Lady Margaret Hall, and at Bath the Holbourne Museum. With Sir Aston Webb and Ernest Newton he was appointed to advise as to the architectural treatment of the Quadrant, Regent Street, London, and he designed a portion of the façade. *Formal Garden in England* (1892), written in collaboration with F. Inigo Thomas, advocated the claim of the architect to consider as his right not only the design of the building but its environment. His *History of Renaissance Architecture in England* (1897) and his works on French architecture (1911 and 1920), became standard textbooks.

Blomfield was elected A.R.A. in 1905 and R.A. in 1914. He was professor of architecture at the Royal Academy from 1906 to 1910, and president of the R.I.B.A. in 1914. During World War I he held a commission as officer in charge of trench work. He was a principal architect of the Imperial War Graves Commission, and one of the chief designers of various forms of local war memorial. In 1919 he was knighted. The English memorial church at Ypres and his bridge at Stratford on Avon are among his later works. He died in Dec. 1942.

BLONDEL, DAVID (1591–1655), French Protestant minister, was professor of history at Amsterdam. His works show a considerable critical faculty. They include a treatise on the so-called False Decretals; and two treatises, *Éclaircissement de la question si une femme a été assise au siège papal de Rome* (1647), and *De Joanna Papissa* (1659), in which, with much learning, the myth of "Pope Joan" is destroyed. The exposure caused some indignation in Protestant circles, since it disposed of a scandal useful in polemics; nevertheless all the works of Blondel were kept on the *Index* of books forbidden by the Roman Catholic Church.

BLONDEL, JACQUES FRANÇOIS (1705–1774), French architect, began life as an architectural engraver. He was among the earliest founders of schools of architecture in France; but he is now best remembered by his voluminous work *L'Architecture française,* a precious collection of views of famous buildings, many of which have disappeared or been remodelled.

BLONDIN (1824–1897), French tight-rope walker and acrobat, was born at St. Omer, France, on Feb. 28, 1824, and died in London on Feb. 19, 1897. His real name was Jean François Gravelet. When five years old he was sent to the École de Gymnase, at Lyons, and, after six months' training as an acrobat, made his first public appearance as "the Little Wonder." He especially owed his celebrity and fortune to his idea of crossing Niagara Falls on a tight-rope, 1,100ft. long, 160ft. above the water. This he accomplished, first in 1859, a number of times, always with different theatric variations: blindfold, in a sack, trundling a

wheelbarrow, on stilts, carrying a man on his back, sitting down midway while he made and ate an omelette. In 1861 he appeared in London, at the Crystal Palace, turning somersaults on stilts on a rope stretched across the central transept, 170ft. from the ground. His final performance was given at Belfast in 1896.

BLOOD. The general principle on which the chemical life of the body is conducted is that each living cell carries out in its own substance all those chemical processes necessary to its existence. Therefore all the materials which it requires must be carried to it and all those which it discards must be removed. Throughout the whole body therefore a system of transport is necessary, with which every living cell is in intimate contact. That system, very primitive in the case of the more humble creatures, has become highly specialized in the vertebrate creation.

The principal materials which a living cell, be it a muscle fibre, a nerve cell or a gland cell, requires are (1) sugar, (2) the basis of albuminous material, (3) fat, (4) vitamines, (5) oxygen, (6) salts, (7) hormones, (8) water. The blood picks these up where they may be had, in the lung or in the alimentary canal or elsewhere, it being the province of the organs of digestion to reduce the solid constituents of the food to such a form that the blood can absorb them. The principal substances of which the cell must be rid are carbonic acid and simple soluble compounds of nitrogen—compounds of ammonia etc., or, in the case of the liver, urea.

In all the higher animals blood consists of a fluid, the plasma, in which are suspended corpuscles of various kinds adapted for special purposes.

THE PLASMA

This fluid is nearly but not quite colourless and is clear, unless a meal containing fat has recently been eaten, when the plasma is somewhat milky, because of the minute globules of fat which it transports. In anaemia also the plasma may be milky. The two materials dissolved in greatest quantity are albuminous substances (proteins) and common salt.

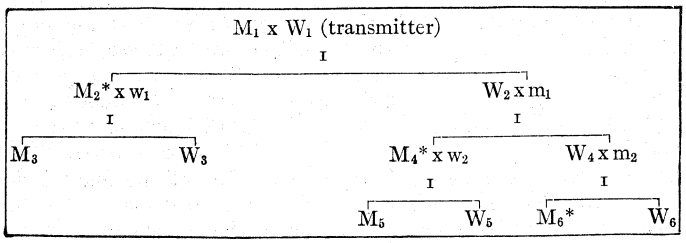
The general nature of plasma resembles that of raw egg white, diluted with a 0·9% solution of salt. In detail, however, plasma differs in every respect; its composition is roughly as follows:—

Water	90%
Proteins (Fibrinogen, paraglobulin, serum albumen)	9%
Salts	0·9%
Sugar, urea, uric acid, kreatin	traces

Water is primarily present in order to dissolve the other substances and to give the blood a degree of fluidity sufficient to secure its easy propulsion through the minute capillaries.

Protein.—The chemical basis of all life is protein in solution. All the cells with which the blood is in intimate relation are made of it. The protein cannot get in or out of these cells, and among its properties is that of attracting water to itself. If therefore there were proteins in the cells and not in the blood, water would always be passing from the blood into the cells, till the latter became dropsical. The protein in the blood balances that in the cells and so the water equilibrium is maintained. The case is different with salts; they can pass to and fro with the water and therefore they do not set up any permanent stream of water in any direction.

A second purpose of one protein at least, fibrinogen, is to confer on blood the power of clotting. The clot is the first aid to the healing of a wound; it at once plugs the wound and forms a scaffold on which new tissue is built. Thus if the chin be cut in shaving, the solidification of the blood is not due to drying or exposure but to a chemical process in the plasma which causes the fibrinogen (hitherto in solution) to separate out as a solid sponge of fibrin connecting the edges of the wound and through which the corpuscles of the blood cannot pass. The blood of some persons does not clot readily. Such are called "haemophils." For these, wounds, even such as those occasioned by the pulling of teeth, are very serious on account of the difficulty of stopping the bleeding. Haemophilia is a hereditary complaint (*see* HEREDITY). It does not appear in women and is never transmitted from one generation to the next through men. Thus, if in the following family tree M stands for man and W for woman, those persons only marked with a star could be haemophilic:—



If therefore M_1 and W_1 had bred only boys, the haemophilic taint would have disappeared. What precisely occurs during the formation of the clot has been the matter of endless research. Microphotographs show a sort of net of material forms which is rendered obvious by bright illumination, as is the mote in the sunbeam. This net is of fibrin. Fibrin is the result of some transformation of the fibrinogen into solid form. The transformation is wrought by minute quantities of a substance, fibrin ferment or thrombin, which is scarcely present at all in circulating blood but which is formed when the blood is injured or is in contact with injured tissue.

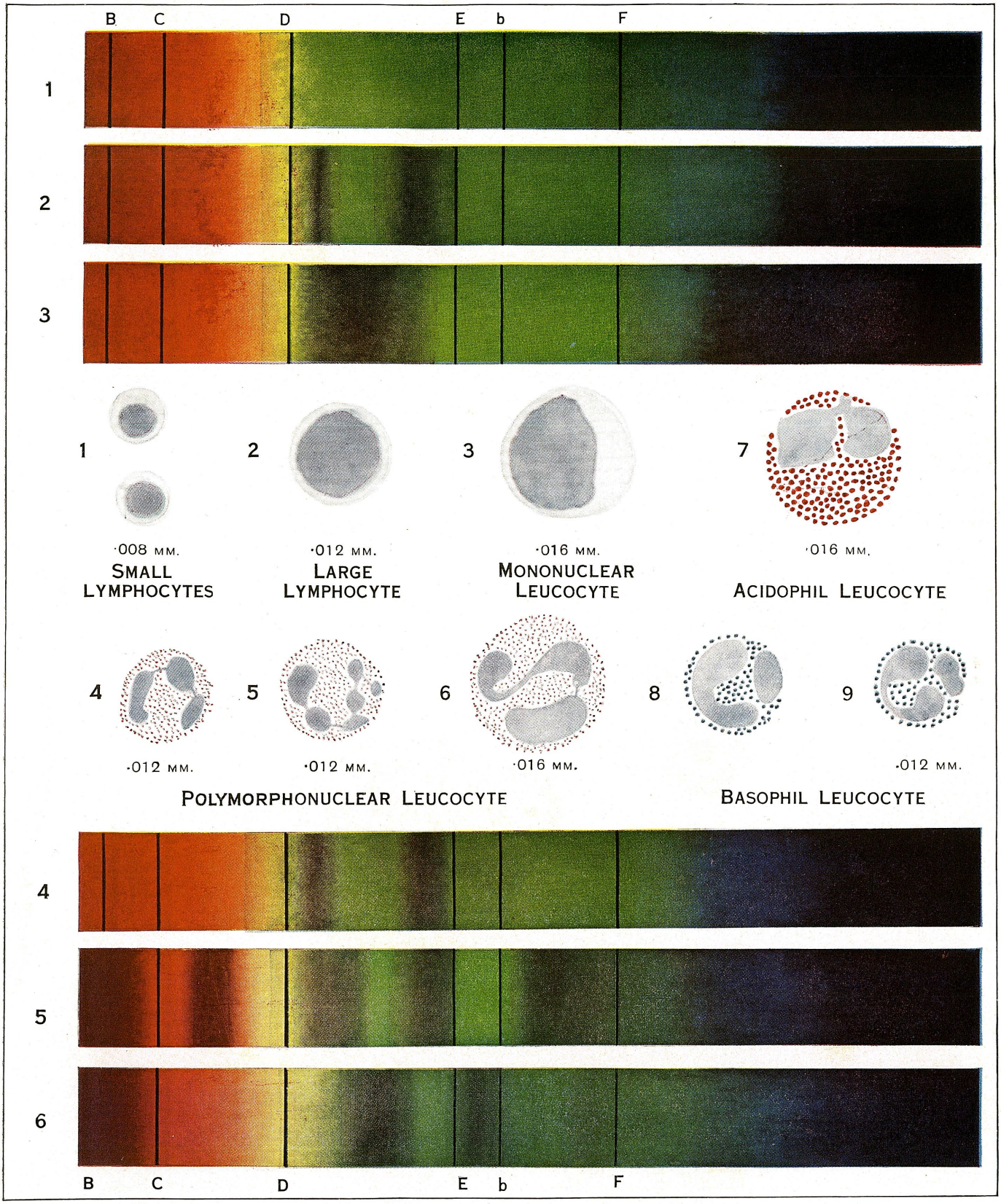
From the chemist's point of view the protein molecule consists of a great number of organic acids held together in a particular way by a link of which ammonia is the basis. When digestion takes place the protein is broken in the alimentary canal into the individual amino-acids. These form molecules small enough to pierce the walls of the capillary vessels surrounding the intestine and so they are picked up by the blood and conveyed to the tissues. If the protein molecule of a cell in one of the tissues has lost a particular amino-acid, the appropriate one can be acquired from the assortment which the blood carries. Similarly, when the protein molecule of a cell loses an amino-acid, the lost matter does not appear in the blood as such, but as a salt of ammonia. It is carried as such to the liver, where it is turned into urea and thrust back into the blood. Hence the presence of ammonium salts and urea in the plasma.

Salts.—Sodium chloride in blood serves primarily to dissolve the protein. Two out of the three proteins in blood are insoluble in pure water. Protein can only form the basis of living material if it is in solution. Many salts might serve equally well to dissolve the protein but they are not innocuous in other respects. Potassium chloride would stop the heart, ammonium chloride would cause convulsions and so on.

The body is capable of regulating the percentage of sodium chloride in the blood with great accuracy. If it is not eaten in sufficient quantity the kidney ceases to excrete it, and the urine, which normally contains a considerable quantity, is almost free from it. The result of a deficiency of sodium chloride may be felt by persons who carry on sustained and heavy work in very hot surroundings (deep mines or ships' furnaces). Such may perspire 18 pounds of sweat (which is practically sodium chloride solution) in a few hours. By drinking water they make up the deficiency of fluid but not of salt, and the percentage of sodium chloride in the blood sinks, which causes agonizing cramp in their abdominal muscles. These cramps do not occur if the loss is made up by the drinking of salt and water or even of beer.

Although the elements calcium, potassium and magnesium are present in much smaller quantities than sodium, it is not to be supposed that they are correspondingly valueless. Especially it appears that the proper working of the heart depends upon the balance of calcium and potassium. Calcium also has a special relation to the clotting of blood, which does not take place in its absence. Among the salts in plasma, sodium bicarbonate holds a special place (1) because of its peculiar relation to the transport of carbonic acid from the tissues in which that gas is produced to the lungs and (2) because of its intimate connection with the fact that the blood is, and is maintained within very narrow limits, just on the alkaline side of absolute neutrality. The concentration of hydrogen ions in normal plasma equals $0{\cdot}4\times10^{-7}$ grams of hydrogen per litre (pH=7·4). As any considerable increase in this causes laboured respiration, the increase is checked automatically, for the laboured respiration augments the volume of carbonic acid expelled from the plasma into the air, so tending to reduce the

BLOOD



ABSORPTION SPECTRA (SHOWN IN THREE BANDS AT TOP AND THREE AT BOTTOM)

1. Spectrum of white light, used as standard of comparison with spectra of forms of haemoglobin. 2. Oxyhaemoglobin (haemoglobin, which is pigment of red blood corpuscles, compounded with oxygen, in arterial blood). 3. Reduced haemoglobin, without oxygen, in venous blood. 4. Carboxyhaemoglobin (haemoglobin combined with carbon monoxide). 5. Methaemoglobin (haemoglobin in which oxygen cannot be removed by a vacuum). 6. Haemochromogen (crystalline pigment derived from haemoglobin)

CORPUSCLES (SHOWN IN CENTRE)

1. Small lymphocytes (white corpuscle surrounded by very slight cell body). 2. Large lymphocyte (is surrounded by larger cell body; chiefly in children). 3. Mononuclear leucocyte (white corpuscle whose one nucleus is surrounded by relatively large cell body). 4, 5, 6. Polymorphonuclear leucocyte (white corpuscle, multiformed nucleus with granules neutral stained). 7. Acidophil leucocyte (white corpuscle with granules acid stained). 8, 9. Basophil leucocyte (white corpuscle with granules basic stained)

concentration of hydrogen ions in the plasma. (*See* RESPIRATION.) On the other hand, should the blood become unduly alkaline, the kidney will redress the reaction by secreting an increased quantity of alkali in the urine. This balance of acid and alkali, the maintenance of which preserves the reaction of the blood at pH of 7·4, is called the "acid-base equilibrium" of the blood. To give a single instance of the way in which it is maintained: when a considerable meal is eaten acid is secreted in the stomach for the purpose of effecting its digestion. This acid is withdrawn from the blood which in itself would make the blood more alkaline, the kidney then secretes sodium; hence the so-called alkaline tide in the urine.

Among fluids blood is remarkable in that addition of acid and alkali produce only a trifling alteration in the hydrogen ion concentration as compared with what they would in water if added to it. This fact is expressed by the phrase "blood is very highly buffered." The buffering of blood is achieved principally by the interaction of the sodium bicarbonate in the plasma and the haemoglobin in the corpuscles. If carbonic acid is added to the plasma, sodium is withdrawn from the sodium chloride liberating chlorine ions; these tend to pass into the corpuscles which are very permeable to them and there unite with some of the sodium which had hitherto been in combination with the haemoglobin.

Hormones.—Among the discoveries of the last 40 years has been that of the importance of a chemical substance of great potency secreted into the blood by such organs as the suprarenal gland, the islets of the pancreas, the pituitary body, etc. These carried in the blood stream stimulate parts of the body remote from those by which they are secreted, and are called hormones. (*See* HORMONES and ENDOCRINOLOGY.)

THE RED BLOOD CORPUSCLE

The primary object of the red blood corpuscle is that of an oxygen transporter. Its efficiency as such depends upon the quantity of haemoglobin it contains. The average number of red corpuscles in man is 5,000,000,000 per cubic centimetre of blood. The average weight of haemoglobin in the same is 0·13 gram and the average amount of oxygen which these will transport is ·185cu.cm. This is more than 50 times the quantity which could be dissolved in a cubic centimetre of blood in its passage through the lung, in the absence of haemoglobin. The intensive oxidation in the tissues of warm-blooded animals has only been made possible by the existence and utilization of haemoglobin.

The number of red blood corpuscles per cubic millimetre of blood varies in different animals thus:—

Animal	Man	Goat	Sheep	Bird	Fish	Frog	Proteus
Millions of red blood corpuscles per cu. mm. blood	4–5	9–10	13–14	1–4	0·25–2	0·5	0·04

Even in the same person the number differs considerably at different times; factors which induce rapid sweating cause an increase; the number increases also at high altitudes. (*See* ANOXAEMIA.)

The size and shape also vary. In the mammals the cells are round, except in the camel, which has oval corpuscles. In the lower vertebrates they are oval and nucleated. Thus:—

Diameter of red blood corpuscles in thousandths of a mm. (μ)

Animal	Pigeon	Frog	Newt	Proteus	Amphiuma
Long axis	14·7	22·3	29·3	58	77
Short axis	6·5	15·7	19·5	35	..

The diameters of some mammalian forms are as follows:—

Diameter in thousandths of a mm. (μ)

Animal	Man	Dog	Rabbit	Cat	Goat	Musk-deer
Diameter red blood corpuscles.	7·5	7·3	6·9	6·5	4·1	2

The above figures are only approximate, for as stated below a single corpuscle alters somewhat in size from time to time, and in the same individual the size of the red blood corpuscles may vary somewhat according to the conditions of stress under which they are produced.

Specific Gravity.—The specific gravity of blood depends principally upon the quantity of haemoglobin present; normally it is between 1,055 and 1,060, distilled water being 1,000. Since the methods for the measurement of haemoglobin have been improved, less account has been taken of specific gravity. The red blood corpuscle in man consists of a minute disc-shaped body having a diameter of 7μ ($1\mu = \frac{1}{1,000}$ mm.) and a thickness of about 1μ. It is very elastic and in the small vessels may take up almost any shape, as has recently been shown by Krogh. It is not, however, amoeboid.

In composition the red corpuscle consists of 60% water and 40% solids, of which 90% is the red pigment haemoglobin. In the larger vessels the red corpuscles tend to form "rouleaux"—an arrangement which is likely to occur in the case of any series of discs with fatty surfaces, floating in an aqueous fluid. Although in mammals they are normally nonnucleated, under abnormal conditions such as anaemia nucleated corpuscles appear in the circulating blood.

The intimate structure of red blood corpuscles has been a matter of much controversy, some authors regarding them simply as bags of fluid and others as consisting of a sponge work or stroma, which is more close at the outside than elsewhere. In the absence of ascertained knowledge of the correctness of either view it may be said that discussions on the chemistry and physics of the red corpuscles are usually carried out on the basis of the former, the corpuscle being regarded as material surrounded by a membrane possessing certain definite chemical and physical characteristics. The membrane is permeable, for instance, to water, and to acid radicles, but less so to sodium, potassium, etc. These facts form the basis of complicated readjustments of equilibria between the constituents of the corpuscles and those of the plasma, when the latter are altered. Among the materials which may pass through the corpuscle membrane is water, therefore the corpuscle may swell and shrink. Normally it swells if the medium in which it is placed is made more acid.

Haemolysis.—The passing of water into the corpuscle may take place on such a scale as ultimately to burst the membrane, the solution of haemoglobin previously enclosed escapes into the surrounding fluid, and the structures which contained the haemoglobin are left as "shadows." This process is known as "laking" or haemolysis which may be induced by the addition of distilled water to blood. The corpuscles may be ruptured in other ways, by freezing and thawing, by the addition of saponin, or bile salts. More remarkable is the fact that if the blood corpuscles of one species are injected into the vessels of another they are destroyed, their haemoglobin being liberated. This phenomenon is not due to osmotic or similar changes, but to some specific substance in the plasma which attacks the foreign corpuscles. That substance is called a haemolysin. It is one of several substances on which the immunity of the body from disease depends. (*See* IMMUNITY.)

Fragility of Red Blood Corpuscles.—All corpuscles are not disrupted with equal ease by haemolytic agents. Thus whilst all or nearly all corpuscles are disrupted by distilled water, salt solutions of less saline concentration than plasma will disrupt some and not others: the "fragility" of the corpuscles differs. Thus in the case of a cat:—

Strength of salt solution	·64	·60	·56	·52	·48	·44	·40	·36
Percentage of corpuscles haemolysed	·0	8	12	45	80	88	93	99

The resistance of the red cells of some animals is greater than that of others. If different animals are graded as regards the resistance of their red cells to saponin the following order would be observed: lamb, goat, ox, cat, grey mouse, pig, grey rat, dog, white rat, rabbit and guinea-pig. The resistance of their red cells to hypotonic salt solutions is, on the contrary, in precisely the opposite order.

Significance of Red Corpuscles.—This is both physical and chemical.

Physical: (1) In the fine vessels the diameter of which is not larger or not much larger than a red corpuscle, the packing of the haemoglobin in the corpuscle ensures that the propulsion of the whole of the haemoglobin along the vessel, were it simply dissolved, would result in a flow in the vessel of the streamline character. Movement would be confined principally to the central core of fluid. (2) The vessel walls are so delicate that haemoglobin diffuses through them. Were they made less diffusible so as to retain the haemoglobin, they would offer a greater resistance to other substances which require to traverse them quickly.

Chemical: (1) The exchange of oxygen between blood and haemoglobin should take place most efficiently in a medium slightly less alkaline than the blood plasma; this medium is supplied in the corpuscle. (2) The haemoglobin of many animals crystallizes easily; the corpuscle, by what means we do not know, holds it in solution—a condition necessary to its function.

The *origin* of red corpuscles in the embryo is in the forming blood vessels. These are laid down as ropes of tissue which ultimately become differentiated, the outer cells forming the vessel wall, the inner acquiring haemoglobin and becoming the nucleated ancestors of the red blood corpuscles. About half way through embryonic life in the mammal these nucleated ancestors disappear from the general circulation and are found only in the spleen, the liver and the bone marrow, and at a later stage the bone marrow is the sole normal breeding ground for red blood corpuscles. The activity of the bone marrow during life is regulated to some degree by circumstances; any exaggerated destruction of corpuscles such as bleeding, or the injection into the veins of such drugs as pyrogallic acid, will awake the bone marrow to greater production. So also will conditions which reduce the efficient functional activity of the corpuscles, such as exposure to low oxygen pressures. On the other hand, the normal activity of the bone marrow may become impaired, resulting in certain grave kinds of anaemia.

The *longevity* of a red corpuscle has been placed at 30–70 days. The calculation does not rest on any very reliable basis. Probably it is safe to say that the lifetime of the red corpuscle is to be measured in months, being longer than weeks and shorter than years. The ultimate fate of the pigment of red corpuscles is for the most part to have its iron detached in the liver and for the rest of the haematin moiety to be secreted as bile pigment. The débris of broken-down corpuscles is found in the spleen.

WHITE CORPUSCLES

The blood contains about 11,000 white corpuscles per cubic millimetre; thus there is only one white corpuscle to 400–500 red. The number varies within considerable limits.

The white corpuscles in blood are of at least five kinds; the classical classification depends upon (1) whether the protoplasm of the cells contains granules—those in which it does not being called hyaline and (2) among the granular ones whether the granules stain with acid dyes such as eosin (acidophil, eosinophil) or basic dyes such as methylene blue (basophil) (*see* PLATE). These five cells are given many different names:—

1. Small hyaline, *lymphocyte.*
2. Large hyaline, mononuclear, *monocyte.*
3. Fine granular eosinophil, neutrophil, polynuclear, *polymorphonuclear.*
4. Coarsely granular eosinophil, *eosinophil.*
5. Basophil, *mast cell.*

1. **The lymphocyte** is about 6·5μ in diameter. It has a large spherical nucleus which is surrounded by a small rim of clear protoplasm. It forms normally about 20–25% of the white corpuscles. It is not amoeboid, nor is it phagocytic (*i.e.*, it does not ingest other cells). These cells are formed in the lymphatic glands.

2. **The large hyaline cell** may really include two quite different cells of similar appearance, one of which is a larger edition of the lymphocyte, the other being the monocyte proper. The nucleus is spherical or kidney shaped. The protoplasm is larger in amount than in the lymphocyte. About 4% of the white cells in the blood are large hyaline cells. The monocyte is highly amoeboid and phagocytic, its tendrils being long and delicate.

The relation of the monocyte to certain other cells in the body is a matter of much discussion. It has been seen in cultures to ingest large quantities of other cells taking on the appearance of a cell known as the clasmocyte. Also there is similar evidence of the epitheloid cells common in tuberculous lesions being merely monocytes which have wandered from the blood in special guise. Some authors go much farther, alleging that the monocyte can turn into other cells; *e.g.*, connective tissue cells, and that these can return to become monocytes once more. Such a view involves the general conception of a cell being at one moment the cell of one type of tissue, at another that of another and is to be treated with great reserve.

3. **The Polymorphonuclear Cell.**—This contains a nucleus consisting usually of several lobes joined by threads. The protoplasm contains numerous fine granules which stain with eosin. The cell is about 10μ in diameter. It is highly amoeboid and phagocytic and forms about 70% of the total number of leucocytes.

The polymorphonuclear cells wander into infected tissues in great numbers, their presence forming an important factor in the processes of shutting off foci of infection and of repair of tissue (*see* PATHOLOGY). These cells are formed in the red marrow of the bones.

4. **The coarsely granular eosinophil cells** are about 12–15μ in diameter, the nucleus is horseshoe shaped, the protoplasm contains large granules which stain conspicuously with eosin. They form about 2% of the white cells. According to Hardy and Kanthak they are not phagocytic but secrete their granules in the neighbourhood of cells to which the granules are poisonous. The cell is amoeboid.

5. **The Basophil Cell.**—This possesses a spherical nucleus and the protoplasm contains a small number of granules staining deeply with basic dyes. It forms about 0·5% of the white cells.

PLATELETS

As well as the red and white corpuscles there are in the blood certain formed elements of a much more obscure character. Much smaller than the corpuscles they form minute rods or plates. In the frog they appear to be nucleated. Their function is not completely understood.

QUANTITY OF BLOOD IN THE BODY

The body of an adult man contains about 5 litres of blood, usually rather less. The quantity in man may be measured in one of two ways. Each depends upon putting a known quantity of some substance into the body, and, after it has been distributed uniformly over the whole circulating fluid, measuring the degree of dilution which has taken place. The two substances used are (1) carbon monoxide and (2) vital red.

(1) Carbon monoxide to the extent of about 250cu.cm. (the exact quantity being known) is inhaled from a special apparatus; the gas unites with the haemoglobin of the blood, producing a compound the concentration of which can be measured spectroscopically.

(2) Vital red is a pigment for which it is claimed that its injection into the blood stream has no deleterious effects, that the quantity injected does not leave the blood for some time, but in its entirety remains dissolved in the plasma. A known quantity of vital red is injected into a vein, a sample blood is subsequently withdrawn and centrifuged, the plasma is tinted red with the dye and the depth of the tint is a measure of the degree to which the dye has been diluted.

Probably different species and indeed different individuals in the species differ considerably in the quantity of blood contained in their vessels, some being more full blooded than others. As a very rough estimate the blood volume is somewhere around $\frac{1}{15}$–$\frac{1}{17}$ of the body weight in man. It is believed to increase at great heights, under tropical conditions and during anaemia.

Considerable loss of blood may take place without serious ill-effects, but if the volume decreases beyond a certain point the

blood pressure commences to drop and a condition of shock supervenes. Besides the blood which actually circulates in the arteries, veins and capillaries, the body possesses reserves which can be mobilized. One such is known to be located in the spleen. On the onset of haemorrhage the spleen shrinks, squeezing blood as from a sponge into the circulation, thus some animals may lose a fifteenth of their blood without the volume of that fluid in circulation suffering any appreciable decrease, the spleen contributing as much as is lost by the haemorrhage.

The blood may lose in volume from causes other than haemorrhage, *i.e.*, through exposure or injury, especially to the visceral organs, and a condition may arise in which the capillary walls appear to become unduly permeable and dilated; the plasma then escapes into the tissue spaces, the number of corpuscles per cubic millimetre increases, they being left in the vessels when the fluid escapes and ultimately the volume of blood becomes so small that the arterial pressure cannot be maintained. The condition is known as "surgical shock" and can be closely simulated by the introduction into the circulation of the drug histamine.

BLOOD PIGMENTS

The red pigment of the corpuscles, which is responsible for their capacity to carry oxygen, is called haemoglobin. It consists of a compound of a protein "globin" with a crystalline substance haematin.

The Importance of Haematin.—Haematin has the formula $C_{34}H_{30}N_4O_4FeOH$. Its principal chemical characteristics are (1) that it contains iron; (2) that it contains four pyrrol groupings—a fact which gives it a superficial relationship to chlorophyll; (3) it is easily reduced and reoxidized by chemical reagents. This oxidation does not seem actually to involve the valency of the iron, which is in the ferrous condition throughout. In haemoglobin the ratio of the iron by weight to the detachable oxygen (*labile*) is by weight as 56:32. In small quantities haematin is widely distributed both in the animal and vegetable kingdoms, as has recently been shown by Keilin. It forms compounds, other than haemoglobin, with proteins; a conjunction of three such is frequently found both in animals and plants giving the spectroscopic appearance of a substance with four absorption bands. To their spectrum the name cytochrome was given. In reality it consists of six bands, three of which overlap and is really three spectra, each of two bands superposed. The three spectra correspond of course to the three haematin-protein compounds mentioned above. The function of cytochrome appears to be that of a catalyst.

The Importance of the Globin.—Unlike cytochrome, haemoglobin can easily be crystallized, the corpuscles of different animals yielding crystals of different forms. They present specific differences in solubility, in the power of uniting with gases and in the position of the bands in their absorption spectra. Such differences are believed to be due to the specific characters of the globin. Haemoglobin unites with oxygen to form a compound of so loose a nature that (1) it can be completely broken down by a vacuum and (2) proportion of the whole haemoglobin oxidized is a function of the partial pressure of oxygen to which it is exposed. On this property depends the value of the pigment as a carrier of oxygen (*see* RESPIRATION).

Carboxyhaemoglobin.—Haemoglobin unites with carbon monoxide in a manner quite similar to that of its union with oxygen, but the affinity of the pigment for carbon monoxide is much greater than for oxygen; at the body temperature in man it is about 250 times as great. (For carbon monoxide poisoning, *see* ANOXAEMIA.)

The spectrum also of carboxyhaemoglobin is very similar to that of oxyhaemoglobin, having two absorption bands in the green as well as a considerable absorption of the ends of the spectrum, especially the blue end. It also has an absorption band in the ultra violet. Haemoglobin also unites with nitrous oxide; their compound does not occur in blood.

Methaemoglobin.—In all the above compounds the iron is in the ferrous state; a compound sometimes found in the blood in certain cases of poisoning (*see* ANOXAEMIA) is methaemoglobin, which differs from ordinary haemoglobin by containing its iron in the ferric condition. Its absorption spectrum contains a conspicuous band in the red. It is formed by the action of potassium ferricyanide, nitrites, nitro-bodies, etc., on haemoglobin in the blood.

Haemochromogen.—There are some other important derivatives of haemoglobin which do not occur in blood—of these perhaps the most important is haemochromogen, a body in which haematin, in the reduced condition, is united not with native globin but with another protein formed by the action of strong alkali on globin and known as denatured globin, principally because it is insoluble at the point of neutrality. The practical importance of haemochromogen lies in two facts: (1) that it is very easily made from old blood by the action of alkali in combination with a reducing agent; (2) of all the blood pigments it is the one whose spectrum can be recognized in the greatest dilution. Therefore in medico-legal cases stains suspected of being due to blood can be tested by attempting the conversion of the pigment into haemochromogen and the observation of the material obtained with the spectroscope. (J. BAR.)

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BLOOD, PATHOLOGY OF (*see* also ANAEMIA). The changes in the blood in disease are probably as numerous and varied as the diseases which attack the body. The immense majority of these changes are, however, so subtle that they escape detection by our present methods. But in certain directions, notably in regard to the relations with micro-organisms, changes in the blood-plasma can be made out, though they are not associated in all cases with changes in the formed elements which float in it, nor with any obvious microscopical or chemical alterations.

The phenomena of immunity (*q.v.*) from the attacks of bacteria or their toxins, of agglutinative action, of opsonic action, of the precipitin tests, and of haemolysis, are all largely dependent on the inherent or acquired characters of the blood serum.

The methods at present employed in examining the blood clinically are: the enumeration of the red and white corpuscles per cubic millimetre; the estimation of the percentage of haemoglobin and of the specific gravity of the blood; the microscopic examination of freshly-drawn blood and of blood films made upon cover-glasses, fixed and stained. In special cases the alkalinity and the rapidity of coagulation may be ascertained, or the blood may be examined bacteriologically. We have no universally accepted means of estimating, during life, the total amount of blood in the body, though the method of Haldane and Lorrain Smith, in which the total oxygen capacity of the blood is estimated, and its total volume worked out from that datum, has seemed to promise important results (*Journ. of Physiol.* vol. xxv. p. 331, 1900).

Volume and Composition.—Estimates of the total volume of blood in man vary between about $\frac{1}{20}$ and $\frac{1}{13}$ of the body weight but no doubt it varies from time to time. After death the amount of blood sometimes seems to be increased, and sometimes, as in "pernicious anaemia," it is certainly diminished. But the high counts of red corpuscles which are occasionally reported as evidence of plethora or increase of the total blood are really only indications of concentration of the fluid except in certain rare cases. It is necessary, therefore, in examining blood diseases, to confine ourselves to the study of the blood-unit, which is always taken as the cubic millimetre, without reference to the number of units in the body.

Though the relative proportions of the leucocytes are probably continually undergoing change even in health, especially as the result of taking food the number of red corpuscles remains much

more constant. Through the agency of some unknown mechanism, the supply of fresh red corpuscles from the bone-marrow keeps pace with the destruction of effete corpuscles, and in health each corpuscle contains a definite and constant amount of haemoglobin. The disturbance of this arrangement in anaemia may be due to loss or to increased destruction of corpuscles, to the supply of a smaller number of new ones, to a diminution of the amount of haemoglobin, in the individual new corpuscles, or to a combination of these causes.

It is most easy to illustrate this by describing what happens after a haemorrhage. If this is small, the loss is replaced by the fully-formed corpuscles held in reserve in the marrow, and there is no disturbance. If it is larger, the amount of fluid lost is first made up by fluid drawn from the tissues, so that the number of corpuscles is apparently diminished by dilution of the blood; the erythroblasts, or formative red corpuscles, of the bone-marrow are stimulated to proliferation, and new corpuscles are quickly thrown into the circulation. These are apt, however, to be small and to contain a subnormal amount of haemoglobin, and it is only after some time that they are destroyed and their place taken by normal corpuscles. If the loss has been very great, nucleated red corpuscles may even, in some cases, be carried into the blood-stream.

Destruction and Regeneration.—The blood possesses a great power of recovery, if time be given it, because the organ (bone-marrow) which forms so many of its elements never, in health, works at high pressure. Only a part of the marrow, the so-called red marrow, is normally occupied by erythroblastic tissue, the rest of the medullary cavity of the bones being taken up by fat. If any long-continued demand for red corpuscles is made, the fat is absorbed, and its place gradually taken by red marrow. This compensatory change is found in all chronic anaemias, no matter what their cause may be, except in some rare cases in which the marrow does not react.

It is often very difficult, especially in "secondary" anaemias, to say which of the above processes is mainly at work. In acute anaemias, such as those associated with septicaemia, there is no doubt that blood destruction plays the principal part. But if the cause of anaemia is a chronic one, a gastric cancer, for instance, though there may be an increased amount of destruction of corpuscles due to sepsis, and though there is often loss by haemorrhage, the cancer interferes with nutrition, the blood is impoverished and does not nourish the erythroblasts in the marrow sufficiently, and the new corpuscles which are turned out are few and poor in haemoglobin. In chronic anaemias, regeneration always goes on side by side with destruction, and it is important to remember that the state of the blood in these conditions gives the measure, not of the amount of destruction which is taking place so much as of the amount of regeneration of which the organism is capable. The evidence of destruction has often to be sought for in other organs, or in secretions or excretions.

Leucocytosis.—The number and nature of the leucocytes in the blood bears no constant or necessary relation to the number or condition of the red corpuscles, and their variations depend on entirely different conditions. The number in the cubic millimetre is usually about 7,000, but may vary in health from 5,000 to 10,000. A diminution in their number is known as *leucopenia,* and is found in starvation, in some infective diseases, as for example in typhoid fever, in malaria and Malta fever, and in pernicious anaemia. An increase is very much more frequent, and is known as *leucocytosis,* though in this term is usually connoted a relative increase in the proportion of the polymorphonuclear neutrophile leucocytes. Leucocytosis occurs under a great variety of conditions, normally to a slight extent during digestion, during pregnancy, and after violent exercise, and abnormally after haemorrhage, in the course of inflammations and many infective diseases, in malignant disease, in such toxic states as uraemia, and after the ingestion of nuclein and other substances. It does not occur in some infective diseases, the most important of which are typhoid fever, malaria, influenza, measles and uncomplicated tuberculosis. In all cases where it is sufficiently severe and long continued, the reserve space in the bone-marrow is filled up by the active proliferation of the leucocytes normally found there, and is used as a nursery for the leucocytes required in the blood. In many cases leucocytosis is known to be associated with the defence of the organism from injurious influences, and its amount depends on the relation between the severity of the attack and the power of resistance. There may be an increase in the proportions present in the blood of lymphocytes (*lymphocytosis*), and of eosinophile cells (*eosinophilia*). This latter change is associated specially with some forms of asthma, with certain skin diseases, and with the presence of animal parasites in the body, such as ankylostoma and filaria.

Leucaemia.—The disease in which the number of leucocytes in the blood is greatest is *leucocythaemia* or leucaemia. There are two main forms of this disease, in both of which there are anaemia, enlargement of the spleen and lymphatic glands, or of either of them, leucocytic hypertrophy of the bone-marrow, and deposits of leucocytes in the liver, kidney and other organs. The difference lies in the kind of leucocytes present in excess in the blood, blood-forming organs and deposits in the tissues. In the one form these are lymphocytes, which are found in health mainly in the marrow, the blood itself, the lymph glands and in the lymphatic tissue round the alimentary canal; in the other they are the kinds of leucocytes normally found in the bone-marrow—myelocytes, neutrophile, basophile, and eosinophile, and polymorphonuclear cells, also neutrophile, basophile and eosinophile. The clinical course of the two forms may differ. The first, known as lymphatic leucaemia or *lymphaemia,* may be acute, and prove fatal in a few weeks or even days with rapidly advancing anaemia, or may be chronic and last for one or two years or longer. The second, known as spleno-myelogenous leucaemia or *myelaemia,* is almost always chronic, and may last for several years. Recovery does not take place, though remissions may occur. The use of the X-rays has been found to influence the course of this disease very favourably, at least, for a time. The most recent view of the pathology of the disease is that it is due to an overgrowth of the bone-marrow leucocytes analogous in some respects to tumour growth and caused by the removal of some controlling mechanism rather than by stimulation. In course of time a lymphaemia may pass into a myelaemia. The anaemia accompanying the disease is due partly to the leucocyte overgrowth, which takes up the space in the marrow belonging of right to red corpuscle formation and interferes with it.

BLOODLESS SURGERY. The method originated by Lorenz is employed in orthopaedics and, strictly speaking, is not bloodless, for the bruising that may result is evidence of ruptured blood-vessels; a better term would be woundless or subcutaneous surgery.

Stretching Procedure.—The contrast between surgery and bloodless surgery in correction of an orthopaedic deformity is as follows:—Orthosurgery, by cutting or excising, adapts the bones to the shortened soft parts; bloodless surgery lengthens the shortened soft parts by stretching until they correspond to the length of the bones. This lengthening is effected by repeated (many hundred) small stretching procedures (the modelling correction of the Germans) and not by a single forcible procedure (the forcible correction of the French), which introduces undesirable damage, such as fracture or injury to nerves. Modelling and forcible correction differ further in that the former gradually annihilates the natural elasticity of the shortened soft parts so that they fail to retract when the modelling tension ceases, and can be fixed, passively, in any desired position by a suitable appliance. This gradual process is unaccompanied by the pain that characterizes forcible correction.

Modelling Correction.—Modelling correction is not without danger, even if cautiously performed. The soft parts, when subjected to tension and extension, are of different tolerance. Muscles and ligaments are little liable to damage. In case of absolute resistance to stretching, the tendons are severed with a thin, sharp knife (tenotome). The blood-vessels, being elastic, are less sensitive to stretching, but the circulation can be greatly impaired if excessive stretching of the vessels causes their inner walls to come in contact.

Nerve Stretching.—Of all soft parts the nerves are the most sensitive to stretching. "Pins and needles" is a familiar example of the fact. Should pressure on the nerve last a comparatively short time (say some hours) paralysis may ensue, the nerve remaining anatomically uninjured. Such a paralysis persists for many months.

Reactive Swelling.—Another danger of modelling correction is reactive swelling of the soft parts after the procedure. The plaster cast, maintaining the limb in the corrected position, must therefore be very accurately upholstered and even split appropriately, to provide room for the swelling, which is always to be expected, or gangrene may develop.

Nature of Deformity.—The aim of modelling procedure is correction of deformity, and the essence of deformity is impairment of function, with or without obvious alteration in shape of the bones of which a joint is composed. Most of the deformities are represented by fixed joints. The angle, in which a joint is fixed, is of no importance. Ankylosis is beyond the reach of bloodless surgery. If an ankylosed knee is not straight, it cannot be made so by the modelling correction, but solely by the chisel. Contracted joints, however, with even the slightest trace of mobility, represent the most important objects of bloodless treatment. But even here the field of bloodless surgery is limited by the nature of the underlying disease.

Contractures.—To make evident the necessity of such further limitation, contractures must be classified according to their origin. The most important causes of contractures are tuberculous disease of the joints, rickets and similar softenings of the bones and infantile paralysis. Congenital deformities, though less frequent, are, in many cases, the cause of contractures. In addition there are contractures caused by accident (fractures of bones, luxations of joints), by rheumatic joint diseases, by luetic, cerebral affections, etc.

Tuberculous Contractures.—On the whole the army of cripples can be divided into two groups, viz., diseased cripples and healthy cripples. Among the first are those whose contractures are due to tuberculosis. The treatment of tuberculous bone and joint diseases exclusively belongs to bloodless surgery. Resections of tuberculous joints in children in the course of time often result in deformities more severe than those occurring naturally. Open-air life, plentiful food and sunshine, combined with bloodless mechanical treatment, bring about results which contrast favourably with those due to the knife. This is particularly noticeable in spinal tuberculosis.

The Plaster Bed.—The apparently difficult problem of immobilizing the spinal column has been solved by Lorenz's plaster bed, which is a well-upholstered plaster model of the trunk. Though pain has been severe, especially during the night, the patient in his plaster bed is exempt to such a degree that he bears perambulator exercise with equanimity. Thus he is neither confined to his bed nor to his room, he can enjoy open air, sunshine, undisturbed sleep, his appetite increases, and he gets well without any operation. The developing gibbosity can be lessened, and sometimes even prevented, by adjustable cushions placed underneath the prominent parts. A similar plaster bed has been employed with benefit for spinal injuries.

Other Joint Diseases.—In the same way immobilization is essential in the treatment of all other tuberculous diseases of the joints (hip-disease, white swelling of the knee, etc.). Immobilization by plaster casts is superior to extension, though this latter method is also useful as a means of fixation. By far the greater number of cases of tuberculous joint diseases, develop contractures, whatsoever method of treatment they may have gone through. Should the contracture not be evident at the time when the treatment has come to an end, it will develop later.

The usual contraction of the knee-joint is flexion, of the hip-joint flexion and abduction. Although Lorenz advocates bloodless surgery in the treatment of the acute stage of tuberculous joint diseases, he warns strongly against treatment of the resulting contractures by modelling correction. The healed tuberculous joint is comparable to a bone scar and should not be torn asunder, lest the tuberculous process be stirred up anew. Such contractures call for the chisel, and correction is done not in, but near, the joint (pararticular osteotomy).

Rickets.—To the diseased cripples also belong patients suffering from rickets. During the acute stages of the disease, correction of deformities belongs to bloodless procedures. Patients with lateral deviation of the spine too, belong to this class, because their deformity is due to a pathological softening of the bones of the spine. Besides measures to improve the general health of such patients, gymnastics, massage, corsets, etc., are of great importance in treatment, in which the plaster bed plays a great part.

Healthy Cripples.—Finally reference must be made to the class of healthy cripples. Leaving on one side deformities due to accident where recourse may be had to bloodless surgery, mention must be restricted to deformities consequent on infantile paralysis, the most terrible scourge of childhood. It can well be asserted that all contractures caused by paralysis can be straightened out by the bloodless method. When the normal shape of the limbs is restored, a very simple brace is sufficient to make walking possible. It must be admitted that conditions can be improved by successful transplantation of tendons. But this operation is not absolutely necessary. Many cases do without it—for instance, cases of paralytic flexure-contraction of the knee-joint. Instead of transplanting the active flexors of the knee-joint to the paralysed extensor (quadriceps), Lorenz substitutes the lost power of this latter muscle by the weight of the body. This is done by a slight over-stretching of the contracted knee, by which the line of weight is thrown in front of the axis of the knee-joint.

Arthrodesis, or artificial stiffening of joints by an operation on the cartilage, and on the bone, gives poor results, except in the shoulder joint. Lorenz also strongly objects to extirpating bones in paralytic deformities of the foot. At first the result may seem to be good enough, but very often in the course of years consecutive deformities develop, which are worse than the original ones. To the healthy cripples belong further such congenital deformities as congenital wry-neck, congenital club-foot and (most frequent of all) congenital dislocation of the hip joint.

Advantages of Modelling Correction.—In all these cases modelling correction, assisted by preliminary tenotomy, if necessary, can overcome the severest deformity. It restores the normal position of the deformed bones to each other and maintains this position by mechanical means. The bandaged foot, being compelled to support the weight of the body, is subject to the formative power of physiological function. By acting in their normal function the deformed bones, in the course of time, assume the normal shape. In this way the function, viz., to bear the weight of the body, is forced to serve the purpose of the orthopaedic treatment. Similar benefit may often be derived from the treatment in cases of flat-foot.

Luxation of the Hip-joint.—Congenital luxation of the hip-joint can be entirely cured by the method of bloodless surgery. Reposition of the displaced head of the femur into the acetabulum is brought about by manoeuvres which are entirely consistent with those of modelling correction. By repeated stretching of the soft parts the head of the femur is forced into the acetabulum. Far more difficult is the second part of the treatment, *i.e.,* retention of the head of the bone in the socket, the latter being too small and too shallow to retain it within its defective borders. To accomplish this, the thigh has to be fixed in certain extreme positions by which the head is prevented from slipping out of the socket. Owing to forced pressure of the head into the socket, the latter develops according to the size and shape of the head of the femur, while without it the socket would get smaller and smaller. Contractures and shortening of certain soft parts caused by the extreme position of the thigh help to retain the head in its normal place. It takes about a year before the socket is developed so far as to guarantee retention of the head. The third part of the treatment consists in gradual reduction of the extreme abducted position of the thigh into the normal one. The difficulty of simultaneous treatment of bilateral hip luxation can be imagined. Children with unilateral luxation are allowed to move about during the greater part of the treatment's duration and bear fairly well the impediment caused by the fixing bandage.

Described thus shortly the plan of treatment seems to be simple but its actual achievement is by no means so. Experience has proved, that within certain limits of age (up to five or six years) the cure of the children can be a perfect one, while in older cases at least great improvement can be obtained. This is so much the more remarkable, as surgeons of all times regarded the deformity in question as absolutely incurable.

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BLOOD-LETTING, the abstraction of a portion of the blood, from three or four ounces up to twenty or even thirty in extreme cases. This may be effected by venesection, or the application of leeches, or more rarely by cupping (*q.v.*). In the past, blood-letting was used to such excess, as a cure for almost every known disease, that public opinion became opposed to it. Latterly, this prejudice has disappeared to a great extent. In certain pathological conditions it brings relief and saves life when no other means would act with sufficient promptness to take its place.

Venesection, in which the blood is usually withdrawn from the median-basilic vein of the arm, should be carried out with strict asepsis and then is without danger. If only a small amount of blood is to be abstracted, leeches may be used and the nurse can apply them. From one to twelve leeches are applied at the time, the average leech withdrawing some two drachms of blood. As much again can be abstracted by the immediate application of hot fomentations to the wounds. Leeches should always be applied over some bony prominence, that pressure may be effectively used to stop the haemorrhage afterwards. They should never be placed over superficial veins, or where there is much loose subcutaneous tissue. If, as is often the case, there is any difficulty in making them bite, the skin should be pricked at the desired spot with the point of a sterilized needle, and the leech will then attach itself without further trouble. Also they must be left to fall off of their own accord, the nurse never dragging them forcibly off. If cold and pressure fail to stop the subsequent haemorrhage, a little powdered alum or other styptic may be inserted in the wound. The following are the main indications for blood-letting. (1) For stagnation of blood on the right side of the heart with constant dyspnoea, cyanosis, etc. In acute lung disease, the sudden obstruction to the passage of blood through the lungs throws such an increased strain on the right ventricle that it may dilate to the verge of paralysis; but by temporarily lessening the total volume of blood, the heart's work is lightened for a time, and the danger at the moment tided over. This is a condition frequently met with in the early stages of acute pneumonia, and acute bronchitis, when the obstruction is in the lungs, the heart being normal. But the same condition also accompanies failure of compensation with back pressure in certain forms of heart disease (*q.v.*). (2) To lower arterial tension. In the early stages of cerebral haemorrhage (before coma has supervened), when the heart is working vigorously and the tension of the pulse is high, removal of a pint of blood may lead to arrest of haemorrhage by lowering the blood pressure temporarily and so giving the blood in the ruptured vessel an opportunity to coagulate. (3) In various convulsive attacks, as in acute uraemia and eclampsia.

Though there is no doubt that blood-letting often benefits the patient remarkably, its mode of action is not fully clear. Changes in the composition and volume of the blood induced by haemorrhage (*q.v.*) are of short duration unless indeed the amount of blood removed is so great as to be dangerous.

BLOOD-MONEY, the money-penalty paid in old days by a murderer to the kinsfolk of his victim. The system was common among the Scandinavian and Teutonic races previous to the introduction of Christianity, and a scale of payments, graduated according to the heinousness of the crime, was fixed by laws, which settled who could exact the blood-money, and who were entitled to share it; blood-money could be exacted for all crimes of violence. Some acts, such as killing anyone in a church or while asleep, or within the precincts of the royal palace were excepted; the criminal was outlawed, and his enemies could kill him wherever they found him. Colloquially the term is used of the reward for betraying a criminal.

BLOOD PRESSURE, the hydrostatic pressure under which the blood exists in the arteries and veins of human beings and animals. This pressure was first measured by the Rev. Dr. Stephen Hales, in 1733. Hales connected the femoral artery of a horse to a glass tube 9 ft. in length. When the blood was permitted to flow into this tube, it rose 8 ft. 3 in., showing that the pressure of the blood due to the pumping of the heart-beat was equal to the weight of a column of blood of this height. When a similar tube was attached to a vein, the blood rose only 12 inches. In 1828 was invented the mercury manometer, which consisted of a U tube, with mercury resting at the same level in both arms of the tube. When the pressure of blood from an artery was applied to the top of the mercury column in one arm, it forced the mercury column in the other arm of the tube to rise. The difference in height of the two mercury columns then represented the number of millimetres which the blood pressure had lifted the mercury column. Since then, blood pressure has been given in terms of millimetres of mercury.

The sphygmomanometer was devised by von Basch, in 1887, for measuring the blood pressure in the arteries of man. The modern form of this instrument consists of a rubber bag, into which air can be pumped by means of a hand-bulb, with a pressure gauge communicating with the air inside the bag. (The pressure gauge may consist of a spring device, calibrated to correspond with mercury pressure, or of a column of mercury which can be read on a millimetre scale as its level changes.) The bag is wrapped around the subject's arm (usually the left), above the elbow, in a position appropriate to shut off the flow of blood in the brachial artery, when the bag is inflated. Air is then pumped into the bag until the pulse in the radial artery, at the wrist, disappears. The reading of the pressure gauge at this moment gives the systolic blood pressure; *i.e.*, the pressure necessary to suppress the maximum pressure of blood in the artery.

Three phases of arterial blood pressure are customarily distinguished during a single beat of the heart: systolic during the heart's systole, when the arterial blood pressure is at its maximum; diastolic, when the heart is in diastole, with arterial pressure at its minimum; and the mid-point, or mean between these two extremes, called the "pulse-pressure." If the pulse beat be recorded graphically, as the air pressure compressing the artery is diminished, the pressure at which the maximum pulse wave is obtained marks the diastolic pressure. By the auscultation method of obtaining blood pressure, a stethoscope is placed over the brachial artery just below the cuff, the air pressure in the cuff is raised above that necessary to obliterate the artery and is then allowed to fall slowly. The first sound heard through the stethoscope gives the systolic blood pressure; since this marks the moment when the maximum arterial pressure is just able to break through the closed artery. The pressure at which the sound is last heard is the diastolic pressure.

It is a common belief that systolic blood pressure in adults equals 100 plus the individual's age; but research has not verified this idea. Erlanger reports that the average adult (20 to 25), when wholly free from emotional excitement, has a systolic pressure (brachial artery) of 116 mm., and a diastolic of 65 millimetres. Psychologists have found that normal adults have systolic blood pressure varying between 90 and 150 mm., with little or no uniformity, or correspondence with the physical age of the individual (up to 35 years). Blood pressure changes very greatly under emotional excitement, and the excitement caused by undergoing a physical examination, or having the blood pressure taken for such a purpose as obtaining a life insurance policy, has been found to raise the systolic blood pressure 50 to 60 millimetres.

Blood pressure is of value to physicians in diagnosing various diseases, especially such disorders as arteriosclerosis, or dis-

tinguishing between hyper-thyroid and hyper-adrenal conditions. Systolic blood pressure has been found useful by psychologists as a means of detecting emotional excitement (*see* DECEPTION TEST).

Knowledge of the pressure of blood in the veins is not as frequently required as is arterial pressure. The simplest method of determining venous pressure in man is that of Gaertner. The subject's arm is slowly raised until the veins on the back of the hand just disappear. The height above the heart at which this happens gives the venous pressure in the right auricle; the entire vein constitutes, in essence, a manometer tube leading from heart to hand, with the height of the hand above the heart thus measuring the height to which the venous blood-column is supported by the pressure exerted upon it.

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BLOODROOT (*Sanguinaria canadensis*), a North American plant of the poppy family, Papaveraceae, called also red puccoon, common in rich woods in eastern North America. It is a low, smooth, bluish-green perennial which blossoms usually before its own leaves or those of its native woodland unfold. The showy white or pinkish flowers, about 2 in. broad, are usually borne singly on stalks about 8 in. long. The flower stalks and the large, rounded, many-lobed leaves rise from a horizontal rootstock, often an inch thick and several inches long. The rootstock, together with other parts, is surcharged with an acrid, orange-red juice, whence the name. The plant contains an alkaloid, sanguinarin (*see* ALKALOIDS), used in medicine. Throughout its range the bloodroot is one of the most attractive early bloomers and is often transplanted for ornament. In Great Britain the name bloodroot is sometimes applied to the tormentil (*Potentilla Tormentilla*) and the crimson crane's bill (*Geranium sanguineum*).



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BLOODROOT, A FRAGILE FLOWER OF EARLY SPRING, COMMON ON THE BORDERS OF WOODS AND COPSES

BLOODSTONE or **HELIOTROPE** (*Girasol*) is a dark green variety of crypto-crystalline silica, having bright-red nodules distributed throughout its mass. Polished sections therefore show red spots on a dark green background, and from the resemblance of these to drops of blood, it derives its name. The word heliotrope is derived from the Greek (*Helios,* the sun; *trope,* a turning) and related to one of its supposed properties described by Marbodus in the following lines:—

> The Heliotrope or "gem that turns the sun,"
> From its strange power the name has justly won:
> For set in water opposite his rays,
> As red as blood 'twill turn bright Phoebus' blaze.

It was greatly prized in the middle ages and used in sculptures representing flagellation and martyrdom; it is of small importance now. On heating, the red spots turn black and the green background changes to grey.

See C. W. King, *Antique Gems* (1860); Max Bauer, *Precious Stones,* trans. L. J. Spencer (1904). (W. A. W.)

BLOOD TRANSFUSION, the term used in medical literature for the process of transferring the blood from the circulation of one living animal to that of another. The first authentic record of it was not made until the middle of the 17th century. A Florentine physician, Francesco Folli, claimed to have transfused blood from one animal to another on Aug. 13, 1654. Subsequently many experiments bearing on the subject were made by Dr. (later Sir Christopher) Wren, Richard Lower, Edmund King, and Thomas Cox, their experiences being recorded in the *Philosophical Transactions* published by the Royal Society about 1666. Some of these experiments were witnessed by Samuel Pepys, who referred to them in his *Diary.* In spite of this activity in England the credit for first performing a blood transfusion upon a human being must be given to Jean Denys of Montpellier. An account of his experiment done upon a boy aged 15 was published in the *Philosophical Transactions* for July 22, 1667.

On this occasion, and indeed throughout the 17th century, the blood for transfusion was taken from a lamb or calf, and, although good therapeutic results were claimed at first, the operation soon fell into disrepute and was almost entirely abandoned. Little or nothing was heard of it during the 18th century and it was not until 1818 that attention was again focused upon its possibilities. The coagulation of the blood outside the body was always the prime difficulty. One way of overcoming this was to remove the fibrin which forms the basis of the clot, and from 1835 onwards this defibrinated blood was used by various operators.

Transfusion did not, however, come into general use as a therapeutic measure during the 19th century, and after the year 1875 was largely neglected. This was probably due to the increased number of disasters which had attended the operation as soon as it began to come into fashion. An improvement in technique was initiated in America through advances in the surgery of the blood vessels, and this culminated in the work of Crile, who about 1907 described in detail an efficient method of performing *direct* transfusion by means of an anastomosis between an artery of the donor and a vein of the recipient.

Meanwhile discoveries were being made which tended to eliminate the chief factor responsible for the fatal results of some of the earlier transfusions. It had long been known that the bloods of different species of animals were incompatible, that is to say, the blood of a calf introduced into the circulation of a man was inevitably and rapidly destroyed, this process being attended by more or less serious symptoms, or even by death, according to the amount of blood introduced. In 1907 it was shown by Jansky in Scandinavia that an analogous incompatibility exists in all races of man between the bloods of different individuals, so that a given recipient may safely receive the blood of certain selected donors only. Hitherto no such selection had been practised. Jansky's work was repeated by Moss in America in 1910, and human beings have since that time been classified into four definite groups, the blood of only one of these being suitable for more or less indiscriminate injection into all recipients.

A further advance was made in 1914 when Agôte of Buenos Aires first used sodium citrate as an anti-coagulant for the donor's blood. This substance, when mixed with the blood as it issues from the donor's vein, combines with, and renders inert, the calcium which is present in the blood in small quantity and is an essential factor in the coagulation reaction. The blood then remains fluid for an indefinite time, and the small amount of citrate which it contains is usually harmless to the recipient. Direct transfusion by Crile's method was technically difficult to perform, and it was soon abandoned in favour of citrated blood. This method was introduced opportunely for use in the treatment of the wounded during the World War, though it was largely employed only after the entry of the American surgeons into the hospitals in France. Some surgeons, however, then believed, and still believe, that citrate is responsible for the reactions, usually mild in degree, which follow a certain percentage of all transfusions, however carefully the bloods of donor and of recipient may have been tested. In spite of much controversy the supposed harmful effect of citrate has not yet been proved, and this method, which has many advantages, is more often used than any other. If whole, or untreated, blood be preferred, coagulation may be retarded by receiving the blood into a glass vessel coated on the inside with paraffin; it must then be transferred to the recipient as rapidly as possible.

In 1923 a return was made by Storer to the older method of using defibrinated blood to which no foreign substance has been added, and it is possible that this may prove to be the method of choice in the future. Storer's ground for eliminating the anti-coagulant was the belief that its presence impaired the anti-bacterial properties of the donor's leucocytes, but his contention still has to be substantiated in practice.

Blood transfusion has been found to have its greatest clinical

value in the treatment of acute anaemia (*see* ANAEMIA) due to loss of blood after injury, or in cases such as bleeding from a gastric ulcer or *post-partum* haemorrhage. Transfusion is also of value in combating the shock following severe surgical operations or injury, which may or may not have been accompanied by much loss of blood, and in the treatment of several diseased conditions in which, for one reason or another, the patient's blood is deficient in its power of coagulation. Thus, in the hereditary disease known as haemophilia, the patient may be rendered temporarily normal by transfusion of blood, and persistent bleeding will cease. Transfusion has been used in the treatment of a very large number of patients suffering from pernicious anaemia, some having received as many as thirty injections of blood over a period of several years; but, although a temporary remission of the disease may be obtained and the patient's life be prolonged, the disease cannot thereby be cured. The limitations of transfusion as a therapeutic measure, are, therefore, fairly well defined. It is still used more widely in America than in other countries, but it is coming to be employed more frequently everywhere. Transfusion may also be considered from the point of view of the donor. Here the chief point of interest is the amount of blood which he can afford to lose without danger. It has been found that a healthy young man can part with any amount up to a litre of blood without experiencing anything more than a transient faintness. Usually he is not called upon to give more than 500 to 750 cu. cm. for one transfusion.

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BLOODWORM. A name given to certain larvae belonging to the family Chironomidae, of the order Diptera (*q.v.*).

(C. H. CN.)

BLOODY ASSIZES, the name given in history to the commission conducted by Chief Justice Jeffreys after the Monmouth Rebellion in the west of England in 1685. Over 300 persons were condemned to death; hundreds more were transported. Although modern research has acquitted Jeffreys, in certain cases, of any technical irregularity, the trials generally were conducted with a ferocity which has, with reason, made his name notorious. (*See* JEFFREYS, GEORGE JEFFREYS; LISLE, ALICE; MONMOUTH, JAMES SCOTT.)

BLOOM, the blossom of flowering plants (from Ang.-Sax. *blôma*, a flower), or the powdery film on the skin of fresh-picked fruit; hence applied to the surface of newly minted coins or to a cloudy appearance on the varnish of painting due to moisture.

In metallurgy, a term used of the rough billets of iron and steel, which have undergone a preliminary hammering or rolling, and are ready for further working. (*See* IRON AND STEEL.)

BLOOMER, AMELIA JENKS (1818–1894), American dress-reformer and women's rights advocate, was born at Homer (N.Y.), on May 27, 1818. In 1849 she took up the idea—previously originated by Mrs. Elizabeth Smith Miller—of a reform in woman's dress, and the wearing of a short skirt, with loose trousers, gathered round the ankles. The name of "bloomers" gradually became popularly attached to any divided-skirt or knickerbocker dress for women. Until her death on Dec. 30, 1894, Mrs. Bloomer took a prominent part in the temperance and woman suffrage movements.

BLOOMFIELD, MAURICE (1855–1928), American Indological and philological scholar, was born on Feb. 23, 1855, in Bielitz, Austria. He went to the United States in 1867, studied at the University of Chicago, Furman university, Greenville, S.C., Yale university and at Johns Hopkins, to which university he returned as professor of Sanskrit and comparative philology in 1881 after a stay of two years in Berlin and Leipzig. He is best known as a student of the Vedas. He translated, for Friedrich Max-Müller's *Sacred Books of the East,* the "Hymns of the Atharva-Veda" (1897); contributed to the Bühler-Kielhorn *Grundriss der indo-arischen Philologie und Altertumskunde* the section "The Atharva-Veda and the Gopatha Brāhmana" (1899); was first to edit the Kauçika-Sūtra (1890); published in conjunction with Prof. Richard von Garbe of the Tübingen university a chromophotographic reproduction of the Paippalāda version of the Atharva-Veda (Baltimore, 1901). In 1907 he published, in the Harvard oriental series, *A Vedic Concordance;* in 1905 *Cerberus, The Dog of Hades,* a study in comparative mythology; in 1908 *The Religion of the Vedas;* in 1916 *Rig-Vida Repetitions;* in 1919 *The Life and Stories of the Jaina Savior Pārçvanātha.* The bulk of his work is laid down in articles on Indic and linguistic and ethnological subjects printed in the journals of America and Europe. He died in San Francisco, Calif., June 12, 1928.

See the bibliography at the end of the foreword to *Studies in Honor of Maurice Bloomfield,* by a group of his pupils (1920).

BLOOMFIELD, ROBERT (1766–1823), English poet, was born of humble parents, at the village of Honington, Suffolk. He was apprenticed at the age of 11 to a farmer, but he was too small and frail for field labour, and four years later he came to London to work for a shoemaker. The poem that made his reputation, *The Farmer's Boy,* was written in a garret in Bell alley. The manuscript, declined by several publishers, fell into the hands of Capell Lofft, who arranged for its publication with woodcuts by Bewick in 1800. The success of the poem was remarkable, over 25,000 copies being sold in the next two years. His reputation was increased by the appearance of his *Rural Tales* (1802), *News from the Farm* (1804), *Wild Flowers* (1806), and *The Banks of the Wye* (1811). Influential friends attempted to provide for Bloomfield, but the poet died in poverty at Shefford, Bedfordshire. His *Remains in Poetry and Verse* appeared in 1824.

BLOOMFIELD, a town of Essex county (N.J.), U.S.A., about 12 mi. west of New York, adjoining Newark. It is served by the Erie and the Lackawanna railways, and has easy access for motor trucks to the Port Newark terminal and by way of the Holland tunnel to the New York water front. The area is 5.42 sq. miles. The population was 9,668 in 1900; 22,019 in 1920, of whom 4,587 were foreign-born white; and was 41,623 in 1940 by federal census. Bloomfield is an important industrial centre, as well as a residential suburb of Newark and New York. Its 70 manufacturing establishments in 1940 produced a diversity of articles, valued at $90,060,499. The area called Bloomfield was a part of Newark, and its early settlers (1670–1700) were for the most part sons of the men from Connecticut who founded Newark. It was known at first as Wardsesson, but in 1796 received its present name, in honour of Gen. Joseph Bloomfield (1753–1823). In 1812 it was incorporated as a township and in 1900 as a town. Belleville was separated from it in 1839; Montclair in 1868; and Glen Ridge in 1895.

BLOOMINGTON, a city in the north central part of Illinois, U.S.A., 125 mi. southwest of Chicago; the county seat of McLean county. It is an important highway and railway centre of the Illinois corn belt; at the intersection of federal highways 51, 66 and 150; also nine state highways; is served by the Alton, the Illinois Central, the Big Four, the Nickel Plate and the Illinois Terminal (electric) railways; and has a municipal airport, with hangar and equipment. The population was 30,930 in 1930 (91% native white); and was 32,868 in 1940 (federal census).

The city has 60 mi. of wide, paved streets, shaded with elms, oaks and maples which were systematically planted in its early days. It is the headquarters of the Alton Railroad company, which has here its general offices and shops employing 1,500 men. Important industries are connected with books and stationery; stoves and furnaces; portable barn elevators and smokehouses, concrete ventilated corncribs and granaries, and lighting plants for farms; washing machines, oil burners, ventilating systems, awnings, men's clothing and candy. The varied output of the manufacturing establishments in 1940 was valued at about $15,500,000. Coal has been mined in the vicinity since 1867. Illinois Wesleyan university, founded there in 1850 by a group of the county families, has an enrolment of 800 and is renowned for its

school of music. In 1857 the first state institution for the training of teachers in the Mississippi valley (now called the State Normal university) was established on the outskirts of Bloomington, in what is the separately incorporated town of Normal. Its enrolment is about 2,000 with 1,600 in the summer school. The Illinois Soldiers' and Sailors' Children's school and state headquarters of the American Legion are there. There are three country clubs and a municipal golf course. The city of Bloomington is internationally famous for its American Passion play. Bloomington is the site of Blooming Grove, which was crossed by several trails in pioneer days. The first settlement was made in 1822; the town became the county seat in 1831, and was incorporated as a city in 1850; the public school system was established in 1857. In 1856 it was the meeting place of the first convention of the Republican Party in Illinois, called by editors of the state who were opposed to the Kansas-Nebraska bill, and attended (among others) by Owen Lovejoy, Richard Yates, John M. Palmer, and Abraham Lincoln.

BLOOMINGTON, a city of Indiana, U.S.A., 50 mi. southwest of Indianapolis; the county seat of Monroe county. It is served by the Monon route and the Illinois Central railway. The population in 1920 (95% native white) was 11,595, and it was 18,227 in 1930 and 20,870 in 1940 by federal census. There are limestone quarries in the vicinity, and the city has considerable manufactures of furniture, baskets, and hampers, gloves, wax products and other commodities.

Bloomington was settled about 1818. It is the seat of Indiana university, which had an enrolment of 8,168 resident students and 8,768 students in extension classes and correspondence courses in 1940–41. Its history goes back to the state seminary established in 1820 on land granted by Congress for the purpose in 1816. The name was changed to Indiana college in 1828, and to Indiana university in 1838, to correspond with the development in scope. Since 1867 women have been admitted to all departments. The school of medicine, with its training school for nurses and its three teaching hospitals, and the school of dentistry, are in Indianapolis. The extension division maintains centres in Indianapolis, Ft. Wayne, and Gary. The biological station of the university is on Winona lake, in the northern part of the state.

BLOOMSBURG, a town in east central Pennsylvania, U.S.A., on Fishing creek, near the Susquehanna river, 35m. S.W. of Wilkes-Barre; the county seat of Columbia county. It is on Federal highway 11, and is served by the Bloomsburg and Sullivan, the Reading, the Lackawanna, and (through East Bloomsburg, just across the river) the Pennsylvania railways. The population in 1940 was 9,799 by federal census. The town is built on a bluff commanding extensive views, and is the seat of a State Teachers college, established in 1869. There are manufactures of importance, including carpets, silk, woollen goods, fountain pens, iron foundries and canning factories. Bloomsburg was laid out in 1802, became the county seat in 1846, and was incorporated in 1870.

BLORE HEATH, BATTLE OF. This was the second important battle of the WARS OF THE ROSES (*q.v.*), and ended like that of St. Albans four years before in a Yorkist victory. The site is near Market Drayton, and the date was Sept. 23, 1459.

BLOUNT, CHARLES (1654–1693), English deist, was born at Upper Holloway. His father, Sir Henry Blount (1602–82), was the author of a *Voyage to the Levant,* describing his own travels. He gave his son a careful education, and is said to have helped him in his *Anima Mundi* (1679), which gave great offence by the sceptical views on immortality expressed in it. It was suppressed by order of the bishop of London, but a reissue was permitted. Blount was an admirer of Hobbes, and published his "Last Sayings" (1679), a pamphlet consisting of extracts from *The Leviathan.* His best-known book, *The Two First Books of Philostratus concerning the Life of Apollonius Tyaneus . . .* (1680), is said to have been prohibited in 1693, chiefly on account of the notes, which are stated by Bayle (note, *s.v. Apollonius*) to have been taken mainly from a ms. of Lord Herbert of Cherbury. Blount contributed materially to the removal of the restrictions on the freedom of the press, with two pamphlets (1693) by "Philopatris," mainly derived from Milton's *Areopagitica.*

Shortly before his death a collection of his pamphlets and private papers was printed with a preface by Charles Gildon, under the title of the *Oracles of Reason.* His *Miscellaneous Works* (1695) is a fuller edition by the same editor.

BLOUNT or **BLUNT, EDWARD** (born 1565?), the printer, in conjunction with Isaac Jaggard, of *Mr. William Shakespeares Comedies, Histories and Tragedies. Published according to the true Originall Copies* (1623), usually known as the first folio of Shakespeare. It was produced under the direction of John Heming (died 1630) and Henry Condell (died 1627), both of whom had been Shakespeare's colleagues at the Globe theatre, but as Blount combined the functions of printer and editor on other occasions, it is fair to conjecture that he to some extent edited the first folio.

The Stationers' *Register* states that he was the son of Ralph Blount or Blunt, merchant tailor of London, and apprenticed himself in 1578 for ten years to William Ponsonby. He became a freeman of the Stationers' Company in 1588. Among the most important of his publications are Giovanni Florio's Italian-English dictionary and his translation of Montaigne, Marlowe's *Hero and Leander,* and the *Sixe Court Comedies* of John Lyly. He wrote a preface to *Hero and Leander,* in which he defended the dead poet's reputation. He himself translated *Ars Aulica, or the Courtier's Arte* (1607) from the Italian of Lorenzo Ducci, and *Christian Policie* (1632) from the Spanish of Juan de Santa Maria. From 1609 he was for a time in partnership with William Barret, and published in 1612 Shelton's translation of *Don Quixote.*

BLOUNT, THOMAS (1618–1679), English antiquarian, was the son of Myles Blount, of Orleton in Herefordshire. He was born at Bordesley, Worcestershire. He was called to the bar at the Inner Temple, but, being a zealous Roman Catholic, his religion interfered considerably with the practice of his profession. He retired to his estate at Orleton, where he died on Dec. 26, 1679.

His principal works are: *Glossographia; or, a dictionary interpreting the hard words of whatsoever language, now used in our refined English tongue* (1656, reprinted in 1707), which went through several editions and remains most amusing and instructive reading; *Nomolexicon: a law dictionary interpreting such difficult and obscure words and terms as are found either in our common or statute, ancient or modern lawes* (1670; third edition, with additions by W. Nelson, 1717); and *Fragmenta Antiquitatis: Ancient Tenures of land, and jocular customs of some mannors* (1679; enlarged by J. Beckwith and republished, with additions by H. M. Beckwith, in 1815; again revised and enlarged by W. C. Hazlitt, 1874). Blount's *Boscobel* (1651), giving an account of Charles II.'s preservation after Worcester, with the addition of the king's own account dictated to Pepys, has been edited with a bibliography by C. G. Thomas (1894).

BLOUNT, SIR THOMAS POPE (1649–1697), English author, eldest son of Sir Henry Blount and brother of Charles Blount (*q.v.*), was born at Upper Holloway. He represented the borough of St. Albans in the two last parliaments of Charles II., and was knight of the shire from the revolution till his death. He was created a baronet in 1679. His *Censura celebrorum authorum* (1690) was originally compiled for Blount's own use, and is a dictionary, in chronological order, of what various eminent writers have said about one another. It was published at Geneva in 1694 with all the quotations from modern languages translated into Latin, and again in 1710. His other works are *A Natural History, containing many not common observations extracted out of the best modern writers* (1693), *De re poetica, or remarks upon Poetry, with Characters and Censures of the most considerable Poets . . .* (1694), and *Essays on Several Occasions* (1692). It is on this last work that his claims to be regarded as an original writer rest. Blount displays throughout a hatred of pedantry and convention, which makes his book still interesting.

See A. Kippis, *Biographia Britannica,* vol. ii. (1780). For an account of Blount's family *see* Robert Clutterbuck, *History and Antiquities of the County of Hertford,* vol. i. pp. 207–212 (1815).

BLOUNT, WILLIAM (1749–1800), American politician, was born in Bertie county (N.C.), on March 26, 1749. He was a member of the early continental congresses, of the Constitutional Convention at Philadelphia in 1787, and of the State con-

vention which ratified the Federal Constitution for North Carolina in 1789. From 1790 until 1796 he was governor superintendent of Indian affairs of the "Territory South of the Ohio River." He presided over the Constitutional Convention of Tennessee in 1796 and became one of its first representatives in the United States Senate. Blount was impeached by the House of Representatives on July 7, 1797, for his connection with a conspiracy to seize the Spanish-owned Floridas and Louisiana for England, then at war with Spain, and on the following day was formally expelled from the Senate for "having been guilty of high misdemeanour, entirely inconsistent with his public trust and duty as a senator." On Jan. 14, 1799, however, the Senate, sitting as a court of impeachment, decided that it had no jurisdiction, Blount not then being a member of the Senate, and, in the Senate's opinion, not having been, even as a member, a civil officer of the United States. The case is significant as being the first impeachment brought before the United States Senate. Blount was enthusiastically supported by his constituents, and upon his return to Tennessee was made a member and the presiding officer of the State Senate. He died at Knoxville on March 21, 1800.

For a defence of Blount, *see* Gen. Marcus J. Wright's *Account of the Life and Services of William Blount* (Washington, D.C., 1884).

BLOW, JOHN (1648–1708), English musical composer, was born in 1648, probably at North Collingham in Nottinghamshire. He became one of the children of the Chapel Royal when the choir was reconstituted in 1660. He composed several anthems at an unusually early age, including *Lord, Thou hast been our refuge; Lord rebuke me not;* and the so-called "club anthem," *I will always give thanks,* the last in collaboration with Pelham Humphrey and William Turner. To this time also belongs the composition of a two-part setting of Herrick's *Goe, perjur'd man,* written at the request of Charles II. to imitate Carissimi's *Dite, o cieli.* When his voice broke he spent his time in the study of music, and in 1669 became organist of Westminster Abbey. In 1673 he was made a gentleman of the Chapel Royal, and in September of this year he was married to Elizabeth Braddock, who died in childbirth ten years later. Blow, who by the year 1678 was a doctor of music, was named in 1685 one of the private musicians of James II. Between 1680 and 1687 he wrote the only stage composition by him of which any record survives, the *Masque for the Entertainment of the King: Venus and Adonis.* In 1687 he became master of the choir of St. Paul's church; in 1695 he was elected organist of St. Margaret's, Westminster, and is said to have resumed his post as organist of Westminster Abbey, from which in 1680 he had retired to make way for his pupil, Henry Purcell. In 1699 he was appointed to the newly created post of composer to the Chapel Royal. Fourteen services and more than a hundred anthems by Blow are extant. In addition to his purely ecclesiastical music Blow wrote *Great sir, the joy of all our hearts,* an ode for New Year's day 1681–82; similar compositions for 1683, 1686, 1687, 1688, 1689, 1693 (?), 1694 and 1700; odes, etc., for the celebration of St. Cecilia's day for 1684, 1691, 1695, and 1700; for the coronation of James II. two anthems, *Behold, O God, our Defender,* and *God spake sometimes in visions;* some harpsichord pieces for the second part of Playford's *Musick's Handmaid* (1689); *Epicedium for Queen Mary* (1695); *Ode on the Death of Purcell* (1696). In 1700 he published his *Amphion Anglicus,* a collection of pieces of music for one, two, three and four voices. His pupil, Henry Purcell, said of him that his "character is sufficiently known by his works, of which this very instance (the Gloria from his *Jubilate in C major*) is enough to recommend him as one of the greatest masters in the world." Blow died on Oct. 1, 1708, at his house in Broad Sanctuary, and was buried in the north aisle of Westminster Abbey.

BLOWGUN or, as it is usually called, BLOWPIPE. This, with its poisoned dart, is a lethal weapon employed in South America, and in the Malay peninsula and archipelago. In each case it is used by *savages* of high ethnological status and mental development, usually forest peoples, its efficacy depending largely upon the user not being seen.

The blowpipe is a wooden tube some seven feet long (bore about one-third of an inch across) the external diameter diminishing from about one inch at the mouth end to three-quarters at the nozzle. The tube is made of a light, rigid wood, found commonly throughout Borneo and Malaya. A piece being selected, free from knots, it is roughly shaped. This is bored with an iron rod, eight feet long, with a cutting edge at one end. The pole and the boring tool are placed upright, the pole being fixed in a vice of branches of trees, the rod passing through guides above the ground.

Two men do the drilling. One brings the chisel down repeatedly on to the centre of the pole, turning it slightly each time. The other moistens the wood with water, which he ladles into the hole. It takes from eight to ten hours to bore through the pole, and although the chisel does fine work, the natives polish the inside with a rattan. When satisfied with this, they whittle away the outside to the required size and smoothness.

When a native of Borneo uses the blowpipe, he lashes a short spear to the end, so that he may ward off the attacks of infuriated victims. The weight of this spear would distort the tube, and make it difficult to take true aim. Accordingly, he slightly curves the thin end, so that the weight of the spear and lashings compensates and bends the tube perfectly straight. The mouth end of the pole is fixed somewhere in the dwelling, and is supported by a loop, weights being attached to the other end. The curvature is judged sufficient when, on looking through the tube, only two-thirds of the bore can be seen through. The blowpipe is then warmed, to make it "set." When this is done, a little, round piece of wood is lashed on to the upper side of the narrow end to act as a sight.

The darts used are made of splinters of palm-wood eight to ten inches long, sharpened at one end, the whole length being whittled down until the diameter is about that of a steel knitting-needle. The butt is a cone made of soft pith about half an inch long, being, at its base, exactly the size of the bore of the pipe. At the pointed end the shaft is partially cut through at intervals of about a quarter of an inch, in order that it may break easily and ensure the lethal portion remaining in the wound made. Where the game is large the shaft of the dart is split at the point and a sharp triangular metal point, cut from an oil tin, inserted and secured by a wooden peg.

As to the poison used, Dr. C. G. Seligmann, in a note published by the *Journal of the Anthropological Institute* (1902) says that it is obtained either from *Strychnos* or *Antiaris.* The Bornean tribes use the inspissated juice of the *Ipoh* or upas tree (*Antiaris toxicaria*); it is yellow-white in colour, becoming buff on exposure to air, and of a very bitter taste. It is a glucoside which acts on the heart-muscles and central nervous system. The juice is obtained by making incisions in the bark, and collecting the sap. It is dried slowly over a fire, until almost black, and viscous, like sealing wax, and when wanted for use is softened in warm water and kneaded. The darts are smeared with the poison while it is moist, and then dried by the fire. A little pith-cone is afterwards fixed on the dart. The poison usually retains its power for two months from the time it is taken from the tree. Neither the weapons nor the darts vary much in respect to local conditions.

See C. Hose and W. McDougall, *The Pagan Tribes of Borneo* (1912); *Handbook to the Ethnographical Collection of the British Museum* (2nd ed. 1925). (C. H.)

BLOWING ENGINES. Appliances for the production of a stream of air under pressure may be divided into three groups, namely compressors, blowing engines and blowers, the latter being again sub-divided into positive blowers and fans. The distinctions between these groups are drawn in several ways by different makers, but the simplest and perhaps the most generally used is based upon the pressures at which they are intended to work; air compressors deliver a stream of air at a pressure almost invariably above 40lb. per sq.in.; blowing engines work between 5lb. and 30lb. per sq.in., occasionally going up to 40lb.; and blowers below 5lb. per sq.in., though often considerably lower. It may be noted that appliances of the last group are used for exhausting as well as for forcing air, whereas those of the first two groups are used only for forcing. The boundaries between these two groups are by no means sharply drawn, and there is a certain amount of slackness in the terminology employed; thus some makers will call an appliance a turbo-compressor, which others would describe as a

turbo-blower. To some extent the objects for which the stream of air is required is also taken into account; thus an appliance producing a stream of air at a pressure of about 40lb. would probably be described as an air compressor if the air were employed to work a compressed air engine or a drill, but would be called a blowing engine if the air were utilized for a metallurgical operation. The term blowing engine is practically restricted to appli-

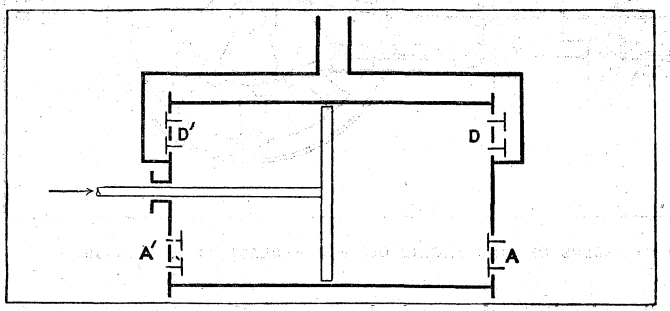


FIG. 1.—DIAGRAM OF SECTION OF BLOWING CYLINDER, SHOWING PISTON AND AIR ADMISSION AND DISCHARGE VALVE

ances used in the metallurgy of iron, large blowing engines at a relatively low pressure being used for supplying blast to blast-furnaces, whilst those giving a smaller air supply, but at a higher pressure, are employed for blowing Bessemer converters, which are, however, gradually becoming obsolete.

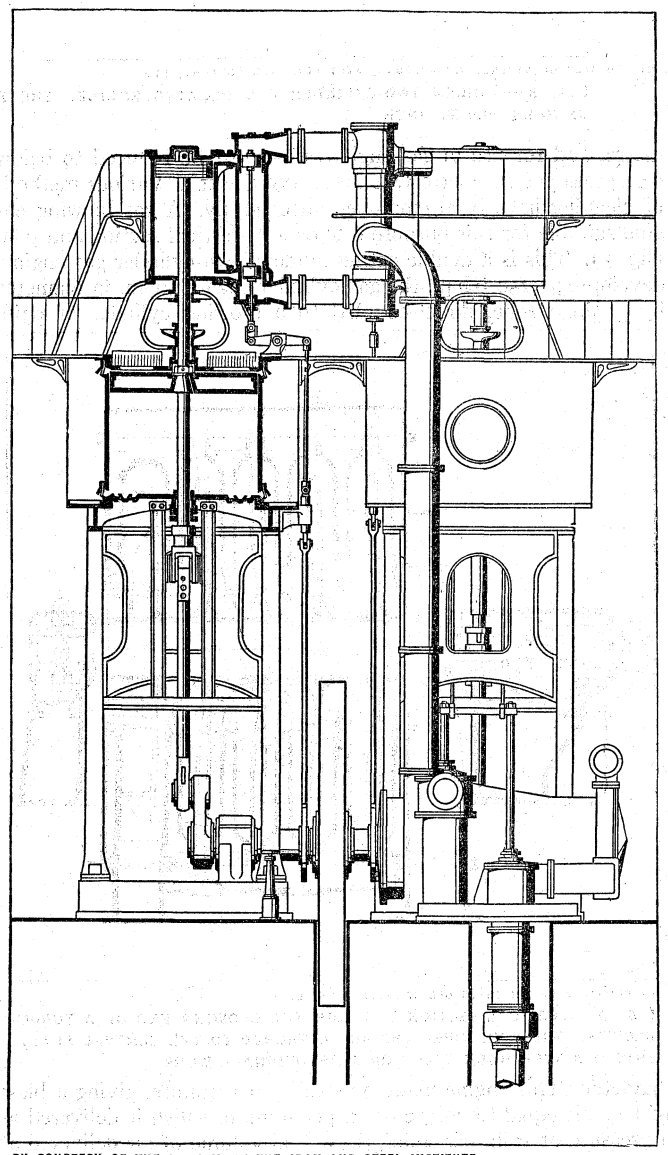
As regards their mode of operation, blowing engines may be divided into two main classes, reciprocating and rotary.

Reciprocating Blowing Engines.—The blowing end of a reciprocating blowing engine consists of a cylinder (or cylinders) fitted with admission and discharge valves, the piston being caused to move to and fro by being direct-coupled to a steam engine or gas engine. As a rule the pressures generated are so low that it is not worth while to make use of any special arrangement for getting rid of the heat evolved by the compression of the air.

The simplest type of construction of a blowing cylinder is shown diagrammatically in longitudinal section in fig. 1. A and A′ are the air admission valves and D and D′ the air discharge valves which open into a chamber or receiver connected with the air delivery pipe. When the piston is moving in the direction indicated by the arrow, A′ and D are open and A and D′ are closed, these relations being reversed when the piston is travelling in the opposite direction. Sometimes the air admission valves are open to the atmosphere, as indicated in fig. 1, but in many modern instances the air is drawn from a casing to which an air pipe is connected opening outside the engine house, so that cool air can be used. Sometimes the incoming air is artificially refrigerated, and also dried, by passing it through a "silica gel" tower. Moreover, a filter can be disposed at the mouth of the suction pipe, so that only dust-free air is aspirated. In the simple form of cylinder here illustrated, the valves are opened and closed by the pressure of the air itself, and hence do not open or close instantaneously the moment the direction of the piston is reversed, because it necessarily takes some little pressure, positive or negative, to overcome the inertia of the valve. This drawback is got over in modern blowing engines by the employment of mechanically actuated valves. There is also considerable difference in the construction of the valves themselves; the old form of simple flap valve is now hardly ever seen, annular or disk valves of thin sheet steel, poppet valves, slide valves and cylindrical rotating valves being all used by different makers.

Blowing cylinders may be arranged either horizontally, if space is not important; or vertically, in which case they are more difficult to repair. Large blowing engines, such as are used for blast-furnaces, are mostly of the vertical type in Great Britain and of the horizontal type in the United States. It is a matter of indifference whether in the vertical engine the blowing cylinder is above or below the steam cylinder, but the former is the more usual place. Blowing engines, whether vertical or horizontal, must be arranged with a heavy fly-wheel, for it must be remembered that the air pressure in the blowing cylinder reaches its maximum at the same time that the steam pressure in the steam end is falling rapidly. Modern blowing engines consist as a rule of a pair of blowing cylinders direct-coupled to a corresponding pair of steam cylinders, the latter being often low and high pressure respectively, and thus forming a cross-compound engine. A good example of this type is shown in fig. 2. (*See* also *Journal of the Iron and Steel Institute*, 1889, No. 1, fig. 2, plate 2.) The boiler pressure is 100lb. per sq.in., the two steam cylinders being 36in. and 64in. in diameter respectively. The blowing cylinders work up to a maximum pressure of 10lb. per sq.in.; they are 88in. in diameter and 60in. stroke, and running at 23 revs. per min. they are capable of blowing 19,000 cu.ft. of free air per minute.

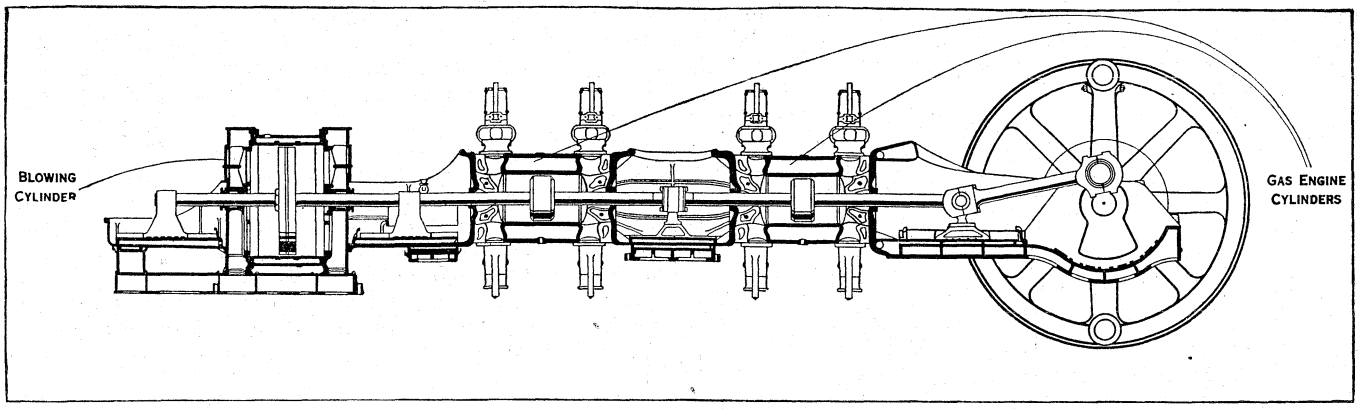
A number of reciprocating blowing engines are now quite often gas-driven instead of steam-driven, the waste gas of the blast-



BY COURTESY OF THE COUNCIL OF THE IRON AND STEEL INSTITUTE

FIG. 2.—ELEVATION (PART SECTIONAL) OF A CROSS-COMPOUND BLOWING ENGINE. THE BLOWING CYLINDERS, BELOW THE STEAM CYLINDERS, ARE DIRECT-COUPLED TO THE HIGH AND LOW PRESSURE STEAM CYLINDERS RESPECTIVELY

furnace being as a general rule employed for this purpose. Since such gas is of low calorific value (say about 100 B.T.U. per cu.ft.), these engines must be of large capacity. The first person to utilize blast-furnace gas in explosion engines was B. H. Thwaite about 1894; and the first gas-driven blowing engine (of 600 h.p.) was built at Seraing, Belgium, in 1899. One of the most serious difficulties connected with this use of the blast-furnace gas is the necessity of thoroughly cleaning the waste gas from the dust with which it is always charged; after leaving the ordinary furnace dust-catchers, the gas contains about 5 grams of dust per cu.



BY COURTESY OF MESSRS. RICHARDSONS, WESTGARTH AND COMPANY, LTD.

FIG. 3.—TANDEM TWO-CYLINDER GAS BLOWING ENGINE. THE TWO CYLINDERS OF THIS ENGINE DELIVER A BLAST AT A PRESSURE OF 10 LB. PER SQ. INCH

metre, and for use in gas engines this must be reduced to below 0·01 gram per cu. metre (*see* IRON AND STEEL). Various methods of cleaning have been employed successfully. A gas blowing engine suitable for this purpose is shown in vertical section and plan (fig. 3). This is a double acting tandem, two-cylinder gas engine, developing 1,250 b.h.p., the gas cylinders being 39½in. in diameter by 47½in. stroke, direct-coupled to a blowing cylinder of 93in.

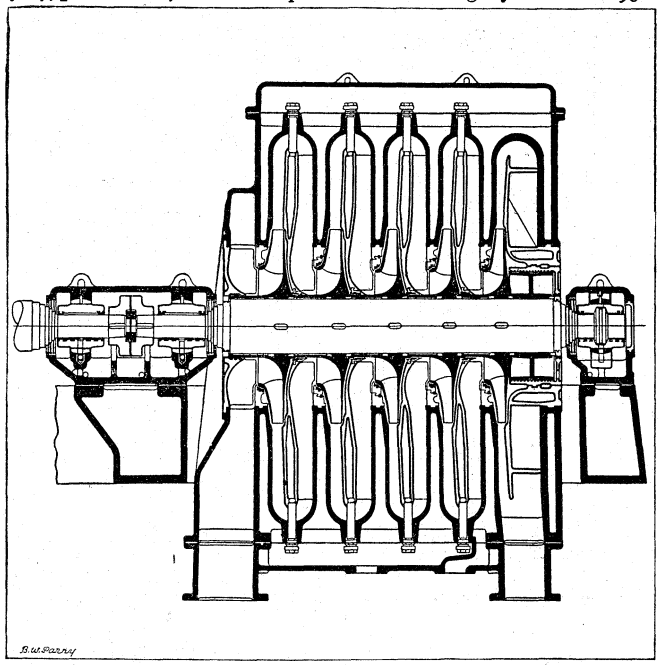


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FIG. 4.—VERTICAL SECTION THROUGH THE BLOWING END OF A TURBO-BLOWER. THE FIVE IMPELLERS ARE ATTACHED TO THE CENTRAL SHAFT. THIS IS A TYPE MUCH USED FOR BLAST-FURNACE WORK

diameter. This engine made 90 strokes per minute, giving a blast of free air equal to 29,400 cu.ft. per minute, which it delivered at a pressure of 10lb. per sq.in., the actual volume of air delivered at this pressure being 17,600 cu.ft. per minute. The consumption of blast-furnace gas per b.h.p. per hour in these engines was approximately 100 cu.ft. at full load, therefore about 10,000 B.T.U. per b.h.p. per hour.

Where coke-oven plants are combined with blast-furnaces, it is possible to mix a proportion of rich coke-oven gas (with about 450 B.T.U. per cu.ft.) with the blast-furnace gas, such a mixture giving excellent results.

Turbo-blowers.—A form of blowing engine that has obtained much popularity in recent years since its introduction in 1902 is the turbo-blowing-engine, or, as it is often called, the turbo-blower —which may be described as a reversed steam turbine. In the turbo-blower the discs are mechanically rotated and become impellers which force the air through the guides and thus gradually raise it to the required pressure; the greater the number of stages the greater is the pressure obtained. Turbo-blowing engines are at their best when delivering large quantities of air at relatively low pressures, and are, therefore, particularly well adapted for blast furnace work. In practice, since their speed of revolution has to be tolerably high, they are generally direct-coupled to steam turbines, though occasionally they are driven in the same way by electric motors. The general arrangements of a turbo-blowing engine may be seen from fig. 4, which is a vertical section through the blowing end of one of a pair of such engines; as will be seen, it is a five-stage blowing engine, the five impellers being shown attached to the central shaft, and it is intended to compress 50,000 cu.ft. of free air per minute up to a pressure of 15lb. per sq. inch. The usual American practice is to build such turbo-blowing engines with capacities ranging from 30,000 to 80,000 cu.ft. of free air per min. and for pressures ranging between 12 and 25 or exceptionally up to 30lb. per sq. inch. For the higher pressures the turbine casing is jacketed to receive a flow of cold water and thus absorb the heat generated by the compression of the air. These blowing engines run at between 2,750 and 4,000 revs. per min., and the horse-power developed by the steam turbine is from 3,000 to 9,000 b.h.p.

Fig. 6 shows a vertical section through steam turbine and turbo-blower complete, built for British blast-furnaces. As will be seen from the section, the turbo-blower is a single flow three-stage blower and is intended to compress 20,000 cu.ft. of free air per minute against a maximum pressure of 10lb. per sq. inch. Generally speaking, British blast-furnace practice demands both smaller quantities of air and lower pressures than are usual in the United States. As compared with gas-driven blowing engines, turbo-blowing-engines are somewhat less efficient, but they generally cost less in up-keep and are, generally speaking, more reliable, this latter quality being of the utmost importance for appliances that are required to work continuously for long periods, as is the case with blast-furnace blowing engines.

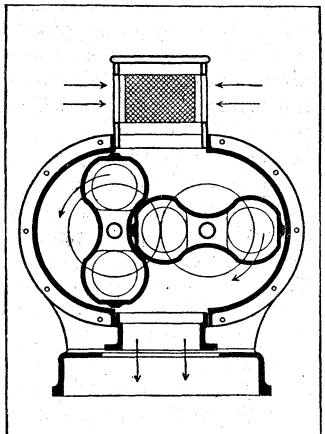

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FIG. 5.—VERTICAL SECTION THROUGH ROOTS BLOWER
The curved arrows indicate direction of rotation of impellers; the straight arrows indicate the course of air flow

Positive Blowers.—Finally, mention may be made of the positive blower, such as is generally used for foundry cupolas and for water-jacket furnaces for smelting copper and lead. The most widely employed blower for these purposes is shown in cross section (fig. 5). It will be seen that the blower consists of a couple of impellers, dumb-bell shaped in cross section, which are rotated

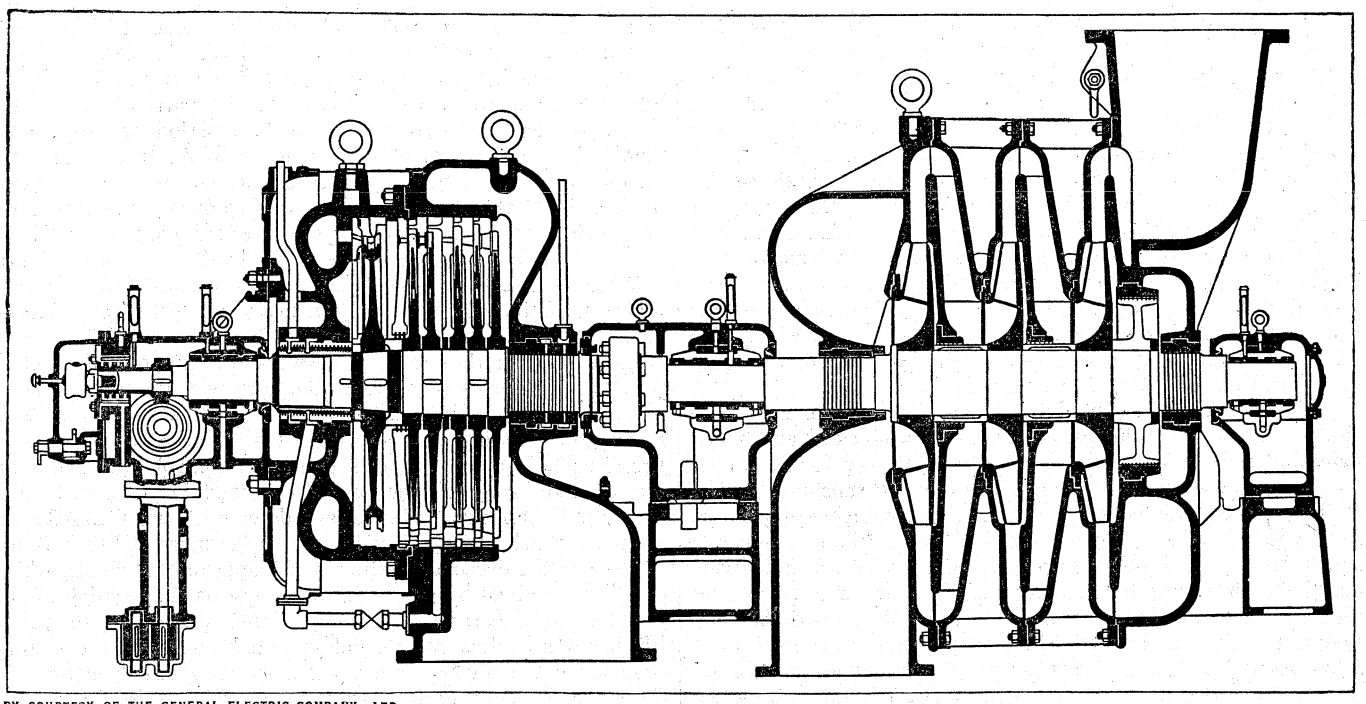

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FIG. 6.—VERTICAL SECTION THROUGH A 3-STAGE SINGLE-FLOW TURBO-BLOWER. HERE THE STEAM-TURBINE IS COUPLED TO THE BLOWER DIRECT

within a casing in such a way as to force a continuous stream of air through it. These blowers are in the majority of cases belt-driven, but may also be driven by gearing or at times direct-coupled to a dynamo. They are positive, inasmuch as the quantity of air delivered by their agency depends entirely upon the speed of rotation, and is not affected by the pressure against which they are called upon to work. What are known as low-pressure blowers are usually built for pressures up to 1½lb. or 2lb. per sq.in., whilst high-pressure blowers will work up to pressures of 5lb. per sq. inch. For ordinary cupola practice about 1lb. per sq.in. is required. (H. Lo.)

BLOWITZ, HENRI GEORGES STEPHAN ADOLPHE DE (1825–1903), Anglo-French journalist, was born, according to the account given in his memoirs, at his father's château in Bohemia on Dec. 28 1825. Young Blowitz became acquainted in Paris with M. de Falloux, minister of public instruction, who appointed him teacher of foreign languages at the Tours Lycée, whence, after some years, he was transferred to the Marseilles Lycée. In 1859 he resigned his post, but remained at Marseilles, devoting himself to literature and politics. In 1869 information which he supplied to a legitimist newspaper at Marseilles with regard to the candidature of M. de Lesseps as deputy for that city led to a demand for his expulsion from France. He was, however, allowed to remain, but had to retire to the country. In 1870 his predictions of the approaching fall of the empire caused the demand for his expulsion to be renewed. While his case was under discussion the battle of Sedan was fought, and Blowitz applied for naturalization as a French subject. Once naturalized, he went to Marseilles. Thiers employed him in collecting information at Versailles and then offered him the French consulship at Riga. But Laurence Oliphant, then Paris correspondent of *The Times,* for which Blowitz had already done some occasional work, asked him to act as his regular assistant for a time. In 1873 Blowitz became chief Paris correspondent to *The Times,* and became famous in journalism and diplomacy.

In 1875 the duc de Decazes, then French foreign minister, showed Blowitz a confidential despatch from the French ambassador in Berlin (in which the latter warned his government that Germany was contemplating an attack on France), and requested the correspondent to expose the German designs in *The Times.* Blowitz's most sensational journalistic feat was achieved in 1878, when his enterprise enabled *The Times* to publish the whole text of the treaty of Berlin at the actual moment that the treaty was being signed in Germany. In 1877 and again in 1888 Blowitz rendered considerable service to the French Government by his exposure of internal designs upon the Republic. He died on Jan. 18 1903.

My Memoirs, by H. S. de Blowitz, was published in 1903.

BLOWPIPE, in the arts and chemistry, a tube for directing a jet of air into a fire or into the flame of a lamp or gas jet, for the purpose of producing a high temperature by accelerating the combustion. The blowpipe has been in common use from the earliest times for soldering metals and working glass, but its introduction into chemical analysis is to be ascribed to A. F. Cronstedt, who employed it for testing minerals. The first work on this application of the blowpipe was by G. v. Engeström, and was published in 1770 as an appendix to a treatise on mineralogy. Its application was improved by T. O. Bergman, J. G. Gahn, and especially by J. J. Berzelius, C. F. Plattner, and R. W. Bunsen.

The simplest and oldest form of blowpipe is a conical brass tube, about 7in. in length, curved at the small end into a right angle, and terminating in a small round orifice, which is applied to the flame, while the larger end is applied to the mouth. Where the blast has to be kept up for only a few seconds this instrument is quite serviceable, but in longer chemical operations inconvenience arises from the condensation of moisture exhaled by the lungs in the tube. Hence most blowpipes are now made with a cavity for retaining the moisture. The mode of blowing is peculiar and requires some practice; an uninterrupted blast is kept up by the muscular action of the cheeks, while the ordinary respiration goes on through the nostrils.

If the flame of a candle or lamp be closely examined, it will be seen to consist of four parts—(*a*) a deep blue ring at the base; (*b*) a dark cone in the centre; (*c*) a luminous portion round this, and (*d*) an exterior pale blue envelope (*see* FLAME). In blowpipe work only two of these four parts are made use of, viz., the pale envelope, for oxidation, and the luminous portion, for reduction. To obtain a good *oxidizing flame,* the blowpipe is held with its nozzle inserted in the edge of the flame close over the level of the wick, and blown into gently and evenly. A conical jet is thus produced, consisting of an inner cone, with an outer one commencing near its apex—the former, corresponding to (*a*) in the free flame, blue and well defined; the latter corresponding to (*d*),

pale blue and vague. The heat is greatest just beyond the point of the inner cone, combustion being there most complete. Oxidation is better effected (if a very high temperature be not required) the farther the substance is from the apex of the inner cone, for the air has thus freer access. To obtain a good *reducing flame* (in which the combustible matter, very hot, but not yet burned, is disposed to take oxygen from any compound containing it), the nozzle, with smaller orifice, should just touch the flame at a point higher above the wick, and a somewhat weaker current of air should be blown. The flame then appears as a long, narrow, luminous cone, the end being enveloped by a dimly visible portion of flame corresponding to that which surrounds the free flame, while there is also a dark nucleus about the wick. The substance to be reduced is brought into the luminous portion, where the reducing power is strongest.

Various materials are used as supports for substances in the blowpipe flame; the principal are charcoal, plaster of Paris, platinum, and glass or porcelain. *Charcoal* is valuable for its infusibility and low conductivity for heat (allowing substances to be strongly heated upon it) and for its powerful reducing properties; so that it is chiefly employed in testing the fusibility of minerals and in reduction. Blocks of compressed charcoal are now made especially for use with the blowpipe. Gas-carbon is sometimes used, since it is more permanent in the flame than wood charcoal. *Platinum* is employed in oxidizing processes and in the fusion of substances with fluxes; also in observing the colouring effect of substances on the blowpipe flame (which effect is apt to be somewhat masked by charcoal). Most commonly it is used in the form of wire, with a small bend or loop at the end.

The mouth blowpipe is unsuitable for the production of a large flame and cannot be used for any lengthy operations; hence recourse must be made to types in which the air-blast is occasioned by mechanical means. The laboratory form in common use consists of a bellows worked by either hand or foot, and a special type of gas burner formed of two concentric tubes, one conveying the blast, the other the gas; the supply of air and gas being regulated by stopcocks. Blowpipes in which oxygen is used as the blast are commonly used in conducting fusions which require a temperature above that yielded by the air-blowpipe.

For the applications of the blowpipe in chemical analysis see CHEMISTRY: *Analytical.*

BLÜCHER, GEBHARD LEBERECHT VON (1742–1819), Prussian general field-marshal, prince of Wahlstadt in Silesia, was born at Rostock on Dec. 16, 1742. In his 14th year he entered the service of Sweden, and in the Pomeranian campaign of 1760 he was taken prisoner by the Prussians. He was persuaded by his captors to enter the Prussian service. He took part in the later battles of the Seven Years' War as a hussar officer. In peace his ardent spirit led him into excesses of all kinds, and being passed over for promotion, he sent in his resignation, to which Frederick the Great replied, "Captain Blücher can take himself to the devil" (1773). He now settled down to farming, and in 15 years he had acquired an honourable independence. After the death of Frederick the Great he was reinstated as major in his old regiment, the Red Hussars. He took part in the expedition to Holland in 1787, and in the following year became lieutenant-colonel. In 1789 he received the order *pour le mérite*, and in 1794 he became colonel of the Red Hussars. In 1793 and 1794 he distinguished himself in cavalry actions against the French, and for his success at Kirrweiler he was made a major-general. In 1801 he was promoted lieutenant-general.

He was one of the leaders of the war party in Prussia in 1805–06, and served as a cavalry general in the disastrous campaign of the latter year. At Auerstädt Blücher repeatedly charged at the head of the Prussian cavalry, but without success. In the retreat of the broken armies he commanded the rear-guard of Prince Hohenlohe's corps, and upon the capitulation of the main body of Prenzlau he carried off a remnant of the Prussian army to the northward, and in the neighbourhood of Lübeck he fought a series of combats, which, however, ended in his being forced to surrender at Ratkau (Nov. 7, 1806). His adversaries testified in his capitulation that it was caused by "want of provisions and ammunition." He was soon exchanged for General Victor, and was actively employed in Pomerania, at Berlin, and at Königsberg until the conclusion of the war. After the war, Blücher was looked upon as the natural leader of the patriot party, with which he was in close touch during the period of Napoleonic domination. His hopes of an alliance with Austria in the war of 1809 were disappointed. In that year he was made general of cavalry. In 1812 he expressed himself so openly on the alliance of Russia with France that he was recalled from his military governorship of Pomerania and virtually banished from the court.

When at last the Napoleonic domination was ended by the outbreak of the War of Liberation in 1813, Blücher was at once placed in high command, and he was present at Lützen and Bautzen. During the armistice he worked at the organization of the Prussian forces, and when the war was resumed Blücher became commander-in-chief of the Army of Silesia, with Gneisenau and Müffling as his principal staff officers, and 40,000 Prussians and 50,000 Russians under his control. (The autumn campaign of 1813 will be found described in the article NAPOLEONIC CAMPAIGNS.) He met and defeated Marshal Macdonald at the Katzbach, and by his victory over Marmont at Möckern led the way to the decisive overthrow of Napoleon at Leipzig, which place was stormed by Blücher's own army on the evening of the last day of the battle. On the day of Möckern (Oct. 16, 1813) Blücher was made a general field-marshal, and after the victory he pursued the routed French with his accustomed energy. In the winter of 1813–14 Blücher, with his chief staff officers, was mainly instrumental in inducing the allied sovereigns to carry the war into France itself. The combat of Brienne and the battle of La Rothière were the chief incidents of the first stage of the celebrated campaign of 1814, and they were quickly followed by the victories of Napoleon over Blücher at Champaubert, Vauxchamps and Montmirail. But the courage of the Prussian leader was undiminished, and his great victory of Laon (March 9–10) practically decided the fate of the campaign. After this Blücher infused some of his own energy into the operations of Prince Schwarzenberg's Army of Bohemia, and this army and the Army of Silesia marched in one body direct upon Paris. The victory of Montmartre, the entry of the allies into the French capital, and the overthrow of the First Empire were the direct consequences. Blücher was disposed to make a severe retaliation upon Paris for the calamities that Prussia had suffered from the armies of France, had not the allied commanders intervened to prevent it. Blowing up the bridge of Jena was said to be one of his contemplated acts. On June 3, 1814, he was made prince of Wahlstadt (in Silesia on the Katzbach battlefield).

After the peace he retired to Silesia, but the return of Napoleon soon called him to further service. He was put in command of the Army of the Lower Rhine with General Gneisenau as his chief of staff (*see* WATERLOO CAMPAIGN). In the campaign of 1815 the Prussians sustained a very severe defeat at the outset at Ligny (June 16), in the course of which the old field-marshal was ridden over by cavalry charges, his life being saved only by the devotion of his aide-de-camp, Count Nostitz. He was unable to resume command for some hours, and Gneisenau drew off the defeated army. The relations of the Prussian and the English headquarters were at this time very complicated, and it is uncertain whether Blücher himself was responsible for the daring resolution to march to Wellington's assistance. This was in fact done, and after an incredibly severe march Blücher's army intervened with decisive and crushing effect in the battle of Waterloo. The great victory was converted into a success absolutely decisive of the war by the relentless pursuit of the Prussians, and the allies re-entered Paris on July 7. Prince Blücher remained in the French capital for some months, but his age and infirmities compelled him to retire to his Silesian residence at Krieblowitz, where he died on Sept. 12, 1819, aged 77. He retained to the end of his life that wildness of character and proneness to excesses which had caused his dismissal from the army in his youth. The qualities which made him a great general were his patriotism and the hatred of French domination which inspired every success of the War of Liberation. He was twice married, and had, by his first marriage, two sons and a daughter. Statues were erected to his memory at Berlin, Breslau and Rostock.

Of the various lives of Prince Blücher that by Varnhagen von Ense (1827) is the most important. His *Campagne Journal der Jahre 1793*

und 1794 appeared in 1796, and his *Gedanken über Formierung einer preussischen Nationalarmee* in 1805.

See J. Scherr, *Blücher, seine Zeit und sein Leben* (Leipzig, 1862–63); K. W. von Schöning, *Geschichte des Königlich-preußischen 5, Hussaren-Regiments mit besonderer Rücksicht auf Blücher* (1843); F. Schulze, *Briefe und Reden* (2nd ed. 1917); J. Herold, *Gebhard Leberecht Blücher* (vol. i, 1921).

BLUE, the name of a colour. From the fact of various parties having adopted the colour blue as their badge, various classes of people have come to be known as "blue" or "blues"; thus "true blue" meant originally a staunch Presbyterian, the Covenanters having adopted blue as their colour as opposed to red, the royal colour. From the blue ribbon worn by the knights of the garter comes the use of the phrase as the highest mark of distinction that can be worn, especially applied on the turf to the winning of the most famous English flat-race, known as the derby. The "Blue Peter" is a rectangular blue flag, with a white square in the centre, hoisted at the top of the foremast as a signal that a vessel is about to leave port. At Oxford and Cambridge a man who represents his university in certain athletic sports is called a "blue" from the "colours" he is then entitled to wear, dark blue for Oxford and light blue for Cambridge.

BLUEBEARD, the monster of Charles Perrault's tale of *Barbe Bleue,* who murdered his wives and hid their bodies in a locked room. Perrault's tale was first printed in his *Histoires et contes du temps passé* (1697). The essentials of the story—Bluebeard's prohibition to his wife to open a certain door during his absence, her disobedience, her discovery of a gruesome secret and her timely rescue from death—are to be found in other folklore stories, none of which, however, has attained the fame of *Bluebeard.* Though Perrault does not state the number of his crimes, Bluebeard is generally credited with the murder of seven wives. His history belongs to the common stock of folklore, and has even been ingeniously fitted with a mythical interpretation. In France the Bluebeard legend has its local habitation in Brittany, but whether the existing traditions connecting him with Gilles de Rais (*q.v.*) or Comorre the Cursed, a Breton chief of the 6th century, were anterior to Perrault's time, we have no means of determining. The identification of Bluebeard with Gilles de Rais, the *bête d'extermination* of Michelet's forcible language, persists locally in the neighbourhood of the various castles of the baron, especially at Machecoul and Tiffauges, the chief scenes of his infamous crimes. Gilles de Rais, however, had only one wife, who survived him, and his victims were in the majority of cases young boys. The less widespread identification of Bluebeard with Comorre is supported by a series of frescoes dating only a few years later than the publication of Perrault's story, in a chapel at St. Nicolas de Bieuzy dedicated to St. Tryphine, in which the tale of Bluebeard is depicted as the story of the saint, who in history was the wife of Comorre. Comorre or Conomor had his original headquarters at Carhaix, in Finistère. Alain Bouchard (*Grandes croniques,* Nantes, 1531) asserts that Comorre had already put several wives to death before he married Tryphine. In the *Légendes bretonnes* of the count d'Amezeuil the church legend becomes a charming fairy tale.

See also E. A. Vizetelly, *Bluebeard* (1902); E. Sidney Hartland, "The Forbidden Chamber," in *Folklore,* vol. iii (1885); and the editions of the *Contes* of Charles Perrault (*q.v.*). *Cf.* A. France, *Les Sept Femmes de Barbe Bleue* (1909).

BLUEBELL, the name in England of the wood hyacinth (*Scilla nonscripta*), the common squill, and in Scotland and the United States and Canada of the harebell (*Campanula rotundifolia*), in both cases on account of the shape of the flowers. In the eastern United States the Greek valerian (*Polemonium reptans*) is also called bluebell; on the Pacific coast various species of *Phacelia* plants of the water-leaf family (Hydrophyllaceae) are known as the California bluebell. (*See* CAMPANULA; GRAPE-HYACINTH; HAREBELL; HYACINTH; VIRGINIA COWSLIP.)

BLUEBERRY (*Vaccinium*), the name given in North America to certain shrubs of the heath family, Ericaceae, prized for their sweet, edible fruits. The British species of the genus are called bilberries (*q.v.*) and bear their fruit singly, in contrast to the many-fruited clusters of American blueberries. The most important North American forms are (1) the highbush or swamp blueberry of the north (*V. australe*), 4 ft. to 12 ft. high, native to bogs and swamps from Maine and Quebec to Michigan and southward, the fruit blue with a thick bloom; (2) the rabbiteye highbush blueberry of the south (*V. ashei*), 2 ft. to 16 ft. high, found in swamps and pine barrens in southern Georgia and Alabama and northern Florida, the fruit black with little bloom, occasionally blue; (3) the lowbush blueberry (*V. angustifolium*), 1 ft. to 2 ft. high, supplying the bulk of the blueberries of the market, abundant on pine barrens, heaths and mountain lands from Newfoundland to Saskatchewan and south in the mountains to Virginia and Illinois, fruit black usually with a bloom; (4) the Canadian blueberry (*V. canadense*), similar in size and range to *V. angustifolium,* but with more acid, smaller and later fruits; (5) the dryland lowbush blueberry (*V. pallidum*), 1 ft. to 3 ft. high, of sandy or rocky places from Maine to Wisconsin and south to Georgia and Kansas, the fruit blue with a heavy bloom (part and possibly most of the berries gathered are from tetraploid forms known as *V. tallapusae*); (6) the evergreen blueberry (*V. ovatum*), 6 ft. to 20 ft. high, near the coast from central California to British Columbia, the fruit black or slightly blue, of value also for its foliage, called "evergreen huckleberry"; and (7) the mountain blueberry or bilberry (*V. membranaceum*), 3 ft. to 6 ft. high, in the Sierra and Cascade mountains, especially from northern Oregon to British Columbia, the fruit deep maroon to black, borne singly in the leaf axils, a very drought-resistant species. All of the above species, and to a lesser extent other species, are gathered in large quantities in the wild with a usual total annual value of $8,000,000 to $10,000,000.

Blueberries grow only in very acid soils (pH 4 to 4.8). Some species succeed on upland and are drought-resistant and others on marsh or bog land, but there must be no standing water on their roots in summer. In northwestern Florida and adjacent states, 3,000 to 4,000 acres of native plants of the rabbiteye blueberry are grown on upland soils. Three to four thousand acres of the highbush blueberry (*V. australe*) are cultivated in New Jersey, southwestern Michigan and eastern North Carolina and to a slight extent elsewhere. Several varieties from selected native plants and from breeding work have been named; the largest bear berries about $\frac{7}{8}$ in. in diameter.

Highly flavoured varieties of the highbush are Stanley, Wareham and Pioneer. Weymouth is the earliest variety; Burlington the latest variety; Dixi, Atlantic and Pemberton are the largest varieties; and Pemberton is the most vigorous. Rubel is the most grown. Plantings are usually set 5 ft. by 8 ft. in the fall or early spring. Blueberries are seriously damaged by the "stunt" virus disease, canker, leaf spots and a rust disease. A bud mite, stem borers and fruit worms are serious insects. Superior varieties of the rabbiteye are Myers, Clara, Walker, Hagood, Owens and Black Giant. They are hardy from eastern North Carolina to southern Arkansas. Plantings are usually set 15 ft. by 15 ft. during the winter. The fruit begins to ripen about a month later than the New Jersey type and ripens over a period of 4 to 6 weeks, while some varieties take even longer. (G. M. D.)

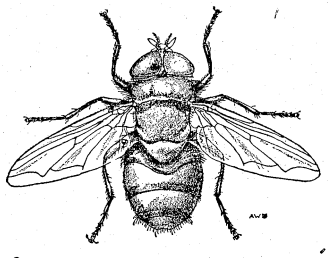
BLUEBIRD (*Sialia sialis*), an American thrush, blue in plumage, with a red breast. A harbinger of spring, this is one of the most familiar and best-loved birds in the eastern and central United States. Five pale blue eggs are laid in holes in trees or posts, but the bluebird is all too often driven out of these situations by the imported house sparrow (*Passer domesticus*). Local races occur in the southern parts of Florida, Texas and Arizona. Other species are the mountain bluebird (*S. currucoides*), of the Rocky mountains and more western states, an exquisite azure; the western bluebird (*S. mexicana occidentalis*), more purplish blue with chestnut on sides of back; and the chestnut-backed bluebird (*S. m. bairdi*) of the Rockies from Colorado to northern Mexico.

BLUE BONNET (*Lupinus texensis*), a North American plant of the pea or pulse family (Leguminosae), native to the plains of Texas. It grows about a foot high, has silky-haired leaves composed of five leaflets and bears handsome clusters of purplish-blue flowers, marked in the centre with white or yellow. As early as March the plant in bloom covers immense areas in southern and western Texas with a blue carpet. The blue bonnet is one of the most popular wild flowers of the southwest, and has been adopted as the state flower of Texas. In Scotland the name is given to the bluebottle (*Centaurea Cyanus*) and also to the blue scabious or devil's-bit (*Succisa pratensis*). *See* LUPIN (LUPINE).

BLUE-BOOK, the general name given to the reports and other documents printed by order of the British parliament, so called from their being usually covered with blue paper, though some are bound in drab and others have white covers. The printing of its proceedings was adopted by the house of commons in 1681; in 1836 began the official practice of selling parliamentary papers to the public. All notices of questions, resolutions, votes and proceedings in both houses of parliament are issued each day during the session; other publications include the various papers issued by the different government departments, the reports of committees and commissions of inquiry, public bills, as well as returns, correspondence, etc., specially printed by either house. Most countries have a distinctive colour for the binding of their official publications. That of the United States varies, but foreign diplomatic correspondence is bound in red. German official publi-

cations are bound in white; French, in yellow; Austrian, in red; Portuguese, in white; Italian, in green; Spanish, in red; Mexican, in green; Japanese, in grey; Chinese, in yellow.

BLUEBOTTLE, any of several large calypterate flies (*see* DIPTERA), belonging to *Calliphora* and allied genera that frequently enter houses. They are noisy in flight and have the habit of laying their eggs on meat. The name is derived from the Gaelic, *boiteag* (maggot), and the colour of the fly. The species of *Lucilia,* having similar habits, are called green-bottles. Their larvae sometimes infest open wounds and, while they prevent infection, they will also eat healthy tissue. *L. sericata* and *L. cuprina* commonly infest sheep. The closely related flesh flies (*Sarcophaga*) have black and gray stripes on the thorax and a checkered abdomen. They mostly deposit living maggots on dead animals but also may infest wounds. Several species of *Chrysomya,* either green or blue, attack wounds and cause serious damage to sheep in Australia and South Africa. The most dangerous species in America is *Cochliomyia americana* in the southern United States and tropical regions. Several species of *Calliphora* are the most serious offenders in Australia. Sheep are frequently killed as a result of attack. *Chrysomya megacephala* is widely distributed in the Pacific, oriental and Australian regions, occurring in enormous numbers, breeding in decaying vegetation, manure, human excrement and carcasses. It is a most important vector of dysentery and probably of jaundice and anthrax. Treating latrines with sodium arsenite, garbage disposal, use of screens and baited flytraps are employed in control.



CHRYSOMYA MEGACEPHALA, A DANGEROUS CARRIER OF DYSENTERY IN THE PACIFIC AREA

Species of *Protocalliphora,* small bluebottle or green bottles, attack nestling birds, particularly the American robin and bluebird; the larvae live in the nests and suck blood, often being so numerous as to kill the nestlings. The cluster fly, *Pollenia rudis,* of Europe and North America, is a parasite of earthworms; the adults often enter houses to hibernate within the walls or in attics and on warm days may cause a loud buzzing sound; they return outdoors in spring. (For the plant bluebottle *see* CORNFLOWER.)

See W. B. Herms, *Medical Entomology* (1939); E. O. Essig, *College Entomology* (1943). (C. H. CN.)

BLUEFIELD, a city of Mercer county, West Virginia, U.S.A., in the Appalachian mountains on the southern boundary of the state at an elevation of 2,600 ft. It is served by the Norfolk and Western railway, and by regular motorbus service as far as Huntington, Asheville and Knoxville. Pop. (1940) 20,641.

Bluefield is the outlet for the Pocahontas coal field, which in 1940 produced an all-time high of 30,111,257 tons and its growth is due primarily to the development of this field. The nearest mine, however, is 12 mi. from the city. In 1883, when the first shipments of this famous "smokeless" coal were made, the site of the city was covered with the bluegrass fields which gave it its name. In a decade over $2,000,000 was spent on public school buildings alone. There is a state normal school for Negroes and a junior college. Concord State teachers college for white students is at Athens. Bluefield was incorporated in 1889 and adopted a city manager form of government in 1921.

BLUEFIELDS, the principal Caribbean port of Nicaragua, Central America. Pop. (1940) 9,844. It is near the mouth of the Bluefields river, and is visited by steamers from New Orleans and coasting schooners, while a river steamer plies the Bluefields river and considerable trade is carried on with the interior, where bananas, lumber, cattle and gold are produced. The actual port is El Bluff, across the bay, where the customs are in charge of an American employee of the Nicaraguan government. Bluefields has been the scene of several revolutionary outbreaks, some of which have been regarded as sufficiently serious to merit intervention on the part of the U.S. marines. The United States has not stationed any marines in Nicaragua after 1933.

BLUEGRASS (*Poa compressa* and *P. pratensis*), a name originally applied to *Poa compressa* because the plants have a somewhat bluish cast, but now generally applied to the latter, which, however, is strictly green, with no bluish tinge. In the United States the term Kentucky blue grass is commonly applied to *Poa pratensis.* It is also called June grass, spear grass and meadow grass. The seeds are brown in colour. Common to meadows all over temperate parts of the United States, Europe and Asia, it has reached greatest perfection in the limestone regions of Kentucky and Tennessee. Because of the plentiful and high-quality blue grass crops in this state, Kentucky is known as the "Blue Grass state." Blue grass is usually grown from seed by the farmer for pasture land, but it is generally present in permanent grasslands which are moderately well drained and in a fair condition of fertility, and is indispensable for any mixed pasture in the eastern United States. It also yields hay of fine quality, but not of great quantity. It is widely spreading in habit and under favourable conditions forms a dense sod. Blue grass grows in clump-like formations with a considerable growth of lower leaves; the stem is comparatively short and slender.

BLUE ISLAND, a city of Cook county (Illinois), U.S.A., 16 mi. S. of the Chicago loop, on a ridge six miles long by two to three wide, which rises abruptly out of the prairie to a height of 40–50 ft. It is on the Dixie highway and the Calumet-Sag canal; and is served by the Rock Island, the Illinois Central, and five other railways. Pop. (1940) 16,638. Blue Island is headquarters for the Chicago Terminal division of Rock Island lines. Extensive yards, roundhouses, and repair shops of the Rock Island and several other railway lines are also in or near there. Other industries include brickyards, canning plant, steel and wire product factories and a dental supply factory. Retail sales in Blue Island in 1939 were $6,887,000.

BLUE-JOINT or **BLUE-STEM,** a name given in North America to various tall coarse grasses with smooth stems overcast with a whitish bloom, especially to certain species of *Agropyron, Andropogon* and *Calamagrostis.*

BLUE PRINT, a photoprint on a paper sensitized with ferroprussiate, according to a method first invented by Herschel in 1840. Used in the early days for the printing of photographic negatives, blue prints have come more recently to be used chiefly for making negative copies of drawings and documents. The cheapness of the materials, the permanence of the prints and the ease and simplicity of the method—only a water bath is necessary for fixing and toning them—have united to make blue printing almost the standard way of reproducing all sorts of drawings for architectural and engineering use, especially in the United States. In making blue prints, the drawing is executed on transparent paper or specially treated linen (tracing paper or tracing cloth). The drawing is placed in a frame or machine in contact with the sensitized paper and between it and an adequate source of light, and after a suitable exposure, the print is removed and washed in clean water. The result is a clear negative print with the dark lines of the drawing appearing as light lines on a dark blue ground. Formerly most of the blue prints were produced individually in printing frames by exposure to the sun or daylight, but at the present time almost all are made in machines using electric light. These machines are based generally upon a rotating glass drum within which the lights are placed, and around which the drawings and the sensitized paper are fed, held tightly in place by rollers. The blue print paper is in a continuous band; after it has rolled around the light drum it is carried by machinery through the water bath and around heated rollers which dry it. The speed of the rotation of the light drum naturally controls the amount of exposure and the depth of the print; it is therefore made adjustable to suit the differences in the quality of the drawings. Documents, typewritten on thin paper, may be blue printed as successfully as drawings, and many architectural specifications are thus copied for the contractor's use.

BLUES, a term applied to a particular type of "jazz" or "ragtime" music which has enjoyed much popular favour in the 20th century. Blues, in their original vocal form, are distinguished chiefly by their peculiar structure—three lines of verse—although

they take their name from their most common motif, that of depression. Originating among the illiterate southern Negroes, they were first brought before the notice of the general public in 1909. In that year a mayoral contest was taking place in Memphis in which three candidates were competing, assisted by as many coloured bands. W. C. Handy, the son and grandson of Methodist ministers, was in charge of one of these. His candidate was E. H. Crump, and one of the airs which he devised for his orchestra was named after his employer. So popular did it become that Crump was elected mayor, Handy became locally famous, the term "Blues" appeared out of nowhere, and "Mr. Crump," rechristened "Memphis Blues," started the avalanche of this form of music that has since swept over the country. Because of their undistinguished origin and associations the "Blues" were frowned upon at first but they made their way notwithstanding and, with the appearance of Carpenter's "Krazy Kat" in 1922 and of Gershwin's "Rhapsody in Blue" in 1924, James Weldon Johnson's prediction, made in 1921, that they would ultimately have an effect on serious modern music, may be said to have been realized. While melancholy is the predominating characteristic of the "Blues," the personality of the singer is at least equally stressed. He sings of his troubles and resentments, of his strong desires and pleasures, but all in a vein of cheerful philosophy and of uncomplaining acceptance of the blows of fate, which gives to these ditties a character and fascination all their own.

BLUE SHIRTS: *see* UNIFORMS.

BLUE SKY LAWS. This term is popularly applied in the United States to statutes enacted in almost all the states to protect credulous purchasers of stocks and bonds from fraud. Formerly, in the absence of definite laws to prevent the practice, promoters of fraudulent schemes and projects made with impunity the most extravagant representations, the sky being the only limit to their claims. Kansas, in 1911, was the first state to enact a Blue Sky law. Among other requirements it compelled investment companies to file with the secretary of state a full description of their business and prohibited their selling securities until authorized by the bank commissioner. Within two years 18 other states had adopted similar legislation. Confronted by laws which seriously threatened their enormous revenue and menaced themselves with imprisonment, promoters of "wild-cat" and other spurious schemes sought in 1914 to have Blue Sky legislation declared unconstitutional. Courts in Michigan, Ohio and Iowa upheld these contentions, but in 1917 the United States supreme court decided that Blue Sky laws were constitutional on the ground that "the prevention of deception is within the competency of government." By 1928 all of the states except Nevada and Delaware had Blue Sky laws or their equivalents in force.

BLUESTOCKING, a derisive name for a literary woman. About 1750 Mrs. Elizabeth Montagu (*q.v.*) made a determined effort to introduce into society a more intellectual tone by holding assemblies at which literary conversation and discussions were to take the place of cards and gossip. Most of those attending were conspicuous by the plainness of their dress, and Benjamin Stillingfleet specially caused comment by always wearing blue or worsted stockings. It was in special reference to him that Mrs. Montagu's friends were called the Bluestocking Society. The origin of the name is also attributed to Mrs. Montagu's deliberate adoption of blue stockings as the badge of the society she wished to form. She is said to have obtained the idea from Paris, where in the 17th century there was a social reunion on the lines of that formed in 1400 at Venice, the ladies and men of which wore blue stockings.

BLUETHROAT, a bird, *Luscinia s. suecica,* allied to the nightingale, but with a blue throat, a dark brown and chestnut tail and a beautiful song. In habits it is shy and skulking. It haunts thickets of birch and willow, especially when swampy, and nests on the ground. Five to seven grey-green eggs, speckled with red-brown, are laid in late June. The bird breeds in northern Europe and Asia, to the Arctic circle, migrating to Africa and India in winter. In the white-spotted bluethroat (*L. s. cyanecula*), the patch on the blue throat is white instead of rufous. It breeds in central Europe.

BLUETS (*Houstonia caerulea*), a popular North American wild flower of the madder family (Rubiaceae), known also as innocence, eyebright and quaker-ladies. It is native to grassy places and wet rocks from Nova Scotia to Wisconsin and south to Georgia and Missouri. This early spring favourite, which grows perennially in matted tufts, with smooth stems 3 in. to 7 in. high, is aptly described by Asa Gray as "a delicate little herb producing in spring a profusion of light blue flowers fading to white, with a yellowish eye." In the southern United States there are about 20 other species of *Houstonia,* some of which are known as bluets, as the thyme-leaved bluets (*H. serpyllifolia*), the least bluets (*H. minima*), the small bluets (*H. patens*) and the purple bluets or Venus'-pride (*H. purpurea*) which grows 18 in. high. In Great Britain the corn bluebottle (*Centaurea Cyanus*) is sometimes called bluet.

BLUE WATER HIGHWAY, a thoroughfare extending from Sarnia to Orillia, in the province of Ontario, Canada. It is about 270 mi. long and for the most part improved with paving. Skirting Lake Huron and Georgian bay for most of the way, it provides an unusual water-side route that passes through Goderich, Southampton, Owen Sound, Collingwood and Midland.

BLUE-WEED: *see* VIPER'S BUGLOSS.

BLUFF, an adjective used of a ship, meaning broad and nearly vertical in the bows (possibly connected with an obsolete Dutch word, *blaf,* broad). Similarly, of a cliff or shore, presenting a bold and nearly perpendicular front; of a person, good-natured and frank, with a rough or abrupt manner. Another word "bluff," perhaps connected with Ger. *verblüffen,* to baffle, meant originally a horse's blinker, the verb meaning to blindfold. It survives in such games as poker, where "to bluff" means to bet heavily on a hand so as to make an opponent believe it to be stronger than it is; hence the phrase "a policy of bluff."

BLUING, indigo, aniline dyes or prussian blue used in water to bring out the whiteness of clothes after washing. A useful liquid bluing may be made by dissolving $1\frac{1}{2}$ parts of indigo-carmine in 15 parts of water to which $\frac{3}{4}$ of a part gum arabic has been added.

BLUM, LEON (1872–), French politician, was born on April 9, 1872, in Paris, a member of an Alsatian Jewish family. A brilliant student, he took his doctor's degree in philosophy, studied law, and won renown as a sparkling literary and dramatic critic. He took part in the Dreyfus campaign with Jaurès, whom he loved and admired, and joined the Socialist party in 1899.

Blum was elected to the chamber of deputies in 1919 and became the undisputed leader of the Socialist party by 1925. A great force in French politics, he refused participation in non-Socialist governments, but accepted leadership of the Popular Front. On June 4, 1936, he became the first Socialist premier of France. During his tenure he introduced the 40-hour week, nationalized the war industries, strengthened the country's defenses and instituted many social reform measures.

Blum strove desperately to keep pace with German rearmament, but the reich had a greater industrial potential, and French industrialists refused to co-operate with his government. In 1937 he resigned after the conservative senate refused to give him decree powers to solve the country's financial difficulties. He was deputy prime minister in the Chautemps cabinet, 1937–38, but declined office in the Daladier government that followed. In Oct. 1940, Blum was indicted by the Pétain regime on war guilt charges and was brought to trial on Feb. 19, 1942, at the Riom court. Towering over his accusers, he flayed the Vichy-appointed court, called the trial a mockery instigated by the puppet regime and blamed Pétain and French fascism for the defeat of France. The power of his arguments discomfited the Vichyites; on April 14, the hearings were suspended indefinitely and Blum was returned to prison. He was later transferred to a prison in Germany. He was freed by U.S. troops in May 1945 from a German concentration camp in the Italian Alps.

BLUM, ROBERT FREDERICK (1857–1903), American artist, was born in Cincinnati (O.), on July 9, 1857. He was employed for a time in a lithographic shop, and studied at the McMicken Art School of Design in Cincinnati, and at the Pennsyl-

vania Academy of Fine Arts in Philadelphia, but he was practically self-taught, and early showed great and original talent. He settled in New York in 1879, and his first published sketches—of Japanese jugglers—appeared in *St. Nicholas*. His most important work is a large frieze in the Mendelssohn music hall, New York, "Music and the Dance" (1895). His pen-and-ink work for the *Century* magazine attracted wide attention, as did his illustrations for Sir Edwin Arnold's *Japonica*. He had been interested for years in Japan and its art. "A Daughter of Japan," drawn by Blum and W. J. Baer, was the cover of *Scribner's Magazine* for May 1893, and was one of the earliest pieces of colour-printing for an American magazine. In *Scribner's* for 1893 appeared also his "Artist's Letters from Japan." He was an admirer of Fortuny, whose methods somewhat influenced his work. Blum's Venetian pictures, such as "A Bright Day at Venice" (1882), have charm and beauty. He died June 8, 1903, in New York city. He was a member of the National Academy of Design, being elected after his exhibition in 1892 of "The Ameya," and was president of the Painters in Pastel. Although a draughtsman and etcher, it was as a colourist that he chiefly excelled.

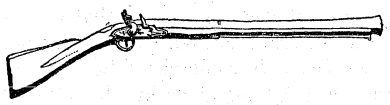
BLUMENBACH, JOHANN FRIEDRICH (1752–1840), German physiologist and anthropologist, was born at Gotha on May 11, 1752. After studying medicine at Jena, he graduated doctor at Göttingen in 1775, and was appointed extraordinary professor of medicine in 1776 and ordinary professor in 1778. He died at Göttingen on Jan. 22, 1840. He was the author of *Institutiones Physiologicae* (1787), and of a *Handbuch der vergleichenden Anatomie* (1804), but he is best known for his work in connection with anthropology, of which science he has justly been called the founder. He was the first to show the value of comparative anatomy in the study of man's history, and his craniometrical researches justified his division of the human race into several great varieties or families, of which he enumerated five—the Caucasian or white, the Mongolian or yellow, the Malayan or brown, the Negro or black, and the American or red. His most important anthropological work was his description of 60 human crania published originally in *fasciculi* under the title *Collectionis suae craniorum diversarum gentium illustratae decades* (Göttingen, 1790–1828).

BLUMENTHAL, LEONHARD, COUNT VON (1810–1900), Prussian field-marshal, was born at Schwedt-on-Oder on July 30, 1810, and died at Quellendorf on Dec. 22, 1900. He entered the Guards as 2nd lieutenant in 1827 and took part in 1848 in the suppression of the Berlin riots. In 1849 he served on the staff of General von Bonin in the Schleswig-Holstein campaign, and so distinguished himself, particularly at Fredericia, that he was appointed chief of the staff of the Schleswig-Holstein army. He was appointed personal adjutant to Prince Frederick Charles in 1858. He was chief of the staff of the 3d army corps in 1864 when on the outbreak of the Danish War of 1864 he was made chief of the general staff of the army against Denmark, and distinguished himself particularly at Düppel and the passage to Alsen island. In the war of 1866 Blumenthal was chief of the general staff to the crown prince of Prussia, commanding the 2nd army. From 1866 to 1870 he commanded the 14th division at Düsseldorf. In the Franco-German War of 1870–71 he was chief of staff of the 3rd army under the crown prince. In 1873 he became a general of infantry, and ten years later he was made a count. In 1888 he was made a general field-marshal, after which he was in command of the 4th and 3rd army inspections.

BIBLIOGRAPHY.—Blumenthal's diary of 1866 and 1870–71 has been edited by his son, Count Albrecht von Blumenthal, *Tagebuch des G. F. M. von Blumenthal* (1902); an English translation, *Journals of Count von Blumenthal,* was published in 1903.

BLUMENTHAL, a town in the Prussian province of Hanover, on the Weser, 12 mi. N.W. of Bremen. Pop. (1939) 14,705. It is a shipbuilding district, with machine-making and woolcombing industries.

BLUNDERBUSS (a corruption of the Dutch donder, thunder, and the Dutch bus; *cf.* Ger. Büchse, a box or tube, hence a thunder-box or gun); perverted in form after *blunder* (perhaps with some allusion to its blind or random firing), an obsolete muzzle-loading firearm with a bell-shaped muzzle. Its calibre was large so that it could contain many balls or slugs, and it was intended to be fired at a short range so that some of the charge was sure to take effect. It was used effectively in the defense of narrow passages. Sometimes made of brass and causing a very loud report. The word is also used by analogy to describe a blundering and random person or talker.



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART
THE BLUNDERBUSS, A FIREARM USED BY ENGLISH AND DUTCH SOLDIERS IN THE 17TH CENTURY

BLUNT, WILFRID SCAWEN (1840–1922), English poet and publicist, was born Aug. 17 1840 at Petworth House, Sussex, and died at Crabbet Park Sept. 10 1922. He was the son of Francis Scawen Blunt, who served in the Peninsular War and was wounded at Corunna. He was educated at Stonyhurst and Oscott, and entered the diplomatic service in 1858, serving successively at Athens, Madrid, Paris and Lisbon, and in South America. He retired from the service on his marriage with Lady Anne Noel, daughter of the earl of Lovelace and a granddaughter of the poet Byron. In 1872 he succeeded, by the death of his elder brother, to the estate of Crabbet Park, Sussex, where he established a famous stud for the breeding of Arab horses. With Lady Anne Blunt he travelled repeatedly in northern Africa, Asia Minor and Arabia, two of their expeditions being described in Lady Anne's *Bedouins of the Euphrates* (2 vols. 1879) and *A Pilgrimage to Nejd* (2 vols. 1881). Mr. Blunt became known as an ardent sympathizer with Mohammedan aspirations, and in his *Future of Islam* (1888) he directed attention to the forces which afterwards produced the movements of Pan-Islamism and Mahdism. He was a violent opponent of British policy in the Sudan, and in *The Wind and the Whirlwind* (in verse, 1883) prophesied its downfall. He supported the national party in Egypt, and took a prominent part in the defence of Arabi Pasha. *Ideas about India* (1885) was the result of two visits to that country, the second in 1883–84. In 1885 and 1886 he stood unsuccessfully for parliament as a Home Ruler; and in 1887 he was arrested in Ireland while presiding over a political meeting in connection with the agitation on Lord Clanricarde's estate, and was imprisoned for two months in Kilmainham. His best-known volume of verse, *Love Sonnets of Proteus* (1880), is a revelation of his real merits as an emotional poet. *The Poetry of Wilfrid Blunt* (1888), selected and edited by W. E. Henley and Mr. George Wyndham, includes these sonnets together with "Worth Forest, a Pastoral," "Griselda" (described as a "society novel in rhymed verse"), translations from the Arabic, and poems which had appeared in other volumes. He published a complete edition of his poetical works in 1914 and two volumes of *My Diaries* (1919 and 1920).

BLUNTSCHLI, JOHANN KASPAR (1808–1881), Swiss jurist and politician, was born at Zürich, the son of a soap manufacturer. Educated at the *Politische Institut* of his native town and at Berlin and Bonn, he threw himself into Swiss politics, pleading in his *Das Volk und der Souverän* (1830) for constitutionalism and protesting against radical policy. Elected in 1837 a member of the great council, of which he became president, his uncompromising conservatism made his position untenable. After the overthrow of the Sonderbund in 1847 he settled at Munich, where he became professor of constitutional law in 1848.

There he devoted himself to the work of his chair, and published *Allgemeines Staatsrecht* (1851–52); *Lehre vom modernen Staat* (1875–76); and with Karl Brater (1819–69), *Deutsches Staatswörterbuch* (11 vols., 1857–70; abridged by Edgar Loening into 3 vols., 1869–75). Meanwhile he had laboured at his code for the canton of Zürich, *Privatrechtliches Gesetzbuch für den Kanton Zürich* (4 vols., 1854–56). The section, devoted to contracts in this work, served as a model for codes in Switzerland and other countries. In 1861 Bluntschli went to Heidelberg as professor of constitutional law, where he again entered the political arena, endeavouring in his *Geschichte des allgemeinen Staatsrechts und der Politik* (1864) "to stimulate," as he said, "the political conscious-

ness of the German people, to cleanse it of prejudices and to further it intellectually." In his new home, Baden, he strove, during the Austro-Prussian War of 1866, to keep the country neutral. From this time Bluntschli became active in the field of international law and wrote *Das moderne Kriegsrecht* (1866); *Das moderne Völkerrecht* (1868) and *Das Beuterecht im Krieg* (1878).

Bluntschli was one of the founders, at Ghent in 1873, of the Institute of International Law, and was the representative of the German emperor at the conference on the international laws of war at Brussels. He died suddenly at Karlsruhe on Oct. 21, 1881. His library was acquired by Johns Hopkins university at Baltimore, U.S.A.

BIBLIOGRAPHY.—Among Bluntschli's works, other than those before mentioned, may be cited *Deutsches Privatrecht* (1853–54); *Deutsche Staatslehre für Gebildete* (1874); and *Deutsche Staatslehre und die heutige Staatenwelt* (1880). For notices of his life and works *see* his interesting autobiography, *Denkwürdiges aus meinem Leben* (1884); F. von Holtzendorff, *Bluntschli und seine Verdienste um die Staatswissenschaften* (1882); and a biography by Meyer von Kronau in *Allgemeine deutsche Biographie.*

BLYTH, municipal borough and seaport of Northumberland, England, at the mouth of the river Blyth, on a branch of the L.N.E. Ry. Pop. (1938 est.) 34,470. This ranks as the fourth coal shipping port of the United Kingdom; and its harbour, on the south side of the river, is provided with mechanical appliances for loading and discharging. There are five dry docks and about 9,500 ft. of quayage. Timber is largely imported. Some shipbuilding and the manufacture of rope, sails and ship fittings are carried on, and the fisheries are valuable. Blyth was made a municipal borough in 1922. Area 10.1 sq.mi. It is in the parliamentary division of Morpeth.

BLYTHEVILLE, a town in north-eastern Arkansas, U.S.A., eight m. from the Mississippi river, at an elevation of 252ft., and 70m. north of Memphis; the county seat of Mississippi county. It is on the Mississippi River Scenic highway (U.S. highway No. 61) and is served by the Frisco and Cotton Belt railroads. The population increased from 302 in 1900 to 6,447 in 1920, and was 10,652 in 1940 federal census, of whom about 2,500 were Negroes. Blytheville is an important cotton market, handling 250,000 bales a year. Mississippi county alone ginned 265,688 bales in 1937 and ranks as the world's largest cotton producing county. Soybeans, livestock, poultry, hay and corn are other big crops.

B'NAI B'RITH, founded at New York in 1843, is the oldest and largest Jewish membership organization engaged in defending Jewish rights, promoting youth welfare, furthering adult education, supporting philanthropic institutions and sponsoring a program of patriotism. In 1939 it had 85,000 members in 520 lodges in the United States and Canada, besides 40,000 women and girls in 300 auxiliaries. It founded and still supports numerous hospitals, orphanages, and homes for the aged, and has expended some $10,000,000 to aid distressed Jews in every part of the world as well as to assist victims of natural disasters regardless of creed. Now engaged primarily in cultural and defence work, it sponsors the Hillel Foundations at twelve American universities, with extension work at thirty others, as religious and educational centres for Jewish students; the Aleph Zadik Aleph, junior B'nai B'rith, for non-college youth; the Vocational Guidance Bureau to further the occupational redistribution of Jews; the Anti-Defamation League to combat anti-Jewish libels and to disseminate the truth about Jews; and a broad program of Americanism. Every American President since Theodore Roosevelt has paid public tribute to its work. Organized abroad since 1882, it had lodges in forty countries, but in the 1930s the lodges in Germany, Austria, Danzig, Czechoslovakia, Brazil, Rumania, Poland, Turkey and Algeria were liquidated or otherwise forced into inactivity by anti-Semitic regimes or other governmental action. In 1939 there were lodges or district grand lodges in twenty foreign countries. It is governed by a president, elected triennially by the convention of the supreme lodge (made up of representatives of the district grand lodges), and an executive committee.

BOA, a name formerly applied to all large serpents that, devoid of poison fangs, kill their prey by constriction; but now confined to serpents of the boa family (Boidae), which have no teeth in the premaxillary bones and are without supraorbital bones. The others are known as pythons (*q.v.*), which represent the distinct family Pythonidae. The true boas comprise about 40 species in America, the Mediterranean region, Melanesia and Madagascar. All boas have vestiges of pelvis and hind limbs, appearing externally as clawlike spurs on each side of the vent but they are so small that they are practically without function. The short tail may be prehensile. One of the commonest species of the family is the "boa constrictor," which has a wide range from tropical Mexico to Brazil. The head is covered with small scales. The general colour is a pale brown, with about 18 darker crossbars, which are often connected by a still darker dorso-lateral streak, enclosing large oval spots. On each side is a series of large dark brown spots with light centres. On the tail the markings become bolder, brick red with black and yellow. The under parts are yellowish with black dots. This species rarely reaches a length of more than 10 feet. It climbs well, prefers open forest near water, is often found in plantations, where it retires into a hole in the ground, and lives chiefly on birds and small mammals.

BOABDIL (a corruption of the name Abu Abdalláh, the last Moorish king of Granada, called *el chico,* the little, and also *el zogoybi,* the unfortunate). A son of Muley Abu'l Hasan, king of Granada, he was proclaimed king in 1482 in place of his father, who was driven from the land. Boabdil invaded Castile, was taken prisoner at Lucena in 1483, and only obtained his freedom by consenting to hold Granada as a tributary kingdom under Ferdinand and Isabella, king and queen of Castile and Aragon. The next few years were consumed in struggles with his father and his uncle Abdullah ez Zagal. In 1491 Boabdil was summoned by Ferdinand and Isabella to surrender the city of Granada, and on his refusal it was besieged by the Castilians. In Jan. 1492, Granada was surrendered, and the king spent some time on the lands which he was allowed to hold in Andalusia. He crossed to Africa, and was said to have been killed in battle fighting for his kinsman, the ruler of Fez. Other authorities claim that he lived at Fez until 1538 in great poverty. The spot from which Boabdil looked for the last time on Granada is still shewn and is known as "the last sigh of the Moor" (*el ultimo suspiro del Moro*). He is said to have been reproached for weeping over the prospect of the Alhambra by his mother, 'Ayeshah (whose quarrels had helped to bring about the disastrous family divisions in the Moorish royal family), in the words "Thou dost well to weep like a woman for that which thou hast not defended like a man."

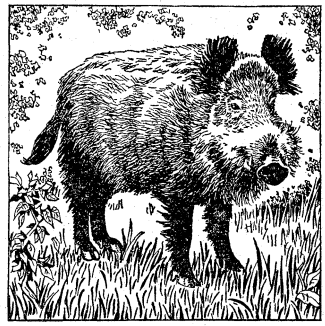
See J. A. Conde, *Dominácion de los Arabes en España* (1840), translated into English by Mrs. J. Foster (1854–55); Washington Irving, *The Alhambra* (New York, ed. 1880).

BOADICEA, strictly BOUDICCA, a British queen in the time of the emperor Nero. Her husband Prasutagus ruled the Icěnī (in what is now Norfolk) as an autonomous prince under Roman suzerainty. On his death (A.D. 61) without male heir, his dominions were annexed, and the annexation was carried out brutally. He had by his will divided his private wealth between his two daughters and Nero, trusting thereby to win imperial favour for his family. Instead, his wife was scourged (doubtless for resisting the annexation), his daughters outraged, his chief tribesmen plundered. The proud, fierce queen and her people rose, and not alone. With them rose half Britain, enraged, for other causes, at Roman rule. Roman taxation and conscription lay heavy on the province; in addition, the Roman government had just revoked financial concessions made a few years earlier, and L. Annaeus Seneca, who combined the parts of a moralist and a money-lender, had abruptly recalled large loans made from his private wealth to British chiefs. A favourable chance for revolt was provided by the absence of the governor-general, Suetonius Paulinus, and most of his troops in north Wales and Anglesey. All south-east Britain joined the movement. Paulinus rushed back without waiting for his troops, but he could do nothing alone. The Britons burnt the Roman municipalities of Verulam and Colchester, the mart of London, and several military posts, massacred "over 70,000" Romans and Britons friendly to Rome, and almost annihilated the Ninth Legion marching from Lincoln to the rescue.

At last Paulinus, who seems to have rejoined his army, met the Britons in the field. The site of the battle is unknown. One writer has put it at Chester; others at London, where King's Cross had once a narrow escape from being christened Boadicea's Cross, and actually for many years bore the name of Battle Bridge, in supposed reference to this battle. Probably, however, it was on Watling Street, between London and Chester. In a desperate soldiers' battle Rome regained the province. Boadicea took poison; thousands of Britons fell in the fight or were hunted down in the ensuing guerrilla. Finally, Rome adopted a kindlier policy, and Britain became quiet. But the scantiness of Romano-British remains in Norfolk may be due to the severity with which the Icēnī were crushed.

See Tacitus, *Annals,* xiv.; *Agric.* xv.; Dio lxii. The name Boudicca seems to mean in Celtic much the same as Victoria. (F. J. H.)

BOAR, the name given to the male of the domestic pig (*q.v.*) and to the males of some wild species of the family Suidae (*see* SWINE). The European wild boar (*Sus scrofa*) is distributed over Europe, northern Africa and central and northern Asia. Long extinct in the British Isles, it is still found in marshy woodland districts, where there is plenty of cover, in Spain, Austria, Russia and Germany. From the earliest times, owing to its great strength, speed and ferocity when at bay, the boar has been one of the favourite beasts of the chase.



THE EUROPEAN WILD BOAR, WHICH ATTAINS A LENGTH OF 4 FT. AND A HEIGHT OF ABOUT 2 FEET

In Europe the wild boar is still hunted with dogs, but the spear, except when used in emergencies and for giving the *coup de grâce,* has been replaced by the gun. The wild boar of India (*S. cristatus*) is slightly taller than *S. scrofa,* standing about 30 to 40in. at the shoulder. It is found throughout India, Ceylon and Burma. Here the horse and spear are used for hunting it (*see* PIG-STICKING).

The boar is one of the four heraldic beasts of venery, and was the cognizance of Richard III., king of England. As an article of food the boar's head was long considered a special delicacy.

BOARD, a plank or long narrow piece of timber. The phrase "to keep one's name on the boards," at Cambridge university, signifies to remain a member of a college. Board was early used of a table, hence such phrases as "bed and board," "board and lodging"; or of a gaming-table, as in the phrase "to sweep the board," meaning to pocket all the stakes. The same meaning leads to "board of trade," etc.

From the meaning of border or side, and especially ship's side, comes "seaboard" meaning sea-coast, and the phrases "aboard" (Fr. *abord*), "overboard," "by the board"; similarly "weather-board," the side of a ship which is to windward, "larboard and starboard."

BOARDING-HOUSE, a private house in which the proprietor provides board and lodging for paying guests. The position of a guest in a boarding-house differs in English law, to some extent, on the one hand from that of a lodger in the ordinary sense of the term, and on the other from that of a guest in an inn. Unlike the lodger, he frequently has not the exclusive occupation of particular rooms. Unlike the guest in an inn, his landlord has no lien upon his property for rent or any other debt due in respect of his board (*Thompson* v. *Lacy,* 1820, 3 B. and Ald. 283). The landlord is, however, under an obligation to take reasonable care for the safety of property brought by a guest into his house, and is liable for damages in case of breach of this obligation (*Scarborough* v. *Cosgrove,* 1905, 2 K.B. 803; *see* BAILMENT). Again, unlike the innkeeper, a boarding-house keeper does not hold himself out as ready to receive all travellers for whom he has accommodation, for which they are ready to pay, and of course he is entitled to get rid of any guest on giving reasonable notice (see *Lamond* v. *Richard,* 1897, 1 Q.B. 541, 548). What is reasonable notice depends on the terms of the contract; and, subject thereto, the course of payment of rent is a material circumstance (*see* LANDLORD AND TENANT). Apparently the same implied warranty of fitness for habitation at the commencement of the tenancy which exists in the case of furnished lodgings (*see* LODGER AND LODGINGS) exists also in the case of boarding-houses; and the guest in a boarding-house, like a lodger, is entitled to all the usual and necessary conveniences of a dwelling-house. Although a boarding-house keeper is carrying on a "business," water supplied to him by a waterworks company but used only in the house for cleaning, cooking, drinking and sanitary purposes, may be water supplied for "domestic purposes" and not for those of "any trade, manufacture or business" (*Pidgeon* v. *Great Yarmouth Waterworks Co.* (1902), 1 K.B. 310).

The law of the United States is similar to English law.

Under the French *Code Civile,* claims for subsistence furnished to a debtor and his family during the last year of his life by boarding-house keepers (*maîtres de pension*) are privileged over the generality of movables, the privilege being exercisable after legal expenses, funeral expenses, the expenses of the last illness, and the wages of servants for the year elapsed and what is due for the current year (art. 2,101 [5]). Keepers of taverns (*aubergistes*) and hotels (*hôteliers*) are responsible for the goods of their guests—the committal of which to their custody is regarded as a deposit of necessity (*dépôt nécessaire*). They are liable for the loss of such goods by theft, whether by servants or strangers, but not where the loss is due to *force majeure* (arts. 1,952–54). Their liability for money, securities, jewellery and objects of value of any kind not actually deposited is limited to 1,000 francs (law of April 18, 1911). These provisions, which have been held in France, however, not to extend to *maîtres de pension* (Carpentier, *Code Civil,* art. 1,952, No. 27), are reproduced in substance, and with an extension to boarding-house keepers, in the Civil Codes of Quebec (arts. 1,814, 1,815, 1,994, 2,006) and of St. Lucia (art. 1,889). In Quebec, boarding-house keepers have a lien on the goods of their guests for the value or price of any food or accommodation furnished to them, and have also a right to sell their baggage and other property, if the amount remains unpaid for three months, under conditions similar to those imposed on innkeepers in England (art. 1,816 A; and *see* INNS AND INNKEEPERS); also in the Civil Code of St. Lucia (arts. 1,714, 1,715).

BOARDING-OUT SYSTEM. In the English Poor Law the boarding-out with foster-parents of orphan or deserted children was first authorized in 1868, though it had previously been in unofficial operation by some boards of guardians. It is now regulated by the Public Assistance Committees, who may, and frequently do, depute their duties to the Education Committee subject to their own general discretion and control; and beside those mentioned above the system is now applicable to children whose parent is (*a*) deemed to be unfit to have control of the child, (*b*) under sentence of penal servitude or detained as an inebriate, (*c*) imprisoned in respect of an offence against his or her child, or (*d*) permanently bedridden, disabled, or a workhouse inmate. Authorities may board-out either within or outside their own areas, and every boarded-out child must be visited at the home of the foster-parents by a woman member of the committee or by a specially appointed woman officer at least once in every six weeks. Payment is made on varying but liberal lines. Though this is the cheapest and probably the most efficient and natural system, it has been hampered by the difficulty of finding suitable homes.

BOARD MAN, in the United States a member of an exchange who appears on the exchange floor and buys and sells. He generally transacts business for his own firm but may, by arrangement, buy and sell for any other member firm.

BOARD OF GUARDIANS: *see* POOR LAW.

BOARD OF TRADE, in Great Britain a department of Government (*see* GOVERNMENT DEPARTMENTS), in the United States a term practically synonymous with chamber of commerce, the first of which was established in New York in 1768. In the United States it is a voluntary organization, consisting of the business and professional men of a community whose purpose it is to promote the civic, industrial and general welfare. Since 1900 there has been a notable increase in these organizations

in number and effectiveness throughout the United States. Among their various activities are the stimulation of public interest in better streets, playgrounds, schools, museums, and parks, besides such matters as industrial development, insurance, banking and transportation.

BOARD OF TRADE UNIT, the unit of energy adopted by the British Board of Trade. It is equal, in electrical units, to one kilowatt-hour. (*See* PHYSICAL UNITS.)

BOARD ROOM, the room where directors or other officers of a corporation or company meet. Also, in the United States, the room in a broker's office equipped for the convenience of customers, and especially for the purpose of supplying them with current market quotations. Tickers bring in the quotations and often customers read directly from the tapes of many machines. It is customary to have a large board on a wall of the room so ruled as to provide a space for each security or commodity quoted, and upon this board are displayed the quotations, as fast as they arrive, in large figures that can be seen from various parts of the room. A similar board in the New York Stock Exchange is generally known as the "Big Board," and that in the Curb exchange as the "Little Board." The "Board Room" is often called the "Customers' Room."

BOAS, FRANZ (1858–1942), U. S. anthropologist, was born July 9, 1858 in Minden, Westphalia. He studied at Heidelberg, Bonn, and Kiel (1877–81). During 1883–84 he made a scientific journey through the Baffin Land region. The following year he acted as assistant in the royal ethnological museum in Berlin. From 1886–88 he served as associate editor of *Science* and from 1888–92 as instructor in anthropology at Clark university. In 1899 he was appointed professor of anthropology at Columbia university, and from 1901–05 he was curator of ethnology in the American museum of natural history. From 1907–08 he was president of the American anthropological society, and in 1910 held the same office with the New York academy of sciences.

The Jesup North Pacific expedition, which he planned, and himself took part in while connected with the American museum, resulted in disclosure of interesting relations between the north Asiatic and north-west American cultures. Reports of this expedition were prepared under his editorship. He died Dec. 21, 1942.

He wrote: *The Growth of Children* (1896, 1904); *Changes in Form of Body of Descendants of Immigrants* (1911); *The Mind of Primitive Man* (1911, 1938); *Kultur und Rasse* (1913); *Baffin Land* (1885); *Tsimshian Texts* (1902); *An Anthropologist's View of War* (1912); *Primitive Art* (1927); *Anthropology and Modern Life* (1928–38); *General Anthropology* (with others) (1938); *Race, Language and Culture* (1940); *Dakota Grammar* (with Ella Deloria) (1941).

BOAT, a comparatively small open craft for conveyance on water, usually propelled by some form of oar or sail.

The origin of the word "boat" is probably to be looked for in the A.S. *bât*=a stem, a stick, a piece of wood. If this be so, the term in its inception referred to the *material* of which the primitive vessel was constructed, and in this respect may well be contrasted with the word "ship," of which the primary idea was the *process* by which the material was fashioned and adapted for the use of man.

We may assume that primitive man, in his earliest efforts to achieve the feat of conveying himself and his belongings by water, succeeded in doing so—(1) by fastening together a quantity of material of sufficient buoyancy to float and carry him above the level of the water; (2) by scooping out a fallen tree so as to obtain buoyancy enough for the same purpose. In these two processes is to be found the genesis of both boat and ship, of which, though often used as convertible terms, the former is generally restricted to the smaller type of vessel such as is dealt with in this article. For the larger type the reader is referred to SHIP.

Great must have been the triumph of the man who first discovered that the rushes or the trunks he had managed to tie together would, propelled by a stick or a branch (cf. *ramus* and *remus*) used as pole or paddle, convey him safely across the river or lake, which had hitherto been his barrier. But use multiplies wants, discovers deficiencies, suggests improvements. Man soon found out that he wanted to go faster than the raft would move, that the water washed over and up through it, and this need of speed, and of dry carrying power, which we find operative throughout the history of the boat down to the present day, drove him to devise other modes of flotation as well as to try to improve his first invention.

The invention of the hollowed trunk, of the "dug-out" (*μονόξυλον*), however it came about, whenever and wherever it came into comparison with the raft, must have superseded the latter for some purposes, though not by any means for all. It was superior to the raft in speed, and was, to a certain extent, water-tight. On the other hand it was inferior in carrying power and stability. But the two types once conceived had come to stay, and to them severally, or to attempts to combine the useful properties of both, may be traced all the varieties of vessel to which the name of boat may be applied.

The development of the raft is admirably illustrated in the description, given us by Homer in the *Odyssey,* of the construction by the hero Ulysses of a vessel of this kind. Floating timber is cut down and carefully shaped and planed with axe and adze, and the timbers are then exactly fitted face to face and compacted with trenails and dowels, just as the flat floor of a lump or lighter might be fashioned and fitted nowadays. A platform is raised upon the floor and a bulwark of osiers contrived to keep out the wash of the waves (cf. *infra,* Malay boats). It seems as if the poet, who was intimately acquainted with the sea ways of his time, intended to convey the idea of progress in construction, as illustrated by the technical skill of his hero, and the use of the various tools with which he supplies him.

The dug-out had its limitations. The largest tree that could be scooped out afforded but a narrow space for carrying goods, and presented problems as to stability which must have been very difficult to solve. The shaping of bow and stern, the bulging out of the sides, the flattening of the bottom, the invention of a keel piece, the attempt to raise the sides by building up with planks, all led on towards the idea of constructing a boat properly so called, or perhaps to the invention of the canoe, which in some ways may be regarded as the intermediate stage between dug-out and boat.

Meanwhile the raft had undergone improvements such as those which Homer indicates. It had arrived at a floor composed of timbers squared and shaped. It had risen to a platform, the prototype of a deck. It was but a step to build up the sides and turn up the ends, and at this point we reach the genesis of ark and punt, of sampan and junk, or, in other words, of all the many varieties of flat-bottomed craft.

When once we have reached the point at which the improvements in the construction of the raft and dug-out bring them, as it were, within sight of each other, we can enter upon the history of the development of boats properly so called, which, in accordance with the uses and the circumstances that dictated their build, may be said to be descended from the raft or the dug-out, or from the attempt to combine the respective advantages of the two original types. Uses and circumstances are infinite in variety and have produced an infinite variety of boats. But we may safely say that in all cases the need to be satisfied, the nature of the material available and the character of the difficulties to be overcome have governed the reason and tested the reasonableness of the architecture of the craft in use. It is not proposed in this article to enter at any length into the details of the construction of boats, but it is desirable, for the sake of clearness, to indicate certain broad distinctions in the method of building, which, though they run back into the far past, in some form or other survive and are in use at the present day.

The tying of trunks together to form a raft is still not unknown in the lumber trade of the Danube or of North America, nor was it in early days confined to the raft. It extended to many boats properly so called, even to many of those built by the Vikings of old. It may still be seen in the Madras surf boats, and in those constructed out of driftwood by the inhabitants of Easter Island in the south Pacific. Virgil, who was an archaeologist, represents Charon's boat on the Styx as of this construction and notes the defect, which still survives, in the craft of the kind when loaded—

"Gemuit sub pondere cymba
Sutilis, et multam accepit rimosa paludem!"
Aen. vi. 303.

Next to the raft, and to be counted in direct descent from it, comes the whole class of flat-bottomed boats including punts and lighters. As soon as the method of constructing a solid floor, with trenails and dowels, had been discovered, the method of converting it into a water-tight box was pursued, sides were attached plank fashion, with strong knees to stiffen them, and cross pieces to *yoke* or *key* (*cf.* ζύγον, κληίς) them together. These thwarts once fixed naturally suggested seats for those who plied the paddle or the oar. The ends of the vessel were shaped into bow or stern, either turned up, or with the side planking convergent in stem or stern post, or joined together fore and aft by bulkheads fitted in, while interstices were made water-tight by caulking, and by smearing with bitumen or some resinous material which would be impervious to water.

The evolution of the boat as distinct from the punt, or flat-bottomed type, and following the configuration of the dug-out in its length and rounded bottom, must have taxed the inventive art and skill of constructors much more severely than that of the raft. It is possible that the coracle or the canoe may have suggested the construction of a framework of sufficient stiffness to carry a water-tight wooden skin, such as would successfully resist the pressure of wind and water. And in this regard two methods were open to the builder, both of which have survived to the present day: (1) the construction first of the shell of the boat, into which the stiffening ribs and cross ties were subsequently fitted; (2) the construction first of a framework of requisite size and shape, on to which the outer skin of the boat was subsequently attached.

Further, besides the primitive mode of tying the parts together, two main types of build must be noticed, in accordance with which a boat is said to be either carvel-built or clinker-built. (1) A boat is carvel-built when the planks are laid edge to edge so that they present a smooth surface without. (2) A boat is clinker-built when each plank is laid on so as to overlap the one below it, thus presenting a series of ledges running longitudinally. The former method is said to be of Mediterranean, or perhaps of Eastern origin. The latter was probably invented by the old Scandinavian builders, and from them handed down through the fishing boats of the northern nations to our own time.

Ancient Boats.—The accounts of vessels used by the Egyptians and Phoenicians generally refer to larger craft which naturally fall under the head of SHIP (*q.v.*). The Nile boats, however, described by Herodotus (ii. 60), built of acacia wood, were no doubt of various sizes, some of them quite small, but all following the same type of construction, built up brick fashion, the blocks being fastened internally to long poles secured by cross pieces, and the interstices caulked with papyrus. The ends rose high above the water, and to prevent hogging were often attached by a truss running longitudinally over crutches from stem to stern. The Assyrian and Babylonian vessels described by Herodotus (i. 194), built up of twigs and boughs, and covered with skins smeared with bitumen, were really more like huge coracles and hardly deserve the name of boats.

The use of boats by the Greeks and Romans is attested by the frequent reference to them in Greek and Latin literature, though, as regards such small craft, the details given are hardly enough to form the basis of an accurate classification. We hear of small boats attendant on a fleet (κελήτιον, Thuc. i. 53), and of similar craft employed in piracy (Thuc. iv. 9), and in one case of a sculling boat, or pair oar (ἀκάτιον ἀμφηρικόν, Thuc. iv. 67), which was carted up and down between the town of Megara and the sea, being used for the purpose of marauding at night. We are also familiar with the passage in the Acts (xxvii.) where in the storm they had hard work "to come by the boat"; which same boat the sailors afterwards "let down into the sea, under colour as though they would have cast anchors out of the foreship," and would have escaped to land in her themselves, leaving the passengers to drown, if the centurion and soldiers acting upon St. Paul's advice had not cut off the ropes of the boat and let her fall off.

There can be little doubt that boat races were in vogue among the Greeks (*see* Prof. Gardner, *Journal of Hellenic Studies,* ii. 91 ff.), and probably formed part of the Panathenaic and Isthmian festivals. It is, however, difficult to prove that small boats took part in these races, though it is not unlikely that they may have done so. The testimony of the coins, such as it is, points to galleys, and the descriptive term (νεῶν ἄμιλλα) leads to the same conclusion. It is hardly possible now to define the differences which separated ἄκατος, ἀκάτιον, from κέλης, κελήτιον, or from λέμβος, or κάραβος. They seem all to have been rowing boats, probably carvel-built, some with keels (*acatii modo carinata,* Plin. ix. 19), and to have varied in size, some being simply sculling boats, and others running up to as many as thirty oars.

Similarly in Latin authors we have frequent mention of boats accompanying ships of war. Of this there is a well-known instance in the account of Caesar's invasion of Britain (*B.G.* iv. 26), when the boats of the fleet, and the pinnaces, were filled with soldiers and sent to assist the legionaries who were being fiercely attacked as they waded on to the shore. There is also an instance in the civil war which is a prototype of a modern attack of torpedo boats upon men of war, *i.e.,* when Antonius manned the pinnaces of his ships to the number of sixty, and with them attacked and defeated an imprudent squadron of Quadriremes (*B.C.* iii. 24). The class of boats so frequently mentioned as *actuariae* seems to have contained craft of all sizes, and to have been used for all purposes, whether as pleasure boats or as despatch vessels, or for piracy. In fact the term was employed vaguely just as we speak of craft in general.

The *lembus,* which is often referred to in Livy and Polybius, seems to have been of Illyrian origin, with fine lines and sharp bows. The class contained boats of various sizes and with a variable number of oars (biremis, Livy xxiv. 40, sexdecim, Livy xxxiv. 35); and it is interesting to note the origin in this case, as the invention of the light Liburnian galleys, which won the battle of Actium, and altered the whole system of naval construction, came from the same seaboard. Besides these, the piratical *myoparones* (*see* Cic. *In Verrem*); and the poetical *phaselus,* deserve mention, but here again we are met with the difficulty of distinguishing boats from ships. There is also an interesting notice in Tacitus (*Hist.* iii. 47) of boats hastily constructed by the natives of the northern coast of Asia Minor, which he describes as of broad beam with narrow sides (probably meaning that the sides "tumbled home"), joined together without any fastenings of brass or iron. In a sea-way the sides were raised with planks added till they were cased in as with a roof, whence their name *camarae,* and so they rolled about in the waves, having prow and stern alike and convertible rowlocks, so that it was a matter of indifference and equally safe, or perhaps unsafe, whichever way they rowed. Similar vessels were constructed by Germanicus in his north German campaign (*Ann.* ii. 6) and by the Suiones (*Ger.* 44). These also had stem and stern alike, and remind us of the old Norse construction, being rowed either way, having the oars loose in the rowlock, and not, as was usual in the south, attached by a thong to the thowl pin. Lastly, as a class of boat directly descended from the raft, we may notice the flat-bottomed boats or punts or lighters which plied on the Tiber as ferry-boats, or carrying goods, which were called *codicariae* from *caudex,* the old word for a plank.

It is difficult to trace any order of development in the construction of boats during the Byzantine period, or the middle ages. Sea-going vessels according to their size carried one or more boats, some of them small boats with two or four oars, others boats of a larger size fitted with masts and sail as well as with oars. We find *lembus* and *phaselus* as generic names in the earlier period, but the indications as to size and character are vague and variable. The same may be said of the *batelli, coquets, chaloupes, chalans, gattes,* etc., of which, in almost endless number and variety, the nautical erudition of M. Jal has collected the names in his monumental works, *Archéologie navale* and the *Glossaire nautique.* It is clear, however, that in many instances the names, originally applied to boats properly so called, gradually attached themselves to larger vessels, as in the case of *chaloupe* and others,

a fact which leads to the conclusion that the type of build followed originally in smaller vessels was often developed on a larger scale, according as it was found useful and convenient, while the name remained the same. Many of these types still survive and may be found in the Eastern seas, or in the Mediterranean or in the northern waters, each of which has its own peculiarities of build and rig.

Existing Types of Boats.—It would be impossible within our limits to do justice to the number and variety of existing types in sea-going boats, and for more detailed information concerning them the reader would do well to consult *Mast and Sail in Europe and Asia,* by H. Warington Smyth, an excellent and exhaustive work, from which much of the information which follows regarding them has been derived. In the Eastern seas the Chinese *sampan* is ubiquitous. Originally a small raft of three timbers with fore end upturned, it grew into a boat in very early times, and has given its name to a very large class of vessels. With flat bottom, and considerable width in proportion to its length, the normal sampan runs out into two tails astern, the timbers rounding up, and the end being built in like a bulkhead, with room for the rudder to work between it and the transom which connects the two projecting upper timbers of the stern. Some of them are as much as 30ft. in length and 8 to 10ft. in beam. They are good carriers and speedy under sail.

The Chinese in all probability were the earliest of all peoples to solve the chief problems of boat building, and after their own fashion to work out the art of navigation, which for them has now been set and unchanged for thousands of years. They appear to have used the lee-board and centre-board in junks and sampans, and to have extended their trade to India and even beyond, centuries before anything like maritime enterprise is heard of in the north of Europe. As regards the practice of long boat racing on rivers or tidal waters the Chinese are easily antecedent in time to the rest of the world. On great festivals in certain places the Dragon boat race forms part of the ceremony. The Dragon boats are just over 73ft. long, with 4ft. beam, and depth 21in. The rowing or paddling space is about 63ft. and the number of thwarts 27, thus giving exactly the same number of rowers as that of the Zygites in the Greek trireme. The two extremities of the boat are much cambered and rise to about 2ft. above the water. At about 15ft. from each end the single plank gives place to three, so as to offer a concave surface to the water. The paddle blade is spade-like in form and about 6½in. broad.

Both in Siam and Burma there is a very large river population, and boat racing is on festival days a common amusement. The typical craft, however, is the Duck-boat, which in the shape of hull is in direct contrast to the dug-out form, and primarily intended for sailing. It is interesting to note that the Siamese method of slinging and using quarter rudders is the oldest used by men in sailing craft, being in fact the earliest development from the simple paddle rudder, which has in all ages been the first method of steering boats. The king of Siam's state barge, we are told, is steered by long paddles, precisely in the same way as is figured in the case of the Egyptian boats of the 3rd dynasty (6000 B.C.). On the other hand the slung quarter rudders are the same in fashion as those used by Roman and Greek merchantmen, by Norsemen and Anglo-Saxons, and by mediaeval seamen down to about the 14th century.

The Malays have generally the credit of being expert boat-builders, but the local conditions are not such as to favour the construction of a good type of boat. "Small displacement, hollow lines, V-shaped sections, shallow draught and lack of beam" result in want of stability and weatherliness. But it is among them that the ancient process of dug-out building still survives and flourishes, preserving all the primitive and ingenious methods of hollowing the tree trunk, of forcing its sides outwards, and in many cases building them up with added planks, so that from the dug-out a regular boat is formed, with increased though limited carrying power, increased though still hardly sufficient stability. To ensure this last very necessary quality many devices and contrivances are resorted to. In some cases (just as Ulysses is described as doing by Homer, *Od.* v. 256) the boatman fastens bundles of reeds or of bamboos all along the sides of his boat. These being very buoyant not only act as a defence against the wash of the waves, but are sufficient to keep the boat afloat in any sea. But the most characteristic device is the outrigger, a piece of floating wood sharpened at both ends, which is fixed parallel to the longer axis of the boat, at a distance of two or three beams, by two or more poles laid at right angles to it. This, while not interfering materially with the speed of the boat, acts as a counterpoise to any pressure on it which would tend, owing to its lack of stability, to upset it, and makes it possible for the long narrow dug-out to face even the open sea. It is remarkable that this invention, which must have been seen by the Egyptians and Phoenicians in very early times, was not introduced by them into the Mediterranean. Possibly this was owing to the lack of large timber suitable for dug-outs, and the consequent evolution by them of boat from raft, with sufficient beam to rely upon for stability.

In the boats of India the influence of Egyptian and Arab types of build is apparent, and the dinghy of the Hugli is cited as being in form strangely like the ancient Egyptian model still preserved in the Ghizeh museum. Coming westward the dominant type of build is that of the Arab *dhow,* the boat class of which has all the characteristics of the larger vessel developed from it, plenty of beam, overhanging stem and transom stern. The planking of the shell over the wooden frame has a double thickness which conduces to dryness and durability in the craft. On the Nile it is interesting to find the *naggar* preserving, in its construction out of blocks of acacia wood pinned together, the old-world fashion of building described by Herodotus. The *gaiassa* and *dahabiah* are too large to be classed as boats, but they and their smaller sisters follow the Arab type in build and rig. It is noteworthy that nothing apparently of the ancient Egyptian or classical methods of build survives in the Mediterranean, while the records of the development of boat-building in the middle ages are meagre and confusing. The best illustrations of ancient methods of construction, and of ancient seamanship, are to be found, if anywhere, in the East, that conservative storehouse of types and fashions, to which they were either communicated, or from which they were borrowed, by Egyptians or Phoenicians, from whom they were afterwards copied by Greeks and Romans.

In the Mediterranean the chief characteristics of the types belonging to it are "carvel-build, high bow, round stern and deep rudder hung on stern post outside the vessel." In the eastern basin the long-bowed wide-sterned *caique* of the Bosporus is perhaps the type of boat best known, but both Greek and Italian waters abound with an unnumbered variety of boats of "beautiful lines and great carrying power." In the Adriatic, the Venetian gondola, and the light craft generally, are of the type developed from the raft, flat-bottomed, and capable of navigating shallow waters with minimum of draught and maximum of load. In the western basin the majority of the smaller vessels are of the sharp-sterned build. Upon the boats of the *felucca* class, long vessels with easy lines and low free-board, suitable for rowing as well as sailing, the influence of the long galley of the middle ages was apparent. In Genoese waters at the beginning of the 19th century there were single-decked rowing vessels, which preserved the name of galley, and were said to be the descendants of the Liburnians that defeated the many-banked vessels of Antonius at Actium. But the introduction of steam vessels has already relegated into obscurity these memorials of the past. Along the Riviera and the Spanish coast a type of boat is noticeable which is peculiar for the inward curve of both stem and stern from a keel which has considerable camber, enabling them to be beached in a heavy surf. On the Douro, in Portugal, it is said that the boats which may be seen laden with casks of wine, trailing behind them an enormously long steering paddle, are of Phoenician ancestry, and that the curious signs, which many of them have painted on the cross board over the cabin, are of Semitic origin though now undecipherable.

Coming to the northern waters, as with men, so with boats, we meet with a totally different type. Instead of the smooth exterior of the carvel-build, we have the more rugged form of clinker-

built craft with great beam, and raking sterns and stems, and a wide flare forward. In the most northern waters the strakes of the sea-going boats are wide and of considerable thickness, of oak or fir, often compacted with wooden trenails, strong and fit to do battle with the rough seas and rough usage which they have to endure. In most of these the origin of form and character is to be sought for in the old Viking vessels or long *keeles* of the 5th century A.D., with curved and elevated stem and stern posts, and without decks or, at the most, half decked. In the Baltic and the North Sea most of the fishing boats follow this type, with, however, considerable variety in details. It is noticeable that here also, as in other parts of the world, and at other times, the pressing demand for speed and carrying power has increased the size in almost all classes of boats till they pass into the category of ships. At the same time the carvel-build is becoming more common, while, in the struggle for life, steam and motor power are threatening to obliterate the old types of rowing and sailing boats altogether. Next to the Norse skiff and its descendants, perhaps the oldest type of boat in northern waters is to be found in Holland, where the conditions of navigation have hardly altered for centuries. It is to the Dutch that we chiefly owe the original of our pleasure craft, but, though we have developed these enormously, the Dutch boats have remained pretty much the same.

The development of boat-building in the British Isles during the 19th century has been unceasing and would need a treatise to itself to do it justice. The expansion of the fishing industry and the pressure of competition have stimulated constant improvement in the craft engaged, and here also are observable the same tendencies to substitute carvel, though it is more expensive, for clinker build, and to increase the length and size of the boats, and the gradual supersession of sail and oar by steam power. Under these influences we hear of the *fifie* and the *skaffie* classes, old favourites in northern waters, being superseded by the more modern *Zulu,* which is supposed to unite the good qualities of both; and these in turn running to such a size as to take them outside the category of boats. But even in the case of smaller boats the *Zulu* model is widely followed, so that they have actually been imported to the Irish coast for the use of the crofter fishermen in the congested districts. For the Shetland *sexern* and the broad boats of the Orkneys, and the *nabbies* of the west coast of Scotland, the curious will do well to refer to H. Warington Smyth's most excellent account. On the eastern coast of England the influence of the Dutch type of build is manifest in many of the flat-bottomed and mostly round-ended craft, such as the Yorkshire *Billyboy,* and partly in the *coble,* which latter is interesting as built for launching off beaches against heavy seas, and as showing Norse influence, though in the main of Dutch origin.

The life-boats of the eastern coast are in themselves an admirable class of boat, with fine lines, great length and shallow draught, wonderful in their daring work in foul weather and heavy seas, in which as a rule their services are required. Here, however, as in the fishing boats, the size is increasing, and steam is appropriating to itself the provinces of the sail and the oar. The wherry of the Norfolk Broads has a type of its own, and is often fitted out as a pleasure boat.

The Thames and its estuary rejoice in a great variety of boats, of which the old *Peter* boat (so called after the legend of the foundation of the abbey on Thorney Island) preserved a very ancient type of build, shorter and broader than the old Thames pleasure wherry. But these and the old *hatch* boat have now almost disappeared. Possibly survivors may still be seen on the upper part of the tidal river. Round the English coast from the mouth of the Thames southwards the conditions of landing and of hauling up boats above high-water mark affect the type, demanding strong clinker-build and stout timbers. Hence there is a strong family resemblance in most of the short boats in use from the North Foreland round to Brighton. Among these are the life-boats of Deal and the other Channel ports, which have done and are still doing heroic work in saving life from wrecks upon the Goodwins and the other dangerous shoals that beset the narrowing sleeve of the English Channel. Along the southern coast, and to the west, where harbours are more frequent, a finer and deeper class of boats, chiefly of carvel-build, is to be found. The Cornish ports are the home of a great boat-building industry, and from them a large number of the finest fishing boats in the world are turned out annually. Most of them are built with stem and stern alike, with full and bold quarters and ample floor.

It is not possible here to enumerate, much less to describe in detail, the variety of types in sea-going boats which have been elaborated in England and in America. For this purpose reference should be made to the list of works given at the end of the article.

The following is a list of the boats at present used in the royal navy. They have all of them a deep fore foot, and with the exception of the whalers and Berthon boats, upright stems and transom sterns. The whalers have a raking stem and a sharp stern, and a certain amount of sheer in the bows.

	Length Feet.	Beam Ft. In.	Depth Ft. In.
1*a*. Dinghy. Freeboard about 9in. Weight 3cwt. 2qr. Between thwarts 2ft. 9in. Elm	13½	4′ 8″	2′ 2″
1*b*. Skiff dinghy for torpedo boats. Freeboard about 9in. Carry about ten men in moderate weather. Between thwarts 2ft. 7½in. Weight 3cwt. 4lb. Yellow pine	16	4′ 6″	1′ 10″
2*a*. Whaler for destroyers. 5in. sheer. Yellow pine	25	5′ 6″	2′
2*b*. Whaler. Between thwarts 2ft. 10in. Freeboard about 12in. Weight 8 cwt. Strakes No. 13. Lap ¾in. Elm	27	5′ 6″	2′ 2″
(All have bilge strakes with hand-holes.)			
3. Gig. Between thwarts 2ft. 9½in. Weight 8cwt. 2qr. 15lb. 13 strakes. Elm	30	5′ 6″	2′ 2″
4. Cutter. Between thwarts 3ft. 1in. To carry 49 men; clinker built; elm.	30	8′ 1″	2′ 8½″
5. Pinnace. Between thwarts 3ft. Carvel-built. Elm	36	10′ 2″	3′ 5″
6. Launch. Between thwarts 3ft. 1in. To carry 140 men. Double skin diagonal. Teak	42	11′ 6″	4′ 6″
7. Berthon collapsible boats weighing 7 cwt. for destroyers.			

With the exception of the larger classes, viz., cutters, pinnaces and launches, the V-shape of the bottom is still preserved, which does not tend to stability, and it is difficult to see why the smaller classes have not followed the improvement made in their larger sisters.

Pleasure Boats and Racing.—Though the number and variety of sea-going boats is of much greater importance, no account of boats in general would be complete without reference to the development of pleasure craft upon rivers and inland waters, especially in England, during the past century. There is a legend, dating from Saxon times, which tells of King Edgar the Peaceable being rowed on the Dee from his palace in Chester to the church of St. John, by eight kings, himself the ninth, steering this ancient 8-oar; but not much is heard of rowing in England until 1453, when John Norman, lord mayor of London, set the example of going by water to Westminster, which, we are told, made him popular with the watermen of his day, as in consequence the use of pleasure boats by the citizens became common. Thus it was that the old Thames pleasure wherry, with its high bows and low sharp stern and V-shaped section, and the old skiff came into vogue, both of which have now given way to boats, mostly of clinker-build, but with rounder bottoms and greater depth, safer and more comfortable to row in.

For racing boats *see* ROWING.

AUTHORITIES.—For ancient boats: *Dict. Ant.*, "Navis"; C. Torr, *Ancient Ships;* Graser, *De re navali.* Medieval: Jal, *Archéologie navale,* and *Glossaire nautique;* Marquis de Folin, *Bateaux et navires, progrès de la construction navale;* W. S. Lindsay, *History of Merchant Shipping and Ancient Commerce.* Modern: H. Warington Smyth, *Mast and Sail in Europe and Asia;* Dixon Kempe, *Manual of Yacht and Boat Sailing;* H. C. Folkhard, *The Sailing Boat;* R. C. Leslie, *Old Sea Wings.* (E. WA.)

BOB, a "call" employed in bell-ringing to signify an alteration of the "coursing order" or order in which the bells are being rung.

The origin of the term is unknown, but it may have been adopted as a short, sharp word, easily uttered by the "conductor" and easily recognized by the ringers. (*Cf.* the term "Hopp!" employed for a similar purpose by Jacques-Dalcroze in his Eurhythmics.) Or, as applied to a "method" or system of ringing, it may refer to the evolution of "dodging"; but this is only surmise, as none of the old writers on the subject attempts to explain it.

"Bob" is also used to signify abridgement or shortening, as in the case of a bob-tailed horse or the "bobbed" hair of a woman.

BOBBILI, a town of British India, in the Vizagapatam district of Madras, 70 mi. N. of Vizagapatam town, on a branch line of the Bengal-Nagpur railway. Pop. (1941) 22,090. It is the residence of a raja of old family. The attack on the fort at Bobbili made by Gen. Bussy in 1756 is a memorable episode. There was a constant feud between the chief of Bobbili and the raja of Vizianagram; and when Bussy marched to restore order the raja persuaded him that the fault lay with the chief of Bobbili and joined the French with 11,000 men against his rival. The defenders held out with valour. Before surrender they killed their women and children and only succumbed at last because every man of them was either killed or mortally wounded. An old man, however, crept out of a hut with a child, the son of the dead chief, who was later invested with his father's estate. The old feud broke out again, and the Bobbili chief was forced to take refuge in the nizam's country, but was later restored by the Britsh. In 1801 a permanent settlement was made with his son, and the title of raja was recognized as hereditary in the family.

See *Imp. Gazetteer of India* (Oxford, 1908), *s.v.* "Bobbili Estate."

BOBBIO, episcopal see of Lombardy, Italy, province of Pavia, 32½ mi. S.W. of Piacenza. Pop. (1936), town 1,787, commune 7,072. St. Columban became first abbot of Bobbio in 612 and died in 615. The church dedicated to him is Lombard (11th-12th centuries), restored in the 13th century. The monastery had manuscripts now at Rome (Vatican), Milan and Turin. The cathedral archives contain documents of the 10th and 11th centuries.

BOBCAT, a North American lynx (*Lynx rufus*), found from southern Canada to Mexico. The name refers to its short stumpy tail. The colour is reddish brown or gray, spotted and streaked with black. Bobcats vary greatly in size, adults weighing from 12 to 39 lb. Two to four young are born in spring, remaining with the mother until autumn. The larger bobcats prey on deer, in addition to rabbits, small rodents and birds. This species differs from the Canada lynx by shorter pelage, poorly developed ear tufts and by several black bands on the tail above the black tip.

(J. E. Hl.)

BOBO, an agricultural and pastoral, animistic people, divided into several tribes and speaking two different languages, living in the Upper Volta and in the valley of the Upper Black Volta, in the French Sudan. There is no tribal organization. Inheritance passes first to the brother and then to the son of the deceased.

BOBOLINK [a name derived from its call], or rice-bird, a North American bird of the family Icteridae, known scientifically as *Dolichonyx oryzivorus*. It is a migrant, breeding in the northern United States and southern Canada in summer and wintering in South America, which it reaches by a migration route through the West Indies. It is remarkable for its bunting-like bill. In the southern part of the United States this bird feeds upon rice and grain and is consequently unpopular with the farmer. Farther north, however, it is an insect-eater, and the young, as is nearly always the case with small birds, are fed almost exclusively upon insects. The bobolink has a rippling song, which it generally sings while fluttering across a meadow. Five mottled eggs are laid in a nest of grasses on the ground. The male in spring is black, with yellow hindneck and pale gray rump, in fall is dull, streaked buff and blackish-brown like the female and young.

BOBRUISK, a town and district in the White Russian S.S.R. on the right bank of the Berezina river and on the railway between Minsk and Gomel. Lat. 53° 10′ N., Long. 29° 12′ E. Pop. (1939) 84,107, mainly White Russians and Jews. It is a centre for corn and timber products and has iron-works and flour mills and a radio station. The town was fortified by Alexander I and withstood Napoleon's bombardment in 1812, and was further fortified by Nicholas I, but dismantled 1897. It suffered from fire in 1902 and from its position in the war zone 1914–21.

BOBWHITE, the best known North American game bird, *Colinus virginianus,* of the subfamily Odontophorinae (new world quail) is about 10 in. long, mottled, reddish-brown above, with white on the breast; resident east of the Rocky mountains, north to Minnesota and Ontario and south to the Gulf of Mexico. It has been successfully introduced into Idaho and Oregon. The bobwhite resembles the (resident) partridge and (migrant) quail of Europe, and is known by both these names, but is best named from the ringing call, "bobwhite!" which resounds through the fields in the evening twilight when the family group is assembling for the night. These families, or "coveys," keep together until the spring following the birth of the young birds; they trot confidingly through the stubble picking up seeds and insects—altogether too confidingly, for in many states they were brought close to extinction, but are again increasing under protection. Since 15 or 20 eggs are laid, they would increase rapidly if permitted. Heavy snow and ice are severe on these nonmigratory birds; they will come readily to feeding stations in winter. In Florida is a smaller, darker subspecies (*C. v. floridianus*), while the Texas subspecies (*C. v. texanus*) is grayer above. The masked bobwhite (*C. v. ridgwayi*) is found in southwestern Arizona. (*See* Quail.) Other subspecies and species extend through eastern and southern Mexico to the borders of northern Brazil, including 14 subspecies of *C. virginianus* ranging to Cuba and Guatemala, and various races of the black-throated bobwhite (*C. nigrogularis*), white-faced bobwhite (*C. leucopogon*) and crested bobwhite (*C. cristatus*).

(G. F. Ss.)

BOCAGE, MANUEL MARIA BARBOSA DE (1765–1805), Portuguese poet, was a native of Setubal. He entered the army at 14, transferring to the navy at 16. At the royal marine academy in Lisbon, however, he spent his time in love affairs and in society, where his skill in improvisation made him a great favourite. After some years spent in India and China he returned to Portugal, which was then enduring a severe reaction under the formidable intendant of police, Manique, who was determined to suppress Voltaireanism and the importation or discussion of liberal ideas. Bocage was imprisoned in 1797 because of some anti-religious verses, but soon recovered his liberty. He was a member of the literary society called New Arcadia, where he had but one serious rival, José Agostinho de Macedo. He died on the eve of the French invasion. Perhaps his best work is in the sonnets addressed to D. Maria Leite, a friend who visited and consoled him on his deathbed. Bocage employed every variety of lyric and made his mark in all.

The best editions of his collected works are those of I. F. da Silva, with a biographical and literary study by Rebello da Silva, 6 vols. (1853), and of Theophilo Braga, 8 vols. (1875–76). *See* also I. F. da Silva, *Diccionario Bibliographico Portuguez,* vol. vi, pp. 45–53, vol. xvi pp. 260–264; T. Braga, *Bocage, sua vida e epoca litteraria* (1902).

BOCAGE, a term applied to several regions of France, the characteristics of which are a granite formation with associated heath or reclaimed land sparsely timbered (from O.Fr. *bascage,* late Lat. *boscum,* a wood). The most important are (1) the Bocage of Normandy, including portions of the departments of Calvados, Manche and Orne; (2) the Bocage of Vendée, in the departments of Vendée, Deux-Sèvres, Maine-et-Loire and Loire-Inférieure.

BOCAS DEL TORO, a town, province, island and bay on the northern coast of the republic of Panamá. The population of the province was 16,523 in 1940, the chief industry of the region being the growing of bananas which are raised or bought by a large American fruit company for consumption in the eastern United States and Europe. The town is located on the island of the same name at one of the entrances of Chiriquí lagoon, 90 nautical miles from Puerto Limón, Costa Rica, and 140 nautical miles from Colón, Panamá. Pop. (1940) 2,101.

BOCCACCIO, GIOVANNI (1313–1375), Italian author, humanist and poet, whose *Decameron* is one of the earliest works in Italian prose and one of the most famous books in all literature,

was born out of wedlock in Paris in 1313[1] of a French mother, whose name was probably Jeanne (so that he is named after her), and of an Italian father, the Florentine banker and merchant, Boccaccio di Chellino da Certaldo, commonly called Boccaccino. At a date difficult to determine, but probably as a baby, he was brought to Florence, where his father almost immediately after his return from Paris in 1314 had married Margherita di Gian Donato de'Martoli. Boccaccio's boyhood was thus, as so many of his works lead us to believe, spent in Tuscany, perhaps at Certaldo, perhaps near Florence at Corbignano, where Margherita had brought some property to her husband. Of his early years we have very little knowledge, and none at all save what may be gathered from his earlier works which are full of autobiographical allegory. Before he was seven years old, as he tells us, he was set to learn to read and write. He studied *Grammatica* under Giovanni di Domenico Mazzuoli da Strada, father of the more famous Zanobi. He began Latin and arithmetic. His father destined him for business, but he early had a lively hatred of such a calling, and desired above all to devote himself to literature and to learning. His father, however, was not to be persuaded, and as the boy was unhappy at home with his step-mother, who had now a son of her own, born in 1321, he sent Giovanni to Naples to his commercial correspondents there, to learn business, as is generally believed in Nov. 1328.



AFTER AN EDITION PUBLISHED IN SALAMANCA, SPAIN, 1496

TITLE PAGE OF BOCCACCIO'S LOVE STORY, "L' AMOROSA FIAMMETTA"

Naples was at the height of its splendour under Robert the Wise, and the young Boccaccio, then 15, knew how to appreciate the delights of life in an exquisite climate amid all the gaiety and pleasure of that beautiful city, on the outskirts of a brilliant court. In his *Filocolo* and his *Fiammetta* he gives us a very vivid impression of the charm of Naples at this time. For six years, however, so he tells us, he did little but waste irrecoverable time with the merchant to whom his father had confided him. He most bitterly reproaches his father for this in his *De Genealogiis:* "If my father had dealt wisely with me I might have been among the great poets." At length, however, he found opportunity for culture, and met the scholar he calls Calmeta, most probably the astronomer Andalò di Negro, and finally his father allowed him to abandon a business career, though he made it a condition that Giovanni should study canon law. He was attracted by letters and may well have frequented the society of Paolo da Perugia, the librarian of King Robert, who had already begun to collect certain Greek manuscripts on the advice of the Calabrian monk Barlaam, who died Bishop of Gerace. But study by no means occupied all his time: life in that gay city, on the fringe of the court, more and more attracted him, and it was now, on Holy Saturday, March 30, 1336, in the Church of S. Lorenzo of the Franciscans, that he first caught sight of the woman who was so profoundly to influence his life and shape his work. This was Maria d'Aquino, a young married woman, natural daughter of King Robert, the lady whom he has immortalized under the name of Fiammetta.

The love story thus begun, if we interpret his own accounts aright, ended in utter disaster, but it nevertheless fills his whole life and inspires every book he wrote before the *Ninfale Fiesolano* and the *Decameron.* Fiammetta after giving herself to him had betrayed him. His misery at the loss of her was deepened by the fact that the ruin of his father at this time made it necessary for him to leave Naples and his love and return to Florence. It was in 1341 that he came back to Tuscany and immersed himself in work. But during his love affair with Fiammetta he had already begun three works, and possibly finished two of them: the *Filocolo,* the *Filostrato* and the *Teseide.* In all these works and in the *Ameto,* the *Amorosa Visione* and the *Fiammetta* which followed them, his state of mind is visible. They are extraordinarily personal. A single thought seems to fill his mind: he had loved a princess and been loved in return; she had forsaken him; but she remained the lodestar of his life. He writes really of nothing else but this. Full of her he sets himself to enchant her with stories, to glorify her, to tell over and over again—under how many disguises!—his own story. It was the story of Florio and Biancofiore which he tells us had charmed Fiammetta at first hearing, when he had told it to her in the convent parlour at Sant' Arcangelo a Baiano, and it is round this tale that the enormous romance of the *Filocolo* (1st ed. Venice, 1472) is written. As he tells us in the first page, this was the first book he made to please her. It is the longest of his works after the *Decameron*—which the episode of the *Questioni* in the fourth book prophesies. He seems to have abandoned it in Naples at the end of the third book and to have resumed it later on his return to Florence, when he felt the need of expressing what he was suffering. What this was is obvious in the *Filostrato* (1st ed. Luca Veneto, 1480?), a poem in *ottava rima,* its first use in Italian, on the story of Troilus and Cressida. This is one of the loveliest and most spontaneous of his works. It has a special interest for us, for Chaucer drew upon it very largely for his Troilus; no fewer than 2,700 lines, nearly half the Italian poem, being literally translated by Chaucer into English. This is about a third of Chaucer's poem. In the *Teseide* (1st ed. Ferrara, 1475), another epic poem, we have the same state of mind. It is full of the agonies of his jealousy. It is prefaced by a letter to Fiammetta in which he tells her he has written this poem to please her—"thinking of past joy in present misery." As for the content, it must be enough here to say that it provided Chaucer with his Knight's Tale in the *Canterbury Tales.* It was begun in the shadow of Virgil's tomb, is modelled on the *Aeneid,* written in 12 books and has precisely the same number of lines as Virgil's poem. It is about twice as long as the *Filostrato.* All these books seem to have been begun in Naples; the *Ameto* (1st ed. Rome, 1478) may well have been conceived in Florence; the whole action takes place in the country about Fiesole, where his father had a villa and podere. We see here, too, the influence of Dante and Petrarch; the *Ameto* is indeed a sort of Dantesque allegory of prose scattered with verses. There follows the *Amorosa Visione* (1st ed. Milan, 1521), a long poem which recalls the happier time of his love, and which is dedicated to Fiammetta in an acrostic. In its construction and precision it reveals the study of Dante. It consists of 50 *capitoli,* each composed of 29 *terzine* and a verse of *chiusa;* that is to say there are 88 verses in each *capitolo.*

The last work directly concerned with Boccaccio's passion for Maria d'Aquino is the *Fiammetta* (1st ed. Padua, 1472). The action is very simple, but it is remarkable in this: here we have the love story told by Fiammetta as though it were her autobiography. But it is she who weeps for Giovanni, who has deserted her. This is the first psychological novel of Europe. Thereafter he turns away from the misery of his love story and writes a delicious idyll, the *Ninfale Fiesolano* (1st ed. Venice, 1477), the most mature of his poems—the loves of Affrico and Mensola, two small streams that flowed by his father's house at Corbignano near Florence. All bitterness is lost in music. He describes with the greatest affection and enthusiasm this country he loved best between the village of Settignano and Fiesole, which later was to be the setting of the *Decameron.*

But all that bright world about Florence, so full of voices for Boccaccio, was presently to be silenced by the most appalling material calamity that has ever befallen Europe—the Black Death of 1348. Three out of five persons died in Florence. The grass grew in the streets. People said the end of the world had come. In a sense they were right. It was the end of the Middle Age.

[1] *See* Petrarca *Senili* VIII. I. Lett. del 20 luglio 1366 (trad. Fracassetti) p. 445; Filippo Villani, *Le vite d'uomini illustri Fiorentini* (Firenze, 1826) p. 12, tells us that Boccaccio died in 1375 aged sixty-two.

We do not know where Boccaccio was at this time. Did he perhaps close Fiammetta's eyes and bear her to the grave? If he did he was soon recalled to Florence by his father's death. And there, after that vengeance, whether of God or outraged nature, in which all he loved had been lost to him, he set himself to put in order that great Human Comedy which has given him immortality.

In the very opening page of the *Decameron* (1st dated ed. Venice, 1471) we see that even after writing six works in prose and verse about her, even now she is dead, he cannot forget Fiammetta. The great Proem opens with her unspoken name and closes too in the same fashion. And of those seven ladies and three youths who are the protagonists of the *Decameron* it is only she named Fiammetta who lives. But strangely enough Boccaccio himself is absent; you will scarcely find him in all the hundred tales of that work which best represents his genius, his humour and wide tolerance and love of mankind.

The *Decameron* is an absolute work of art, as detached as a play by Shakespeare or a portrait by Velasquez. The scheme is formal and should be compared with that of *The Thousand and One Nights* and *The Canterbury Tales*. There are ten protagonists, three youths and seven ladies, and the horror which is designed to set off the stories is a universal pestilence which has already half depopulated the City of Florence, and from which they all fled away to the exquisite seclusion of a great villa garden on the slopes under Fiesole, where they spend their time in telling the stories that have made this work immortal. It is the stories that matter. In Chaucer's *Canterbury Tales* the tales often weary us but the tellers never do: in Boccaccio the tales never weary us but the tellers always do. The *Decameron* is a world in itself, and its effect upon us who read it is the effect of life which includes, for its own good, things moral and immoral. The book has the variety of the world and is full of an infinity of people who represent for us the 14th century in Italy in all its fullness. It deals with man as life does, never taking him very seriously or without a certain indifference, a certain irony and laughter. Yet it is full too of a love of courtesy, of luck, of all sorts of adventures both gallant and sad. Even Chaucer is not so complete in his humanism, his love of all sorts and conditions of men. What immorality there is, is rather owing to the sources of some of the tales than to any invention on the part of Boccaccio, who softened much of their original grossness and later came to deplore what remained. But it is in its extraordinary variety of contents and character that the *Decameron* is chiefly remarkable. We are involved in a multitude of adventures, are introduced to innumerable people of every class, and each class shows us its most characteristic qualities. The book is full of people—living people—that is the secret of its immortality. And yet it must be confessed that while the book is a mirror of the world and doubtless as true to the life of its time as any book ever written, it lacks a certain idealism, a certain moral sense which even from a purely aesthetic point of view would have given a balance, a sense of proportion, to it. It is, however, the greatest, as it is the first, prose work in the Tuscan tongue, and it holds its own even with the Divine Comedy because of its humanity.

With the *Decameron,* Boccaccio's work as a creative artist came to an end. It is true that we have the mysterious and savage satire of the *Corbaccio* (1st ed. Florence, 1487), begun immediately after the *Decameron* was finished, that is about 1353, but the passion which had inspired everything he had done, and made him a great creative artist, here turns round, sneers at itself and we get that wild invective, laughable in its malice, against Woman, which characterizes it. From this time—he was more than 40 years old—he devotes himself to scholarship, forgets love, and turns to friendship: the second great influence of his life appears—Petrarch.

But before he gives himself wholly to his friend he turns—is it for consolation?—to the study of Dante. As soon as the *Corbaccio* is finished we find him at work on the *Vita di Dante* (1st ed. Venice, 1477), the earliest life of the poet, whose *Divine Comedy* he copies with his own hand in order to send it to Petrarch; and we may understand how great a pioneer Boccaccio was in the appreciation of Dante when we learn from this fact that Petrarch had no copy in his library.

Even in his youth Boccaccio had regarded Petrarch with an enthusiasm and an unswerving modesty that, lasting as it did till his death, was one of the beautiful traits of his character. In 1351, in the name of Florence, he went to Padua to recall Petrarch from exile, and was his guest for some days. He was a witness of Petrarch's enthusiasm for "sacred studies," and more and more in accordance with Petrarch's doctrine we see him giving up all work in the vernacular and setting all his energy in the study of antiquity and the acquirement of learning. From a creative writer of splendid genius he became a scholar, a scholar of vast reading, but mediocre achievement. Little by little he seems to have gathered his notes into the volumes we know as: *De Montibus, Sylvis, Fontibus,* etc., a sort of Dictionary of Geography; the *De Casibus Virorum Illustrium* in nine books, which deals with the vanity of human affairs from Adam to his own time; the *De Claris Mulieribus,* which begins with Eve and comes down to Giovanna, queen of Naples, and the *De Genealogiis Deorum,* a cyclopaedia of learning concerning mythology. In all these works it must be admitted we see Boccaccio as Petrarch's disciple. Yet they must not be too much depreciated. They rendered great service; their vast usefulness is witnessed by their enormous popularity and the large number of editions through which they have passed. They were the text books of the Renaissance. Nor was this all his service. In 1358 there was introduced to Petrarch a certain Leon Pilatus, who gave himself out for a Greek, and Petrarch, who possessed a Greek ms. of Homer which he could not read, seized the opportunity to obtain a translation. In this he was not successful; so presently, bored with the barbarous Pilatus, he turned him over to Boccaccio, who with the utmost devotion took this disagreeable barbarian into his house, caused a Chair of Greek to be given him in the University of Florence, and quietly and heroically put up with his ferocious and repellant manners and bad temper till he obtained the translation; and thus it is to Boccaccio that we owe the restoration of Homer to the western world.

During the time he was engaged on this arduous and heroic task he was in a state of great spiritual distress, and hardly comforted by the wise letters of Petrarch. He was never wholly cured of a sort of disillusion and melancholy which went with a curious regret for the greatest achievement of his life. In this state of mind his good fortune was the friendship of Petrarch, which, together with a love of children very characteristic of him, appears always like a ray of sunshine in what proved to be a lonely and even gloomy old age, hard and bitter and passed in poverty. So poor was he that it seems his friends in Florence, hearing of his misery, founded the first Cathedra Dantesca to relieve him. He delivered his first lecture in the Church of Santo Stefano on Oct. 23, 1373, at the age of 60. In the winter of that year he was attacked by illness and returned to Certaldo, really to die. In the hands of an ignorant doctor he suffered tortures, and then a new ill befell him. In the summer of 1374 Petrarch died. He wrote a wonderful letter to Petrarch's son-in-law, full of adoration for his friend and anxiety about his works. That letter was his swan song; though he lingered on for some months, he can scarcely be said to have been alive. He died on Dec. 21, 1375, and was buried in the Church of SS. Jacopo e Filippo at Certaldo.

BIBLIOGRAPHY.—A complete edition of Boccaccio's Italian writings in 17 vols. was published by Moutier (Florence, 1827 *et seq.*). The Letters of Boccaccio were collected and printed by Corazzini (Florence, Sansoni, 1877). The Life of Boccaccio has been written by Tiraboschi, Mazzuchelli, Baldelli, Landau, Crescini (1887), Edward Hutton (1910, in English), and Henri Hauvette (1914, in French). *See* works cited in last two. The first printed edition of the *Decameron* seems to be that without date, place or printer's name, which is believed to belong to the year 1469 or 1470, and to have been printed at Florence. The best edition is that of Florence 1527 (counterfeited in London, 1727). A curious expurgated edition authorized by the ecclesiastical authority appeared at Florence 1573. The first English translation is that of 1620, reprinted in the Tudor Translations (1909). The best modern English translation is that of J. M. Rigg (1903). There are also modern reprints of the 1587 English translation of the *Fiammetta* (*Amorous Fiammetta,* with introduction by Edward Hut-

ton, Navarre Society, 1926), and of the 1566 English translation of the *Thirteen Questions* from the *Filocolo,* also with an introduction by Edward Hutton (Peter Davies, 1927). A Bibliografia Boccaccesca by Guido Traversari (vol. ii. Scritti intorno al Boccaccio) is in course of publication (Città di Castello, 1907 *et seq.*). *See* also T. C. Chubb, *The Life of Giovanni Boccaccio* (1930). (E. Hn.)

BOCCALINI, TRAJANO (1556–1613), Italian satirist, was born at Loreto in 1556, the son of an architect. His most important work is the *Ragguagli di Parnaso,* in which Apollo is represented as receiving the complaints of all who present themselves, and distributing justice according to the merits of each particular case. To escape, it is said, from the hostility of those whom his shafts had wounded, he retired to Venice, and there died on Nov. 16, 1613. It was asserted, indeed, by contemporary writers that he had been beaten to death with sand-bags by a band of Spanish bravadoes, but the story is probably founded on his known hatred of the Spaniards. The only government, indeed, which is exempt from his attacks is that of Venice, a city for which he seems to have had a special affection.

The *Pietra* has been translated into French, German, English and Latin; the English translator was Henry, earl of Monmouth, his version being entitled *The Politicke Touchstone* (1674). Another posthumous publication of Boccalini was his *Commentarii sopra Cornelio Tacito* (1669). Many of his manuscripts are preserved still unprinted.

BOCCHERINI, LUIGI (1743–1805), Italian composer, son of an Italian bass-player, was born at Lucca, and studied at Rome, where he became a fine 'cellist, and soon began to compose. He returned to Lucca, where for some years he was prominent as a player, and there he produced two oratorios and an opera. He toured in Europe, and in 1768 was received in Paris by Gossec and his circle with great enthusiasm, his instrumental pieces being highly applauded; and from 1769 to 1785 he held the post of "composer and virtuoso" to the king of Spain's brother, the infante Luis, at Madrid. He afterwards became "chamber-composer" to King Frederick William II. of Prussia, till 1797, when he returned to Spain. He died at Madrid on May 28, 1805.

As an admirer of Haydn, and a voluminous writer of instrumental music, chiefly for the violoncello, Boccherini represents the effect of the rapid progress of a new art on a mind too refined to be led into crudeness, too inventive and receptive to neglect any of the new artistic resources within its cognizance, and too superficial to grasp their real meaning. His mastery of the violoncello, and his advanced sense of beauty in instrumental tone-colour, must have made even his earlier works seem to contemporaries at least as novel and mature as any of those experiments at which Haydn, with eight years more of age and experience, was labouring in the development of the true new forms.

Most of Boccherini's technical resources proved useless to Haydn, and resemblances occur only in Haydn's earliest works (*e.g.,* in the slow movements of the quartets in op. 3 and in some as late as op. 17). Whichever derived the characteristics of such movements from the other, the advantage is decidedly with Boccherini. But the progress of music did not lie in the production of novel beauties of instrumental tone in a style in which polyphonic organization was either deliberately abandoned or replaced by a pleasing illusion, while the form in its larger aspects was a mere inorganic amplification of the old suite-forms, which presupposed a genuine polyphonic organization as the vitalizing principle of their otherwise purely decorative nature. The true tendency of the new sonata forms was to make instrumental music dramatic in its variety and contrasts, instead of merely decorative. Haydn from the outset busied himself with the handling of new rhythmic proportions; and if it is hardly an exaggeration to say that the surprising beauty of colour in such a specimen of Boccherini's 125 string-quintets as that in E major (containing the popular minuet) is more striking than Haydn's best scoring, it is nevertheless true that even this beauty fails to justify the length and monotony of the work. Where Haydn uses any fraction of the resources of such a style, the ultimate effect is in proportion to a purpose of which Boccherini, with all his genuine admiration of his elder brother in art, could form no conception.

Boccherini's works are, however, still indispensable for violoncellists, both in their education and their concert repertories; and his position in musical history is assured as that of one of the most original writers of music for stringed instruments in the late Italian amplifications of the older quasi-polyphonic sonata or suite-form that survived in his hands into the early 19th century. Boccherini may safely be regarded as its last real master. He was wittily characterized by the contemporary violinist Puppo as "the wife of Haydn"; which is good enough praise for those who hold a restricted view of woman's sphere.

See *Notice sur la vie et les ouvrages de Luigi Boccherini, suivie du catalogue raisonné, de toutes ses oeuvres, tant publiées qu'inédites,* by L. Picquot (1851). (D. F. T.)

BOCCHUS (*c.* 110 B.C.), king of Mauretania, and father-in-law of Jugurtha. In 108 he joined Jugurtha on condition of receiving a third of Numidia. But when the kings had been twice defeated, Bocchus again sought Roman alliance. He was persuaded by Sulla (q.v.) to seek favour by entrapping Jugurtha and handing him over to Rome (105 B.C.). As a result, the Romans made a treaty with Bocchus, and added part of Numidia to his kingdom. He sent to the capitol a group of Victories guarding a device in gold showing Bocchus handing over Jugurtha to Sulla.

Bibliography.—*See* Jugurtha; also Sallust, *Jugurtha,* 80–120; Plutarch, *Marius,* 8–32, *Sulla,* 3; A. H. J. Greenidge, *History of Rome* (London, 1904).

His son, Bocchus, was king of Mauretania, jointly with a younger brother Bogud. As enemies of the senatorial party, their title was recognized by Caesar (49 B.C.). During the African War they invaded Numidia and thus prevented King Juba from joining Metellus Scipio against Caesar. At the end of the war, Caesar gave Bocchus part of the territory of Massinissa, Juba's ally, which was recovered after Caesar's murder by Massinissa's son. After Caesar's death Bocchus actively supported Octavian, while on the other hand Bogud supported Antony. During Bogud's absence in Spain, his brother took the occasion to seize the whole of Numidia, and was confirmed sole ruler by Octavian. After the death of Bocchus in the year 33 B.C., Numidia was made a Roman province.

Bibliography.—*Bell. Afric.,* 25; Dio Cassius xli. 42, xliii. 36, xlviii. 45; Appian, *Bell. Civ.,* ii. 96, iv. 54.

BOCHART, SAMUEL (1599–1667), a famous French scholar, who was born at Rouen on May 30, 1599. He was for many years pastor of a Protestant church at Caen. In 1646 he published his *Phaleg* and *Chanaan* (Caen, 1646 and 1651), the two parts of his *Geographia Sacra.* His *Hierozoicon,* which treats of the animals of Scripture, was printed in London (1663). In 1652 Christina of Sweden invited him to Stockholm, where he studied the Arabian manuscripts in the queen's possession. Bochart had a profound knowledge of the principal oriental languages, including Hebrew, Syriac, Chaldaic, and Arabic, but was obsessed by the desire to derive all languages from Phoenician.

A complete edition of his works was published at Leyden, under the title of *Sam. Bochart Opera Omnia* (1675; 4th ed. 1712). An *Essay on the Life and Writings of Samuel Bochart,* by W. R. Whittingham, appeared in 1829.

BOCHER, MAXIME (1867–1918), American mathematician, son of Ferdinand Bocher, professor of mathematics at Harvard, was born in Boston, Mass., Aug. 28, 1867. He was educated at Cambridge Latin school and at Harvard college where he graduated in 1888. Later he studied at the University of Goettingen from which he received in 1891 the degree of doctor of philosophy for his dissertation *Uber die Reihenentwickelungen der Potentialtheorie.* After serving as instructor in 1891–94 and as assistant professor in 1894–1904, he was made professor of mathematics at Harvard. In 1913–14 he was exchange professor at Paris. He exercised great influence on mathematics and mathematical instruction in America, especially through his seminar teaching in which he stimulated students to undertake mathematical research. His own later work was chiefly concerned with differential equations, series and higher algebra. He died in Cambridge, Mass., on Sept. 12, 1918. Besides elementary texts on trigonometry and analytic geometry, he wrote *Introduction to Higher Algebra* (1907; Ger. trans. by Hans Beck 1910) and *An Introduction to the Study of Integral Equations* (1909). He was

one of the editors of *Annals of Mathematics* in 1896–1907, and again in 1910, and (with L. E. Dickson) was editor of the *Transactions* of the American Mathematical society in 1907–09 and again in 1911.

See G. D. Birkhoff, "The Scientific Work of Maxime Bocher," *Bull. Am. Math. Soc.,* vol. xxv, pp. 197–215, and "The Life and Services of Maxime Bocher," ib., pp. 337–350.

BOCHOLT, town in the Prussian province of Westphalia, Germany, near the Dutch frontier, 12 mi. N. of Wesel. Pop. (1939) 34,809. It is a centre of the cotton industry.

BOCHUM, a town of Germany, in the Prussian province of Westphalia, 11 mi. W. of Dortmund. Pop. (1939) 303,288. A centre of the coal, iron and steel industries, with tin and zinc works, it was bombed by the British in World War II.

BOCLAND, BOCKLAND or **BOOKLAND,** in Anglo-Saxon law, a grant of folkland (*q.v.*) by the king, with the consent of the witan, at first usually to the church, occasionally to laymen for religious purposes. It was a grant of lordship and revenues, and perhaps of jurisdiction also. The grantee by the terms of the charter or book might possess powers equivalent to those of a modern tenant in fee simple. He might dispose of the land by will or make grants out of it to dependents.

BOCSKAY, STEPHEN (ISTVAN) (1557–1606), prince of Transylvania, the most eminent member of the ancient Bocskay family, son of György Bocskay and Krisztina Sulyok, was born at Kolozsvár (Cluj) Transylvania. He advised Prince Zsigmond Báthory to contract an alliance with the emperor instead of holding to the Turk, and was sent on frequent missions to Prague and Vienna. The later Báthory princes of Transylvania confiscated his estates, and he sought protection at the imperial court (1599); but he was alienated by the attempts of the emperor Rudolph II to deprive Hungary of its constitution and the Protestants of their religious liberties, and by the outrages inflicted on the Transylvanians by the imperial generals Basta and Belgiojoso from 1602 to 1604. To save the independence of Transylvania, Bocskay assisted the Turks; and as a reward for his part in driving Basta out of Transylvania, the Hungarian diet, assembled at Modgyes, elected him prince (1604). The Ottoman sultan sent a special embassy to congratulate him, and a splendid jewelled crown made in Persia. Bocskay refused the royal dignity, but made skilful use of the Turkish alliance. To save the Austrian provinces of Hungary, the archduke Matthias, setting aside his semilunatic imperial brother Rudolph, entered into negotiations with Bocskay, and ultimately the peace of Vienna was concluded (June 23, 1606), which guaranteed all the constitutional and religious rights and privileges of the Hungarians both in Transylvania and imperial Hungary. Bocskay was acknowledged as prince of Transylvania and the right of the Transylvanians to elect their own independent princes in future was officially recognized. The fortress of Tokaj and the counties of Bereg, Szatmár and Ugocsa were ceded to Bocskay, with reversion to Austria if he should die childless. Soon after, at Zsitvatörök, a peace, confirmatory of the Peace of Vienna, was concluded with the Turks. Bocskay is said to have been poisoned (Dec. 29, 1606) by his chancellor, Mihály Kátay, who was hacked to bits by Bocskay's adherents in the market place of Kaschau.

See *Political Correspondence of Stephen Bocskay* (Hung.) ed. by Károly Szábo (Budapest, 1882); Jenö Thury, *Stephen Bocskay's Rebellion* (1899).

BOD, the name by which Tibet is known to the Tibetans. The term is also used adjectivally for the people of the country and in such expressions as *Bod-Skad,* the Tibetan language. The etymology of the term is doubtful and the suggestion that it is connected with *Bodh* (wisdom) or *Buddh* (wise, Buddha) is probably nothing more than folk etymology. (*See* TIBET.)

BODE, JOHANN ELERT (1747–1826), German astronomer, was born at Hamburg on Jan. 19, 1747. He founded in 1774, the well-known *Astronomisches Jahrbuch,* 51 yearly volumes of which he compiled and issued. He became director of the Berlin observatory in 1786, withdrew from official life in 1825, and died at Berlin Nov. 23, 1826. His other works include: *Sammlung astronomischer Tafeln* (1776); *Erläuterung der Sternkunde* (1776, 3rd ed. 1808); *Uranographia* (1801) a collection of 20 star maps accompanied by a catalogue of 17,240 stars and nebulae. He propounded, in 1776, a theory of the solar constitution similar to that developed in 1795 by Sir William Herschel. He gave currency to the empirical rule known as "Bode's Law," which was actually announced by Johann Daniel Titius of Wittenberg in 1772. It is expressed by the statement that the proportionate distances of the several planets from the sun may be represented by adding 4 to each term of the series: 0, 3, 6, 12, 24, etc. The irregularity will be noticed of the first term, which should be $1\frac{1}{2}$ instead of 0 (*see* PLANET).

See J. F. Encke, *Berlin Abhandlungen* (1827), p. xi; H. C. Schumacher, *Astr. Nach.* (1827), v, 255, 367; Poggendorff, *Biog. literarisches Handwörterbuch; Allgemeine deutsche Biographie,* iii, 1.

BODE, WILHELM VON (1845–1929), German art critic, was born at Kalvorde, Brunswick, on Dec. 10, 1845. After having studied law he entered the legal profession. In 1869 he turned to the study of Dutch painting. He became assistant in the Berlin museum in 1872, curator of the department of Christian sculpture in 1883, and director of the Kaiser Friedrich museum in 1890. During his management this museum became one of the foremost collections of the world. In 1905 he was made general director of all the royal museums in Prussia, resigning in 1920. His knowledge extended over a wide field and is especially valued in Dutch and Flemish painting and in Italian sculpture.

His more important works are: *Geschichte der deutschen Plastik* (1885); *Italienische Bildhauer der Renaissance* (1887); *Rembrandt,* 8 vols., assisted by Hofstede de Groot (1897–1900, Eng. trans. 1906); *Italienische Hausmöbel der Renaissance* (1902; Eng. trans., 1921); *Florentiner Bildhauer der Renaissance* (1902, Eng. trans., 1908); *Italian Bronze Statuettes of the Renaissance* (3 vols., assisted by Murray Marks, 1907); *Die Meister der holländischen und vlämischen Malerschulen* (1919); *Adam Elsheimer* (1920); *Bertoldo und Lorenzo de Medici* (1925); and *Botticelli* (1926).

He described his administrative work in *Fünfzig Jahre Museums-arbeit* (1922). On the occasion of his 80th birthday a volume was published entitled *Hauptwerke aus den staatlichen Museum zu Berlin, Wilhelm von Bode zu Ehren herausgegeben von den Abteilungsleitern* (1926). He died March 2, 1929.

BODEL, JEHAN (died *c.* 1210), French *trouvère,* was born at Arras in the second half of the 12th century. Very little is known of his life, but in 1205 he was about to start for the crusade when he was attacked by leprosy. In a touching poem called *Le Congé* (printed by Méon in *Recueil de fabliaux et contes,* vol. i), he bade farewell to his friends and patrons, and begged for a nomination to a leper hospital. He wrote *Le Jeu de Saint Nicolas,* one of the earliest miracle plays preserved in French (printed in Monmerqué and Michel's *Théâtre français du moyen âge,* 1839, and for the *Soc. des bibliophiles français,* 1831); the *Chanson des Saisnes* (ed. F. Michel, 1839), four *pastourelles* (printed in K. Bartsch's *Altfranz. Romanzen und Pastourellen,* Leipzig, 1870); and probably the eight *fabliaux* attributed to an unknown Jean Bedel. The legend of St. Nicholas had already formed the subject of the Latin *Ludus Sancti Nicholai* of Hilarius. The *Chanson des Saisnes,* Bodel's authorship of which has been called in question, is a *chanson de geste* belonging to the period of decadence, and is really a *roman d'aventures* based on earlier legends belonging to the Charlemagne cycle. It embraces three distinct legends—those of the wars against the Saxons, of Charlemagne's rebellious barons and of Baudouin and Sebille.

See also the article on Jehan Bodel by Paulin Paris in *Hist. litt. de la France,* xx, pp. 605–638; Gaston Paris, *Histoire poétique de Charlemagne* (1865); Léon Gautier, *Les Épopées françaises* (revised edit., vol. iii, pp. 650–684), where there is a full analysis of the *Chanson des Saisnes* and a bibliography; H. Meyer, in *Ausgaben und Abhandlungen aus . . . der romanischen Philologie* (Marburg, 1883), pp. 1–76, where its relation to the rest of the Charlemagne cycle is discussed.

BODENBACH: *see* PODMOKLY.

BODENSTEDT, FRIEDRICH MARTIN VON (1819–1892), German author, born at Peine, Hanover, April 22, 1819, and died at Wiesbaden on April 19, 1892. He became tutor in the

family of Prince Galitzin at Moscow, and then was head of a school in Tiflis. There he studied Persian literature, and in 1851 published a book of poems, *Die Lieder des Mirza Schaffy* (Eng. trans. 1880), oriental in form and colouring, which had instant success. The book ran through 160 editions, and was translated into many languages. After his return to Germany Bodenstedt became (1854) professor of Slav languages at Munich, made many translations from Russian authors, and wrote a tragedy on the story of the false Demetrius, and an epic on a Circassian theme. In 1858 he became professor of early English literature, and from that time devoted his attention primarily to the Shakespearean drama. He collaborated with Paul Heyse and others in a new translation of Shakespeare's works (9 vols. 1868–73), and himself translated the sonnets. From 1866 onwards he was director of the Meiningen theatre, and he edited the *Tägliche Rundschau* from 1880 to 1888. Among Bodenstedt's other works are: *Tausend und ein Tage im Orient* (1849–50); *Shakespeare's Zeitgenossen und ihre Werke* (1858–60); an autobiography (1888); successful translations from Hafiz and Omar Khayyám, and lyrics and dramas which added little to his reputation.

An edition of his collected works was published at Berlin (1866-69) and his *Erzählungen und Romane* at Jena (1871–72). For further biographical details *see* Bodenstedt's *Erinnerungen aus meinem Leben* (1888–90); and G. Schenck, *Friedrich von Bodenstedt. Ein Dichterleben in seinen Briefen* (1893).

BODH GAYA, a village in British India, in the Gaya district of Bihar, situated 6 mi. south of the town of Gaya. It is one of the holiest places in the Buddhist world, for it was here that, under a *pipal* tree (*Ficus religiosa*), Prince Gautama or Sakya Muni obtained enlightenment, *i.e.,* became free from the circle of re-births and became the Buddha. In the 3rd century B.C. the emperor Asoka erected a temple here; part of the stone railing enclosing this temple and the *vajrasan* or diamond throne marking the spot where Buddha sat are still extant. Asoka's temple, having become ruinous, was replaced by another temple, identified with that now standing, which was restored in the 11th century A.D. and again by the British Government in 1882. The main tower rises to a height of 170 feet. In the courtyard round it are ranged a great number of stone *stupas* which devout Buddhist pilgrims left as memorials of their visit to the shrine. A *pipal* tree of no great age outside the temple is believed to be a lineal descendant of the sacred Bodhi tree under which Buddha sat, for the life of the tree was perpetuated, when it began to die, by dropping a seed in a fork or hollow.

See R. Mitra, *Buddha Gaya* (1878); Sir A. Cunningham, *Mahabodhi* (1892).

BODHIVAṀSA or **MAHĀBODHIVAṀSA,** a prose poem in elaborate Sanskritized Pali, composed by Upatissa in the first half of the 11th century A.D. Based on a Sinhalese original, after outlining the early history of Buddha and Buddhism it describes the bringing of a branch of the celebrated Bo or Bodhi tree (*i.e.,* Wisdom Tree, under which the Buddha had attained wisdom) to Ceylon in the 3rd century B.C. The Bodhivamsa is mainly a compilation from the Nidānakathā Mahāvamsa, and other sources, but it has occasionally preserved details of the older tradition not otherwise known to us.

Edition in Pali for the Pali Text Society by S. Arthur Strong (1891); *see* W. Geiger, *Pali Literatur und Sprache,* p. 25 (Strasbourg, 1916).

BODICHON, BARBARA LEIGH SMITH (1827–1891), English educationalist, was born at Watlington, Norfolk, on April 8, 1827, the daughter of Benjamin Smith (1783–1860), long M.P. for Norwich. She early showed a force of character and catholicity of sympathy that later won her a prominent place among philanthropists and social workers. In 1857 she married an eminent French physician, Dr. Eugène Bodichon, and, although wintering many years in Algiers, continued to lead the movements she had initiated on behalf of English women. In 1869 she published her *Brief Summary of the Laws of England concerning Women,* which had a useful effect in helping forward the passage of the Married Women's Property act. In 1866, co-operating with Miss Emily Davies, she matured a scheme for the extension of university education to women, and the first small experiment at Hitchin developed into Girton college, to which Mme. Bodichon gave liberally of her time and money. With all her public interests, she found time for society and her favourite art of painting. She studied under William H. Hunt, and her water-colours, exhibited at the Salon, the Academy, and elsewhere, showed great originality and talent, and were admired by Corot and Daubigny. Mme. Bodichon died at Robertsbridge, Sussex, on June 11, 1891.

See Lady Stephen, *Emily Davies and Girton College* (1927).

BODIN, JEAN (1530–1596), French political philosopher, was born at Angers in 1530. Having studied law at Toulouse and lectured there on jurisprudence, he settled in Paris as an advocate. In 1588, in refutation of the views of the seigneur de Malestroit, comptroller of the mint, who maintained that there had been no rise of prices in France during the three preceding centuries, he published his *Responsio ad Paradoxa Malestretti* (*Réponse aux paradoxes de M. Malestroit*), which explained the revolution in prices which took place in the 16th century. Bodin showed a more rational appreciation than many of his contemporaries of the causes of this revolution. This tract, the *Discours sur les causes de l'extrème cherté qui est aujourdhuy en France* (1574), and the disquisition on public revenues in the sixth book of the *De la République* (1577) entitle Bodin to a distinguished position among the earlier economists.

His learning, genial disposition and conversational powers won him the favour of Henry III., and of his brother, the duc d'Alençon; and he was appointed king's attorney at Laon in 1576. In this year he represented the *tiers état* of Vermandois in the states-general of Blois, and contended with skill and boldness in extremely difficult circumstances for freedom of conscience, justice and peace. The nobility and clergy favoured the league, and urged the king to force his subjects to profess the Catholic religion. When Bodin found he could not prevent this resolution being carried, he contrived to get inserted in the petition drawn up by the states, the clause "without war," which practically rendered nugatory all its other clauses. While he thus resisted the clergy and nobility he opposed the king's demand to be allowed to alienate the public lands and royal demesnes. In 1581 he acted as secretary to the duc d'Alençon when that prince came over to England to seek the hand of Queen Elizabeth. Here he had the pleasure of finding that the *République* was studied at London and Cambridge, although in a barbarous Latin translation. This determined him to translate his work into Latin himself (1586). The latter part of Bodin's life was spent at Laon, which he is said to have persuaded to declare for the league in 1589, and for Henry IV. five years afterwards. He died of the plague in 1596.

With all his breadth and liberality of mind Bodin was a credulous believer in witchcraft, the virtues of numbers and the power of the stars, and in 1580 he published the *Démonomanie des sorciers.*

Boden's *Six livres de la République* (1576), translated into Latin by himself (1586), though it is said to be the beginning of the science of political economy, was only an incidental part of a larger scheme for a book on the universe. Bodin did not write the *Republic* from the point of view of an impartial philosopher. It was his intention to be very practical—not only to describe the ideal state, but also to establish detailed reforms in France. Two altogether distinct ideas stand out: his conception of sovereignty and his theory of climate. Sovereignty, he says, arises from human needs, and not from God—a hit at the Divine Right of Kings. He conceives of the state as an association of families which recognize unlimited law-making power in some person or group. The family is thus the corner-stone of the state, and the father, as its head, has absolute power, even of life and death, over his children. It must have property attached to it which, Bodin inconsistently says, the king may not take without the father's consent; hence if direct taxation is necessary the king must ask for a grant.

Bodin held that the main types of humanity, their laws and institutions, correspond to three climatic zones: the north, cold and dry, which produces a stupid but physically vigorous type tending towards democratic forms of government; the south which, being very hot, is peopled by intelligent but lazy, and consequently, politically passive races, usually governed by a

theocracy or some form of despotism; and lastly, the central zone where the climate is temperate, and where, as in the case of France, the favourite form of government is a true monarchy.

Bodin was probably the only writer of the 16th century who had grasped the fact that Europe was changing rapidly. He saw that no monarchy, however stable, could last for ever, but realized that the recognition of a strong monarchy in the France of his day, was the only hope of escape from political chaos.

Among his other works are *Oratio de instituenda in republica juventate* (1559); *Methodus ad facilem historiarum cognitionem* (1566); *Universale Naturae Theatrum* (1596, French trans. by Fougerolles, 1597), and the *Colloquium Heptaplomeres de abditis rerum sublimium arcanis,* written in 1588, published first by Guhrauer (1841), and in a complete form by L. Noack (1857). The last is a philosophy of naturalism in the form of a conversation between seven learned men—a Jew, a Mohammedan, a Lutheran, a Zwinglian, a Roman Catholic, an Epicurean and a Theist.

See H. Baudrillart, *J. Bodin et son Temps* (1853); Ad. Franck, *Réformateurs et publicistes de l'Europe* (1864); N. Planchenault, *Études sur Jean Bodin* (Angers, 1858); E. de Barthélemy, *Étude sur J. Bodin* (1876); for the political philosophy of Bodin, *see* P. Janet, *Hist. de la science polit.* (3rd ed. 1887); Hancke, *B. Studien über d. Begriff d. Souveränität* (Breslau, 1894); A. Bardoux, *Les Légistes et leur influence sur la soc. française;* Fournol, *Bodin prédécesseur de Montesquieu* (1896); for his political economy, J. K. Ingram, *Hist. of Pol. Econ.* (London, 1888); for his ethical teaching, A. Desjardins, *Les Moralistes français du seizième siècle,* ch. v.; and for his historical views, R. Flint's *Philosophy of History in Europe* (ed. 1893), pp. 190 foll.

BODINGTON, SIR NATHAN (1848–1911), vice-chancellor of Leeds University, was born at Aston on May 29, 1848. A graduate of Wadham College, Oxford, he became a fellow of Oriel, and in 1882 professor of Greek and principal of Yorkshire College, Leeds. He secured the endowment and incorporation of the college as a university in 1903. He died at Leeds on May 12, 1911.

BODLE or **BODDLE,** a Scottish copper coin worth about one-sixth of an English penny, first issued under Charles II. It survives in the phrase "not to care a bodle," and is said to be derived from Bothwell, the name of a mint master.

BODLEY, SIR THOMAS (1545–1613), English diplomatist and scholar, founder of the Bodleian library, Oxford, was born at Exeter March 2, 1545, and died in London Jan. 28, 1613. Bodley was educated at Geneva, where his father had gone to live on account of his Protestant principles. On the accession of Queen Elizabeth he returned with his father to England and soon after entered Magdalen college, Oxford. In 1563 he was admitted a fellow of Merton college. In 1569 he was proctor, and for some time deputy orator. In 1584 he entered parliament as member for Portsmouth, and represented St. Germans in 1586. In 1585 Bodley was sent to form a league between Frederick II. of Denmark and certain German princes to assist Henry of Navarre. He was next dispatched on a secret mission to France, and in 1588 he was sent as minister to The Hague. The essential difficulties of his mission were complicated by the intrigues of the queen's ministers at home, and Bodley repeatedly begged that he might be recalled. He was finally permitted to return to England in 1596, but, finding his preferment obstructed by the jarring interests of Burleigh and Essex, he retired from public life. He was knighted on April 18 1604. He is remembered specially as the founder of the Bodleian library at Oxford. He determined, he said, "to take his farewell of State employments and to set up his staff at the library door in Oxford." In 1598 his offer to restore the old library was accepted by the university. In 1611 he began its permanent endowment, and the greater part of his fortune was left to it. He was buried in the choir of Merton college chapel, where a monument of black and white marble was erected to him.

Sir Thomas wrote his own life to the year 1609, which, with the first draft of the statutes drawn up for the library, and his letters to the librarian, Thomas James, was published by Thomas Hearne under the title of *Reliquiae Bodleianae, or Authentic Remains of Sir Thomas Bodley* (1703).

BODLEY, GEORGE FREDERICK (1827–1907), English architect, was born at Hull on March 14, 1827, the son of a physician. He was articled to Sir Gilbert Scott, under whose influence he became imbued with the spirit of the Gothic revival, and gradually became known as the chief exponent of 14th century English Gothic, and the leading ecclesiastical architect in England. One of his first churches was St. Michael and All Angels, Brighton, and among his principal erections may be mentioned: All Saints, Cambridge; Eton Mission church, Hackney Wick; Clumber church; Eccleston church; Hoar Cross church; St. Augustine's, Pendlebury; Holy Trinity, Kensington; Chapel Allerton, Leeds; St. Faith's, Brentford; Queen's college chapel, Cambridge; Marlborough college chapel; and Burton church. His domestic work included the London School Board offices, the new buildings at Magdalen, Oxford, and Hewell Grange (for Lord Windsor). From 1869 he was for 20 years in partnership with Mr. T. Garner. He also designed (with his pupil James Vaughan) the cathedral at Washington (D.C.), U.S.A., and cathedrals at San Francisco and in Tasmania; and when Mr. Gilbert Scott won the competition for the new Liverpool cathedral Bodley collaborated as supervisor of its erection. Bodley was elected A.R.A., in 1881 and R.A., in 1902. In addition to being a most learned master of architecture, he was a beautiful draughtsman, and a connoisseur in art; he published a volume of poems in 1899; and he was a designer of wallpapers and chintzes for Watts and Co., of Baker street, London; in early life he had been in close alliance with the Pre-Raphaelites, and, like William Morris, he did a great deal to improve public taste in domestic decoration and furniture. He died on Oct. 21, 1907, at Water Eaton, Oxford.

BODMER, JOHANN JAKOB (1698–1783), Swiss-German author, was born at Greifensee, near Zürich, on July 19 1698. In 1725 he was appointed professor of Helvetian history in Zürich, a chair which he held for half a century, and in 1735 became a member of the "Grosser Rat." He published (1721–23), in conjunction with J. J. Breitinger (1701–76) and several others, *Die Diskurse der Mahlern,* a weekly journal after the model of the *Spectator.* Through his prose translation of Milton's *Paradise Lost* (1732) and his successful endeavours to make a knowledge of English literature accessible to Germany, he aroused the hostile criticism of Gottsched (*q.v.*) and his school, a struggle which ended in the complete discomfiture of the latter. His most important writings are the treatises *Von dem Einfluss und Gebrauche der Einbildungskraft* (1727); *Von dem Wunderbaren in der Poesie* (1740); and *Kritische Betrachtungen über die poetischen Gemälde der Dichter* (1741), in which he pleaded for the freedom of the imagination from the restriction imposed upon it by French pseudo-classicism and for descriptive poetry in general. Bodmer's epics *Die Sündfluth* (1751) and *Noah* (1751) are weak imitations of Klopstock's *Messias,* and his plays are entirely deficient in dramatic qualities. He did inestimable service to German literature by opening up the field of early German poetry by his editions of the Minnesingers and part of the *Nibelungenlied.* He died on his farm near Zürich on Jan. 2, 1783.

See T. W. Danzel, *Gottsched und seine Zeit* (Leipzig, 1848); J. Crüger, *J. C. Gottsched, Bodmer und Breitinger* (Stuttgart, 1884); F. Braitmaier, *Geschichte der poetischen Theorie und Kritik von den Diskursen der Maler bis auf Lessing* (Leipzig, 1888); *Denkschrift zu Bodmers 200. Geburtstag* (1900).

BODMIN, municipal borough and county town of Cornwall, England, 30 mi. W.N.W. of Plymouth, with stations on the G.W. and Southern railways. Pop. (1938) 5,514. It lies in a short valley opening westward upon that of the Camel, at the south end of the high open Bodmin moor. The site is near what seems to have been a transpeninsular route between the estuaries of the Fowey and the Camel in the early metal ages. There are traces of Roman occupation during the first century A.D. The name appears in an early charter as Bodmine, Bodman and Bodmyn. At the time of Domesday the manor, consisting of 68 houses and one market, was held by St. Petrock and owed its importance to its ecclesiastical associations. To successive priors, as mesne lords, it owed its first municipal privileges. Edward I. confirmed to the burgesses the pesage (a duty paid for the weighing) of tin, and Edward II. a market for tin and wool. The town was constituted a free borough in 1563, with two fairs and a Saturday market. The Corporation became extinct in 1789, but

a new charter of incorporation was granted in 1798 and remodelled by the act of 1835.

The large church of St. Petrock is mainly Perpendicular, but has earlier portions. Parts of the buildings of a Franciscan friary, founded *c.* 1240, are incorporated in the market-house. Most of the county institutions are here, and the assizes were fixed here in 1837, having previously been held alternatively at Launceston. Cattle, sheep and horse fairs are held, and there is a considerable agricultural trade. The borough is under the mayor, four aldermen and 12 councillors. Area, 5.2 sq.mi. For purposes of representation it is included in the Bodmin parliamentary county division.

BODO or **BÅRÅ,** a race of tribes in Assam divided roughly into two groups, the western consisting of the Chutiya, Plains Kachari, Rabha, Garo, Mech, Koch, Dhimal and Haijong tribes, the eastern of the Dimasa or Hill Kachari, Hojai, Lalung, Tippera and Moran tribes. The Bodo race were formerly dominant in Assam, where a Chutiya kingdom was destroyed by Shan invaders (*see* SHAN) who set up the Ahom kingdom in its place in the 13th century. The Chutiyas practised human sacrifice, but the general features of Bodo customs may be inferred from the accounts of Kacharis (*q.v.*), Garos and Tipperas. Most of the Bodo tribes have now become superficially Hinduized, and it has been suggested that the Tantrik beliefs, for which the Hinduism of Assam is conspicuous, are based on Bodo belief and custom which has permeated and coloured the superimposed religion. The languages belong to the Tibeto-Burmese family.

BODØ, a seaport on the northwestern coast of Norway, in Nordland *amt* (county), 67° 17′ N., on the north side of the entry into Salt fjord. Population 5,208. The rock-bound harbour admits large vessels, and there is a brisk trade in fish and eider-down. The neighbouring country has many scenic attractions. Sixty miles inland rises the great *massif* of Sulitjelma on the Swedish frontier, with its copper mines, broad snow-fields and glaciers. The fjords of the district include the imposing Beierenfjord, the Saltenfjord and the Skjerstadfjord, with its remarkable cataract (Saltstrøm). Prior to the invasion of 1940, Bodø was the northernmost point on the through auto highway.

BODONI, GIAMBATTISTA (1740–1813), Italian printer, was born in 1740 at Saluzzo in Piedmont, the son of a printer. He became a compositor for the press of the Propaganda. The infante Don Ferdinand, afterwards duke of Parma, placed him in charge of his fine printing-house in Parma, which he soon rendered the first of the kind in Europe. The intrinsic value of his editions is seldom equal to their outward splendour. His Homer, however, is a truly magnificent work; and, indeed, his Greek letters are faultless imitations of the best Greek manuscript. His editions of the Greek, Latin, Italian and French classics are all highly prized for their typographical elegance, and some of them are not less remarkable for their accuracy. Bodoni died at Padua in 1813. In 1818 a magnificent work appeared in two volumes quarto, entitled *Manuale Tipografico,* containing specimens of the vast collection of types which had belonged to him.

See De Lama, *Vita del Cavaliere Giambattista Bodoni* (1816), and Bertieri, *L'arte di Giambattista Bodoni* (1913).

BODY AND MIND. In seeking to deal with the perennial problem of "Body and Mind" our first task is to state in general terms how activities of the body are related to activities of the mind, accepting the distinction between body and mind at its face value—as it is understood in general speech. A body is something that can move in space and can be seen and touched, whereas the mind is revealed in consciousness, which is direct experience of mental activity and, as such, incapable of further definition. It is a matter of observed fact that mind or mental activity does occur in relation to bodily activity. We do not meet with minds independently of bodily organisms—at any rate, not in normal circumstances—and whereas at the time of Aristotle it was thought that the chief seat of the mind was the heart, it is now recognized by everyone that the brain—the most complex and dominant part of the nervous system—is that part of the body which is in immediate relationship to the mind, or to mental activity.

Two general questions arise. One is as to the various parts of the brain with which different kinds of mental activity are directly correlated. This is the question of cerebral localization. The other question is as to the exact nature of the relationship between mental activity and whatever kind of brain activity is correlated with it.

The Doctrine of Cerebral Localization, as first worked out by Fritz, Hitzig, Munk, Ferrier, etc., and developed in modern times by Sherrington, Head and others, is a theory of the localization, not of different kinds of mental activity, but of different kinds of physiological activity correlated therewith. The part of the brain chiefly concerned is the cerebral cortex, which is a layer of "grey" matter, one-eighth to one-twelfth of an inch in thickness, covering the two cerebral hemispheres. This cerebral cortex is a great "projection area," which acts as the ultimate receiving station for sensory impulses, and the primary transmitting station for motor impulses of a volitional, or at least of a conscious, type. Its extent is greatly increased by the "convolutions" into which it is thrown. The nerve fibres running from the cerebral cortex to the lower parts of the nervous system are mainly motor in nature, and carry impulses which pass through sub-cortical "centres" and eventually reach the various muscles on the opposite side of the body. The fibres that run into the cerebral cortex are mainly sensory in nature, and come eventually from the optic thalamus and other sub-cortical "centres" which receive impulses from the various sense organs—eye, ear, skin, etc.—likewise on the opposite side of the body. Within the cortex itself there run short "tangential" fibres which link up one part of the cortex with closely neighbouring parts. These are special association fibres which probably have to do with "immediate memory"—the memory for recent events. They are found to be degenerated in the brains of patients dying of chronic alcoholism, where an outstanding symptom is loss of memory for recent events.

Besides these tangential fibres, there are longer association fibres running from any one part of the cortex to more distant parts, including a mass of fibres, known as the "corpus callosum," linking the two cerebral hemispheres together.

By means of these association fibres and projection fibres, which link up cortical centres with one another, and, through sub-cortical centres, with the sense-organs and muscles of the body, an elaborate and complex system of "integrative action" (Sherrington) is possible, whereby the organism is enabled to react as a unity to its environment, and to obtain a unitary experience of that environment.

It has been discovered by physiological research that voluntary movement, or at least consciously-initiated movement, occurs in relation to physical change in a very special and restricted part of the cerebral cortex, viz., in the precentral convolution, the convolution in front of the fissure of Rolando. The localization is very precise, in that centres for movement of different muscles of the body are spatially distinct from one another. The muscles of the lower limb are represented in the upper part of the precentral convolution. The muscles of the trunk are represented in the middle part, and the muscles of the shoulder, upper arm, lower arm and hand are represented lower down. Lower down still the muscles of the face, tongue, lips and larynx are represented, so that the lowest part of the precentral convolution is concerned with the movement of the muscles of speech. In the postcentral convolution, just behind the fissure of Rolando, there is localization of brain change correlated with cutaneous sensibility. The cutaneous sensations arise from the skin covering the sets of muscles represented by the corresponding areas in the precentral convolution. Other forms of sensory experience are correlated with change in other parts of the cerebral cortex. Visual sensation is related to change in the occipital lobe—at the back of the brain. Auditory sensation is related to change in the first and second convolutions of the temporal lobe—the lobe at the side of the cerebral hemisphere below the fissure of Silvius. Sensations of taste and smell are probably related to change in the cerebral cortex covering the mesial surface of the hemisphere.

These motor and sensory areas are not to be regarded as having clear-cut boundaries, or as adjoining one another like a mosaic

pattern. There is probably depth-localization in the cerebral cortex in addition to correlation according to relationship of surface extent. Many details of the localization theory are still in dispute, especially as regards the more complex problems, such as that of aphasia (Henry Head). Moreover, some forms of affective experience, such as pleasure, pain, and emotional consciousness, are probably directly correlated with brain-change in the optic thalamus and other sub-cortical centres. What is not in dispute is that the different kinds of sensory experience are in direct relation to change in locally distinct parts of the cerebral cortex, and that consciously initiated motor experience is in very detailed relation to other areas of the cerebral cortex. Not only is there localization of brain changes concerned with sensory and motor consciousness, there is also a certain degree of localization of brain changes concerned with higher forms of mental activity. But such localization is not so precise, and its exact nature is still in dispute. In the view of Henry Head there is no exact "point-to-point" correspondence between brain change and mental process.

Psycho-Physical Relation.—The further, and more ultimate question now arises: What exactly is the relationship between any particular form of mental activity and its corresponding physiological correlate, or brain-event? Let us take as a definite example the visual perception of a patch of red colour. The physiological correlate of this experience is some kind of protoplasmic change in a definite part of the occipital cortex—a change ultimately describable in terms of molecular, atomic and intra-atomic movements or vibrations. Obviously, the two sides in this relation are entirely different from one another.

Materialism.—Of the various possible ways in which they may be conceived to be related, one is that the physical change in the occipital cortex produces the mental experience—the perception of red; and that there is a causal relationship between the two occurrences, a temporal sequence, in which the brain-event comes first and the mind-event comes second. Or again, let us take the experience of voluntarily moving the arm. Corresponding to that a physical change occurs in a definite part of the precentral convolution. Here, too, according to the same theory, the brain-event comes first. The change in the precentral convolution occurs because of antecedent change elsewhere in the brain. It produces both the experience of voluntary movement of the arm and also motor impulses which pass down the pyramidal tract to reach the muscles of the arm, causing their contraction. The theory thus illustrated is the theory of Materialism in its crude form. According to this theory there is always a sequence between brain change and consciousness, whether motor or sensory. The brain change always comes first and is the cause of the conscious change. Consciousness is always an effect, never a cause. Like the melody that floats from the harp-string or the shadow that accompanies the pedestrian's footsteps, it remains ineffective.

Interaction.—A second general theory of the psycho-physical relation is that mind and brain are two distinct substances or entities in causal interaction with one another. The mind is relatively passive in sensory perception and relatively active in the conscious initiation of muscular movement. One powerful argument against both these theories is that based upon the nature of the causal relation. In cases where a causal sequence is admitted and is regarded as intelligible, there is generally some thread of identity which can be postulated as running through the sequence, such that cause and effect can be conceived as earlier and later stages of a continuous process. But brain change is one thing, mental process is another; and so great is the disparity between them that it is impossible for the mind to pass smoothly and continuously, in thought, from the one to the other. For the theory of materialism there is also the difficulty that the form of causation assumed is a one-sided one, viz., one passing from the physical to the mental but not vice-versa, and therefore unique in the annals of scientific theory. A further difficulty with materialism is that it makes matter the only real agent, regarding the mind as passive on every occasion. In this it is contrary to direct experience, and leads to absurd results. Indeed, we can draw up an argument according to which it refutes itself. Thus if the brain is the only real agent and the mind is always result and never cause, *i.e.*, is always essentially passive, then mental activity is illusory. If mental activity is illusory, then intellectual activity is illusory. If intellectual activity is illusory, the products of intellectual activity are illusory. Now one such product is this theory of materialism, therefore this theory is illusory. No doubt, this "refutation" is too short and easy a way with materialism, but it does emphasize a serious difficulty in the theory.

Parallelism.—We now come to the theory of Parallelism, which represents an attempt to evade the aforementioned difficulties of materialism and interaction, especially that arising from the impossibility of conceiving any causal relation between realities so disparate in nature as the physical and the mental. According to the parallelist hypothesis, there is a point-to-point correspondence between mental processes and certain physical processes (their "physical correlates") in the organism, but without interaction. There is no temporal sequence between brain-event and mind-event, and no causal relation. The theory is a direct descendant of Spinoza's monistic doctrine that thought and extension are two distinct but corresponding aspects or "attributes" of one universal substance—God or Nature. Brain change is one manifestation of reality, and the consciousness corresponding to that brain change is another manifestation of the same reality. This theory may take different forms. The mental process and the corresponding physical process may be regarded as two aspects of something that is different from either, something that is "in itself" neither merely mental nor merely physical; or the physical process may be regarded as the more real of the two, manifesting consciousness as an additional characteristic, when of a certain degree of complexity; or, thirdly, the psychical process may be regarded as the true and ultimate reality, of which the physical process is the "appearance," or the aspect under which this reality appears to another "centre of consciousness" or subject of experience.

Two fundamental criticisms have been brought against the parallelist hypothesis. In the first place, it is argued that, whereas physical processes are multiple, mental processes show a unity. There is a unity of mind to which nothing on the physical side corresponds. Secondly, it is contended that whereas the mind is essentially teleological or purposive in nature, the body is mechanical in both structure and function, and there can be no parallelism between a teleological series and a mechanical series. But neither argument can hold its ground. On the one side, the mind is not a complete unity, and on the other, the brain shows a certain degree of unity in its working, in accordance with the integrative action of the nervous system. Again, there may be as much teleology or purposiveness in brain activity as there is in mental activity. "Mere mechanism" is a myth, handed down from 18th-century physics. In its place we should put an "organic" theory of the physical universe, such as that sketched out by A. N. Whitehead. In an organism or totality, the whole is greater than the sum of its parts. The entire system is likewise greater than the sum of its subsidiary totalities. There is at least a possibility that the whole physical universe is an organism. A more serious difficulty in Parallelism is that it definitely rules out the possibility of individual survival of bodily death. At death the brain disintegrates. If the mind is the reality of the brain, then the individual mind, the personality, must disappear at death. There are two objections to the acceptance of such a position. One is that it might in time be overturned by the discovery of definite facts, such as are claimed by spiritualists and others to be already in existence, viz., evidence of personal survival. The other is that it seems to run counter to our deepest convictions, and to be in conflict with the results of arguments based on the nature of our *value-experiences*.

Other Views.—Further arguments against parallelism, of a more materialistic trend, are to be found in the recent work of Henry Head on aphasia and of Pavlov on conditioned reflexes. Among alternative theories of the psycho-physical relation, space permits merely the mention of William James's "transmission

theory," and Bergson's view that the brain is solely a motor organ and that "pure" memory (as distinct from rote memory or habit) has no cerebral correlate. Despite the number and variety of the theories brought forward to explain the relation of body and mind, they all remain highly disputable. This probably means that the human mind has not yet succeeded in fashioning concepts adequate for use in so stupendous a task.

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BODY-SNATCHING, the secret disinterring of dead bodies in churchyards in order to sell them for the purpose of dissection. Those who practised body-snatching were frequently called resurrectionists or resurrection-men. Previous to the passing of the Anatomy Act, 1832, no licence was required in Great Britain for opening an anatomical school, and there was no provision for supplying subjects to students for anatomical purposes.

Therefore, though body-snatching was a misdemeanour at common law, punishable with fine and imprisonment, it was a sufficiently lucrative business. Besides watching the grave for some time after burial, lest it should be violated, iron coffins were frequently used for burial, or the graves were protected by a framework of iron bars called *mortsafes,* well-preserved examples of which may still be seen in Greyfriars' churchyard, Edinburgh.

See *The Diary of a Resurrectionist,* edited by J. B. Bailey (1896), which also contains a full bibliography and the regulations in force abroad for the supply of bodies for anatomical purposes.

BODY TEMPERATURE: *see* ANIMAL HEAT.

BOECE or **BOYCE, HECTOR** (*c.* 1465–*c.* 1536), Scottish historian and humanist, was born at Dundee about 1465. He received his early education at Dundee and studied in the University of Paris, where he was appointed regent, or professor, of philosophy in the College of Montaigu; and there he was a contemporary and friend of Erasmus, who in two epistles has spoken of him in the highest terms. He was the chief adviser of William Elphinstone, bishop of Aberdeen, in the foundation of the University of Aberdeen, and its first principal. He was in Aberdeen about 1500 when lectures began in the new buildings, and he appears to have been well received by the canons of the cathedral, several of whom he has commemorated as men of learning. It was a part of his duty as principal to read lectures on divinity. He was in receipt (1527–34) of a small pension from the court, was a canon of Aberdeen, vicar of Tullynessle, and then rector of Tyrie.

His first work, *Episcoporum Murthlacensium et Aberdonensium per Hectorem Boetium Vitae,* was printed at the press of Jodocus Badius (Paris, 1522). The portion of the book in which he speaks of Bishop Elphinstone is of enduring merit; it includes an account of the foundation and constitution of the college, together with some notices of its earliest members. But Boece's fame rests on his history of Scotland, published in 1527 under the title *Scotorum Historiae a prima gentis origine cum aliarum et rerum et gentium illustratione non vulgari.* This edition contains 17 books. Another edition, containing the 18th book and a fragment of the 19th, was published by Ferrerius, who has added an appendix of 35 pages (Paris, 1574). Boece's history is no mere chronicle, for he knew and copied Livy. It is a glorification of the Scottish nation, based on legendary sources, and is more interesting as romance than as history. It was translated into Scots by Bellenden. Holinshed borrowed extensively from it, and the plot of Shakespeare's *Macbeth* is traceable to it, via Holinshed. It had a wide currency abroad through its French translation, by Nicolas d'Arfeville, and undoubtedly coloured French ideas of Scottish history for a long period.

Boece professed to have obtained from the monastery of Icolmkill, through the good offices of the earl of Argyll, and his brother, John Campbell of Lundy, the treasurer, certain original histories of Scotland, and among others that of Veremundus, of whose writings not a single vestige is now to be found.

Boece's history of Scotland was translated into Scots prose by John Bellenden (ed. Bannatyne Club, Edin., 1821), and into verse by William Stewart. The *Lives of the Bishops* was reprinted for the Bannatyne Club in 1825, in a limited edition of 60 copies, and edited and translated by J. Moir for the New Spalding Club (Aberdeen, 1894). A commonplace verse-rendering of the *Life of Bishop Elphinstone,* which was written by Alexander Gardyne in 1619, remains in ms.

BOECKH, (BÖCKH), **PHILIPP AUGUST** (1785–1867), German classical scholar, was born in Karlsruhe on Nov. 24, 1785. He studied under Wolf at Halle. In 1807 he established himself as *privatdozent* in the University of Heidelberg and was shortly afterwards appointed a professor extraordinarius, becoming professor two years later. In 1811 he removed to the new Berlin university, having been appointed professor of eloquence and classical literature. He remained there till his death on Aug. 3, 1867.

Böckh worked out the ideas of Wolf in regard to philology, and illustrated them by his practice. Discarding the old notion that philology consisted in a minute acquaintance with words and the exercise of the critical art, he regarded it as the entire knowledge of antiquity. He divides it into five parts: first, an inquiry into public acts, civil institutions, and law; second, an inquiry into private affairs; third, an exhibition of the religions and arts of the ancient nations; fourth, a history of all their moral and physical speculations and beliefs, and of their literatures; and fifth, a complete explanation of the language.

Böckh's works are:—(1) an edition of Pindar, the first volume of which (1811) contains the text of the Epinician odes; a treatise, *De Metris Pindari,* in three books; and *Notae Criticae;* the second (1819) contains the *Scholia;* and part ii. of volume ii. (1821) contains a Latin translation, a commentary, the fragments and indices. It was especially the treatise on the metres which placed Böckh in the first rank of scholars. In it he pointed out the close connection between the music and the poetry of the Greeks. He investigated minutely the nature of Greek music and musical instruments, so far as it can be ascertained; and he explained the statements of the ancient Greek writers on rhythm. Thus he founded the scientific treatment of Greek metres. (2) *Die Staatshaushaltung der Athener* (1817; 2nd ed. 1851, with a supplementary volume *Urkunden über das Seewesen des attischen Staats;* 3rd ed. by Fraenkel, 1886), Eng. trans. by Sir George Cornewall Lewis (1828) *The Public Economy of Athens.* A work of a similar kind was his *Metrologische Untersuchungen über Gewichte, Münzfüsse, und Masse des Alterthums* (1838). (3) Böckh was chosen as the principal editor of the *Corpus Inscriptionum Graecorum.* This great work (1828–77) is in four volumes, the third and fourth volumes being edited by J. Franz, E. Curtius, A. Kirchhoff and H. Roehl.

Böckh holds a prominent position amongst the investigators of ancient chronology. His principal works on this subject were: *Zur Geschichte der Mondcyclen der Hellenen* (1855); *Epigraphisch-chronologische Studien* (1856); *Über die vierjährigen Sonnenkreise der Alten* (1863), and several papers which he published in the *Transactions of the Berlin Academy.* Böckh also occupied himself with philosophy. *De Platonica corporis mundani fabrica* (1809) was followed by *De Platonico Systemate Caelestium globorum et de vera Indole Astronomiae Philolaice* (1810), *Manetho und die Hundsternperiode* (1845) and *Untersuchungen uber das kosmische System des Platon* (1852).

Besides his edition of Pindar, Böckh published an edition of the Antigone of Sophocles (1843) with a poetical translation and essays. An early and important work on the Greek tragedians is his *Graecae Tragoediae Principum . . . num ea quae supersunt et genuina omnia sint et forma primitiva servata* (1808).

Boeckh's *Gesammelte kleine Schriften* appeared 1858–74. His lectures, in the years 1809–65, were published by Bratuscheck under the title of *Encyklopädie und Methodologie der philologischen Wissenschaften* (2nd ed., Klussmann, 1886). His philological and scientific theories are set forth in C. F. Elze, *Über Philologie als System* (1845), and H. Reichhardt, *Die Gliederung der Philologie entwickelt* (1846). His correspondence with Ottfried Müller appeared at Leipzig in 1883, further letters to Müller (Leipzig, 1908) and to Dissen (Leipzig, 1907). *See* Sachse, *Erinnerungen an August Böckh* (1868); Stark, in the *Verhandlungen der Würzburger Philologensammlung* (1868); Max Hoffmann, *August Böckh* (1901); and S. Reiter, in *Neue Jahrbücher für das klassische Altertum* (1902), p. 436; Sandys, *History of Classical Scholarship,* 3rd ed. (1921), iii. 96 *et seq.*

BOECKLIN, ARNOLD (1827–1901), Swiss painter, was born at Basle Oct. 16, 1827, and died at San Domenico, near Florence, Jan. 16, 1901. He studied at Düsseldorf, Antwerp, Brussels and Paris, but found his real inspiration in Italy, where he returned from time to time, and where the last years of his life were spent. Boecklin first won a reputation by his "Great Pan," exhibited at Munich in 1856, and bought for the Pinakohek, and from 1858 to 1861, taught at the Weimar academy, but the nostalgia of the Italian landscape pursued him, and after an interval during which he completed his mythological frescoes for the decoration of the gallery at Basle, he returned to Italy. At Basle, and in almost all the great German galleries, there are many examples of his art. However, he was first and foremost a landscape painter. In his numerous mythological subjects he sought to express the soul of the landscape in the figures to which it gave birth. His influence on German painting, especially on the Munich school, was very great. His life has been written by Henri Mendelssohn.

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BOEHM, SIR JOSEPH EDGAR, BART. (1834–1890), British sculptor, was born of Hungarian parentage on July 4, 1834, at Vienna, where his father was director of the imperial mint. After studying the plastic art in Italy and at Paris, he worked for a few years as a medallist in his native city. The colossal statue of Queen Victoria, executed in marble (1869) for Windsor castle, and the monument of the duke of Kent in St. George's chapel, were his earliest considerable works. He was made A.R.A. in 1878, and produced soon afterwards the statue of Carlyle on the Thames embankment at Chelsea. In 1881 he was appointed sculptor in ordinary to the queen, and in the ensuing year became full academician. Among his important works in London are the sarcophagus of Dean Stanley in Westminster abbey; the monument to General Gordon in St. Paul's cathedral; and the equestrian statue of the duke of Wellington at Hyde Park corner. Boehm designed the coinage for the jubilee of Queen Victoria in 1887. He died suddenly in his studio at South Kensington on Dec. 12, 1890.

BOEHME (BEHMEN, BEEM, BEHMONT, etc.), **JAKOB** (1575–1624), German mystic, was born at Alt-Seidenberg in Upper Lusatia. After attending the town school of Seidenberg, he entered the shoemaking trade in 1589. In 1612 he gave up business and wrote *Aurora, oder die Morgenröte im Aufgang.* Gregory Richter, the pastor primarius of Görlitz, denounced the work as heretical; and the municipal council seized the manuscript and charged Boehme to abstain from such writings. However, in 1618, Boehme began to produce a number of treatises, expository and polemical, but only a few selections on repentance, resignation, etc., were published as *Der Weg zu Christo* (1624) before clerical hostility was renewed. On his return from a visit to Dresden, he died on Nov. 17, 1624.

Boehme claimed that his speculative power came by a direct divine illumination which enabled him to see the root of all mysteries, the *Ungrund* or *Urgrund* whence issue all contrasts and discordant principles, hardness and softness, severity and mildness, love and sorrow, heaven and hell. These contrasts he attempted to describe in their issue and to reconcile in their eternal result, an attempt often obscured by his puzzling phraseology, largely borrowed from the school of Paracelsus.

Boehme's speculations began with a study of God in Himself (*Aurora*), passed through a study of the manifestation of God in the structure of the world; and of man (*Die Drei Principien göttlichen Wesens; Vom dreifachen Leben der Menschen; Von der Menschwerdung Christi; Von der Geburt und Bezeichnung aller Wesen*), and culminated in his exposition of the life of God in the soul of man (*Von der Gnadenwahl; Mysterium Magnum, Von Christi Testamenten*).

God who is at once *Alles* and *Nichts,* because to think of His nature we must abstract from creatures, is characterized by will whose desire to become manifest results firstly in knowledge of Himself and secondly in the production of creatures. This production is not a creation, for out of nothing, nothing comes; it is rather a generation from the eternal divine nature wherein all things dwell latently. The properties through which the divine energy operates in the procession of spiritual and corporeal beings from the *Ungrund* or Abyss, are firstly, Contraction, Diffusion, and their resultant, the Agony of the unmanifested Godhead. The transition is made; by an act of will the divine Spirit comes to light and immediately the manifested life appears as Love, Expression and their resultant Visible Variety. Hence the world is a manifestation of God who is both transcendent and immanent.

To account for evil, Boehme resorts neither to dualism nor to a repudiation of its existence. His consciousness of the difficulty is obvious from the progressive changes in his attempted solution of the problem. In the *Aurora* nothing save good proceeds from the *Ungrund,* though there is good that abides and good that falls—Christ and Lucifer. In the later works, the antithesis is directly generated, being given as factors of life and movement from the one creative source, the bottomless abyss. In the last writings, evil is a direct outcome of the primary principle of divine manifestation—it is the wrath side of God. Corresponding to these solutions, Boehme has different moral ends for the world's history. In the first stage it is created in remedy of a decline; in the second, for the adjustment of the balances of forces; in the third, to exhibit the eternal victory of good over evil, of love over wrath.

Fallen man has three factors, spirit, soul and body, spirit being the principle of light, soul of darkness, and body, which belongs to the world of sense, the resultant of spirit and soul. Man aspires to a knowledge of God because all things tend towards their source, but a re-birth is necessary before he can have true self-knowledge, the *sine qua non* for a knowledge of God.

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BOEHM VON BAWERK, EUGEN (1851–1914), Austrian economist and statesman, was born at Brünn on Feb. 12, 1851, and died at Vienna on Aug. 28, 1914. He was professor of political economy at Innsbruck (1881–89) and Vienna (1905–14), minister of finance (1895, 1897–98 and 1900–04) and president of the Vienna Academy of Sciences. He wrote the most elaborate exposition of the "Austrian" theory of value and prices, was the author of a theory of interest which approaches the problem both from the angle of time preference and of the marginal productivity of capital, and was a critic of the Marxian theory of profit.

The first edition of his main treatise *Kapital und Kapitalzins* was translated in two parts by W. Smart, viz., *Capital and Interest* (1890) and *The Positive Theory of Capital* (1891); a complete translation of the last, an enlarged and revised edition by H. Gaitskell, was in preparation in 1945. His collected essays were edited in two volumes by F. X. Weiss, 1924 and 1926. In English translation there are available: *Karl Marx and the Close of his System* (by A. M. Macdonald, 1898) and *Recent Literature on Interest* (by W. A. Scott and S. Feilbogen, 1903). (L. VON M.)

BOELLMANN, LEON (1862–1897), French composer, was born at Ensisheim, Alsace, Sept. 25, 1862, and died in Paris Oct. 11, 1897. He studied at the *École de musique religieuse* in Paris and became organist at the church of St. Vincent de Paul, Paris. He composed some works for the organ, also church and chamber music. His best-known work is the *Variations Symphoniques* for violoncello and orchestra.

BOEOTIA, a district of central Greece, bounded by Phocis and Locris on the west and north; by Attica, Megaris and the Corinthian gulf on the south; and by the Strait of Euboea on the northeast; area, 1,100 square miles. In the north the basin of the Cephissus and Lake Copaïs lies between the watershed range of Parnassus (*q.v.*) and Helicon (5,470 ft.) and the Locrian

ridges, which extend eastward from Mt. Oeta, and form with their landward spurs the pass and battlefield of Chaeronea, between the Cephissus valley and the Copaïs lake-land and also the south boundary of Copaïs, with other battle grounds at Coronea and Haliartus. Through this coast-range natural tunnels (*katavothra*) carried off the overflow from Copaïs. South of this, a wider lowland is divided by the low ridge of Teumessus into the Ismenian plain dominated by Thebes, and the valley of the Asopus which rises east of Helicon and flows eastward into the Euboean strait, under the steep north front of Cithaeron and Parnes. Though the Boeotian fenland has foggy winters and sultry summers, its rich soil, though liable to floods, is good for crops, plantations and pasture. The central position of Boeotia, the strength of its frontiers and the ease of internal communication enhanced its political importance. But the lack of harbours restricted trade and sea power. The Boeotians were proverbially as dull as their native air, but they were sturdy fighters, and produced men of such varied distinction as Hesiod, Pindar, Epaminondas, Pelopidas and Plutarch.

The two great centres of Boeotian legend, "Cadmeian" Thebes and "Minyan" Orchomenus, were outposts of the Minoan culture of Crete already in the 14th century B.C., and Orchomenus had passed through two periods of settlement already before its great "bee-hive" tomb (so called "Treasury of Minyas") was built. To its Minyan engineers are probably due the artificial conduits which supplemented the *katavothra* of the Copaïs. The quarrels of the Cadmeian dynasty with Orchomenus, and its disastrous wars with Argos (1230–1200) explain the complete replacement of these earlier régimes by the Boeotian immigrants, of northern Aeolic dialect, about 1120. But Orchomenus and also some marginal communities in the south, Plataea, Thespiae, Tanagra, never acquiesced in the political leadership of Thebes, whose central position and military strength might otherwise have made it a suitable capital, and realized the ambition of the Thebans to absorb other townships into a single state, as Athens had unified Attica (*q.v.*). But the outlying cities only tolerated a loose federation which in early times had a mainly religious character. Boeotia hardly figures in history before the late 6th century, when the resistance of Plataea to the federating policy of Thebes led to a long quarrel between Athens and Thebes.

During the Persian invasion of 480, Thebes assisted the invaders, but Plataea and some other States were on the patriot side, and for a time the presidency of the Boeotian League was taken away from Thebes. But in 457 the Spartans reinstated Thebes as a bulwark against Athenian aggression. Athens retaliated by a sudden advance upon Boeotia, and after the victory of Oenophyta the land remained for ten years under Athenian control, exercised through newly installed democracies; but in 447, after a reactionary victory at Coronea, the old constitutions were restored, and Thebes recovered its primacy in the league. In the Peloponnesian War the first blow was struck by Thebes against Plataea, and in 424 Boeotians decisively defeated Athenian forces at Delium. Though slightly estranged from Sparta after the peace of Nicias, they rendered good service at Syracuse and Arginusae and made possible the Spartan occupation of their outpost at Decelea in northern Attica. And at the close of the war, Athens might have been utterly destroyed had not Sparta restrained Theban animosity.

About this time the Boeotian League comprised 11 groups of sovereign cities and associated townships, each of which elected one Boeotarch or minister of war and foreign affairs, contributed 60 delegates to the federal council at Thebes, and supplied a contingent of about 1,000 foot and 100 horse to the federal army. A safeguard against encroachment by the central government was provided in councils of individual cities, to which all important questions of policy had to be submitted for ratification. These local councils, to which the propertied classes alone were eligible, were subdivided into four sections, resembling the *prytaneis* of the Athenian council, which took it in turns to take previous cognizance of all new measures. Thucydides (v. 38), in speaking of the "four councils of the Boeotians," is referring to the plenary bodies in the various states.

Boeotia was prominent in the Corinthian League against Sparta, especially at Haliartus and Coronea (395–394) because of resentment against foreign interference. Yet disaffection against Thebes was now growing rife, and Sparta fostered this feeling by stipulating for complete independence of all cities in the peace of Antalcidas (387). In 374 Pelopidas restored the Theban dominion. Boeotian contingents fought in all the campaigns of Epaminondas, and in the later wars against Phocis (356–346); while in the dealings with Philip of Macedon the other cities appear merely as the tools of Thebes. The prevalence of democracy made sovereign the popular assembly, which elected the Boeotarchs (between seven and 12 in number), and sanctioned all laws. After the battle of Chaeroneia, in which the Boeotian heavy infantry once again distinguished itself, the land never rose again to prosperity. The destruction of Thebes by Alexander (335) seems to have paralysed the political energy of the Boeotians, though it led to an improvement in the federal constitution, by which each city received an equal vote. Henceforth they never pursued an independent policy, but followed the lead of protecting powers. Though enrolled for a short time in the Aetolian League (about 245 B.C.) Boeotia was generally loyal to Macedonia, and supported its later kings against Rome. In return for the excesses of the democracies Rome dissolved the league, which, however, was allowed to revive under Augustus, and merged with the other central Greek federations in the Achaean synod. The death-blow to the country's prosperity was given by the devastations during the first Mithradatic War.

Save for a short period of prosperity under the Frankish rulers of Athens (A.D. 1205–1310), who repaired the *katavothra* and fostered agriculture, Boeotia long continued in a state of decay, aggravated by occasional barbarian incursions. Even in the 19th century a large part of the population was still Albanian. The first step towards the country's recovery was in 1895, when the outlets of Copaïs were again put into working order, reclaiming a large area for agriculture. Railway communication with Athens, Volo, and Salonica continues to develop the natural riches of the whole land. Boeotia is at present a province with Livadia (the old Turkish capital) for its centre; the other surviving townships are quite unimportant.

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BOER, the Dutch form of the Eng. "boor," in its original signification of husbandman (Ger. *Bauer*), a name given to the Dutch farmers of South Africa, and especially to the Dutch population of the Transvaal and Orange River States. (*See* SOUTH AFRICA and TRANSVAAL.)

BOERHAAVE, HERMANN (1668–1738), Dutch physician and a famous professor of medicine, was born at Voorhout near Leyden on Dec. 31, 1668, and died at Leyden on Sept. 23, 1738. He graduated in philosophy at Leyden and in medicine at Harderwyck. He spent the whole of his professional life at Leyden, being professor of botany and medicine, rector of the university, professor of practical medicine and professor of chemistry. His genius so raised the fame of the university of Leyden, especially as a school of medicine, that it became a resort of strangers from every part of Europe. All the princes of Europe sent him disciples, who found in this skilful professor not only an indefatigable teacher, but an affectionate guardian. When Peter the Great went to Holland in 1715, to instruct himself in maritime affairs, he also took lessons from Boerhaave. A Chinese mandarin wrote him a letter directed "To the illustrious Boerhaave, physician in Europe," and it reached him in due course.

His principal works are *Institutiones medicae* (Leyden, 1708); *Aphorismi de cognoscendis et curandis morbis* (Leyden, 1709), on which his pupil and assistant, Gerard van Swieten (1700–72) published a commentary in 5 vols.; and *Elementa chemiae* (Paris, 1724).

BOERNE, KARL LUDWIG (1786–1837), German political writer and satirist, was born on May 6, 1786, at Frankfort-on-Main, where his father, Jakob Baruch, carried on the business of a banker. After wasting some years as a medical student, he turned to political science and took his doctor's degree at Giessen in 1811. Frankfort was at this time constituted as a grand duchy, and Boerne was appointed police actuary there; but old conditions were restored in 1815 and, as a Jew, he was dismissed from his office. Embittered by the oppression under which the Jews suffered in Germany, he engaged in journalism, and edited the Frankfort liberal newspapers, *Staatsristretto* and *Die Zeitschwingen.* In 1818 he became a convert to Lutheran Protestantism, changing his name from Loeb Baruch to Ludwig Boerne, in order to improve his social standing. From 1818 to 1821 he edited *Die Wage,* but the paper was suppressed by the police, and in 1821 he abandoned journalism for a time and led a retired life in Paris, Hamburg and Frankfort. After the July Revolution (1830), Boerne hurried to Paris, expecting to find the newly-constituted state of society somewhat in accordance with his ideas of freedom. Although to some extent disappointed in his hopes, he was not disposed to look any more kindly on the political condition of Germany; this lent additional zest to the brilliant satirical letters (*Briefe aus Paris,* 1830–33) which he began to publish in his last literary venture, *La Balance,* a revival under its French name of *Die Wage.* The *Briefe aus Paris* was his most important publication, and a landmark in the history of German journalism. Its appearance led him to be regarded as one of the leaders of the new literary party of "Young Germany."

Boerne's works are remarkable for brilliancy of style and for a thorough French vein of satire. His best criticism is to be found in his *Denkrede auf Jean Paul* (1826), his *Dramaturgische Blätter* (1829–34), and the witty satire, *Menzel der Franzosenfresser* (1837). He also wrote a number of short stories and sketches, of which the best known are the *Monographie der deutschen Postschnecke* (1829) and *Der Esskünstler* (1822).

BIBLIOGRAPHY.—The first edition of his *Gesammelte Schriften* appeared at Hamburg (1829–34) in 14 volumes, followed by 6 volumes of *Nachgelassene Schriften* (Mannheim, 1844–50); more complete is the edition in 12 volumes (Hamburg, 1862–63), reprinted in 1868 and subsequently. The latest complete edition is that edited by A. Klaar (8 vols., Leipzig, 1900). For further biographical matter *see* M. Holzmann, *L. Börne, sein Leben und sein Wirken* (Berlin, 1888); *Börnes Briefe an Henriette Herz* (1802–07), first published in 1861, have been re-edited by L. Geiger (Oldenburg, 1905), who has also published Boerne's *Berliner Briefe* (1828) (Berlin, 1905). *See* also Heine's witty attack on Boerne (*Werke,* ed. Elster, vii.), and the chapters in G. Brandes, *Hovedströmninger i det 19de Aarhundredes Litteratur* vol. vi. (Copenhagen, 1890, German trans. 1891. English trans. 1905).

BOER WAR: *see* SOUTH AFRICAN WAR.

BOETHIUS, ANICIUS MANLIUS SEVERINUS (*c.* A.D. 480–524), philosopher and statesman, has been described as the last of the Romans and the first of the Scholastics. On the death of his father, who had been consul in 487, the young Boethius passed into the charge of the senator Q. Aur. Memmius Symmachus, whose daughter Rusticiana he married. Through his intimacy with Theodoric, the Ostrogoth, ruler in Rome from 500, Boethius was made consul in 510, and his sons, while still young, held the same honour together (522). But his good fortune did not last, and he attributes the calamities that came upon him to the ill-will roused by his bold maintenance of justice and his opposition to every oppressive measure. Towards the end of the reign of Theodoric he was accused of treason, the charges being that he had conspired against the king, that he was anxious to maintain the integrity of the senate, and to restore Rome to liberty, and that for this purpose he had written to the emperor Justin. Justin had, no doubt, special reasons for wishing an end to the reign of Theodoric. Justin was orthodox, Theodoric was an Arian. The orthodox subjects of Theodoric were suspicious of their ruler; and many would gladly have joined in a plot to displace him. The knowledge of this fact may have rendered Theodoric suspicious. But Boethius denied the accusation in unequivocal terms. He did indeed wish the integrity of the senate. He would fain have desired liberty, but all hope of it was gone. The letters addressed by him to Justin were forgeries, and he had not been guilty of any conspiracy. Notwithstanding his innocence he was condemned and sent to the prison at Ticinum (Pavia). It was during his confinement there that he wrote the famous *De Consolatione Philosophiae.* He was put to death in 524, and in 996 Otho III. ordered his remains to be removed from Pavia to the church of S. Pietro in Ciel d'Oro.

The contemporaries of Boethius regarded him as a man of profound learning. Priscian the grammarian speaks of him as having attained the summit of honesty and of all sciences. Cassiodorus, *magister officiorum* under Theodoric and the intimate acquaintance of the philosopher, employs language equally strong, and Ennodius, the bishop of Pavia, knows no bounds for his admiration. During the middle ages, the influence of Boethius was exceedingly powerful, and rightly, for he had preserved for them the learned treatises of expiring antiquity. Although he had planned to translate all the works of Plato and of Aristotle and to reconcile their systems of philosophy, he did not fully accomplish this; but his work on Aristotle entitles him to the credit of having introduced that philosopher into the West. He translated into Latin Aristotle's *Categories* and his *Perihermenias,* and wrote a commentary on the first and a double commentary on the second. The translations of the *Analytica Priora et Posteriora,* the *Topica,* and *Elenchi Sophistici* ascribed to him in the Basle (1546) edition of his works (this was utilized by Migne, *Patrol. lat.* 64), are now regarded as spurious (*cf.* Ueberweg and Grabmann, works quoted below). He also produced commentaries on the *Isagoge* of Porphyry and the *Topica* of Cicero, as well as independent works on logic:—*Introductio ad Categoricos Syllogismos,* in one book; *De Syllogismis Categoricis,* in two books; *De Syllogismis Hypotheticis,* in two books; *De Divisione,* in one book; *De Differentiis Topicis,* in four books—all of which had great influence on the development of the terminology of logic in the West. His elementary treatises on arithmetic and music furnished manuals for the quadrivium of the schools, and that on music long remained a text-book in the universities of Oxford and Cambridge. The *Ars Geometriae* is regarded as spurious by many critics, though some incline to accept the *Interpretatio Euclidis.* But by far the most important and the most famous of the works of Boethius is his *De Consolatione Philosophiae,* its high reputation in mediaeval times being attested by the numerous translations, commentaries, and imitations which then appeared. Among others, Asser, the instructor of Alfred the Great, and Robert Grosseteste, bishop of Lincoln, commented on it. Alfred translated it into Anglo-Saxon and Chaucer into English. Versions of it appeared in German, French, Italian, Spanish, and Greek before the end of the 15th century.

This famous work, which is alternately in prose and verse, exhibits the neo-platonism and stoicism that Boethius had imbibed at Rome, and because it deals with natural theology only, ignores the possibility of finding consolation in any Christian belief. The first book opens with a few verses, in which Boethius describes how his sorrows had brought him to a premature old age. As he is thus lamenting, a majestic woman, whom he recognizes as his guardian Philosophy, appears. Resolving to apply the remedy for his grief, she questions him for that purpose. She finds that he believes that God rules the world, but does not know what he himself is; and this absence of self-knowledge is the cause of his weakness. In the second book Philosophy presents to Boethius Fortune, who enumerates the blessings he has enjoyed and then proceeds to discuss the unsatisfactory blessings that are bestowed by her. In the third book Philosophy promises to lead him to true happiness, which is to be found in God alone, for since God is the highest good, and the highest good is true happiness, God is true happiness. Nor can real evil exist, for God is all-powerful, and since He does not wish evil, evil must be non-existent. In the fourth book Boethius raises the question, Why, if the governor of the universe is good, do evils exist, and why is virtue often punished and vice rewarded? Philosophy proceeds to show that in fact vice is never unpunished nor virtue unrewarded. From this Philosophy passes on to a discussion of the nature of providence and fate, and shows that every fortune is good. The fifth and last book raises the question of man's free will and God's foreknowledge, and, by an exposition of the nature of God, attempts to show that these doctrines are not inconsistent; the conclusion is

that God remains a foreknowing spectator of all events, and that the ever-present eternity of his vision agrees with the future quality of our actions, dispensing rewards to the good and punishments to the wicked.

Of the five theological tractates ascribed to Boethius, it is now generally admitted that only the *De Fide Catholica* is spurious. This admission is based on a note in a Reichenau manuscript of the 10th century in which Cassiodorus ascribes to his friend Boethius "a book on the Trinity, some dogmatic chapters, and a book against Nestorius." (See *Anecdoton Holderi,* ed. H. Usener, Leipzig, 1877.) E. K. Rand, who formerly adopted this position, is now inclined to accept even the *De Fide Catholica.* (*See* his edition in the *Loeb Classical Series,* p. 52, 1918.) The first tractate, *De Sancta Trinitate,* is addressed to Symmachus, and the result of the short discussion, which is of an abstract nature, and deals partly with the ten categories, is that unity is predicated absolutely, or, in regard to the substance of the Deity, trinity is predicated relatively. The second treatise, *Utrum Pater et Filius et Spiritus Sanctus de divinitate substantialiter praedicentur,* is addressed to John the deacon, and arrives at the same conclusion as the first. The third treatise bears the title, *Quomodo substantiae in eo quod sint bonae sint cum non sint substantialia bona,* the fourth is the *De Fide Catholica,* and the fifth the *Contra Eutychen et Nestorium,* chapter iii. of which contains the famous definition of *persona: Persona est naturae rationabilis individua substantia.*

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(2) *Authorities.*—J. G. Sutterer, *Der letzte Römer* (Eichstädt, 1852); H. Usener, *Anecdoton Holderi* (Leipzig, 1877); M. Grabmann, *Die Gesch. der scholast. Methode,* vol. i. (Freiburg, i/B., 1909); Manitius, *Gesch. der lat. Lit d. Mittelalters,* vol. i. (Munich, 1911); Ueberweg, *op. cit.;* H. F. Stewart, *Boethius: an Essay* (1891); T. Hodgkin, *Italy and her Invaders,* iii. bk. iv. ch. xii. (1896). On the date and order of the works of Boethius *see* S. Brandt in *Philologus,* lxii. pp. 141–154, 234–279, and A. P. McKinlay, *Harvard Classical Studies* (1907).

BOETHUS, a sculptor of the Hellenistic age, a native of Carthage (or possibly Chalcedon), who lived probably in the 2nd century B.C. He was noted for his representations of children, and especially for a group representing a boy struggling with a goose, of which several copies survive in museums.

BOG (from Ir. and Gael. *bogach, bog,* soft), soft, spongy, water-logged ground, composed of vegetation, chiefly mosses, in various stages of decomposition forming "peat" (*q.v.*). With very heavy rain there is danger of a "bog-slide," or "bog-burst," which may obliterate the neighbouring cultivated land with a deposit of the contents of the bog. Destructive bog-slides have occurred in Ireland, such as that at Kilmore, Co. Galway, in 1909, but on a smaller scale they have been experienced in several parts of the British Isles.

BOGALUSA, a city of Washington parish, Louisiana, U.S.A. in the southeastern part of the state, near the Pearl river, on the Gulf, Mobile and Ohio railroad, about 60 mi. N. by E. of New Orleans. The population in 1940 was 14,604. The industries include large kraft paper, board and paper bag mills; creosoting plant; hardwood and pine lumber mills; furniture stock plant and other related industries, employing approximately 5,000 workers with a pay roll of $5,000,000 and an output of manufactured products of $18,000,000 annually. There are 260,000 ac. of reforested lands. It has a commission form of government.

BOGARDUS, JAMES (1800–1874), American inventor, was born in Catskill, N.Y., on March 14, 1800. He was apprenticed to a watch-maker and his first inventions were in chronometry. At 28 he produced the "ring flier" used in cotton-spinning and, shortly after, a grist-mill in which the stones followed the same direction at varying speeds. From 1831–39 he gave much attention to engraving and in the latter year submitted the prize-winning specifications in a postage-stamp manufacturing competition opened by the British Government. He also perfected a separate die process for making bank-notes. A dynamometer, a pyrometer, rubber-cutting, glass-pressing, deep-sea sounding and drilling machines were among his other inventions. In 1847 he erected for his New York factory a cast-iron building of five stories, the first of the kind in the United States; he later contracted for the erection of many other similar structures. He died in New York City on April 13, 1874.

BOG ASPHODEL: *see* ASPHODEL.

BOGATZKY, KARL HEINRICH VON (1690–1774), German hymn-writer, was born at Jankowe in Lower Silesia, on Sept. 7, 1690. After living for a time at Köstritz, and from 1740–45 at the court of Christian Ernst, duke of Saxe-Coburg, at Saalfeld, he made his home at the Waisenhaus (orphanage) at Halle, where he engaged in spiritual work and in composing hymns and sacred songs, until his death on June 15, 1774. Bogatzky's chief works are *Güldenes Schatzkästlein der Kinder Gottes* (1718), which has reached more than sixty editions; and *Übung der Gottseligkeit in allerlei geistlichen Liedern* (1750).

See Bogatzky's autobiography—*Lebenslauf von ihm selbst geschrieben* (1872); Kelly, *C. H. von Bogatzky's Life and Work* (1889).

BOGHAZ KEUI, a small village in Asia Minor, north-west of Yuzgat in the Angora vilayet, remarkable for the ruins and rock-sculptures in its vicinity. The discovery of a rich store of cuneiform tablets during the early part of the 20th century has shown Boghaz Keui to have been the site of the Hattic capital during the 14th and 13th centuries B.C. Though the original site of the capital is thought to have been somewhere on the eastern edge of the Axylon plains, nevertheless when the Hittite empire included all Cappadocia, most of Syria and central Asia Minor, Boghaz Keui was the seat of authority. Many of the tablets are in native dialects, a factor which has caused difficulty in deciphering them. The finds indicate a high standard of legal, artistic and social life, and are the source of new and unexpected facts illustrating the early history of Asia Minor.

BOGIE, an under-carriage possessing freedom to move in such a way that wheels can turn or follow a track with the least effort and friction. Familiar examples are those of locomotives, and long carriages, vans, wagons, tenders, and tramcars. There may be two wheels only thus carried, if conditions of length impose restriction, or the weight does not require four wheels. This type, called a "pony" truck, has a triangular frame, terminating in a pivot some way from the axle, and connecting thus to the main framing. It is employed to a large extent for engines not requiring high speeds. Six-wheel bogies are fitted on very large tenders, and some of the heaviest carriages and vans, but the four-wheel meets ordinary requirements for rolling-stock and locomotives when the length is too much for rigid wheels. Tramcar bogies often have two pairs of wheels of unequal diameter, the driven axle carrying the larger pair, but in double-motor trucks (four motors per tram) all the wheels are of equal size.

The railway bogie was originated soon after 1830. Some of the first designs had ball-and-socket joints to form the union with the framing, but a pivot pin soon came into favour. Then the Adams bogie was invented, having the pin in a sliding-block controlled by rubber blocks, thus affording a little lateral freedom. This style, but with steel springs, is in great vogue. Another kind of bogie has a swinging link device for lateral play, instead of the sliding action. The "radial axle," with two wheels, is controlled by curved guides in the framing, without pivotal movement.

The diagram represents the features of a four-wheel bogie designed by Sir John Fowler, K.C.B., for L.M.S. express locomotives. The casting which turns around the pivot-pin has a cross-movement in between castings secured to the frame-plates of the bogie, four powerful springs tending to keep the pin central. The axle-boxes are not sprung with separate coiled springs, as in some

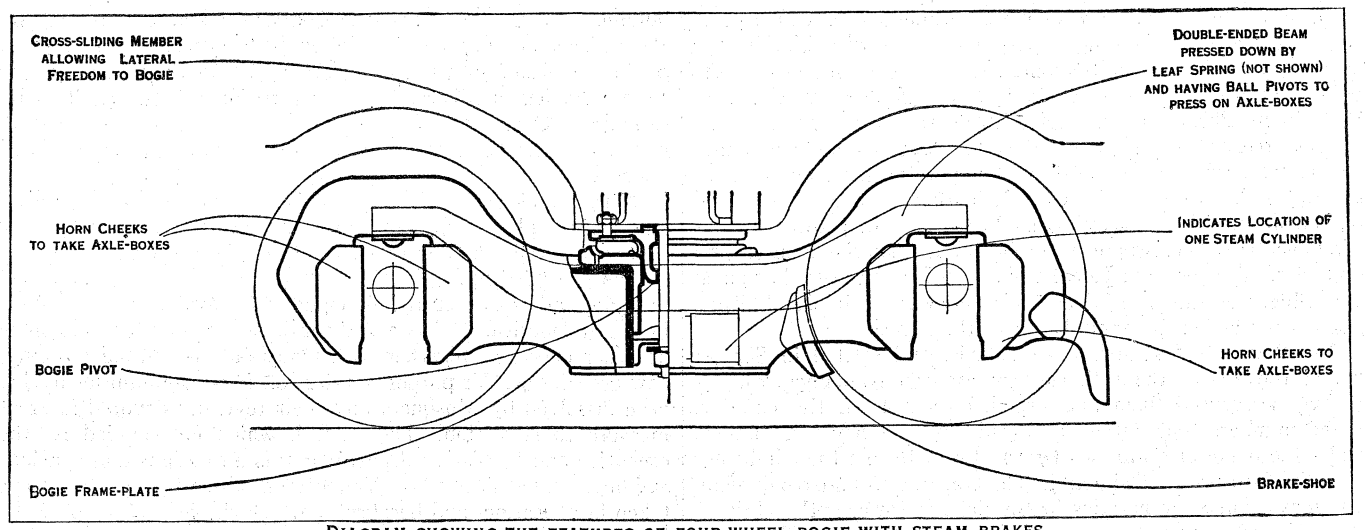

DIAGRAM SHOWING THE FEATURES OF FOUR-WHEEL BOGIE WITH STEAM BRAKES

This type is used for London Midland and Scottish express locomotives. The bogie is distinctive in having four 7-in. bore steam cylinders, operating links which move the brake-shoes on to the 3 ft. 3½-in. diameter wheels, the action taking place simultaneously with the application of the brake-shoes on the driving wheels

instances, but by two centrally-located leaf springs, controlling beams which reach over the boxes. This bogie is rather distinctive from the fact of having four 7in.-bore steam cylinders, operating links which move the brake-shoes on to the 3ft. 3½in. diameter wheels, the action taking place simultaneously with the application of the brake-shoes on the driving wheels.

A bogie annealing furnace is a long unit into which piles of material for heat treatment may be carried on low bogies or trolleys, moved along on rails by an hydraulic ram or a crane. The bogies, after a certain period of heating, come out with their loads at the rear end of the furnace for cooling down.

BOGNOR REGIS, urban district and seaside resort, Sussex, England, 66 mi. S.S.W. from London by the Southern railway. Pop. (1938) 19,890. Area 4.8 sq.mi. It was chosen for the convalescence of King George in 1929, hence the adjective "Regis." The town possesses a pier and promenade, extensive pleasure gardens, a theatre, assembly rooms, and numerous convalescent homes. The church of the mother parish of South Bersted is Norman and Early English, and retains a fresco of the 16th century.

BOGÓ, a municipality (with administrative centre and 12 barrios or districts), of the province and island of Cebu, Philippine Islands, on Bogó bay, at the mouth of the Bulac river in the northeast part of the island. Pop. (1939), 27,517; and six whites. Although the climate is hot even for the Philippines, it is not unwholesome and the locality is fertile and produces copra, sugar, maize (corn), maguey, palay (rice) and varieties of fruits. Manufactures and exports include hats, cloth, baskets and rope, and fishing is locally important. Of those between the ages of 6 and 19, 20·4% attended school and of those ten years old and over 26·5% were reported as literate. The vernacular is Cebuano.

(C. S. L.)

BOGODUKHOV, a town in the Kharkov province of the Ukrainian Soviet Socialist Republic. Lat. 50° 9′ N., Long. 35° 33′ E. Population 16,013. It is on the railway and has a radio-station. It is the centre of a market gardening area and trades in grain, cattle and fish and has koustar (peasant) leather industries. It was a settlement in 1571, and was captured by Menshikov and the Emperor Alexius in the Russo-Swedish war, 1709. Its cathedral was built 1793.

BOGOMILS, the name of an ancient religious community which had its origin in Bulgaria. It is a complicated task to determine the true character and the tenets of ancient sects of this kind, considering that almost all the information that has reached us has come from their opponents. Concerning the Bogomils something can be gathered from the information collected by Euthymius Zygadenus in the 12th century, and from the polemic *Against the Heretics* written in Slavonic by St. Kozma during the 10th century. The old Slavonic lists of forbidden books of the 15th and 16th centuries also give us a clue to the discovery of this heretical literature and of the means the Bogomils employed to carry on their propaganda. Taking as our starting-point the teaching of the heretical sects in Russia, notably those of the 14th century, which are a direct continuation of the doctrines held by the Bogomils, we find that they denied the divine birth of Christ, the personal co-existence of the Son with the Father and Holy Ghost, and the validity of sacraments and ceremonies. The miracles performed by Jesus were interpreted in a spiritual sense, not as real material occurrences; the Church was the interior spiritual church in which all held equal share. Baptism was only to be practised on grown men and women. The Bogomils repudiated infant baptism, and considered the baptismal rite to be of a spiritual character neither by water nor by oil but by self-abnegation, prayers and chanting of hymns. Carp Strigolnik, who in the 14th century preached this doctrine in Novgorod, explained that St. Paul had taught that simple-minded men should instruct one another; therefore they elected their "teachers" from among themselves to be their spiritual guides, and had no special priests. Prayers were to be said in private houses, not in separate buildings such as churches. Ordination was conferred by the congregation and not by any specially appointed minister. The congregation were the "elect," and each member could obtain the perfection of Christ and become a Christ.

These doctrines have survived in the great Russian sects, and can be traced back to the teachings and practice of the Bogomils. But in addition they held the Manichaean dualistic conception of the origin of the world.

They taught that God had two sons, the elder Satanail and the younger Michael. The elder son rebelled against the father and became the evil spirit. After his fall he created the lower heavens and the earth and tried in vain to create man; in the end he had to appeal to God to make man a living being. After creation Adam was allowed to till the ground on condition that he sold himself and his posterity to the owner of the earth. Then Michael was sent in the form of a man; he became identified with Jesus, and was "elected" by God after the baptism in the Jordan. When the Holy Ghost (Michael) appeared in the shape of the dove, Jesus became Christ and received power to break the covenant in the form of a clay tablet (*hierographon*) held by Satanail from Adam. In this way he vanquished Satanail, and deprived him of the termination *-il*=God, in which his power resided. Satanail was thus transformed into Satan. Through his machinations the crucifixion took place, and Satan was the originator of the whole Orthodox community with its churches, vestments, ceremonies, sacraments and fasts with its monks and priests.

According to Slavonic documents the founder of this sect was a certain priest Bogumil, who "imbibed the Manichaean teaching and flourished at the time of the Bulgarian emperor Peter" (927–

968). According to another source the founder was called Jeremiah (or there was another priest associated with him by the name of Jeremiah). The Slavonic sources are unanimous on the point that his teaching was Manichaean. Zealous missionaries, clad like mendicant friars, carried his doctrines far and wide. In 1004, scarcely 15 years after the introduction of Christianity into Russia, we hear of a priest Adrian teaching the same doctrines as the Bogomils. In 1125 the Church in the south of Russia had to combat another heresiarch named Dmitri. The Church in Bulgaria also tried to extirpate Bogomilism but it survived for several centuries. The popes in Rome whilst leading the crusade against the Albigenses did not forget their counterpart in the Balkans and recommended the annihilation of the heretics.

The Bogomils first spread westwards, and settled in Serbia; but at the end of the 12th century Stephen Namanya, king of Serbia, persecuted them and expelled them from the country. Large numbers took refuge in Bosnia, where they were known under the name of Patarenes (*q.v.*). From Bosnia their influence extended into Italy (Piedmont). The Hungarians undertook many crusades against the heretics in Bosnia, but towards the close of the 15th century the conquest of that country by the Turks put an end to their persecution.

See the article "Bogomils" in Hastings' *Encyclopaedia of Religion and Ethics;* F. C. Conybeare, *The Key of Truth* (1898). The principal source of information on the doctrine of the Bogomils is the account given by Euthymius Zygadenus, in his work on 24 heresies (Migne, *Patrologia Graeca* vol. cxxx.; *Narratio de Bogomilis,* edit. by Gieseler).

BOGORODSK, the name of several Russian towns. The chief (also called Noginsk) is a town 38 mi. E.N.E. of Moscow on the Klyazma river. Lat. 55° 52′ N., Long. 38° 20′ E. Pop. (1939) 81,024. It supplies electricity by cable to Moscow from the electric power station nearby, which has a workers' settlement of 5,500. It was formerly noted for gold brocade, and has small woollen, cotton, silk, chemical and dye works. Its experimental school is famous for pioneer educational work.

BOGOS, a pastoral race of mixed Hamitic descent, occupying the highlands immediately north of Abyssinia, now part of the Italian colony of Eritrea. The community is divided into two classes, the *Shumaglieh* or "elders" and *Tigré* or "clients." The latter are serfs of the former, who, however, cannot sell them. The Tigré goes with the land, and his master must protect him. In blood-money he is worth another Tigré or ninety-three cows, while an elder's life is valued at one hundred and fifty-eight cattle or one of his own caste. The eldest son of a Shumaglieh inherits his father's two-edged sword, white cows, lands and slaves, but the house goes to the youngest son. Female chastity is much valued, but women have no rights and inherit nothing. The Bogo husband never sees the face or pronounces the name of his mother-in-law, nor may a wife utter her husband's or father-in-law's name.

BOGOTÁ or **SANTA FÉ DE BOGOTÁ,** the capital of the republic of Colombia, and of the interior department of Cundinamarca. Pop. in 1938, 325,658. The city is on the eastern margin of a large elevated plateau 8,563 ft. above sea-level. The plateau may be described as a great bench or shelf on the western slope of the eastern Cordilleras, about 70 mi. long and 30 mi. wide, with a low rim on its western margin and backed by a high ridge on the east. The plain forming the plateau appears to be an old lacustrine basin and has numerous small lakes remaining and many streams. These streams, one of which, the San Francisco, passes through the city, unite near the south-western extremity of the plateau and form the Rio Funza, or Bogotá, which finally plunges over the edge at Tequendama in a beautiful, perpendicular fall of about 475ft. The city is built upon a sloping plain at the base of two mountains, La Guadalupe and Monserrate, upon whose crests stand two imposing churches. From a broad avenue on the upper side, downward to the west, slope the streets, through which run streams of cool, fresh water from the mountains above. The north and south streets cross these at right angles, and the blocks thus formed are like great terraces. A number of handsomely laid out plazas, or squares, ornamented with gardens and statuary, have been preserved; on these face the principal public buildings and churches. In Plaza Bolívar is a statue of Bolívar by Pietro Tenerani (1789–1869), a pupil of Canova, and in Plaza Santander is one of Gen. Francisco de Paula Santander (1792–1840). Facing on Plaza de la Constitución are the capitol and cathedral. Owing to the prevalence of earthquakes, private houses are usually of one storey, built of sun-dried bricks whitewashed.

Railway lines connect the city of Bogotá with the major settlements of the plateau and the upper Magdalena river, and highway connections will soon link the city with the Pan-American highway system at Medellín. Bogotá is an archiepiscopal see, founded in 1561, and is one of the strongholds of mediaeval clericalism in South America. It has a cathedral, rebuilt in 1814, and some 30 other churches, together with many old conventual buildings now used for secular purposes, their religious communities having been dissolved by Mosquera and their revenues devoted in great measure to education. The capitol, which is occupied by the executive and legislative departments, is an elegant and spacious building, erected since 1875. The interest which Bogotá has always taken in education, and because of which she has been called the "Athens of South America," is shown in the number and character of her institutions of learning—a university, several colleges and schools, a public library, a national observatory, a natural history museum and a botanic garden. The city also possesses a well-equipped mint, little used in recent years. The plain surrounding the city is very fertile, intensively cultivated, and pastures cattle and produces cereals, vegetables and fruit in abundance. It was the centre of Chibcha civilization before the Spanish conquest and sustained a large population. The climate is mild.

Bogotá was founded in 1538 by Gonzalo Jiménez de Quesada and was named Santa Fé de Bogotá after his birthplace Santa Fé, and after the southern capital of the Chibchas, Bacatá (or Funza). It was made the capital of the viceroyalty of Nueva Granada, and soon became one of the centres of Spanish colonial power and civilization on the South American continent. In 1811 its citizens revolted against Spanish rule and set up a government of their own, but in 1816 the city was occupied by Pablo Morillo (1777–1838), the Spanish general, who subjected it to a ruthless military Government until 1819, when Bolívar's victory at Boyacá compelled its evacuation. On the creation of the republic of Colombia, Bogotá became its capital, and when that republic was dissolved into its three constituent parts Bogotá remained the capital of Nueva Granada (which became officially Colombia in 1861).

(A. J. L.)

BOGRA or **BAGURA,** a town and district of British India, in the Rajshahi division of Bengal. The town is situated on the right bank of the river Karatoya. Pop. (1941) 21,681. The district of Bogra lies west of the main channel of the Brahmaputra. It contains an area of 1,475 sq.mi. and a population (1941) of 1,260,463. Mohammedans account for 89% of the population, the highest district percentage in Bengal. The district stretches out in a level plain, intersected by numerous streams and dotted with patches of jungle. The Karatoya river flows from north to south, dividing it into two portions, possessing distinct characteristics. The eastern tract consists of rich alluvial soil, well watered, and subject to fertilizing inundations; the western portion is high-lying. The principal rivers are formed by the different channels of the Brahmaputra, which river here bears the local name of the Daokoba or "hatchet-cut." The population is almost entirely agricultural, rice being the staple crop.

BOHEMIA, an ancient kingdom in Central Europe. Its early history is very obscure. The country derives its name from a tribe of uncertain origin, the Boii, conquered by the Teutonic Marcomanni about 12 B.C. It is probable that Slavic peoples, of whom the Cechs were most important, had entered the country by the first century A.D., but nothing is really known of the stages by which they became its masters, and it is hard to ascertain the historical basis which may underlie the traditions of their early kings, the founders of the Přemyslide dynasty.

The Přemyslide Dynasty.—The first attempts to introduce Christianity into Bohemia undoubtedly came from Germany.

They met with little success, as innate distrust of the Germans naturally rendered the Bohemians unfavourable to a creed which reached them from their western neighbours. Matters were different when Christianity approached them from Moravia, where its doctrine had been taught by Cyril and Methodius—Greek monks from Thessalonica. About the year 873 the Bohemian prince Bořivoj was baptized by Methodius, and the Bohemians now rapidly adopted the Christian faith. Of the rulers of Bohemia the most famous at this period was Wenzel, surnamed the Holy, who in 935 was murdered by his brother Boleslav, and was afterwards canonized by the Church of Rome. During the reigns of Boleslav and his son, Boleslav II., Bohemia extended its frontiers in several directions. Boleslav II. indeed established his rule not only over Bohemia and Moravia, but also over a large part of Silesia, and over that part of Poland which was included in the former Austrian province of Galicia. Like most Slavic States at this and even a later period, the great Bohemian empire of Boleslav II. did not endure long. Boleslav III., son of Boleslav II., lost all his foreign possessions to Boleslav the Great, king of Poland, and was ultimately dethroned in favour of the Polish prince Vladivoj, brother of Boleslav the Great. Vladivoj attempted to strengthen his hold over Bohemia by securing the aid of Germany. He consented not only to continue to pay the tribute which the Germans had already obtained from several previous rulers of Bohemia, but also to become a vassal of the German empire and to receive the German title of duke. This state continued when after the death of Vladivoj the Přemyslide dynasty was restored. The Přemyslide prince Břetislav I. (1037–55) again added Moravia, Silesia and a considerable part of Poland to the Bohemian dominions.

During the constant internal struggles of the next hundred years the German influence became stronger, and the power of the sovereign declined, as the nobility on whose support the competitors for the crown were obliged to rely constantly obtained new privileges. In 1197 Přemysl Ottakar became undisputed ruler of Bohemia, and was crowned as king in the following year. The royal title of the Bohemian sovereigns was continued uninterruptedly from that date. Wenzel I. (1230–53) succeeded his father without opposition. His son Přemysl Ottakar II. was one of the greatest of Bohemia's kings. He had during the lifetime of his father obtained possession of the archduchies of Austria, and, about the time of his accession to the Bohemian throne, the nobility of Styria also recognized him as their ruler. These extensions of his dominions involved him in repeated wars with Hungary. In 1260 he decisively defeated Bela, king of Hungary, in the great battle of Kressenbrunn and obtained possession of Carinthia, Istria and parts of northern Italy. His possessions extended from the Giant Mountains in Bohemia to the Adriatic, and included almost all the parts of the late Habsburg empire west of the Leitha. From political rather than racial causes Ottakar favoured the immigration of Germans into his dominions. He hoped to find in the German townsmen a counterpoise to the overwhelming power of the Bohemian nobility. In 1273 Rudolph, count of Habsburg, was elected king of the Romans. It is very probable that the German crown had previously been offered to Ottakar, but that he had refused it. His Slavic nationality was likely to render him obnoxious to the Germans. As Rudolph immediately claimed as vacant fiefs of the Empire most of the lands held by Ottakar, war was inevitable. Ottakar was deserted by many of his new subjects, and even by part of the Bohemian nobility. He was therefore obliged to surrender to Rudolph all his lands except Bohemia and Moravia, and to recognize him as his overlord. In 1278 Ottakar invaded the Austrian duchies, now under the rule of Rudolph, but was defeated and killed at Durnkrut on the Marchfield. With the death of his grandson Wenzel III. the ancient Přemyslide dynasty came to an end (1306).

The Luxemburg Dynasty.—Albert, king of the Romans, declared that Bohemia was a vacant fief of the Empire, and, mainly by intimidation, induced the Bohemians to elect his son Rudolph as their sovereign; but Rudolph died after a reign of only one year. The Bohemians thereupon chose as king Henry, duke of Carinthia, who had married a daughter of King Wenzel II. Henry soon became unpopular, and he was accused of unduly favouring the German settlers in Bohemia. He was deposed, and the choice of the Bohemians fell on John of Luxemburg, son of Henry, king of the Romans. The Luxemburg dynasty henceforth ruled over Bohemia until its extinction at the death of Sigismund (1437). Though king John married a daughter of Wenzel II., most of his life was spent in other lands than Bohemia, his campaigns ranging from Italy to Lithuania. He fell at Crécy (1346).

He was succeeded as king of Bohemia by his son Charles, whom the German electors had previously elected as their sovereign at Rense (1346). Charles proved one of the greatest rulers of Bohemia, where his memory is still revered. Prague was his favourite residence, and by the foundation of the *nové město* (new town) he greatly enlarged the city. He also added greatly to the importance of the city by founding the famous University of Prague. Charles succeeded in re-establishing order after the disorders of the reign of John. He also attempted to codify the obscure and contradictory laws of Bohemia; but this attempt failed through the resistance of the powerful nobility of the country. He died in 1378 at the age of 62.

Charles was succeeded by his son Wenzel, then aged 17. His reign marks the decline of the rule of the house of Luxemburg over Bohemia. By this time the reforming party was strong in Bohemia and almost the whole nation espoused the cause of Huss (*q.v.*). Huss was tried before the council of Constance (*q.v.*), to which he had proceeded with a letter of safe conduct given by Wenzel's brother Sigismund, king of the Romans. He was declared a heretic and burnt on July 6, 1415. The inevitable and immediate result of this event was the outbreak of civil war in Bohemia. From this time until 1436, when peace was made, Bohemian history is essentially the record of the Hussite Wars (*see* HUSSITES).

George of Poděbrad.—In the latter year Sigismund, who had inherited a claim to the Bohemian throne on Wenzel's death in 1419, proceeded to Prague and was accepted as king. He died in the following year (1437) and was succeeded by his son-in-law, Albert of Austria, whom the estates chose as their king. Albert died after he had reigned over Bohemia less than two years. Though it was known that Albert's widow Elizabeth would shortly give birth to a child, the question as to the succession to the throne again arose; for it was only in 1627 that the question whether the Bohemian crown was elective or hereditary was decided for ever. The nobles formed two parties, one of which, the national one, had George of Poděbrad (*q.v.*) as its leader. Ulrich of Rosenberg was the leader of the Roman or Austrian division of the nobility. The two parties finally came to an agreement known as the "Letter of Peace." Those who signed it pledged themselves to recognize the Compacts (*see* HUSSITES), and to support as archbishop of Prague, John of Rokycan, whom the Church of Rome refused to recognize. On Feb. 22, 1440, Queen Elizabeth gave birth to a son, who received the name of Ladislas. The Bohemians formally acknowledged him as their king, though only after their crown had been declined by Albert, duke of Bavaria. Ladislas remained in Austria under the guardianship of his uncle Frederick, duke of Styria, afterwards the emperor Frederick III., and Bohemia, still without regular government, continued to be the scene of constant conflicts between the rival parties of the nobility. In 1446 a general meeting of the estates of Bohemia together with those of Moravia, Silesia and Lusatia—the so-called "lands of the Bohemian crown"—took place. This meeting has exceptional importance for the constitutional history of Bohemia. It was decreed that at the meeting of the estates their members should be divided into three bodies—known as *curiae*—representing the nobles, the knights and the towns. These *curiae* were to deliberate separately and only to meet for a final decision. An attempt made at this meeting to appoint a regent was unsuccessful. Negotiations with the papal see led to no result, as the members of the Roman party used their influence at the papal court for the purpose of dissuading it from granting any concessions to their countrymen. Shortly after the termination of the diet of 1446 George of Poděbrad therefore determined to appeal

to the fortune of war. He assembled a considerable army at Kutna Hora and marched on Prague (1448). He occupied the town almost without resistance and assumed the regency over the kingdom. The diet in 1451 recognized his title, which was also sanctioned by the Emperor Frederick III., guardian of the young king. Poděbrad was none the less opposed, almost from the first, by the Romanists, who even concluded an alliance against him with their extreme opponents, Kolda of Žampach and the other remaining Taborites. In Oct. 1453 Ladislas arrived in Bohemia and was crowned king at Prague; but he died somewhat suddenly on Nov. 23, 1457. George of Poděbrad has from the first frequently been accused of having poisoned him, but historical research has proved that this accusation is entirely unfounded. The Bohemian throne was now again vacant, for, when electing Ladislas the estates had reaffirmed the elective character of the monarchy. Though there were several foreign candidates, the estates unanimously elected George of Poděbrad, who had now for some time administered the country. Though the Romanist lords, whom Poděbrad had for a time won over, also voted for him, the election was considered a great victory of the national party and was welcomed with enthusiasm by the citizens of Prague.

During the earlier and more prosperous part of his reign the policy of King George was founded on a firm alliance with Matthias Corvinus, king of Hungary, through whose influence he was crowned by the Romanist bishop of Waitzen. His principal supporters were the men of the smaller nobility and the towns. After a certain time, however, some of the Romanist nobles became hostile to the king, and, partly through their influence, he became involved in a protracted struggle with the papal see. It was in consequence of this struggle that some of George's far-reaching plans—he endeavoured for a time to obtain the supremacy over Germany—failed. After the negotiations with Rome had proved unsuccessful George assembled the estates at Prague in 1452 and declared that he would to his death remain true to the communion in both kinds, and that he was ready to risk his life and his crown in the defence of his faith. The Romanist party in Bohemia became yet more embittered against the king, and at a meeting at Zelena Hora (Grünberg) in 1465 many nobles of the Roman religion joined in a confederacy against him. In the following year Pope Paul II. granted his moral support to the confederates by pronouncing sentence of excommunication against George of Poděbrad and by releasing all Bohemians from their oath of allegiance to him. It was also through papal influence that King Matthias of Hungary, deserting his former ally, supported the lords of the league of Zelena Hora. Desultory warfare broke out between the two parties, in which George was at first successful; but fortune changed when the king of Hungary invaded Moravia and obtained possession of the Brünn, the capital of the country. At a meeting of the Catholic nobles of Bohemia and Moravia at Olmütz in Moravia, Matthias was proclaimed king of Bohemia (May 3, 1469). In the following year George obtained some successes over his rival, but died in 1471. George of Poděbrad, the only Hussite king of Bohemia, has always, with Charles IV., been the ruler of Bohemia whose memory has most endeared itself to his countrymen.

Vladislav of Poland.—After protracted negotiations Prince Vladislav of Poland was elected King at Kutna Hora, on May 27, 1471. This election was a victory of the national party, and may be considered as evidence of the strong anti-clerical feeling which then prevailed in Bohemia; for Matthias was an unconditional adherent of Rome, while the Polish envoys who represented Vladislav promised that he would maintain the Compacts. The new king was involved in a struggle with Matthias of Hungary until 1478, when a treaty concluded at Olmütz secured Bohemia to Vladislav, Matthias retaining Moravia, Silesia and Lusatia during his lifetime, which were to be restored to Bohemia after his death.

As regards matters of State the reign of Vladislav is marked by a decrease of the royal prerogative, while the power of the nobility attained an unprecedented height, at the expense, not only of the royal power, but also of the rights of the townsmen and peasants. A decree of 1487 practically established serfdom in Bohemia, where it had hitherto been almost unknown. It is impossible to exaggerate the importance of this measure for the future of Bohemia. The rulers of the country were henceforth unable to rely on that numerous sturdy and independent peasantry of which earlier Bohemian armies had mainly consisted. Various enactments belonging to this reign also curtailed the rights of the Bohemian townsmen. A decree known as the "regulations of King Vladislav" codified these changes. It enumerated all the rights of the nobles and knights, but entirely ignored those of the towns. It was tacitly assumed that the townsmen had no inherent rights, but only such privileges as might be granted them by their sovereign with the consent of the nobles and knights. Civil discord was the inevitable consequence of these enactments. Several meetings of the diet took place at which the towns were not represented. The latter in 1513 formed a confederacy to defend their rights, and chose Prince Bartholomew of Münsterberg—a grandson of King George—as their leader.

The Diet of St. Wenceslas.—Vladislav was elected king of Hungary in 1490 and many of the events of his later life belong to the history of Hungary where he died in 1516. His successor was his son Louis, who had already been crowned as king of Bohemia at the age of three. According to the instructions of Vladislav, Sigismund, king of Poland, and the emperor Maximilian I. were to act as guardians of the young king. The Bohemian estates recognized this decision, but they refused to allow the guardians any right of interference in the affairs of Bohemia. The great Bohemian nobles, and in particular the supreme burgrave, Zdeněk Leo, lord of Rožmital, ruled the country almost without control. The beginning of the nominal reign of King Louis is marked by an event which had great importance for the constitutional development of Bohemia. At a meeting of the estates in 1517 known as the diet of St. Wenceslas they settled the questions which had been the causes of discord. The citizens renounced certain privileges which they had hitherto claimed, while the two other estates recognized their municipal autonomy and tacitly sanctioned their presence at the meetings of the diet, to which they had already been informally readmitted since 1508. At the first sitting of this diet, on Oct. 24, it was declared that the three estates had agreed henceforth "to live together in friendly intercourse, as became men belonging to the same country and race." In 1522 Louis arrived in Bohemia from Hungary, of which country he had also been elected king. On his arrival at Prague he dismissed all the Bohemian State officials, including the powerful Leo of Rožmital. He appointed Charles of Münsterberg a cousin of Prince Bartholomew and also a grandson of King George, as regent of Bohemia during his absences, and John of Wartenberg as burgrave. The new officials appear to have supported the more advanced Hussite party, while Rožmital and the members of the town council of Prague who had acted in concert with him had been the allies of the Romanists and those Utraquists who were nearest to the Church of Rome. The new officials thus incurred the displeasure of King Louis, who was at that moment seeking the aid of the pope in his warfare with Turkey. The king therefore reinstated Leo of Rožmital in his offices in 1525. Shortly afterwards Rožmital became involved in a feud with the lords of Rosenberg; the feud became a civil war, in which most of the nobles and cities of Bohemia took sides. Meanwhile Louis, who had returned to Hungary, opened his campaign against the Turks. He requested aid from his Bohemian subjects, and this was granted by the Rosenberg faction, while Rožmital and his party purposely delayed sending any forces to Hungary. There were, therefore, but few Bohemian troops at the battle of Mohács (Aug. 29, 1526) at which Louis was decisively defeated and perished. (X.)

1526–1740

The Accession of the Habsburgs.—The Crown left vacant by the death of Louis II. was claimed by the Archduke Ferdinand of Austria, by virtue of the hereditary rights invested in his wife Anna, Louis's sister, by the succession pacts concluded by Ferdinand's grandfather Maximilian. The Bohemian estates, however, denied these rights and claimed the exercise of their

prerogative to fill the vacant throne by election. Ferdinand acquiesced, outmanoeuvred and defeated his most dangerous rivals, the dukes of Bavaria, and was unanimously elected on Oct. 23, 1526. The adjunct lands of the Bohemian Crown, however (Moravia, Silesia and Lusatia), whom the Bohemian magnates had neglected to convoke for the electoral diet, revenged themselves by recognizing Anne and Ferdinand as their sovereigns by hereditary right. This national division enabled Ferdinand to refuse to sign the severest clauses of the electoral capitulation presented to him by the diet. In 1541, a fire having destroyed the State archives, he substituted, with the forced consent of the diet, an act recognizing his wife's hereditary right for the act registering his election, and in 1547 he exacted from the diet a fresh confirmation of this recognition.

Ferdinand I.—In consolidating and strengthening the unity of this monarchy, to make it a lasting and secure possession of the Habsburg dynasty, Ferdinand first set about restoring the much-diminished power of the monarch. The country had suffered so severely from anarchical conditions that it was in general grateful to a prince who could restore public order and security. Even the establishment of central authorities to direct the affairs common to all the sovereign's dominions (foreign relations, military organization, finance) encountered little opposition, as the measures decided by these authorities were executed in Bohemia only by the constitutional national authorities. Where the king and the nation clashed was on the religious question, and the defeat of the latter was due to its divisions. To check the advance of Lutheranism in Bohemia, Ferdinand, for purely political motives, supported the official "Utraquist" Church, which was slowly falling into decay and disunion, while the Unity of the Bohemian Brethren inclined increasingly towards Luther. Bohemia was drawn into the great duel in which the house of Austria was now engaged with German Protestantism. The Bohemian estates long wavered between resistance and obedience to the king, who summoned them to assist the cause of his house; finally (1547) the diet met unconvoked by the king, even despite his express prohibition, which made its action revolutionary, drew up a list of demands which would have given it all power and reduced the king to a figurehead, and nominated a provisional directory. The defeat of the German Protestants at Mühlberg suddenly reversed the situation; it was now Ferdinand who dictated. His rigour was directed chiefly against the towns, which he had long considered the chief hotbeds of rebellion and heresy, particularly Prague; their administrative autonomy was replaced by the authority of royal judges, and in Prague, of royal captains also; their judiciary autonomy by a new royal court of appeal, and under pretext of revising old privileges, they were deprived of most of their domains, which passed to the king (who, however, later restored much of them). These measures impoverished the burgesses and rendered them politically impotent; henceforward, administratively and in the diet, the towns were puppets of the king. The nobles and knights most compromised also had their estates confiscated, or reduced to fiefs. There were few death-sentences; only four persons (two nobles and two burgesses) were executed on the eve of the opening of the "Bloody Diet" (Aug. 22, 1547) which recorded Ferdinand's measures and again recognized the heredity of the Crown. The nobles and knights had viewed without displeasure the humiliation of their old rivals, the towns; but this naturally increased their own dependence on the king. The latter was able partially and temporarily to repair his disorganized finances, out of the yield of the confiscated estates. Believing that he would easily master heresy in the Czech countries, Ferdinand proceeded with much rigour against the Bohemian Brethren, whom he regarded as the ringleaders, with the towns, in the revolt. Persecution, however, only enhanced the Brethren's courage and determination, and the diet of Moravia, where tolerance was general, opposed the king's demands. Ferdinand, suspecting his brother of wishing to rob him of the imperial Crown, became more conciliatory towards the German Protestants, and was forced to modify his attitude in Bohemia correspondingly. While Lutheranism increasingly penetrated the Utraquist Church, Ferdinand thought to recover heretics by persuading the pope to concede communion in both kinds to lay persons (1564). About the same time he introduced the Jesuits into Bohemia (1561) and their work, at first slow and difficult, prepared the generation which after the White mountain realized Ferdinand's plans much more fully and boldly than he himself had conceived.

The Turkish advance had reduced the Habsburg territories in Hungary to the semi-circle bordering the western and northern frontier of the kingdom. The great majority of the population of these regions was Slavonic, Croat in the south, Slovak in the north; while Pressburg, the capital of royal Hungary, stood in Slovak territory. Conditions were favourable for a rapprochement between the Czechs and the Slovaks, who had been separated since the early 10th century by the Magyar domination in Hungary; but such a rapprochement could be neither far-reaching nor effective, given contemporary political and social conditions, and the mistrust and fear which it would have inspired in the Habsburgs, whose centralizing, and consequently Germanizing, policy was opposed to it.

Maximilian II.—To ensure respect for the hereditary principle Ferdinand had made the estates recognize his eldest son, Maximilian, in 1549. This custom of recognition of the heir presumptive during the king's lifetime was again followed in the cases of Maximilian's own three successors, his sons Rudolph and Matthias and his nephew Ferdinand. As a young man, Maximilian had appeared favourably inclined towards the Protestants; but after his election as emperor (1561) he had adopted his father's policy in a milder form. He readily accorded the diet the abrogation of the compacts which, originally a guarantee of religious liberty, had become under Ferdinand an obstacle to the free development of Protestantism in its various forms, including the Unity; but refused to authorize the Neo-Utraquists to adopt the Augsburg confession. In 1576 the Lutheran and Calvinist tendencies agreed on the text of a new confession, the "Bohemian confession." Maximilian managed to dissuade the estates from giving this legal sanction and to content themselves with his word of honour to respect religious liberty and with the right of electing 15 "defenders" to watch over the liberty of the Protestant faith; promises which Rudolph repeated on his recognition as king. Maximilian died shortly after, disappointed in his far-reaching international ambitions, and leaving the royal authority weaker and less respected than he found it.

Rudolph II.—In the middle of the 16th century about two-thirds of the population of Bohemia were Protestants (Neo-Utraquists or Lutherans); one-tenth United Brethren; rather more had remained Catholics, especially in southern Bohemia and Moravia; among the nobles, however, the proportion of Catholics was much higher (about one-fourth). As soon as the counter-reformation began, this Catholic minority gained in numbers and vigour; various nobles, including some great families, reverted to the old faith; the Catholic magnates began to impose their religion throughout their domains, and intolerance grew widespread. While the old official Utraquist Church fell into final collapse, the United Brethren organized more strongly in a remarkable religious and intellectual movement; but they were too unpractical to help the nation greatly in the impending life-struggle.

The religious struggles were partly the manifestation of social and national conflict. The economic evolution of the 16th century tended to enrich the magnates, who extended their great properties at the expense of the knights; while the cities lost their commerce and decayed in consequence of the shifting of the great trade routes. The economic condition of the peasants improved slightly, but their legal status grew worse, the growing need of labour inducing the magnates to restrict increasingly their liberty of movement. The spread of Protestantism in Bohemia had attracted thither German immigrants, who had advanced the linguistic frontier, and forced the estates, first of Moravia, then of Bohemia, to issue laws in the early 18th century protecting the use of the Czech language in public life.

Rudolph II., with his unstable, suspicious and melancholy character and narrow Spanish upbringing, was not the man to

pilot the kingdom through a formidable crisis. His arbitrary attempt to exterminate Protestantism in Hungary evoked Bocskay's formidable rebellion, which forced Matthias, the king's lieutenant in Hungary, to sign the peace of Vienna with the rebels and that of Zsitvatörök with the Turks (1606). On Rudolph's refusing ratification, Matthias, supported by the Hungarian and Bohemian magnates, rose against him; Moravia followed him, whereupon Bohemia remained faithful to Rudolph. The Peace of Liben (1608) left Matthias in possession of Moravia and Austria, and recognized him as future king of Bohemia. The fratricidal struggle had naturally profited the nobles of their estates; Matthias was curbed by a confederation of his new subjects, and Rudolph had to sign a series of articles, designed to exclude all foreign influence from Bohemia and vest all real power in the diet. He demurred only to the religious demands; but Matthias having yielded on this point, the diet of 1609 finally forced Rudolph to grant confessional liberty for the nobles and royal towns, liberty of conscience for all, a constitutional guarantee for the Bohemian confession, appointment of the consistory by the estates, and the control of the university by defenders chosen by them. This famous Charter-Majestat (July 9) was accompanied by an agreement between Catholics and Protestants, indubitably sincerely meant but so obscurely drafted that it afterwards formed the occasion of the disputes which developed into the rebellion of 1618. While the last remnants of the traditionalist Utraquist Church reverted to Catholicism, the new consistory was composed of Neo-Utraquists and Brethren, the latter closely allied with the Lutherans, and thanks to the wisdom of Budovec, the moral leader of the Union, the new régime opened smoothly. When Rudolph, whose sole thought was now revenge against Matthias, encouraged his cousin Leopold, bishop of Passau, whom he hoped to make his successor, to conspire with the Catholic magnates to cancel the *Majestat* and release his mercenaries upon Bohemia, which they invaded as far as Prague, the country rose against the invaders; Matthias came to the estates' assistance, and Rudolph, who had betrayed all parties, had to abdicate (April 1611), dying soon after (Jan. 1612).

The Revolt.—Under Rudolph, Prague had been the capital of the Austrian monarchy. Matthias removed the capital to Vienna, thereby confirming the estates in their suspicions and opposition. Nevertheless the diet of 1617 dared not refuse to recognize as their future king the Archduke Ferdinand of Styria, Matthias's nephew, a pupil and docile instrument of the Jesuits. For some years, however, the leaders of the Protestant party had been in communication abroad to prepare a revolt; Bohemia was also affected by the situation in Germany, where the conflict between the Catholic league and the Protestant union was growing acute. The violation of the promises contained in the *Majestat* regarding the royal and church domains and Matthias's action in entrusting the government to a council composed of fanatical Catholics brought the outbreak nearer. The rejection of the claims presented in March 1618 by the Protestant assembly legally convoked by the defenders in virtue of the *Majestat,* led in May to the famous defenestration of Prague, when the two most ardent Catholics of the council, Martinic and Slavata, were hurled into the moat of the castle (being, incidentally, only slightly injured). The diet appointed a council of 30 directors, decided to levy an army, decreed the expulsion of the Jesuits and confiscation of their property, and negotiated for an agreement with the other lands of the Bohemian Crown. They reached agreement with Silesia, at the price of relaxing the ties between that province and the Crown; the scruples of Žerotin delayed the adherence of Moravia until most of its importance was gone. The Protestant party itself was divided by the reappearance of old misunderstandings between Lutherans and Brethren, and the former were estranged when, on the death of Matthias, the diet again proclaimed the throne elective and invited a Calvinist, the Elector Palatine, Frederick V., to fill it (Aug. 1619). A young, inexperienced and weak sovereign; an undisciplined and selfish oligarchy; an inferior army and lack of foreign allies; exhaustion after the great effort of the 15th century; absence of self-confidence, especially the absence of what had been the nation's strength in the Hussite wars—the enthusiasm of the peasant masses, now reduced to serfdom and consequently deaf to any sentiment beyond that of their misery and social hatred: these causes explain the defeat of the insurgents at the White mountain, at the gates of Prague (Nov. 8, 1620). Frederick, the "winter's king," fled, followed by many of the magnates, abandoning the country to Ferdinand, who had become emperor in Aug. 1619, and to the Jesuits.

The Reaction, 1620–27.—Lichtenstein, the new governor, presided over the political, the papal nuncio Carafa over the ecclesiastical, reaction. The execution of 27 real or alleged leaders of the revolt (three nobles, seven knights, 17 burgesses) preluded the general confiscation of the rebels' properties, whereby three-quarters of the estates (excluding those of king and church) changed hands; this gigantic expropriation, which was attended by scandalous corruption, substituted for the old aristocracy new families: Spaniards, Walloons, Germans, who had furnished the emperor's mercenary officers; one of the most greedy and best favoured of them was Waldstein. The concession of communion in both kinds was revoked, all pastors expelled, the ancient schools closed, and the ancient and glorious university, the entire conduct of public instruction, and the censorship (1622) delivered to the Jesuits. In 1625 the re-catholicization of the towns by fines, prison and bailiffs began; by 1626 it was complete, at least outwardly. In 1627 all nobles refusing to adopt Catholicism, which the new constitution proclaimed the sole recognized religion, were expelled. Revolts of the peasants against conversion were fairly easily repressed. The serfs had not the last resort of nobles and burgesses who refused conversion—emigration. Thirty thousand families emigrated, comprising nearly a quarter of the nobility and urban population of Bohemia, the moral and intellectual flower of the nation. In 1627 Ferdinand enacted a new Constitution. Absolute heredity was established, the practice of securing recognition for the future king disappearing; the estates were forbidden any legislative initiative on any important point; Catholicism was proclaimed the sole religion; the clergy were constituted as the leading estate in country and diet; and German was admitted beside Czech as the official language. Legally, the Bohemian lands preserved their independent identity; actually, they were absorbed in the Austrian monarchy, keeping their own administrative forms so long as it remained patrimonial, losing them increasingly as it was transformed into a modern state.

National Decline.—The Treaty of Westphalia ended the hopes of revenge which, thanks to Waldstein, had seemed for a moment practicable. The last light of Czech intellectual life went out when Comenius died in Holland in 1670. The exhausted country fell into misery and torpor. The peasant class, now sole representatives of the nation, were crushed under the yoke of the greedy and brutal foreigners, their new masters. The large landed properties, which formerly covered one-third of the country, now occupied two-thirds, while the estates of the knights and the towns had become insignificant. The population was reduced by 50% or more. The peasant, with three days of *corvée* a week under the law of 1680, rising to six at busy periods under that of 1738, his dues multiplied five-fold between 1660 and 1730, could hardly live, fell into debt, degenerated physically; frequent risings were brutally repressed. Czech fell to be a peasant tongue, German monopolizing polite society and public life. The old ties with Moravia, which gravitated increasingly towards Vienna, were relaxed. In Slovakia Czech gained a little ground, thanks to the Bohemian immigrants; and the Slovak peasants, with the Ruthene, formed the bulk of the forces raised by the Hungarian rebel chiefs against the Habsburgs; but they were led in the name of Hungarian liberty, for the benefit of Magyar nobles. The reconquest of Hungary from the Turks, the peace of Szatmár, and the adoption of the Pragmatic Sanction (1720 in Bohemia) further strengthened the position of the dynasty and consolidated the unity of the monarchy.

1740–1848

Period of Enlightened Despotism (1740–90).—In the first years of Maria Theresa's reign, the Bohemian Crown lost Silesia to Frederick II., by the treaties of Breslau (1742) and Dresden

(1745); while its independence and dignity were diminished by the various reforms (*see* AUSTRIA); measures which marked the beginning of centralization in Austria, and, Hungary not being included in them, held the germ of dualism. Local administration, hitherto divided between the sovereign and the estates, passed entirely to the sovereign (1751); while the decree fixing the contribution towards the upkeep of the army for ten years (1748) deprived the diet of the chance to exercise one of its few remaining powers. The undignified and cowardly attitude of the Bohemian nobles when Bohemia and Prague were occupied by Charles Albert's forces in 1741 (half the nobles did him homage) contrasted painfully with the Hungarian attitude at the diet of Pressburg and influenced, if not the principle of these reforms, at least the manner of their execution.

Against the potential injury to the Czech cause from this abolition of the last remnants of national independence and the retreat of the national language before German, which conquered successively the upper schools (1770–81), the university (1784) and the municipal administration of Prague, must be placed the beneficial effects of the economic and educative measures taken by Maria Theresa's Government, particularly the legislation for relief of the peasants; a maximum was fixed for their share of dues (one-third, later—1756—two-fifths of the total yield of the land) and their *corvée* obligations (Patent of 1756). They were still heavy, but the authority of the State now intervened against arbitrary extension of them. General prosperity increased rapidly. The first census (1754) showed 3,000,000 inhabitants in the lands of the Bohemian Crown; in 1781, this had risen to 4,500,000.

The more systematic and radical reforms of Joseph II. did even more to raise the Czech nation; while the evolution of democracy broadened the basis of national life. Two supremely important measures were issued almost simultaneously: the edict of toleration (Oct. 13, 1781) which abolished the draconic dispositions which had throttled the nation's religious life since Ferdinand II.'s day, and allowed Protestants liberty to confess their faith and practise their religion; and the edict of Nov. 1, 1781, which restored to the peasants their personal liberty, leaving only their economic obligations towards their masters, and reducing even these by the edict of Feb. 10, 1789, which fixed the maximum dues on the peasants at 30% of the total yield of their land (12% for taxation, 18% for the landlord and the priest). Although the last-named measure was abrogated under Leopold II., the two chief edicts survived; and the Czech renaissance benefited from them more than it suffered from the new restrictions imposed on the activity of the diets or their committees, or the general introduction (for purely practical, not nationalist, reasons) of German as the language of administration.

The Reaction (1790–1848).—The opposition to Joseph's reforms was mainly feudal; but an instinctive adaptation to the spirit of the age led it to adopt liberal and constitutional formulas, while against Germanization it naturally took its stand on the national tongue. Although less vigorous than in Hungary, it was sufficiently stout in Bohemia, while Moravia remained, as usual, more timid, more conservative and more truly reactionary. Joseph's successor, Leopold II., re-established in the main the constitutional situation of the middle of Maria Theresa's reign and made peace with the nobles by sacrificing to them the edict of 1789 on *corvée*. He made, however, a first concession to the growing Czech national feeling among the upper and middle classes by founding a chair of Czech language at Prague university. From this moment the idea of Czech solidarity with the Serbs, of Pan-Slav solidarity, begins to appear; for example, in the great scholar and patriot, Dobrovsky.

The French wars of 1792–1815 suspended the normal political life of the shaken monarchy and reduced it to financial extremity. In the Bohemian countries the events in France awoke some faint echo in the peasant masses, while the passage of Russian troops stimulated somewhat Slav sentiment. The creation of the title of emperor of Austria (1804) strengthened centralizing tendencies, *de facto,* if not *de jure*. The first generation of "awakeners," on the other hand, with Dobrovsky and Jungmann, revived the scientific study of the national language and antiquities, while the large industry which was to advance the country so enormously made its modest beginnings. After the restoration of 1815, the national movement, hitherto inspired mainly by 18th-century rationalism, came under the influence of German romanticism. The study of history now supplanted that of philology; Palacký began his great task of organizing the national effort, both in pure scholarship (foundation of the *Review of the Bohemian Museum,* 1827) and in the practical field (formation of the "Matice" publishing concern, 1830). He was helped by a little group of aristocrats, notably Count Sternberg, founder of the Bohemian museum (1818), provincial patriots, desirous to defend the individuality of Bohemia against Viennese centralism rather than the Czech nation for itself. The same provincial feeling animated the diet in its manifestations of growing opposition to the Government and, in 1847, inspired its programme of political demands, reminiscent of that which it had presented to Leopold II. 50 years earlier. Provincial patriotism again, although of a very different trend, wholly democratic, inspired the young German literature of Bohemia at that time. After the revolution of 1830 showed the weakness of the restoration, and the Polish insurrection of 1831 stimulated the sentiment of Slavonic solidarity towards the Poles (the Russophils were only a small group), the national renaissance became more markedly political and liberal; Charles Havliček, a liberal democrat, disciple of the French thinkers and writers, joined Palacký, the liberal conservative, as a moulder of Czech opinion.

All this movement was concentrated in Bohemia. Moravia was in general sluggish and indifferent, while Slovakia chose this moment for a linguistic secession. The Czech renaissance originated largely in Slovakia, doubtless because in Hungary Protestantism, protected by the Constitution, had preserved its liberty. Intellectual life there centred round the Pressburg Lyceum, which produced the great figures of Palacký, Šafařik and Kollář, the first apostle of Slav intellectual and moral solidarity. The more Slovakia formed the "Czech national reserve," as Havliček said, the greater was the potential danger to the national forces of the linguistic separation which, after the first attempt made by Bernolak, 1790–1810, seemed definitely accomplished when Louis Štúr, a young teacher at Pressburg, raised the dialect of central Slovakia to the rank of a literary language in 1843. This apparent separatism was in each case rooted in a deep national sentiment. Bernolak had hoped to fight at once Protestantism, which was still attached to the Czech of the reformers, and the advance of German; Štúr to create a linguistic instrument common to the Slovaks of every district and every creed to resist the increasingly violent assaults of Magyarization.

1848–1918

The Revolution of 1848.—In 1848 the national leadership passed from the aristocracy to the new middle classes. Their programme comprised a Bohemia restored in its political individuality; *i.e.*, with full internal autonomy, national equality, true constitutionalism and a strong, united monarchy (as Palacký said: "if Austria did not exist, she must be invented"). Proclaimed at the first revolutionary meeting (March 11), accepted in principle by an imperial cabinet order (April 8), thwarted by the counter-offensive of centralism (Austrian Constitution of April 25) and the increasingly separatist ambitions of Hungary, this programme was forced to reduce its claims when the Whitsun rising (June 12, 1848), which coincided with the meeting at Prague of a Slavonic Congress, brought the Austrian army under Windischgrätz its first victory over the revolution. The Czechs had to abandon their ambition of a constituent diet in Prague for the lands of the Bohemian Crown and concentrated their efforts on the Austrian parliament which met at Vienna in July. Their policy of loyalty to a federalist or autonomist Austria grew more marked. The course of events in Germany itself showed increasingly how right Palacký had been in April to answer the invitation to Frankfurt by declaring that Bohemia was not German, Austria not Germanic but super-national, and increasingly justified the Czechs' action in May in refusing to elect deputies for the lands of

the Bohemian Crown to the German parliament. The growth of extreme nationalism and separatism in Hungary, the violent refusal returned by the Pest Government to the moderate demands of the Slovaks, which thus drove them to armed resistance and civil war, the assumption by Jellačić, the Ban of Croatia, of the rôle of defender of the Slavs, naturally inclined Czech policy in this Austrophil direction. The parliament was about to commence discussion on a draft Constitution, based on mutual concession between the Germans and the Slavs, which it would certainly have passed, probably thereby changing the whole evolution of the Austrian question, when the Viennese Government abruptly dissolved parliament (March 7, 1849) and reintroduced an absolutism which was legally consecrated in Dec. 1851.

Results of the Revolution.—The only gain of the revolution which was not questioned was the liberation of the peasants. No Austrian nationality profited more than the Czech from the law of Sept. 7, 1848, which abolished all old feudal burdens (*see* AUSTRIA). After the White mountain the Czechs had sunk to be a peasant nation, with only the faint beginnings, in the 19th century, of a middle class; the establishment of peasant ownership enabled them to develop a real national wealth, while the restoration of personal liberty and dignity allowed them to develop their system of national education and thus create the elements of modern political life; in both fields they would now meet the competition of their rivals and compatriots, the Germans, and also profit by the industrial development which followed the abolition of tariff walls within the monarchy, the establishment of railways, the extension of industry and the expansion of modern capitalism. This new middle class, peasant-born, conquered successively the liberal professions and public offices, both at home and in the central departments in Vienna, thus gradually preparing the way for the future Czechoslovak State.

The effects of these developments could not, however, be felt at once, and the 20 years after the revolution formed for the Czechs and Slovaks a period of painful struggle, relieved only by rare rays of hope. One of these was the enactment—after ten years of centralist, absolutist and Germanizing rule—of the Oct. (1860) Diploma, a compromise between the necessary unity of the monarchy and the historical autonomy of its parts. The February (1861) Patent, however, on the pretext of applying the principles of the Diploma, actually substituted for it a centralist and Germanic pseudo-institutionalism, the franchise being ingeniously calculated to favour the Germans enormously against the Czechs in the Bohemian lands, and still more, the higher aristocracy against the people of either nationality. The aristocracy was divided into two camps, differing rather by family rivalry than by political conviction, and united by their common will to maintain their privileges; a court party, soi-disant liberal, and a provincial and feudal, known as "historic." The Czech leaders, believing that they needed a link with the all-powerful Crown, allied themselves in 1860 with the "historic" party. Their policy thus became tinged with historicism and soon brought them into conflict with the national Hussite tradition and the economic evolution of the country. The February Constitution, discredited by the abstention of the Czechs, who ceased to attend parliament in 1863, and the hostility of the Magyars, was suspended in 1865. Again the outlook improved for Bohemia, the new leader of the Government, Belcrèdi, belonging to the party of "historic" nobility. But in 1867 Francis Joseph signed the compromise with Hungary embodying the Hungarian dualist programme. The recognition of Hungary as a sovereign State cut the Slovaks off from the Czechs and delivered them to Magyar domination, whereas the Constitution of the non-Hungarian territories in a single State, corresponding to the Hungarian State, was the crown and sanction of the long evolution commenced by the Constitution of 1627.

Struggle for Historic Rights.—Czech policy after 1860 had undoubtedly committed a great mistake in imitating too faithfully that of the Magyars. From the identity of the legal status of the two kingdoms with respect to the monarch during the century 1526–1627 they drew political deductions which ignored the actual differences between the situations and relative strengths of the two countries and nations. The same idea dictated their attitude of passive opposition from 1867 to 1879, which gave a free hand to the centralist German "liberals" who formed the governments in Austria. The national language made, however, some progress during this period in public life, particularly in the schools; and the nation grew in wealth and culture, and thus, automatically, in national consciousness. After the creation of the German empire the Viennese court, fearing its attraction on the Germans of Austria, attempted to counter this danger by concessions to the Slavs; but Hungary's resistance to any modification, even nominal, of the Compromise, forced Francis Joseph to revoke the rescript of Sept. 12 by which he had invited the diet to present to him a new Bohemian Constitution, and to drop the "fundamental articles" which it had elaborated. The revised franchise of 1873 (*see* AUSTRIA) was another blow to the historic individuality of the lands of the Bohemian Crown, and weakened Czech resistance. In Moravia passive resistance ceased in 1874; the Czech deputies for Bohemia reappeared in the diet in 1878. When the opposition of the Germans to the annexation of Bosnia led the emperor to replace the German Liberal system by a Conservative régime, neutral towards the nationalities (Taaffe's Ministry, 1879), the policy of passivity ceased automatically.

The Czechs gained appreciable advantages from the new régime: the linguistic decrees of 1880 which, if not establishing an equality between Czech and German in public life, diminished the difference between them, the Czech university in Prague (1882), a more friendly, or less hostile, administration, ministers of their own nationality. But their own leaders were embarrassed by the need, as one of them said, of thus "picking up crumbs," of depending wholly on the Government and the "historic" nobility, which grew increasingly intransigeant in their conservatism and Catholicism; while the power of the Young Czechs, the more advanced fraction, increased. The compromise concluded by the more conservative Old Czechs with the Germans in 1890, although bringing real and permanent advantages to the Czech cause, was denounced as treason because it left German the language of internal administration; at the 1891 elections they were swept away by the Young Czechs. This virtually ended Taaffe's régime (he resigned 1893).

Respect for the maxims of "historic" rights, and the Magyar example, naturally hindered the Czechs largely from defending the Slovaks against Magyarization, which was exerted with extreme brutality. Slovakia was represented in the Hungarian parliament only by Magyars or Germans; Slovak upper schools were closed on the pretext of Pan-Slav conspiracies (1874); the Slovak national cultural society, the Matice, was dissolved and its funds confiscated (1875).

New National Spirit (1890–1914).—From 1893–1905, political life seemed dominated by the language question. The tumultuous party and national conflict was only aggravated by the introduction of universal suffrage in 1907. In Bohemia both the diet (1908) and its executive committee, which was replaced provisionally in 1913 by a commission of officials, were paralysed; but in Moravia a compromise was achieved (1905) which assured the Czechs their rights as a majority, while safeguarding the German minority. The development of the Eastern crisis from 1908 on steadily increased the hostility of the Slavs to Austrian official policy, subordinated to Germany, and therefore anti-Slav, and increasingly dominated by the Magyars, whose power in the monarchy increased as Austria grew weaker. In Hungary the persecution of the Slovaks grew. First the schools were attacked (Apponyi's law of 1907, which made even the confessional schools, entirely supported by Slovak voluntary contributions, instruments of Magyarization), then the clergy, to enlist the influence of ecclesiastical authority in the service of Magyarization.

Below the surface of this political turbulence, a new spirit, modern, critical and scientific, had been growing up since the foundation of Prague university. It found political expression in the foundation of a "realist" group, later party, under Professor Masaryk (*q.v.*). Masaryk gathered round him a group of young intellectuals who introduced new inspiration into the moral and

political life of the Czechs, and substituted among the Slovaks the idea of self-help for the old fatalist and Russophil mysticism. His courage and energy in the Agram and Friedjung trials gained him a unique authority among the Slavs of Europe, even in those parties whose old romantic errors he combated.

For the history of Bohemia during and after World War I, and the creation of the German protectorate of Bohemia-Moravia in 1939, *see* CZECHOSLOVAKIA.

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BOHEMIAN LITERATURE: *see* CZECH LANGUAGE AND LITERATURE.

BOHEMUND, the name of a series of princes of Antioch, afterwards counts of Tripoli. Their connection is shown below:

Robert Guiscard = (1) Alberida: (2) Sicelgaeta.
- Bohemund I. = Constance, daughter of Philip I. of France.
  - Bohemund II. = Alice, daughter of Baldwin II. of Jerusalem.
    - (1) Raymund = Constance = (2) Raynald of Châtillon.
      - Bohemund III. = (2) Orguilleuse.
        - Bohemund IV. = (1) Plaisance. (2) Melisinda, daughter of Amalric II.
          - Bohemund V. = (1) Alice, widow of Hugh of Cyprus. = (2) Luciana, daughter of count of Segni.
            - Henry I. of Cyprus = Plaisance
              - Hugh II.
            - Bohemund VI. = Sibylla, sister of Leo III. of Armenia.
              - Bohemund VII.

BOHEMUND I. (*c.* A.D. 1058–1111), prince of Otranto and afterwards of Antioch, was the eldest son of Robert Guiscard, by an early marriage contracted before 1059. He served under his father in the great attack on the East Roman empire (1080–85), and commanded the Normans during Guiscard's absence (1082–84), penetrating into Thessaly as far as Larissa, but being repulsed by Alexius Comnenus. This early hostility to Alexius had a great influence in determining the course of his future career, and thereby helped to determine the history of the First Crusade. On the death of Guiscard in 1085, his younger son Roger succeeded to the duchy of Apulia and Calabria, and a war arose between Bohemund and Duke Roger. The war was finally composed by the mediation of Urban II. and the award of Otranto and other possessions to Bohemund. In 1096 crusaders began to pass on their way through Italy to Constantinople, and Bohemund joined the crusade. He gathered a fine Norman army, at the head of which he crossed the Adriatic, and penetrated to Constantinople along the route he had tried to follow in 1082–84. At Constantinople he did homage to the emperor. From Constantinople to Antioch Bohemund was the real leader of the First Crusade. He took a great part in the siege of Antioch (1097–98), beating off the Mohammedan attempts at relief from the east, and connecting the besiegers on the west with the port of St. Simeon and the Italian ships which lay there. The capture of Antioch was due to his connection with Firuz, one of the commanders in the city; but he would not bring matters to an issue until the possession of the city was assured him (May 1098), under the terror of the approach of Kerbogha with a great army of relief, and with a reservation in favour of Alexius, if Alexius should fulfil his promise to aid the crusaders. But Bohemund was not secure in the possession of Antioch, even after its surrender and the defeat of Kerbogha; he had to make good his claims against Raymund of Toulouse, whom he had alienated, and who was now the ally of Alexius. He obtained full possession in Jan. 1099. Bohemund went to Jerusalem at Christmas 1099, and had Dagobert of Pisa elected as Patriarch, perhaps in order to check the growth of a strong Lotharingian power in the city. It might seem in 1100 that Bohemund was destined to found a great principality in Antioch, which would dwarf Jerusalem; he had a fine territory, a good strategical position and a strong army. But he had to face two great forces—the East Roman empire, which claimed the whole of his territories and was supported in its claim by Raymund of Toulouse, and the strong Mohammedan principalities in the north-east of Syria. Between these two forces he failed. In 1100 he was captured by Danishmend of Sivas, and he languished in prison till 1103. His nephew Tancred took his place; but meanwhile Raymund established himself with the aid of Alexius in Tripoli, and was able to check the expansion of Antioch to the south. Ransomed in 1103 by the generosity of an Armenian prince, Bohemund attacked the neighbouring Mohammedan powers in order to gain supplies, but was severely defeated at Balich, near Rakka on the Euphrates, and despairing of his own resources, returned to Europe for reinforcements. There he won the hand of Constance, the daughter of the French king, Philip I., and collected a large army. Instead of defending Antioch with this army he attacked Alexius, who, aided by the Venetians, proved too strong; and after the unsuccessful siege of Durazzo, Bohemund had to submit to a humiliating peace at Deabolis (1108), by which he became the vassal of Alexius, consented to receive his pay, with the title of *Sebastos*, and promised to cede disputed territories and to admit a Greek patriarch into Antioch. Bohemund was buried at Canossa in Apulia, in 1111.

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BOHEMUND II. (1108–1130), son of the great Bohemund by his marriage with Constance of France, came in 1126 from Apulia to Antioch (which, since the fall of Roger, the successor of Tancred, in 1119, had been under the regency of Baldwin II.); and in 1127 he married Alice, the younger daughter of Baldwin. After joining with Baldwin II. in an attack on Damascus (1127), he was slain on his northern frontier by a Mohammedan army (1130).

BOHEMUND III. (d. 1201), was the son of Constance, daughter of Bohemund II., by her first husband, Raymund of Antioch. He succeeded his mother in the principality of Antioch in 1163, and first appears prominently in 1164, as regent of the kingdom of Jerusalem during the expedition of Amalric I. to Egypt. During the absence of Amalric he was defeated and captured by Nureddin (Aug. 1164) at Harenc, to the east of Antioch. He was at once ransomed by his brother-in-law, the Emperor Manuel, and went to Constantinople, whence he returned with a Greek patriarch. In 1177 he made an unsuccessful attempt to recapture Harenc. In 1180 he deserted his second wife, the princess Orguilleuse, for a certain Sibylla, and he was in consequence excommunicated. By Orguilleuse he had had two sons, Raymund and Bohemund (the future Bohemund IV.). Raymund married Alice, a daughter of the Armenian prince Rhupen (Rupin), brother of Leo of Armenia, and died in 1197, leaving behind him a son, Raymund Rhupen; and the problem which occupied the last years of Bohemund III. was to determine whether his grandson, Raymund Rhupen, or his younger son, Bohemund, should succeed him in Antioch. Leo of Armenia championed his great-nephew, Raymund Rhupen. Bohemund the younger, however, prosecuted his claim with vigour, and even evicted his father from Antioch about 1199; but he was ousted by Leo (now king of Armenia by the grace of the emperor, Henry VI.), and Bohemund III. died in possession of his principality (1201).

BOHEMUND IV. (d. 1233), younger son of Bohemund III. by his second wife Orguilleuse, became count of Tripoli in 1187, and succeeded his father in the principality of Antioch, to the exclusion of Raymund Rhupen, in 1201. After Raymund Rhupen's death in 1221, Bohemund reigned in Antioch and Tripoli till his

own death.

BOHEMUND V. (d. 1251), son of Bohemund IV. by his wife Plaisance (daughter of Hugh of Gibelet), succeeded his father in 1233, and carried on the struggle with Armenia till 1251, when the marriage of the future Bohemund VI. to the sister of the Armenian king finally brought peace. By his first marriage in 1225 with Alice, the widow of Hugh I. of Cyprus, Bohemund V. connected the history of Antioch for a time with that of Cyprus. He had resided chiefly at Tripoli, and under him Antioch was left to be governed by its bailiff and commune.

BOHEMUND VI. (1237–1268), was the son of Bohemund V. by Luciana, a daughter of the count of Segni, nephew of Innocent III., and succeeded his father in 1251. His sister Plaisance had married in 1250 Henry I. of Cyprus, the son of Hugh I.; and the Cypriot connection of Antioch, originally formed by the marriage of Bohemund V. and Alice, the widow of Hugh I., was thus maintained. In 1252 Bohemund VI. established himself in Antioch, leaving Tripoli to itself, and in 1257 he procured the recognition of his nephew, Hugh II., the son of Henry I. by Plaisance, as king of Jerusalem. In 1268 he lost Antioch to the Mamelukes under Bibars, and when he died in 1275 he was only count of Tripoli.

BOHEMUND VII. (d. 1287), son of Bohemund VI. by Sibylla, sister of Leo III. of Armenia, succeeded to the county of Tripoli in 1275, with his mother as regent. He had trouble with the Templars who were established in Tripoli; and in the very year of his death he lost Laodicea to the sultan of Egypt. He died without issue; and as, within two years of his death, Tripoli was captured, the county of Tripoli may be said to have become extinct with him.

See E. Rey, *Revue de l'Orient Latin* (1893 *et seq.*), vol. iv., "Resumé chronologique de l'histoire des princes d'Antioche," and vol. viii., "Les dignitaires de la principauté d'Antioche." *See* also R. Röhricht, *Geschichte des Königreichs Jerusalem* (Innsbruck, 1898).

BOHN, HENRY GEORGE (1796–1884), British publisher, son of a German bookbinder settled in England, was born in London on Jan. 4, 1796. In 1831 he started as a dealer in rare books and "remainders." In 1841 he issued his "Guinea" *Catalogue* of books, a monumental work containing 23,208 items. Bohn was noted for his book auction sales: one held in 1848 lasted four days, the catalogue comprising 20 folio pages. Printed on this catalogue was the information: "Dinner at 2 o'clock, dessert at 4, tea at 5, and supper at 10." The name of Bohn is principally remembered by the important *Libraries* which he inaugurated: these were begun in 1846 and comprised editions of standard works and translations, dealing with history, science, classics, theology and archaeology, consisting in all of 766 volumes. One of Bohn's most useful and laborious undertakings was his revision (6 vols. 1864) of *The Bibliographer's Manual of English Literature* (1834) of W. T. Lowndes. Bohn collected pictures, china and ivories, and was a famous rose-grower. He died at Twickenham on Aug. 22, 1884.

BOHR, NIELS (1885–), Danish physicist, was born at Copenhagen, the son of Christian Bohr, professor of physiology at Copenhagen university. He studied at Copenhagen until 1911, in which year he took his doctor's degree. In the same year he proceeded to Cambridge, where he worked in the Cavendish laboratory under Sir J. J. Thomson, and in 1912 passed on to Sir Ernest Rutherford's laboratory at Manchester, where he came into intimate contact with those conceptions of atomic structure which he was later to turn to so brilliant account. After a year's sojourn in Copenhagen he returned to Manchester in 1914. In 1916 he was appointed professor of theoretical physics in the University of Copenhagen. Largely by his instrumentality an institute for theoretical physics was established at the university in 1920. Niels Bohr was appointed as its head. This institute has become one of the great intellectual centres of Europe and is visited by students from all over the world, including many men of mature performance. Much brilliant work on the subject of atomic structure, experimental as well as theoretical, has been carried out there.

Although Niels Bohr started his scientific life by an experimental investigation, which dealt with the determination of surface tension by means of oscillating jets of fluid, it is on his theoretical work in the field of atomic structure that his fame rests. In 1911 Rutherford had put forward the theory that the atom consists of an impenetrable nucleus, very small compared to the size of the atom itself, surrounded by electrons occupying the space which is, in ordinary parlance, the volume of the atom (*see* ATOM; NUCLEUS). Planck had shown how the assumption of a quantum, or unit, of radiant energy was necessary to explain the distribution of radiant energy in the spectrum, and the quantum theory had already come to occupy a very prominent place in theoretical physics. In 1913 Bohr, by a few bold yet simple assumptions, showed how the quantum theory could be applied to the problem of the structure of the atom. In three papers published in the *Philosophical Magazine* (1913 and 1915) he obtained a series of important results, of which the most striking were a theoretical derivation of Balmer's formulae for the hydrogen series and an explanation of the line spectrum of ionized helium, which afterwards led to a remarkable quantitative confirmation of the theory. A fact which went far to convince the most sceptical that there was something in this theory was that Bohr obtained, on purely theoretical grounds, a value for the Rydberg constant R, which agreed very closely with that obtained experimentally. Two of the basic assumptions made in these early papers remain as fundamental for all modern theories of the atomic structure, namely, that the atom can exist in a series of *stationary states* each characterized by a certain value of the energy, and that when the atom passes from one stationary state to another a radiation is emitted, the frequency being given by a quantum condition. The exact ways in which the stationary states are to be fixed has been somewhat indefinite since the early days of the theory.

The great success of the Bohr theory, in explaining the simplest optical and X-ray spectra, inspired a large number of workers, and, in spite of the World War, there developed a new school of theoretical physics, in which the mechanism of the motions of electrons in an atom of the Bohr pattern was mathematically investigated, with the object of explaining details of spectral systems. Bohr himself made a great advance when he showed, by means of his so-called *correspondence principle* (*see* ATOM) how the quantum theory could be made to work in co-operation with the older theory of radiation, so that the useful results of both theories could be used to supplement one another. In 1921 and 1922 Bohr showed how his atomic theory could be applied to consideration of the physical and chemical properties of the elements considered in order. This work led directly to the discovery of the new element hafnium by Coster and Hevesy. More recently, at the Institute of Analytical Physics at Copenhagen, Bohr has inspired a number of experimental and theoretical investigations, which have led to valuable results, all on the subject of atomic structure. In 1922 Bohr was awarded the Nobel prize for physics, in 1921 the Hughes medal of the Royal Society, and in 1926 he was elected a foreign member of the Royal Society.

(E. N. DA C. A.)

BÖHTLINGK, OTTO VON (1815–1904), German Sanskrit scholar, was born on May 30 (June 11, N.S.), 1815, at St. Petersburg (Leningrad). In 1868 he settled at Jena, and died at Leipzig on April 1, 1904. Böhtlingk's works are of great value in Indian and comparative philology. His first great work was an edition of Panini's *Acht Bücher grammatischer Regeln* (Bonn, 1839–40), which was in reality a criticism of Franz Bopp's philological methods. This book Böhtlingk again took up 47 years later, when he republished it with a complete translation under the title *Paninis Grammatik mit Übersetzung* (1887). The earlier edition was followed by *Vopadevas Grammatik* (1847); *Über die Sprache der Jakuten* (1851); *Indische Sprüche* (2nd ed., 1870–73, to which an index was published by Blau, 1893); and other works. But his *magnum opus* is his great Sanskrit dictionary, *Sanskrit-Wörterbuch* (1853–75; new ed., 1879–89), which, with the assistance of his two friends, Rudolf Roth (1821–95) and Albrecht Weber (b. 1825), was completed in 23 years.

BOHUN, the name of a family which plays an important part in English history during the 13th and 14th centuries; it was taken

from a village situated in the Cotentin between Coutances and the estuary of the Vire. The Bohuns came into England at, or shortly after, the Norman Conquest; but their early history there is obscure. The founder of their greatness was Humphrey III., who in the latter years of Henry I., appears as a *dapifer*, or steward, in the royal household. He married the daughter of Milo of Gloucester, and played an ambiguous part in Stephen's reign, siding at first with the king and afterwards with the empress. Humphrey III. lived until 1187, but his history is uneventful. He remained loyal to Henry II., and fought in 1173 at Farnham against the rebels of East Anglia. Outliving his eldest son, Humphrey IV., he was succeeded in the family estates by his grandson Henry. Henry was connected with the royal house of Scotland through his mother Margaret, a sister of William the Lion; an alliance which no doubt assisted him to obtain the earldom of Hereford from John (1199). The lands of the family lay chiefly on the Welsh Marches, and from this date the Bohuns take a foremost place among the Marcher barons. Henry de Bohun figures with the earls of Clare and Gloucester among the 25 barons who were elected by their fellows to enforce the terms of the Great Charter. In the subsequent civil war he fought on the side of Louis, and was captured at the battle of Lincoln (1217). He took the cross in the same year and died on his pilgrimage (June 1, 1220). Humphrey V., his son and heir, returned to the path of loyalty, and was permitted, some time before 1239, to inherit the earldom of Essex from his maternal uncle, William de Mandeville. But in 1258 this Humphrey fell away, like his father, from the royal to the baronial cause. He served as a nominee of the opposition on the committee of 24 which was appointed in the Oxford parliament of that year to reform the administration. It was only the alliance of Montfort with Llewelyn of North Wales that brought the earl of Hereford back to his allegiance. Humphrey V. headed the first secession of the Welsh Marchers from the party of the opposition (1263), and was amongst the captives whom the Montfortians took at Lewes. The earl's son and namesake was on the victorious side, and shared in the defeat of Evesham, which he did not long survive. Humphrey V. was, therefore, naturally selected as one of the 12 arbitrators to draw up the ban of Kenilworth (1266), by which the disinherited rebels were allowed to make their peace. Dying in 1275, he was succeeded by his grandson Humphrey VII. This Bohun was one of the recalcitrant barons of the year 1297, who extorted from Edward I. the *Confirmatio Cartarum*. The motives of the earl's defiance were not altogether disinterested. He had suffered twice from the chicanery of Edward's lawyers; in 1284 when a dispute between himself and the royal favourite, John Giffard, was decided in the latter's favour, and again in 1292 when he was punished with temporary imprisonment and sequestration for a technical, and apparently unwitting, contempt of the king's court. In company, therefore, with the earl of Norfolk he refused to render foreign service in Gascony, on the plea that they were only bound to serve with the king, who was himself bound for Flanders. Their attitude brought to a head the general discontent which Edward had excited by his arbitrary taxation; and Edward was obliged to make a surrender on all the subjects of complaint. At Falkirk (1298) Humphrey VII. redeemed his character for loyalty. His son, Humphrey VIII., who succeeded him in the same year, was allowed to marry one of the king's daughters, Eleanor, the widowed countess of Holland (1302). This close connection with the royal house did not prevent him, as it did not prevent Earl Thomas of Lancaster, from joining the opposition to the feeble Edward II. In 1310 Humphrey VIII. figured among the Lords Ordainers; though, with more patriotism than some of his fellow-commissioners, he afterwards followed the king to Bannockburn. He was taken captive in the battle, but exchanged for the wife of Robert Bruce. Subsequently he returned to the cause of his order, and fell on the side of Earl Thomas at the field of Boroughbridge (1322). With him, as with his father, the politics of the Marches had been the main consideration; his final change of side was due to jealousy of the younger Despenser, whose lordship of Glamorgan was too great for the comfort of the Bohuns in Brecon. With the death of Humphrey VIII. the fortunes of the family enter on a more peaceful stage. Earl John (d. 1335) was inconspicuous; Humphrey IX. (d. 1361) merely distinguished himself as a captain in the Breton campaigns of the Hundred Years' War, winning the victories of Morlaix (1342) and La Roche Derrien (1347). His nephew and heir, Humphrey X., who inherited the earldom of Northampton from his father, was territorially the most important representative of the Bohuns. But the male line was extinguished by his death (1373). The three earldoms and the broad lands of the Bohuns were divided between two co-heiresses. Both married members of the royal house. The elder, Eleanor, was given in 1374 to Thomas of Woodstock, seventh son of Edward III.; the younger, Mary, to Henry, earl of Derby, son of John of Gaunt and afterwards Henry IV., in 1380 or 1381. From these two marriages sprang the houses of Lancaster and Stafford.

See J. E. Doyle's *Official Baronage of England* (1886), the *Complete Peerage* of G. E. C(okayne), (1887–98); T. F. Tout's "Wales and the March during the Barons' War," in *Owens College Historical Essays*, pp. 87–136 (1902); J. E. Morris' *Welsh Wars of King Edward I.*, chs. vi., viii. (1901). (H. W. C. D.)

BOIARDO, MATTEO MARIA, COUNT (1434–94), Italian poet, was born at Scandiano, one of the seignorial estates of his family, near Reggio Emilia, and was educated at the University of Ferrara. At the court of Ferrara he was entrusted with several honourable employments, and was named governor of Reggio, an appointment which he held in the year 1478. Three years afterwards he was elected captain of Modena, and reappointed governor of the town and citadel of Reggio, where he died.

Almost all Boiardo's works, and especially his great poem of the *Orlando Innamorato*, were composed for the amusement of Duke Hercules d'Este and his court. The *Orlando Innamorato* is considered as one of the most important poems in Italian literature, since it served as a model for Ariosto's *Orlando Furioso*. The subject-matter of the poem is derived from the *Fabulous Chronicle* of the pseudo-Turpin; though, with the exception of the names of Charlemagne, Roland, Oliver, and some other principal warriors, there is little resemblance between the detailed plot of the one and that of the other. The poem, which Boiardo did not live to finish, was printed at Scandiano the year after his death, but Niccolo degli Agostini, an indifferent poet, had the courage to continue the work commenced by Boiardo, adding to it three books, printed at Venice in 1526–31.

Boiardo's poem suffers from the incurable defect of a laboured and heavy style. His story is skilfully constructed, the characters are well drawn and sustained throughout; many of the incidents show a power and fertility of imagination not inferior to that of Ariosto, but the perfect workmanship indispensable for a great work of art is wanting. The poem in its original shape was not popular, and has been completely superseded by the *Rifacimento* of Francesco Berni (*q.v.*).

See Panizzi, *Boiardo* (1830–31) and E. W. Edwards, *The Orlando Furioso and its Predecessor* (1924).

BOIE, HEINRICH CHRISTIAN (1744–1806), German author, was born at Meldorf in the then Danish province of Schleswig-Holstein on July 19, 1744, and died there on March 3, 1806. After studying law at Jena he went, in 1769, to Göttingen, where he became one of the leading spirits in the Göttingen "Dichterbund" or "Hain." Together with F. W. Gotter he founded in 1770 the Göttingen *Musenalmanach*, which he directed and edited until 1775, when, in conjunction with C. W. von Dohm (1751–1820), he brought out *Das deutsche Museum*, which became one of the best literary periodicals of the day. In 1776 Boie became secretary to the commander-in-chief at Hanover, and in 1781 was appointed administrator of the province of Süderditmarschen in Holstein.

See K. Weinhold, *Heinrich Christian Boie* (Halle, 1868).

BOIELDIEU, FRANÇOIS ADRIEN (1775–1834), French composer of comic opera, was born at Rouen, Dec. 16, 1775. He began composing songs and chamber music at a very early age—his first opera, *La Fille coupable* (the libretto by his father), and his second opera, *Rosalie et Myrza*, being produced on the stage of Rouen in 1795. In 1796 *Les deux Lettres* was produced in Paris, where the composer had now settled, and in 1797 *La Famille suisse* was well received. Several other operas

followed in rapid succession, of which only *Le Calife de Bagdad* (1800) has escaped oblivion. Boieldieu, then recognizing the deficiencies of his earlier musical training, took lessons in counterpoint from Cherubini, the influence of that great master being clearly discernible in his pupil's later compositions. In 1802 Boieldieu went to St. Petersburg (Leningrad), where he composed a number of operas. He also set to music the choruses of Racine's *Athalie,* one of his few attempts at the tragic style of dramatic writing. In 1811 he returned to his own country, and in 1812 produced one of his finest works, *Jean de Paris.* He succeeded Méhul as professor of composition at the Conservatoire in 1817. *Le Petit Chaperon rouge* was produced with success in 1818. Boieldieu's second and greatest masterpiece was *La Dame blanche* (1825). The libretto, written by Scribe, was partly suggested by Walter Scott's *Monastery,* and several original Scottish tunes introduced by the composer add to the charm and local colour of the work. On the death of his wife in 1825, Boieldieu married the singer, Philis Desroyes. The Revolution of 1830 reduced him to poverty, but he was ultimately relieved by a pension. He died in Paris of consumption, 1834.

Lives of Boieldieu have been written by G. Hequet (1864), A. Pougin (1875) and Émile Duval (Geneva, 1883). *See* also P. L. Robert, *Une correspondance inédite de Boieldieu* (1916).

BOIGNE, BENOIT, COUNT (1751–1830), the first of the French military adventurers in India, was born at Chambéry, Savoy, March 8 1751. He joined the Irish Brigade in France in 1768; subsequently he entered the Russian service and was captured by the Turks. After serving for a short time in the East India Company, he resigned and joined Mahadji Sindhia in 1784. In the battles of Lalsot and Chaksana, Boigne and his two battalions proved their worth by holding the field when the rest of the Mahratta army was defeated by the Rajputs.

In the battle of Agra (1788) he restored the Mahratta fortunes, and made Mahadji Sindhia undisputed master of Hindustan. He was given the command of a brigade of ten battalions of infantry, with which he won the victories of Patan and Merta in 1790. Boigne was then allowed to raise two further brigades of disciplined infantry, and made commander-in-chief of Sindhia's army. In the battle of Lakhairi (1793) he defeated Holkar's army. In 1796 he returned to Europe with a fortune of £400,000.

See H. Compton, *European Military Adventurers of Hindustan* (1892).

BOII, a Celtic people, whose original home was Gallia Transalpina. They were known to the Romans in the time of Plautus, as is shown by the reference in the *Captivi* (888). At an early date they split up into two groups, one of which made its way into Italy, the other into Germany. Some, however, appear to have stayed behind, since, during the second Punic war, Magalus, a Boian prince, offered to show Hannibal the way into Italy after he had crossed the Pyrenees. The first group of immigrants crossed the Pennine Alps (Great St. Bernard) into the valley of the Po, proceeded over the river, drove out the Etruscans and Umbrians, and established themselves as far as the Apennines in the modern Romagna. From the remains discovered in the tombs at Hallstatt, etc., they appear to have been fairly civilized.

Several wars took place between them and the Romans: in 224 B.C., after the battle of Telamon in Etruria, they were forced to submit. But they still cherished a hatred of the Romans, and during the second Punic war (218), irritated by the foundation of the Roman colonies of Cremona and Placentia, they rendered valuable assistance to Hannibal. They continued the struggle against Rome from 201 to 191 B.C., when they were subdued and deprived of nearly half their territory. There was a settlement of the Boii on the Danube from very early times, in part of the modern Bohemia (anc. *Boiohemum,* "land of the Boii"). Thirty-two thousand Boii joined the expedition of the Helvetians into Gaul, and shared their defeat near Bibracte (58 B.C.). They were subsequently allowed by Caesar to settle in the territory of the Aedui between the Loire and the Allier. Those who remained on the Danube were exterminated by the Dacian king, Boerebista, and the district they had occupied was afterwards called the "desert of the Boii" (Strabo vii. p. 292).

The Boii, as we know them, belonged almost certainly to the Early Iron Age. They used long iron swords for dealing cutting blows, and from the size of the handles they must have been a race of large men (*cf.* Polybius ii. 30).

BIBLIOGRAPHY.—For the ethnological affinities of the Boii and their possible connection with the Homeric Achaeans *see* W. Ridgeway's *Early Age of Greece* (vol. i., 1901); *see* also A. Desjardins, *Géographie historique de la Gaule romaine,* ii. (1876–93); T. R. Holmes, *Caesar's Conquest of Gaul,* 426–428 (1899); T. Mommsen, *Hist. of Rome,* ii. (Eng. trans., 1894), 373, note; M. Ihm in Pauly-Wissowa's *Real-encyklopädie,* iii. pt. i. (1897).

BOIL, in medicine, a progressive local inflammation of the skin, taking the form of a hard suppurating mass with a core of dead tissue, resulting from infection by a microbe, *Staphylococcus pyogenes,* and commonly occurring in young persons, or as a complication in certain diseases. Usually an infected hair follicle is the starting point. Treatment is local and systemic, the latter being necessary since boils are apt to occur in persons who are "run down." In the English Bible, and also in popular medical terminology, "boil" is used of various forms of ulcerous affection. The boils which were one of the plagues in Egypt were apparently the bubonic plague. The terms Aleppo boil (or button), Delhi boil, Oriental boil, Biskra button, etc., have been given to a tropical epidemic characterized by ulcers on the face, due to a micro-organism (Leishmania).

BOILEAU-DESPRÉAUX, NICOLAS (1636–1711), French poet and critic, was born in the rue de Jérusalem, Paris, the 15th child of Gilles Boileau, a clerk in the parlement. Two of his brothers attained distinction: Gilles Boileau (1631–1669), who is the author of a translation of Epictetus; and Jacques Boileau, who became a canon of the Sainte Chapelle, and made valuable contributions to church history. His mother died when he was two years old; and Nicolas Boileau, who had a delicate constitution, seems to have suffered something from want of care. Sainte-Beuve puts down his somewhat hard and unsympathetic outlook quite as much to the uninspiring circumstances of these days as to the general character of his time. He studied at the Collège de Beauvais, and at the Sorbonne, and was called to the bar Dec. 4, 1656, but from 1657 onwards he devoted himself to letters.

The first piece in which his peculiar powers were displayed was the first satire (1660), in imitation of the third satire of Juvenal; it embodied the farewell of a poet to the city of Paris. This was quickly followed by eight others, and the number was at a later period increased to twelve. A twofold interest attaches to the satires. In the first place the author skilfully parodies and attacks writers who at the time were placed in the very first rank, such as Jean Chapelain, the abbé Charles Cotin, Philippe Quinault and Georges de Scudéry. In the second place he showed both by precept and practice what were the poetical capabilities of French verse. His admiration for Molière found expression in the stanzas addressed to him (1663), and in the second satire (1664). In 1664 he composed his prose *Dialogue des héros de roman,* a satire on the elaborate romances of the time, which may be said to have once for all abolished the lucubrations of La Calprenède, Mlle. de Scudéry and their fellows. Though fairly widely read in manuscript, the book was not published till 1713, out of regard, it is said, for Mlle. de Scudéry. To these early days belong the reunions at the *Mouton Blanc* and the *Pomme du Pin,* where Boileau, Molière, Racine, Chapelle and Antoine Furetière met to discuss literary questions.

In 1666, prompted by the publication of two unauthorized editions, he published *Satires du Sieur D. . .* , containing seven satires and the *Discours au roi.* From 1669 onwards appeared his epistles, graver in tone than the satires, maturer in thought, more exquisite and polished in style. The *Épîtres* gained for him the favour of Louis XIV., who desired his presence at court. The king asked him which he thought his best verses, whereupon Boileau diplomatically selected as his "least bad" some still unprinted lines in honour of the grand monarch and proceeded to recite them. He received forthwith a pension of 2,000 livres. In 1674 his two masterpieces, *L'Art Poétique* and *Le Lutrin,* were published with some earlier works as the *Oeuvres diverses du sieur*

D. . . . The first, in imitation of the *Ars Poetica* of Horace, lays down the code for all future French verse, and may be said to fill in French literature a parallel place to that held by its prototype in Latin.

On English literature the maxims of Boileau, through the translation revised by Dryden, and through the magnificent imitation of them in Pope's *Essay on Criticism,* have exercised no slight influence. Boileau does not merely lay down rules for the language of poetry, but analyses carefully the various kinds of verse composition, and enunciates the principles peculiar to each. Of the four books of *L'Art poétique,* the first and last consist of general precepts, inculcating mainly the great rule of *bon sens;* the second treats of the pastoral, the elegy, the ode, the epigram and satire; and the third of tragic and epic poetry. The *Lutrin,* a mock heroic poem, of which four cantos appeared in 1674, furnished Alexander Pope with a model for the *Rape of the Lock,* but the English poem is superior in richness of imagination and subtlety of invention. The fifth and sixth cantos, afterwards added by Boileau, rather detract from the beauty of the poem; the last canto in particular is quite unworthy of his genius. In 1674 appeared also his translation of Longinus *On the Sublime.*

Boileau was made historiographer to the king in 1677. From this time the amount of his production diminished. The satires had raised up a crowd of enemies against him. The 10th satire, on women, provoked an *Apologie des femmes* from Charles Perrault. Antoine Arnauld in the year of his death wrote a letter in defence of Boileau, but when, at the desire of his friends, he submitted his reply to Bossuet, the bishop pronounced all satire to be incompatible with the spirit of Christianity, and the 10th satire to be subversive of morality. The friends of Arnauld had declared that it was inconsistent with the dignity of a churchman to write on any subject so trivial as poetry. The epistle, *Sur l'amour de Dieu,* was a triumphant vindication on the part of Boileau of the dignity of his art. He was admitted to the Academy in 1684, and then only by the king's wish. In 1687 he retired to a country-house he had bought at Auteuil, which Racine, because of the numerous guests, called his *hôtellerie d'Auteuil.* In 1705 he sold his house and returned to Paris, where he lived with his confessor in the cloisters of Notre Dame. In the 12th satire, *Sur l'équivoque,* he attacked the Jesuits in verses which Sainte-Beuve called a recapitulation of the *Lettres provinciales* of Pascal. This was written about 1705. He then gave his attention to the arrangement of a complete and definitive edition of his works. But the Jesuit fathers obtained from Louis XIV. the withdrawal of the privilege already granted for the publication, and demanded the suppression of the 12th satire. These annoyances are said to have hastened his death.

BIBLIOGRAPHY.—Numerous editions of Boileau's works were published during his lifetime. The last of these, *Oeuvres diverses* (1701), known as the "favourite" edition of the poet, was reprinted with variants and notes by Alphonse Pauly (1894). The critical text of his works was established by Berriat Saint-Prix, *Oeuvres de Boileau* (1830–37), who made use of some 350 editions. This text, edited with notes by Paul Chéron, with the *Boloeana* of 1740, and an essay by Sainte-Beuve, was reprinted by Garnier *frères* (1860).

See also Sainte-Beuve, *Causeries du lundi,* vol. vi.; F. Brunetière, "L'Esthétique de Boileau" (*Revue des Deux Mondes,* June 1889), and an exhaustive article by the same critic in *La Grande encyclopédie;* G. Lanson, *Boileau* (1892), in the series of *Grands écrivains français;* A. Bellessort, *Sur les grands chemins de la poésie classique . . . Boileau* (1914); A. F. B. Clark, *Boileau and the French Classical Critics in England, 1660–1830* (1925).

BOILER MAKER, an operative who constructs new boilers and mends, patches or rebuilds old ones. His work includes shearing, clipping, riveting, tube setting, calking, bending plates and general repair of boilers. A knowledge of applied mathematics and mechanical drawing is helpful. The boiler maker must be thoroughly acquainted with boiler shop tools and machinery and be able to work from blue-prints. (*See* BOILERS.)

BOILER-MAKING. This industry is remarkable for the immense amount of detail work to be performed, since nothing is really ready to be put together. The plates, angles, bars and other sections arrive in a fairly straight condition, and must be variously sheared, sawn, straightened, bent, flanged, dished, tapered or thinned, planed, turned, welded and drilled before any kind of construction is possible. Then follows the closing up of hundreds of rivets, the caulking, the fitting of stays, gussets, tubes, and finally the attachment of the numerous mountings.

Each great class of boiler has its peculiar constructional features, necessitating the use of specialized types of machines and riveters. The Cornish and Lancashire boilers require a large quantity of plates, with consequent joints and rivets, and the flues involve rolling, welding, and riveting. The marine Scotch boilers have a good deal of flue work also, as well as tubes and numerous stays, and the great size, as much as 18 ft. diam., together with the thick plates, require the employment of the most massive shearing, bending, and riveting machines. In the case of locomotive boilers, the flat fire-box plates necessitate the fitting of a great number of stays to prevent collapse under the pressure; holes for these must be drilled and tapped, and the stays must be screwed in and riveted over. The fire-tubes likewise are many in number, while superheaters in these and other types often add to the work. Water-tube boilers, though possessing no large amount of plating, demand much attention in the preparation of the tubes and their connections.

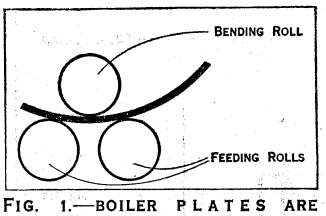


FIG. 1.—BOILER PLATES ARE CURVED BY PASSING THEM THROUGH POWERFULLY GEARED ROLLERS. THE TOP ROLL IS ADJUSTABLE TO CONTROL THE CURVATURE OF THE PLATE

Although plate flattening and bending are done cold, the shop must be equipped with furnaces for heating certain plates for flanging, thinning, or special bends, as well as angles, tees and bars for bending or forging. There are also smaller rivet-heating furnaces. Special sorts of cranes have to be installed, some to transport pieces from the furnaces and hold them in position during a process, others to suspend portable riveters in various attitudes about a boiler, and yet others to suspend boilers over fixed riveters.

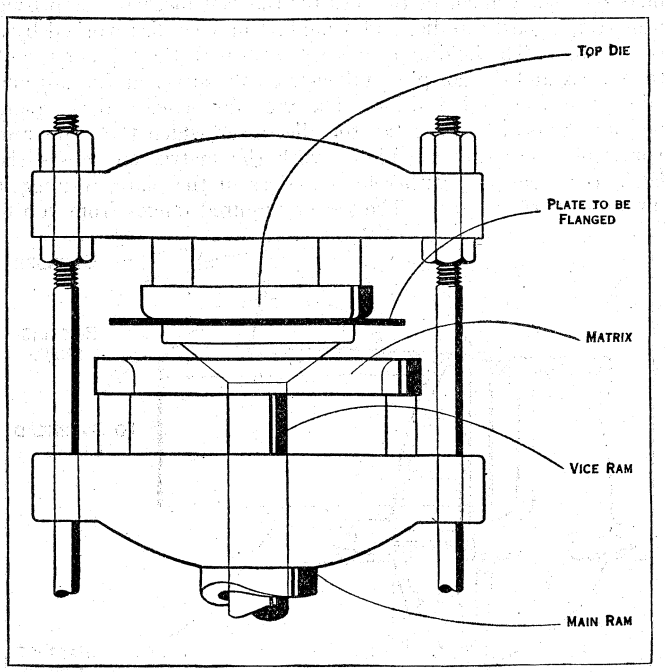


FIG. 2.—FLANGING A BOILER END IN HYDRAULIC PRESS
The heated plate is placed on the vice-ram, which rises and holds it tightly against the top die. The main ram, carrying the matrix, rises and forces the edge of the plate all around the top die in one operation

Shearing machines cut the plates to dimensions, the largest sizes being capable of shearing 12 ft. at a stroke through 2 in. cold plate. The shorn edge cannot be used thus, but must be planed on a long machine having a girder and jacks to hold the plate while a tool carriage travels up and down and planes the rough, slightly cracked edge into a smooth finish. This is a necessary preliminary to the caulking of the joints after riveting.

Some plates require flattening to take out the buckles and uneven tension; this is effected in a "mangle" with four, five or seven rollers. Bending can be done with three rolls, two driven ones, and a vertically adjustable bending one (fig. 1); the setting of this with screws in the end framings determines the degree of curvature. The thick heavy plates which make up the shells of Scotch marine boilers are often handled in vertical rolls, to avoid difficulties of floor space and handling with the crane; and there

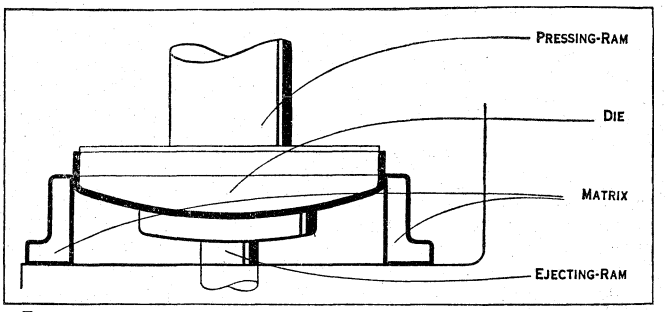


FIG. 3.—DIAGRAM OF A BOILER-END FLANGED AND DOMED IN DIES
Fig. 2 shows method of flanging to leave the face of the plate flat. In this, the face of the die is convex so as to impart the dome shape to the plate

are powerful hydraulic benders that press the plate bit by bit between dies, completing the curve more quickly than a rolling machine of the requisite size and driving power.

Flanging is performed in dies, with the exception of that for cylindrical flues, which are frequently put into a rotary machine with rollers that turn over the edge at one heat. Otherwise hydraulic presses are utilized that press the shape at one operation or, in the case of large plates, by a succession of squeezes, employing relatively small dies and a narrow machine. Fig. 2 depicts the arrangement of the dies for the first method, comprising a matrix, a fixed top die, and a holding or vice disc worked by a central ram. The holding disc is set level with the top surface of the matrix and the hot plate taken from the adjacent furnace and laid on in a central position. The vice ram rises and the plate becomes gripped against the top die, after which the main ram (or rams) actuating the platen with the matrix on causes the latter to ascend and gather in the edges of the plate, forming it up into a perfect flange. The power required ranges from 100 to

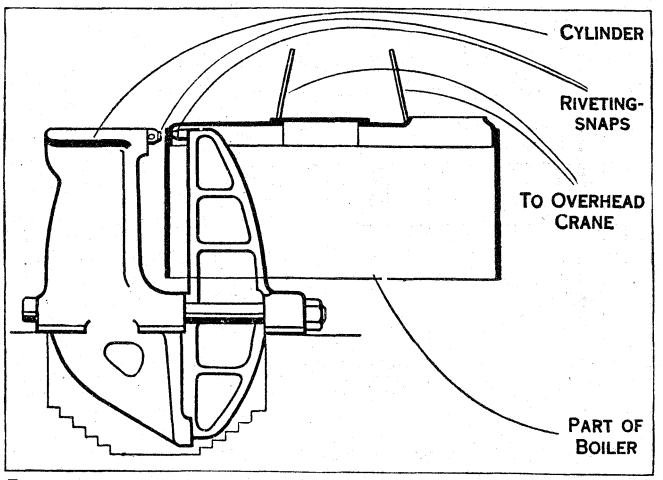


FIG. 4.—150-TON HYDRAULIC RIVETER RIVETING A MARINE BOILER SUSPENDED FROM CRANE
Some portions of boilers are riveted by means of portable riveters, but in making large marine-type boilers, they are slung from an overhead crane into position between the snaps of the big fixed machine

500 tons according to the diameter and thickness of plate. Differently-shaped dies are wanted for locomotive fire-box plates and other contours. Some parts of boilers, such as the ends of certain Cornish types, and of steam drums must be dished as well as flanged; this is seen in fig. 3. Proper finish to edges has to be imparted in a turning or sawing or milling machine, and some end plates have to go to a special machine which cuts large circular or elliptical holes.

Although some amount of drilling is done with portable electric or pneumatic drills, the bulk of the work goes to special fixed machines, either to those with a single spindle and devices for rapid transference from one spot to another, which do about 100 holes in an hour, or to those with multiple spindles driving a lot of drills simultaneously. The largest design of the latter will take a marine boiler shell up to 20 ft. diameter, upon rollers which revolve it as required to bring fresh portions of the periphery opposite the drills. Some machines drill and tap 2 in. stay holes through both shell and combustion-chamber plates and screw the stays into place, tap stay-tube holes up to 4 in. diameter through both plates and screw the tubes in.

Some details, as flues, are riveted up before insertion in a shell, but there is much awkward riveting to be carried on, this sometimes necessitating the employment of the hand-controlled pneumatic riveters. But all that is practicable goes preferably to the hydraulic riveters, or to the pneumatic yoke riveters, *i.e.*, those having a U-shaped frame carrying the riveting hammer at the termination of one arm and the holder-up at the other. The large fixed hydraulic machines have a gap as deep as 23 ft., in which a locomotive boiler may be lowered and moved about to the various positions. Marine boiler riveters are built on a more massive scale in order to deal with the thick plates and large rivets, one about $1\frac{5}{8}$ in. diameter requiring 150 tons pressure. The union of an end plate to the shell may be seen in fig. 4. As the plates are so thick and unyielding, and absolute tightness of joint is essential for the high steam pressures employed, a plate-closing device is incorporated, as represented in fig. 5. The closer touches the plate before the snap reaches the rivet tail, and squeezes with a force of from 30 to 50 tons, in opposition to the fixed snap at the back. Then the riveting snap advances and closes up the rivet.

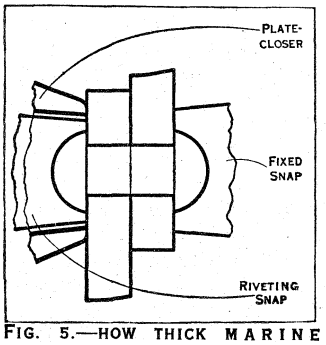


FIG. 5.—HOW THICK MARINE BOILER PLATES ARE SQUEEZED TOGETHER FOR RIVETING
The plates of marine boilers are not pliable enough to be ensured a close-fitting joint by the pressure of the powerful riveting snaps. Hence the hydraulic riveting machine has a secondary cylinder which jams the plates together with irresistible force as the riveting cylinder operates

There are many smaller kinds of portable hydraulic or pneumatic riveters slung from a crane and shaped to reach awkward situations, including corners and interiors. The screwed stays in locomotive fire-boxes are closed over by hand-manipulated pneumatic riveters, or with the help of a large U-shaped machine reaching inside the box and outside the shell.

The insertion of other stays and tubes occupies a good deal of time in the later stages. The tubes have to be expanded to fit tight by means of a power-driven tool carrying rollers that are forced hard against the interior of the tube as the expander revolves. Beading is accomplished with a hand or power-driven tool which forces over the projecting end of the tube to snug contact with the plate.

Caulking of the riveted seams, and of some rivets, is essential as a safeguard against leaks. A flat-nosed tool with matted face is driven against the plate edge with a hand hammer or more generally a pneumatic hammer, and burrs up the edge slightly, so that it makes intimate contact with its fellow. If, after testing the boiler with the hydraulic pump, leaks reveal themselves, the seams or rivets are marked at such spots; to be attended to again.

Attachment of the numerous mountings on a boiler means a lot of drilling, tapping and riveting, as well as the making of steam-tight joints in cases where detachment has to be provided for, for cleaning or inspection purposes. The final process consists in covering the shell with non-conducting composition, and fitting the bands and lagging sheets.

BOILERS. The origin of vessels for generating steam to supply the motive power of an engine was contemporaneous with the evolution of the steam engine itself, and even in the earliest days

of steam it was recognized that they should be fitted with safety valves and have a considerable margin of safety. They were made of cast-iron with leaden or even wooden tops and often with flat surfaces. These iron tanks were set in brickwork and the fire was lighted underneath. The Watts "wagon" boiler marked a striking improvement in practice, for it was constructed of wrought iron with an internal furnace flue passing through it from back to front. As this was flat sided it became generally known as the "marine box boiler." The interior surfaces were stayed with iron rods, which added to its strength, but the average working pressure was very low, being generally in the neighbourhood of 10 lb. The advent of the compound engine revolutionized the construction of boilers, especially for marine use, as pressures were increased to 25 lb. and upwards. A further impetus was given to progress when in the 1850's the steamship "Lima," of the Pacific steam navigation company, by using higher steam pressure, reduced her coal consumption from $1\frac{3}{4}$ tons to one ton per hour.

Two Great Classes of Boilers.—Boilers fall into two classes: tank or shell boilers, which contain relatively large quantities of water, and water tube boilers, in which a small quantity of water is contained in numerous and comparatively small tubes. The outstanding examples of the former are the Cornish or single-flued boiler, the Lancashire, which is usually double-flued, the Scotch marine and the locomotive types, while the best known examples of the water-tube boiler are the Babcock and Wilcox and the Yarrow. For mercantile marine use this class of boiler has made good headway consequent upon the demand for higher steam pressures, but in the British Navy the type was adopted in 1894, when the first torpedo boat destroyer, H.M.S. "Hornet," built by Messrs. Yarrow at Poplar, was fitted with eight small water tube boilers having copper generating tubes, for which, however, steel ones were very soon substituted. Subsequent destroyers were fitted with Thornycroft, White, Reed, Blechenden, or Yarrow boilers, while more recently it has been the practice to fit the Yarrow type in all the latest t.b.d.'s of the British fleet. In cruisers and battleships the water tube boiler first installed was the Belleville, but this has now disappeared. The battleships "Nelson" and "Rodney," as well as the post-war 10,000 ton cruisers, were equipped with Yarrow boilers working at a pressure of 250 lb. with a superheat of 200° Fahrenheit. In the case of destroyers, pressure has increased to 300 lb. and is likely to go to 400 lb., though since the Belleville boiler, with its 300 lb. pressure, went out, it was not usual until quite recently for naval boilers to exceed a pressure of 250 lb. The "King George V.," the Clyde-built passenger steamer, has Yarrow boilers designed for a pressure of 550 lb. per sq. inch.

Cornish Boilers.—This type of steam raiser has played a very important part in industry, but it has certain disadvantages which militate against its use when high pressure, efficiency, and space economy are desiderata. Circulation is slow, and therefore a long time is required to raise steam, and the tendency is for the water at the top to become hot before the boiler is equally heated at the bottom. Consequently, the strains to which the material is subjected are increased. The fact, too, that the heating surface is not ideal for breaking up the hot gases of combustion, so that heat is only absorbed slowly, means that the boiler is efficient at only a slow rate of working. A modification of the old type is that in which the flue is eccentric. This facilitates cleaning, but it does not remove the inherent disabilities attaching to the type.

The Lancashire Boiler.—The advantages of this type have been so widely recognized by steam users that many improvements have been made with a view to increasing its efficiency and overcoming the limitations of relatively narrow furnace flues and small combustion chamber volume. One of these includes mechanical forced draught with hand firing, special heat-resisting firebars and air heating, the combination of which enables low grade fuel with a high moisture content to be consumed without any difficulty. With Lancashire boilers, now operated with narrow furnace flues and small combustion chamber volume, wear and tear and maintenance costs are items of the greatest importance in relation to any appliances that may be used. Further, it is not always possible to have the most scientific supervision, especially on smaller plants. An extremely interesting combination consists of mechanical forced draught, hand firing, an ordinary design of firebars constructed of special heat-resisting alloy, and air heating, especially when high moisture content or other difficult fuel is under consideration. Efficient combustion, with an intensely hot fire and the maximum emission of radiant heat, can be obtained even with the worst material, the disadvantages of natural draught being eliminated. In many cases also it is not essential to use feed water economizers, especially when the water can be raised in temperature by means of exhaust steam or other source of waste heat.

The "Usco" hand-fired forced draught furnace (fig. 1) consists essentially of entirely closed furnace fronts with suitable trunking leading to a brick conduit passing along under the boiler footplates, at the end of which is a forced draught fan. The firing is carried out as usual, and when the firedoors are opened the blast is automatically shut off. Part of the air passes up through the furnace fronts behind the liners of the firedoors, thus keeping the whole arrangement extremely cool, while at the same time supplying a comparatively small amount of secondary heated air over the top of the fires, the main part of the volume, of course, passing underneath the bars in the ordinary way. A large amount of fuel can be burned per square foot of grate area and the forced draught is completely controlled by the fireman by means of a simple damper arrangement. Forced draught has the advantage not only of supplying air in a cool condition, but also of "localizing" the heat in the boiler, which is of particular importance for many inferior fuels of low specific gravity, such as wood material, brown coal, peat, and general factory refuse. The design of the air heater consists essentially of a series of flat multiple thin metal plates, fixed close together in a casing, the outgoing hot gases and the incoming cold air, flowing in opposite directions on the contra-flow principle, being split up vertically into alternate extremely long segments or channels of cold air and hot gases about $\frac{1}{2}$in. wide, travelling at high speed. This gives an extremely intimate contact between the air and the hot gases through the metal walls, which are about 12 wire gauge thick, resulting in high efficiency of heat transmission, while there is a negligible resistance to the passage of both the air and the gases, the flow throughout—including the entry and discharge—being on the stream line principle without any eddies or back pressure. The saving in coal obtained depends, of course, on the size of the heater and the saving already made by the feed water economizers and superheaters, if these are fitted. Even under the latter conditions, however, the average additional saving is from 10 to 12% in the fuel bill. This combination of air heater, mechanical forced draught with closed fronts, and hand firing, is highly advantageous for a large proportion of Lancashire boiler plants, extremely efficient results being obtained in continuous operation.

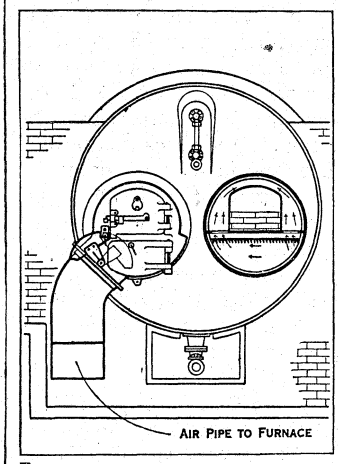


FIG. 1.—"USCO" IMPELLED DRAUGHT SYSTEM APPLIED TO A LANCASHIRE BOILER
Direction and attachment of air pipe to furnace is shown. The average saving is from 10–20% in fuel bill

Locomotive Boilers.—These boilers may be classified as of the dry bottom or wet bottom type. The ordinary locomotive boiler has a copper firebox and copper stays at the sides. The roof stays and shell are of steel and the tubes of copper. In construction, the front plates, back tube plates, and throat plates are usually pressed in one operation, and the workmanship must be of the best. The top plate of the furnace is sometimes made joggled to allow for expansion and the roof stays are of special design with solid heads screwed in from inside and nutted on the top, the face of the stay head being made with a V projection to

increase the efficiency of the connection between stay and copper plate. The foundation ring in the dry bottom boiler is a difficult forging, and great care must be taken to get a perfect shape and weld. The highest boiler pressure used is about 215 lb. per sq. inch.

The Scotch Boiler.—For the "marine" or cylindrical return tube boilers, which are commonly styled Scotch boilers, the British mercantile marine is indebted to the genius of the firm of Randolph Elder, now the Fairfield Shipbuilding and Engineering Company, who as far back as 1862 installed them in the s.s. "Velasquez" and "Murillo." Their advent created a revolution in existent beliefs as to the pressures possible in steamship propulsion. The old rectangular boilers, which prior to that date had been known as "marine" boilers, but which usually worked up to a maximum pressure of only about 20 lb., were quickly superseded. Pressures were at once raised to 50 or even 55 lb., and by steady evolution they have advanced to 250 lb. and upwards.

It has always been a principle of Scotch boiler practice that the furnaces, combustion chamber, and nests of tubes which return the hot gases to the front of the boiler should be surrounded by water—an admirable feature. But in spite of its many advantages and the great work which this class of boiler has done for the shipping industry, it has certain imperfections, which would almost seem to be impossible of elimination. Combustion is never perfect, as witness the volume of smoke which issues from the funnels of steamers, the unconsumed fuel which passes into the tubes, and in some cases the re-ignition of the gases at the base of the funnel. All this suggests waste, and in spite of many improvements and exhaustive tests the waste continues. Oil firing, however, has done much to reduce these shortcomings.

The Yarrow Boiler.—The outstanding characteristics of the Yarrow water tube boiler are lightness combined with simplicity. In the case of H.M.S. "Hornet," in which, as already mentioned, eight boilers were fitted in 1894. Copper was used as the tube material, though that metal was being almost universally abandoned for such purpose. Previously Mr. Yarrow, as he then was, had used steel. He had, however, been able to obtain special copper tubes which could stand internal pressure without developing the faults of which other boiler makers complained. Subsequently, he returned to steel.

The specifications for the materials for a Yarrow boiler are very severe. Steel plates, bars, and rivets must satisfy all the tests and inspections laid down in accordance with the British engineering standards specification, while the conditions respecting the manufacture of the tubes are very exacting. They must be straight, smooth, cylindrical, and of uniform sectional thickness and equal diameter throughout, while they are also required to be free from scale, longitudinal seaming, grooving, or blistering either internally or externally. They must successfully stand temper, flattening, bell-mouthing, and maximum pressure tests, together with a water pressure test in the case of a seamless tube of 2in. or less external diameter, of 2,500 lb. per square inch. All plates which may be subject to stress in the boilers must be pickled in a dilute liquid of hydrochloric acid to remove oxide or scale. Hydraulic flanging is insisted upon, and great importance is attached to subsequent annealing. Ultimate tensile strength and the percentage of elongation are carefully measured. It is therefore very rarely that trouble is experienced with boiler tubes, and great attention is also given to the U-shaped tubes used in the superheaters. High pressures and temperatures have been rendered possible by this care in manufacture, with the result that steam pressures of 500 to 600 lb. per sq. in. and superheat of 700° to 750° Fahr. are common in land practice, and there seems no reason why they should not be extensively adopted at sea. There are certain fundamental factors common to both problems, among them being suitable materials and workmanship. The better and more uniform materials now in use and the improved metallurgical and manufacturing methods adopted remove from the designer's mind any anxiety as to materials. Copper, wrought-iron, and cast-iron have been discarded in the manufacture of water tube boilers of high pressures. Steel is in common use, and its uniformity leaves little to be desired. Certain of the non-ferrous alloys which are now used also contribute to that security which characterizes modern installations. There is, however, one difference between land and marine practice, viz., that in the latter there is always the risk of a leaky condenser allowing salt to enter the system, although it must be remembered that there are many electric power stations where the condensing water is by no means entirely free from salt.

The design of the boiler which is illustrated (fig. 2) has been passed by the Board of Trade, whose officers have offered many

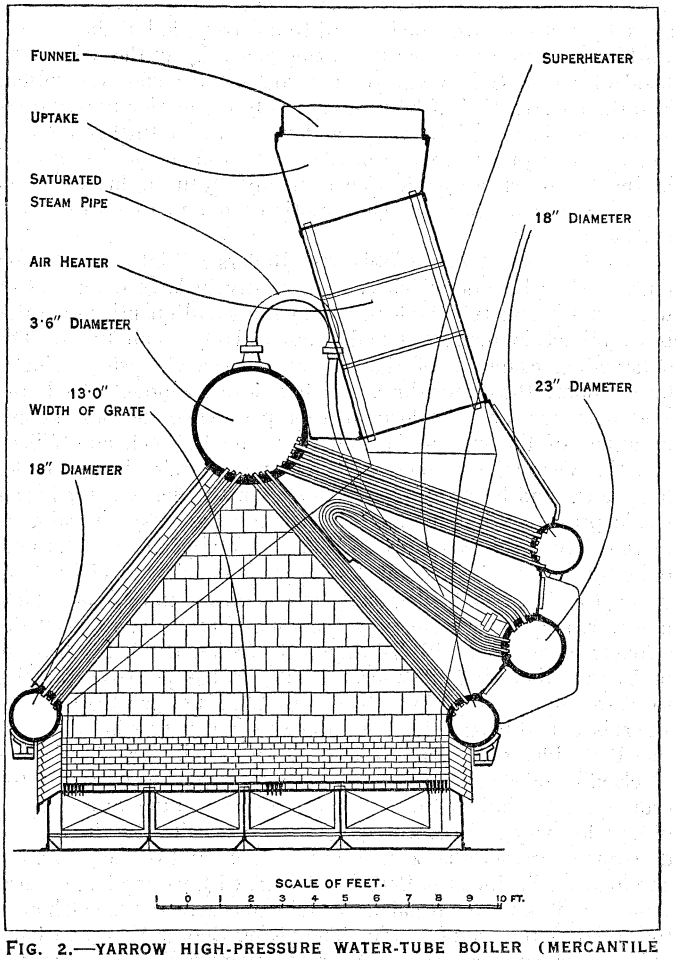


FIG. 2.—YARROW HIGH-PRESSURE WATER-TUBE BOILER (MERCANTILE TYPE) FOR 575 LB. PER SQ. INCH PRESSURE
This type has a heating surface of 3,420 sq. ft.; a superheating surface of 870 sq. ft., and in addition, 2,200 sq. ft. air heating surface for pre-heating air prior to admission to closed ashpit

valuable suggestions. The boiler has a total heating surface of 3,420sq.ft., of which the superheating surface is 870sq.ft.; in addition, there are 2,200sq.ft. of air-heating surface for preheating the air prior to its admission to the closed ashpit. The safety valves are set to 575 lb. pressure, and the final temperature will be from 700° to 750° Fahrenheit. The test pressure is 913 lb. The design generally, while not unlike that used in the navy, has been based on mercantile practice, and more closely follows the design of the Yarrow land type boiler now in use at a number of electric power stations. The boiler consists of a forged steam drum connected to the three forged water drums by means of straight tubes expanded and bell-mouthed in accordance with the usual practice. Between the two water drums on the right-hand side is a superheater, consisting of a forged drum with a number of U tubes and placed between the two generating elements. The gases all pass up one side of the boiler and through the air-heater situated above the boiler to the funnel. The reason for adopting a single-flow type of boiler, where all the gases pass through one side, is that this design makes in this particular case a somewhat better arrangement in the ship than the double-flow type, where the gases pass equally through each side. The generating element on the left-hand side of the boiler absorbs a considerable portion of the heat from the furnace by direct radiation, and it will be

noted that the proportion of the total surface of the boiler subject to direct radiation is considerable—an important feature in modern water-tube boiler design, not only increasing the output and efficiency of the unit, but also providing a large amount of comparatively cool surface adjacent to the combustion chamber, which lengthens the life of the brickwork. The admission of air for combustion is secured by the cool air in the stokehold entering an opening between the inner and outer casings at the front of the boiler about 6ft. up from the firing-floor, passing up the double casing through the air-heater, down the double casing at the back of the boiler into the closed ashpit, and so through the fire-bars. The efficiency of the unit is naturally increased by the air-heater, which extracts heat from the flue gases; moreover, the air in its passage to the combustion chamber takes up a certain amount of heat which would otherwise be lost owing to radiation, and incidentally keeps the stokehold cool. Also, the circulation of air in close proximity to the furnace lining helps to keep the brickwork at a temperature which ensures low cost of upkeep.

For controlling the supply of steam—especially as, unlike an oil-burning boiler, the supply of fuel cannot be quickly cut off—various means of regulation have been provided. A damper is fitted in the uptake at the side of the top of the air-heater. When this is in its horizontal position the air passes through the air-heater to the combustion chamber. When, however, the damper is brought to a vertical position the air from the fan passes straight up to the funnel, thereby short-circuiting the air-heater and entirely stopping the supply of air for combustion. This arrangement would be used when the engines are stopped suddenly. Provision is also made for controlling the speed of the forced draught fan, thereby limiting the amount of air for combustion. A still further control is to by-pass the steam direct from the boiler to the condenser by the silent blow-off.

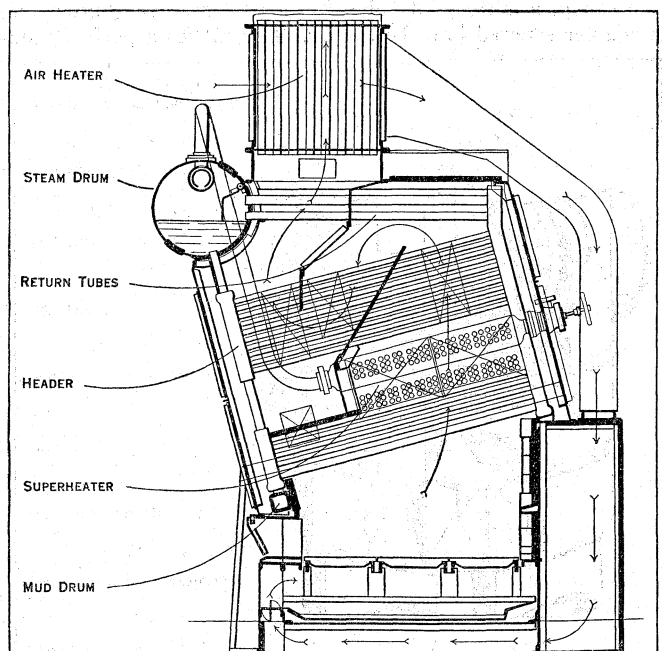


FIG. 3.—SECTION OF A BABCOCK AND WILCOX WATER-TUBE BOILER
The arrows indicate the direction taken by the gases. The main tubes are at an angle of 22° with the horizontal. The boilers are constructed sectionally to facilitate transport

Babcock and Wilcox Boiler.—The original boiler of this type was patented in 1867; since then over 40 water-tube or sectional boilers have been put on the market, the great majority of which have disappeared. The land type boiler, which has attained world-wide popularity, is of the longitudinal drum standard type; it is built up in sections and has distinguishing features as follows: (1) horizontal drum; (2) inclined section headers (staggered); (3) inclined straight tubes. The tubes, usually 4in. in diameter and 18 to 20ft. in length, are arranged in vertical and horizontal rows and are expanded into pressed steel headers. Two vertical rows are fitted to each other and are staggered. The headers are connected with the steam drum by short tubes expanded into a cross box, which in turn is connected to the drum. Each tube is accessible through individual handhole openings. These openings are elliptical in shape in the vertical headers because of the inclination of the tubes, the shape being necessary to provide for the insertion and removal of the tubes. The elliptical openings are closed by inside fitting forged covers, held in position by steel clamps and bolts. The circular openings—where circular handholes are used in incline headers—are closed on the outside by forged steel caps, milled and ground and held in place by clamps and bolts. Jointing rings or gaskets are required with the inside elliptical covers, but not with the outside circular plates. The main tubes are inclined at an angle of 22° with the horizontal. The rear headers are connected at the bottom to a rectangular forged steel mud-drum by means of nipples expanded into counterbored seats. The boiler is supported by steel girders resting on suitable columns independent of the brick setting. The feed water enters the front of the drum. All these water-tube boilers are constructed on the sectional principle, *i.e.*, they may be shipped in sections and erected at the power station. In the marine boiler, to save weight, it is usual to fit only one (or sometimes two) rows of 4in. tubes, the remainder being $1\frac{3}{16}$ in. in diameter. The land type boiler is fitted with revolving mechanical chain grate stoker automatically fired and with economizer feedheater and superheater.

The Babcock and Wilcox boiler is by far the most popular land type boiler of the present day. At sea it has been fitted in battleships and battle cruisers and also in certain mercantile ships, but it is not, owing to its circulation, recognized as a boiler that can be forced greatly. With water-tube boilers it is of the greatest importance to use nothing but distilled water, and great care must be exercised in the selection of material for condenser tubes. It has recently been shown that a cupro-nickel tube is likely to be the tube of the future. Pure nickel would be the most reliable metal, but the difficulty of manufacture has not yet been overcome. A composition, however, of 70 parts of copper to 30 of nickel gives excellent results. (*See* fig. 3.)

Cochran Boiler.—The Cochran boiler is remarkably efficient, durable, and adaptable. It is manufactured in 22 standardized sizes up to 8ft. 6in. diameter and 1,000sq.ft. heating surface. It takes up comparatively little space and is economical to install. A special feature is the patent seamless furnace, which has a large ratio of heating surface to grate area, and provides easy facilities for cleaning or inspection purposes. The bricklined combustion chamber has a large thermal storage capacity, and the boiler has the additional recommendation of being readily adaptable to any class of fuel—coal, oil, coke, or wood, town, producer, or water gas.

Beardmore Blake Boiler.—This is of the vertical multitubular type, occupies very little ground space, and requires no brick settings. It may be fired either by coal or oil and has been designed with a view to utilizing waste heat from furnaces. Other features are general compactness and a large wet-back combustion chamber. One of these boilers, 7ft. in diameter with a height of 18ft., and a heating surface of 582sq.ft., using two oil burners, has evaporated 4,197 lb. of water per hour on a consumption of 328·6 lb. of oil when working at a pressure of 165 lb. per sq. inch. Its general utility is shown by its suitability for auxiliary purposes on board ship, for steam heating and also for supplying the motive power for steam cranes.

Howden High Pressure Boiler.—This combines the advantages of the cylindrical and water-tube boilers by ensuring that there is a large amount of water in circulation and also an ample steam space. There are no stays or stay nuts in contact with the flames, and although designed for the high pressures of marine service, the thickness of the shell plate is kept within practicable limits. Another feature is that the water-tubes are not subjected to intense heat, as the flames first operate on the cylindrical portion of the boiler, the tubes coming into contact only with the combustion chamber gases. The temperature drop from the forward portion of the cylindrical furnace to the water-tubes is

approximately 700° to 800° Fahrenheit. All parts of this boiler are readily accessible both from the front through the furnaces and from the sides through the combustion chamber, and observation can be made of the flame during the whole time the boiler is in operation. Installations of this type do not require the space occupied by a battery of marine boilers, while the weights are 40% less than those of Scotch boilers of the same capacity. Any mud or scale is deposited in the lower water-tube drum, which is not subjected to flame and whence it can be removed easily. An oil-burning boiler of this description with a heating surface of 420sq.ft. in the cylindrical portion and 2,580sq.ft. in the water tubes, with a steam pressure of 305·6 lb. per sq. inch, evaporated 16 lb. of water per hour per lb. of oil used. The total weight of the boiler with water was 60 tons and the efficiency worked out at 87·78%.

Superheaters.—In order to increase the working efficiency of the boiler many devices have been invented and much importance attaches to the superheater, which may be defined as an apparatus for increasing the temperature of steam without augmenting the pressure. It consists of a system of tubular units or elements with the steam flowing inside and hot gases outside. One end of each tube or unit is connected to a distributor or saturated steam heater, the other end to a collector or superheated steam heater. In the locomotive and Scotch marine boilers the fire tube type superheater is the usual design. The "integral" superheater is installed within the boiler setting and receives heat from the same flue gases and the same furnace as the boiler. They are usually of the convection type, absorbing heat from the gases of combustion which sweep over them. In some cases, in locomotive and Scotch marine types, the superheaters are located in the uptake, but the degree of superheat here is limited to about 50° F, whereas the fire tube superheater gives 200° to 300°. In some instances superheaters have to be provided with their own furnace, *e.g.*, when the design of the boiler does not permit the installation of an integral superheater. The most remarkable improvement in the steam locomotive since its invention has been the introduction and use of superheated steam. Practically no locomotive is built to-day without superheaters.

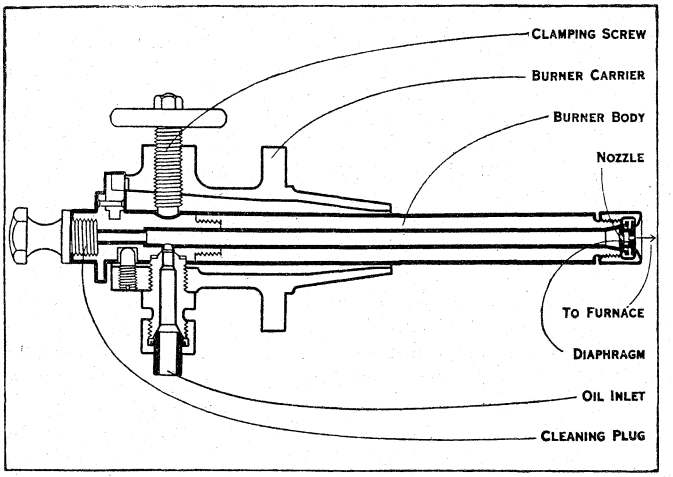


FIG. 4.—WALLSEND-HOWDEN PATENT LIQUID FUEL BURNER
This extremely simple and strong type of burner, requires only a few seconds to change, replace and light

The "elesco" fire tube superheater consists of loops of tubing forming units which extend into the boiler flues.

Liquid Fuel.—The use of liquid fuel, especially under marine boilers, is a notable feature of modern development in boiler practice. The advantages are reduction in engine room staff, increase in cargo carrying capacity, and more steady steaming. Fuel oils, as used for steam-raising purposes, are the residuals which remain after the lighter fractions have been removed from the crude oil. The result is that most fuel oils are heavy viscous liquids which would not be satisfactory if methods of oil firing had not greatly improved. One advantage, however, arises from the use of these residuals, viz., that in bulk they are not inflammable, and therefore can be stored with safety. The oil is drawn through the suction strainer by the oil fuel pump and discharged to the heater in which its temperature is raised to reduce the viscosity of the oil sufficiently to enable a very fine spray to be obtained at the burner. After leaving the heater the oil is passed through a discharge strainer in which it is very finely strained. The fittings and their accessories are generally mounted on an oil-tight tray to form a complete unit. From the pumping and heating

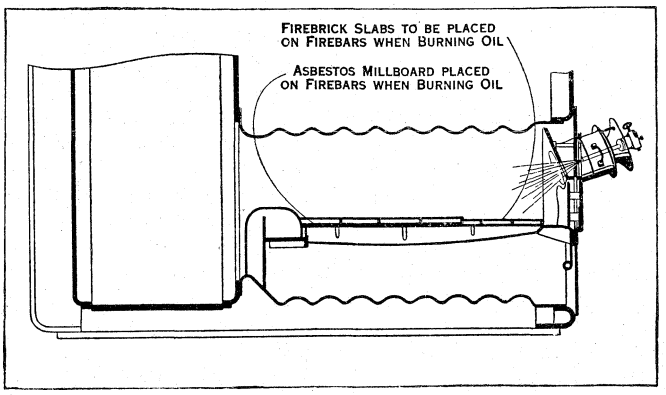


FIG. 5.—FURNACE ARRANGEMENT OF THE WALLSEND-HOWDEN PATENT LIQUID FUEL BURNING SYSTEM

unit the oil travels through the discharge pipe to the burners, one of which is illustrated. The burner (fig. 4) is extremely simple and strong, and consists of only four parts—viz., the body, cap, nozzle, and diaphragm. Holes are drilled nearly tangentially through the diaphragm, causing the oil to spin rapidly in the swirling chamber, so that on issuing from the nozzle it opens out in the form of a fine conical mist-like spray, due to the centrifugal effect of the spinning motion. The burner is held in its carrier by a clamp, a mitre joint being formed between the burner and an adapter screwed into the carrier. This makes a perfectly oil-

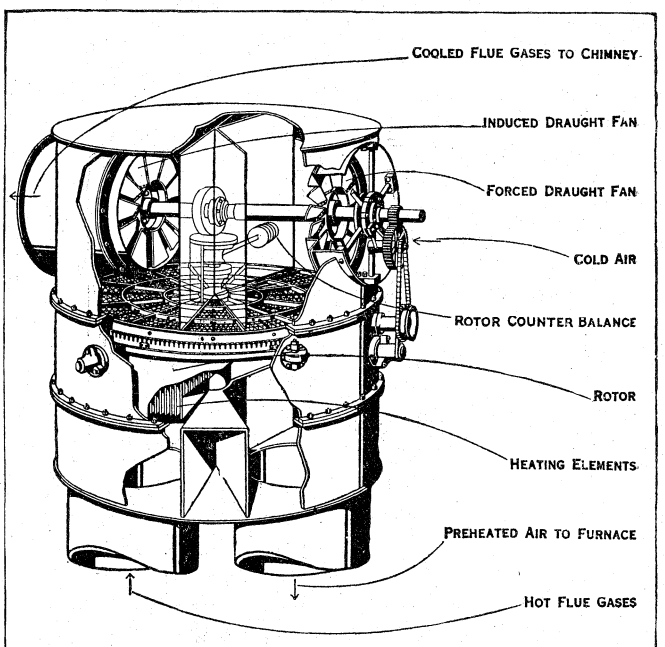
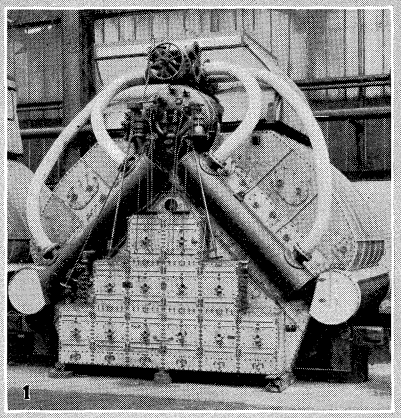


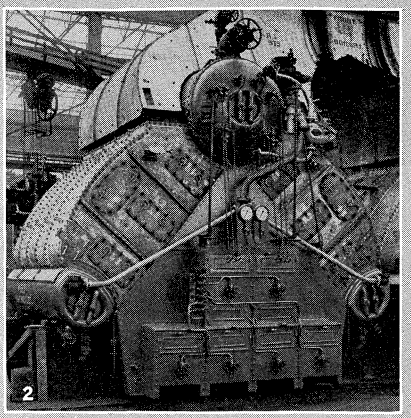
FIG. 6.—HOWDEN-LJUNGSTROM AIR PREHEATER, WITH PART OF CASING REMOVED TO SHOW THE CONTRA-FLOW PRINCIPLE USED IN THIS TYPE OF CONTINUOUS AIR-REGENERATOR

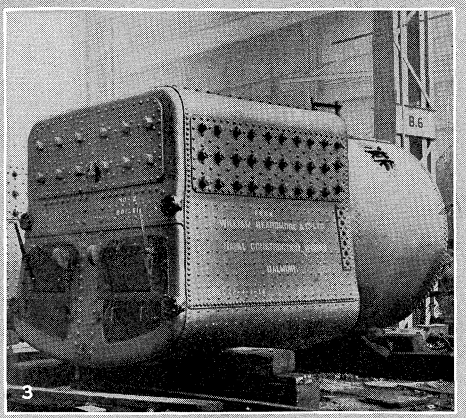
tight joint and enables a burner to be removed without breaking pipe joints. The time required to change the burner, replace it by another, and light it up is a matter of a few seconds only.

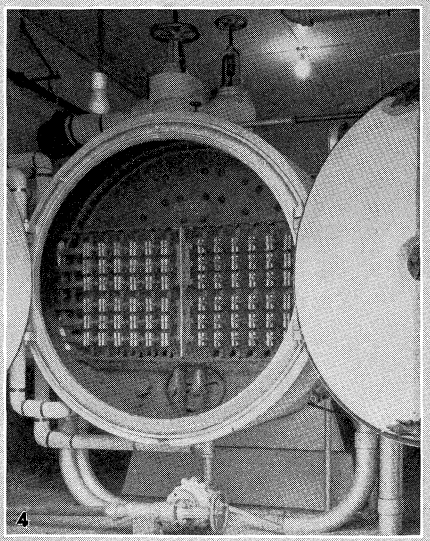
In the Wallsend-Howden liquid fuel burning system, the furnace arrangement allows (1) burning coal only (2) burning oil only or (3) burning coal and oil together (fig. 5).

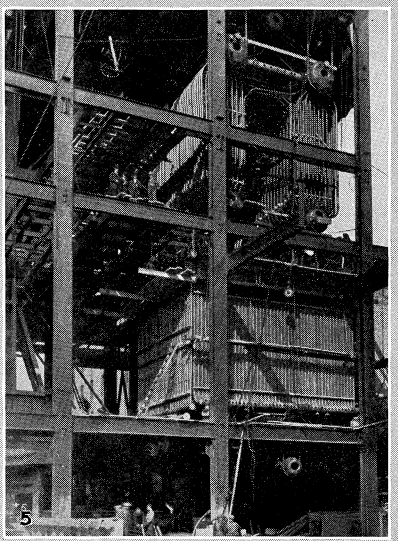
Preheated Air.—Preheated air gives better combustion, and with high temperatures the intensity of any chemical reaction becomes greater. It also increases the temperature of combustion.

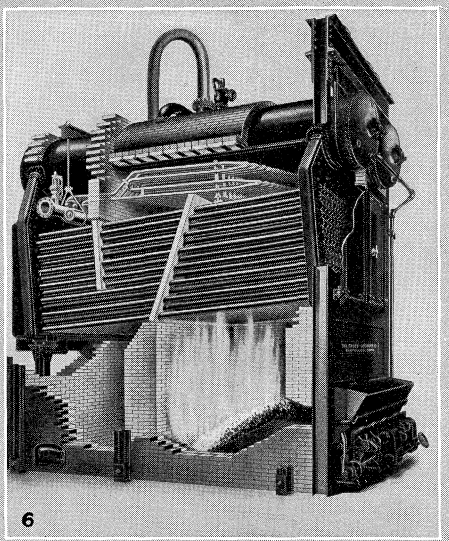


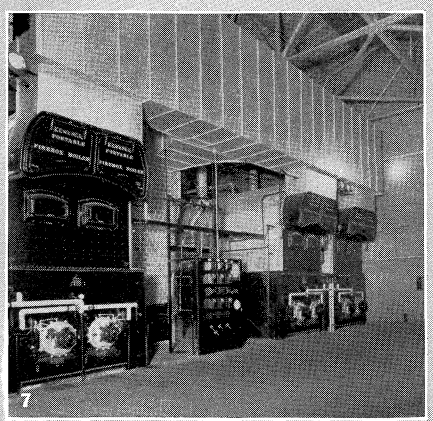


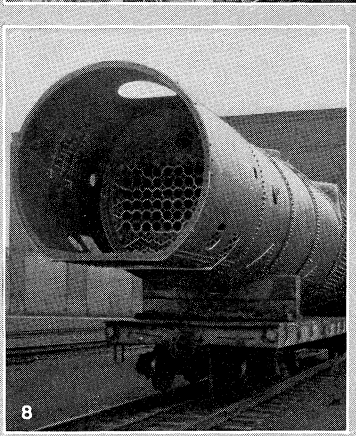


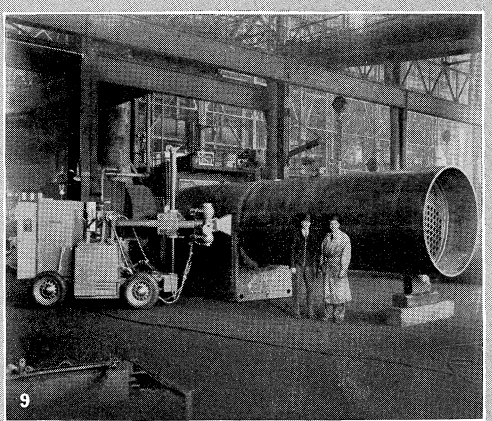












BY COURTESY OF (3) WM. BEARDMORE AND COMPANY, LTD., (4) THE GENERAL ELECTRIC COMPANY, U.S.A., (5) THE COMBUSTION ENGINEERING CORPORATION, (6) THE SUPERHEATER COMPANY, (7, 9) KEWANEE BOILER CORPORATION, (8) THE BALDWIN LOCOMOTIVE WORKS

VARIOUS TYPES OF WATER-TUBE AND FIRE-TUBE STEAM-GENERATING BOILERS

1. A Yarrow water-tube 10,000-h.p. boiler, 250lb. sq.in. pressure, high superheat
2. A Yarrow water-tube boiler of 3,750 h.p., with feed water admitted to lower drums
3. Wet bottom locomotive boilers
4. Horizontal tubular type electric steam boiler, 1,200kw., 440 volts. The doors are open, showing end view
5. First unit at Kips Bay station, New York city, for burning pulverized fuel
6. Convection type Elesco superheater in a Hedges-Walsh-Weidner longitudinal drum (box header) boiler
7. Battery of three oil-burning fire-tube boilers, each rated at 42,500 sq.ft. radiation, or 304 h.p. apiece
8. Oil-burning locomotive boiler, with a heating surface of 7,142 sq.ft. and a grate area of 108 square feet
9. All-welded oil field boiler with seams X-rayed before placing in stress-relieving furnace

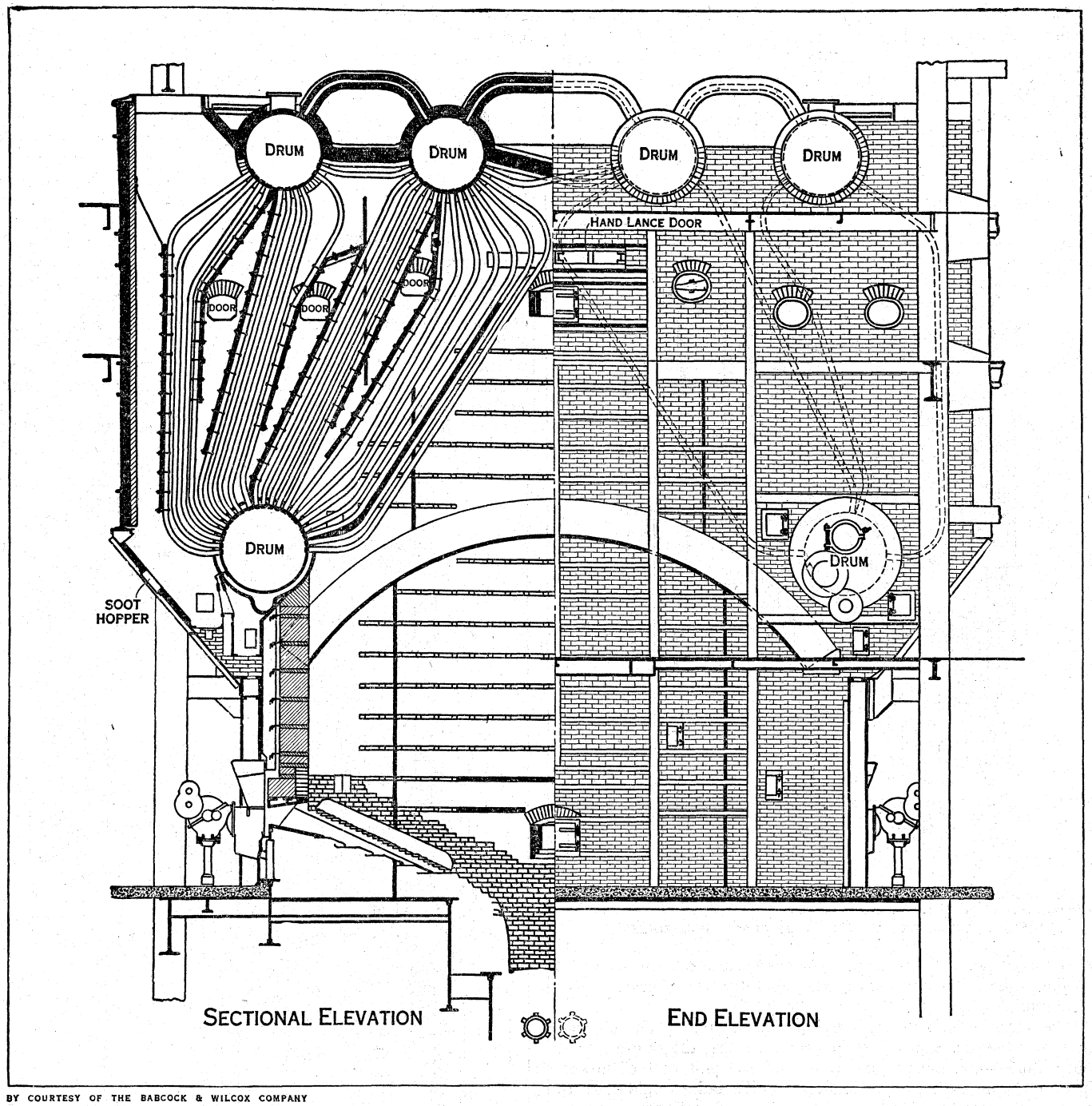


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FIG. 7.—LARGE SIZE CENTRAL STATION BOILER WITH 43,370 FT. OF HEATING SURFACE. IT IS OF THE INCLINED CURVED-TUBE, MULTI-DRUM TWIN TYPE

The Howden-Ljungstrom air preheater (fig. 6) differs from others, inasmuch as it is constructed as a continuous regenerator and uses the contra-flow principle. The air enters the preheater through the forced draught fan and passes downwards through the rotor to be delivered through steel ducts to the boiler furnace. The flue gases pass through the rotor in the opposite direction, being drawn by the induced draught fan and delivered to the chimney. These fans are of the axial type, the upper part of the preheater shell being adapted as the fan casting.

Use of Pulverized Fuel.—Considerable experiment and research has been devoted to discovering the best means of using pulverized coal both for land and marine boilers, and the difficulties of the problem now seem to be overcome. Coal dust, together with the requisite quantity of air, is introduced into the combustion chamber, and as each particle of fuel is surrounded by the necessary air, combustion is instantaneous and complete. Successful experiments have been carried out by the United States shipping board, which show there is no difficulty not only in burning pulverized coal under boilers, but in performing the requisite pulverizing on board ship. The advantages of the system are: higher temperature of combustion; complete combustion and therefore no carbon loss in ash; ability to use any class of coal; increased flexibility of operation, so that the fuel supply can be immediately cut off or automatically adjusted to the load; reduced costs; and elimination of wastage from smoke. (W. O.)

UNITED STATES

Advances in boiler practice in the United States during the ten years ending in 1928 have been made primarily in the size of boiler units used, in the pressures for which they have been built and operated, in the ultimate steam temperatures used and in the capacities or rates of evaporation developed from a given amount of heating surface.

Boiler Sizes.—Twenty years ago the average boiler in power plant service contained some 2,500 sq.ft. of heating surface while the maximum sized unit contained approximately 6,000 sq.ft. The average sized boiler in central station work now contains from 12,000 to 14,000 sq.ft. of heating surface, the largest boiler yet built containing 42,370 sq.ft. This unit is of the inclined, curved tube design (fig. 7); the largest boiler of the straight tube type

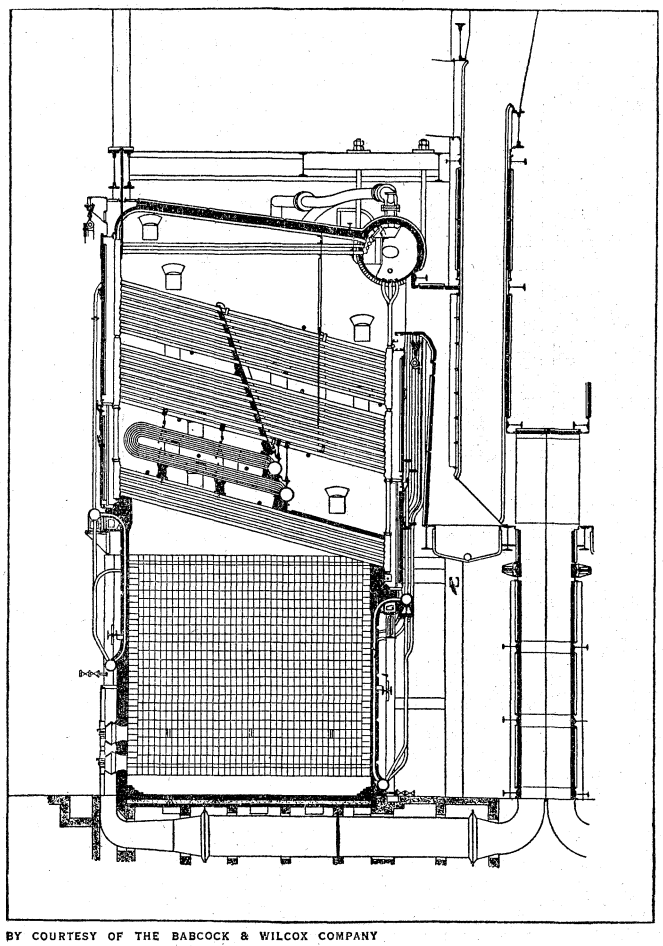

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FIG. 8.—HORIZONTAL WATER TUBE CROSS DRUM BOILER

contains 35,449 sq.ft. of heating surface exclusive of furnace wall cooling tubes. This unit is of the horizontal sectional heater water tube type (fig. 8).

The increase in size of individual boiler units has followed naturally the increase in size of prime movers, the desire to cut down boiler-room labour and to reduce the unit cost of power. The limitation on the physical size of boiler units would seem to be set by a combination of boiler design and boiler-shop equipment.

Capacities.—While the maximum amount of heating surface possible in a single unit is a question of physical size and the ability to build any particular design of boiler to such maximum, the maximum amount of steam to be generated by any given amount of heating surface is dependent upon a great number of factors. Almost regardless of the design of any particular combination of furnace, boiler, economizer or air heater, or both, because of the great number of these factors involved, it is impossible to state what rate of output per sq.ft. of surface represents the best rate for the best commercial return. The limitation is set not by the maximum thermal efficiency obtainable so much as by the return on the capital invested and by problems of operation. With first cost eliminated, it would always be possible to obtain efficiencies at very high rates of boiler output comparable with those obtainable at normally high rates simply by the addition of economizer or air pre-heater surface. It is the operating factor that has the greater bearing. In one plant the maximum output per boiler unit may be limited by the class of coal used, as affecting slag troubles either on the furnace walls or on the boiler tubes. Much has been done in the development of the so-called slag screens, formed by certain of the boiler tubes, to minimize the latter trouble. This has been accomplished by the use of an arrangement of the boiler tubes which the products of combustion first strike in such manner as to give greater gas flow areas, and lower gas velocities, into the boiler heating surfaces. A sufficient number of tubes are so arranged as to cool the gases below the temperature at which the ash will fuse to the tubes before the gases strike the main portion of the heating surface of the boiler. The development of water-cooled furnaces, discussed hereafter, has tended to minimize any slagging trouble with the furnace walls.

In another plant, where refractory furnaces are used, the limiting factor may be the life of the furnace brickwork as affected by the rate of driving. This factor too is becoming of less importance through the increased use of water walls in high duty boilers. In a third plant the load factor may have the greatest bearing on the rate of output; *i.e.*, at peak load periods, rates might be justifiable from the standpoint of slag or brickwork trouble that would not be allowable in steady operation.

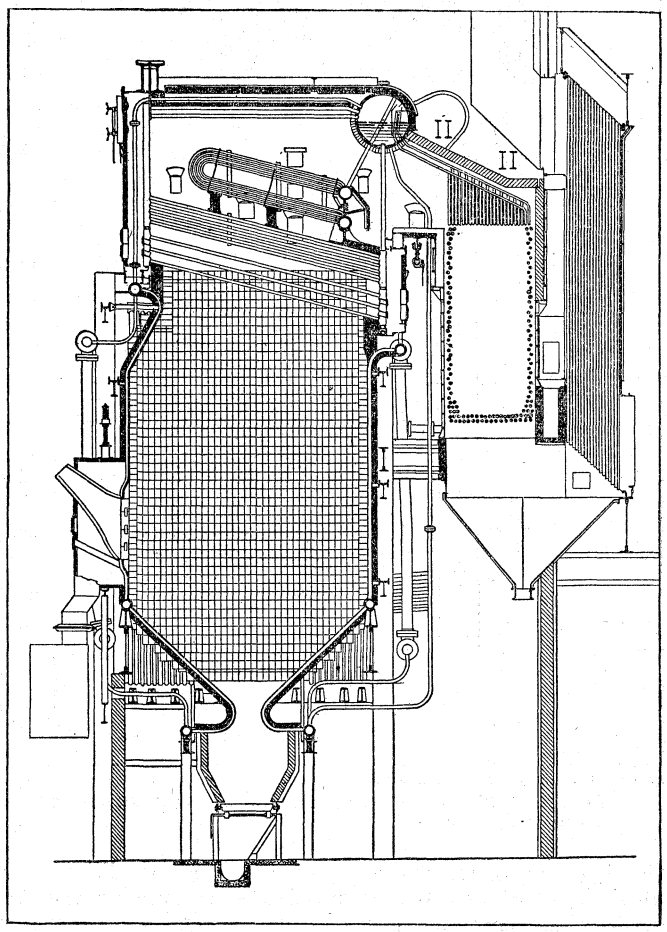

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FIG. 9.—HORIZONTAL WATER TUBE, CROSS DRUM, STEAM ECONOMIZER TYPE BOILER

Twenty years ago rates of evaporation of 5 or 6 lb. per sq.ft. of boiler heating surface were considered high. Such rates were limited not so much by the lack of ability of the boiler to absorb heat as by the limitations of the combustion apparatus available. With the developments in combustion apparatus, improvements in furnace design, and the increase in use of water-cooled furnaces, such rates to-day are considered moderate and continuous rates of 9 or 10 lb. per sq.ft. of boiler heating surface are common in central station practice, while somewhat lower rates are common in industrial plants.

The highest rates of evaporation expressed in pounds per square foot of heating surface have been obtained with a boiler of a late design in which a large proportion of total heat absorption is through direct radiation. A boiler of this type, illustrated in fig. 9, is divided in heating surface as follows:—Boiler, 5,938 sq.ft.; furnace walls and floor, 2,460 sq.ft.; economizer, 8,365 sq.ft.; total water surface, 16,763 sq.ft.; air heater, 41,700 sq.ft.

This boiler has been operated at a capacity of somewhat over 290,000 lb. output per hour. Such a rate would mean an evaporation per square foot of boiler and furnace wall surface of 34·5 lb. or of total water surface including economizer of 17·3 lb. While the economizer is designed to permit steaming, the amount of steam made in the economizer, even at the high rates of output, is not great, and the actual evaporation per square foot of boiler and furnace wall surface is much closer to the first figure than the second. Another design of boiler in which the major proportion of the total heat absorption is through direct radiation, and for which a rate of evaporation of 24·6 lb. per sq.ft. of surface per hour is reported, is shown in fig. 10. Of the boilers absorbing heat largely through convection, the maximum total evaporation is largely a function of the fuel burning equipment, while the maximum evaporation per square foot of heating surface will decrease as the heating surface per foot of furnace width increases. Of the convection absorption boilers of the general design illustrated in fig. 8 the maximum evaporation per square foot of heating surface is from 15·1 lb. per hour for a boiler 18 tubes high to 22·5 lb. per hour for a boiler 11 tubes high.

The maximum evaporation reported with multidrum boilers of the design illustrated in fig. 7 is 20·5 lb. per hour. With continued developments in furnace design, combustion apparatus, and possibly some modification in the arrangement of heating surface relative to furnace, these rates may be exceeded. It is to be understood that these high rates of steam output are only possible with the very best feed water, and it is becoming more and more thoroughly appreciated in the United States that the best of feed water is essential to proper central station operation.

Pressures.—Twenty years ago the average boiler pressure used in central station work was 200 or 225 lb., though some few stations were equipped with 350 lb. boiler units. In 1926, two 650-lb. pressure plants were placed in operation. In 1928 there were 18 different stations either in operation or in course of erection, utilizing pressures of 650 lb. or over. There are to-day, in operation or in course of erection, seven different stations utilizing pressures of from 1,200 to 1,400 lb., the latter being the highest pressure for which boilers have as yet been built for commercial service in the United States. Experimental boilers have been built for pressures higher than 1,400 pounds.

Riveted drums have been used for pressures up to 730 lb. per sq.in. Boilers built for pressures above this have been equipped with seamless forged steel drums. In the more or less unstable state of the art it is useless to attempt to predict what pressure will ultimately be accepted as representing the best practice. The efficiency of the steam cycle increases very slowly with increased steam pressures above 600 lb., and the problems of reheating—it is generally accepted that reheating is necessary at pressures of about 550 lb. and above—feed pumps and the like must be carefully weighed against the increased first cost and the increased skill necessary in operation resulting from added complication. Maintenance costs are apparently no higher with high than with moderate pressures. The number of plants in service and in contemplation perhaps best indicate that under proper conditions the so-called super-pressures are justifiable. Most engineers have felt that the use of such pressures could only be justified for a base load plant where fuel costs were high. On the other hand at least one plant is being built for 1,400 lb. that will not be a base load plant and where fuel costs are reasonably low, and the engineers responsible for the design have been able to justify the installation.

An attractive field for the use of the very high pressure boiler would seem to be in the older and less efficient plants. Here the high pressure turbine can be made to exhaust at existing line pressure and the overall plant efficiency be raised appreciably.

The tendency toward the use of higher steam pressures is not limited to central station practice. Industrial plants within the past few years have also been adopting higher pressures though not the super-pressures. Many industrial plants are utilizing 450 lb. pressure and one plant has gone to 800 lb. The use of high pressures in industrial plants is particularly of advantage where process steam is used, the steam being bled from the turbine at one or more stages at such pressure or pressures as are used in process work. *See* the article STEAM GENERATION and related subjects, including MERCURY-VAPOUR BOILER.

Superheat.—Twenty years ago when the average central station pressures were 200 to 225 lb., the steam temperatures required and used were rarely over 550° F—approximately 150° of superheat. This ultimate temperature has been gradually increased until to-day temperatures of from 700° to 750° are generally accepted as representing best central station practice. A superheater designed to give 750° ultimate temperature may under certain conditions of operation give for short intervals temperatures of, say, 800°, but in the United States 750° has as yet been considered the maximum allowable for steady operating conditions. It is probable, however, that higher temperatures will be demanded and that the demand will be met by the use of special alloy steels in the hot portion of the superheater. One manufacturer at least is at the present time using such steel in the hot end of the superheater where ultimate temperatures of 725° and over are required. The limiting factor is tube temperature. It is to be remembered that the temperature of the tube metal is appreciably higher than the temperature of the steam within, particularly where the superheater is located in a hot gas temperature zone. This tube temperature may be as much as 150° above steam temperature, which would mean for an ultimate steam temperature of 750° a tube temperature of 900°. For this reason it is essential in superheater design that steam velocities be used to keep the tube temperatures as near that of the steam as possible and to assure a proper distribution of steam to all superheater tubes.

Both convection and radiant heat superheaters are in use in the United States and in some instances a combination of the two. Radiant heat superheaters show a falling superheat curve; *i.e.*,; a decrease in superheat with increased rates of steam output. A properly designed combination convection and radiant heat superheater should give the desirable flat superheat curve; *i.e.*, a constant degree of superheat regardless of rate of output. The principal objection to the combination type as so far designed has been a total pressure drop that at high rates of output might be considered excessive.

The so-called interdeck superheater such as is shown in fig. 8, where the superheater is placed closer to the furnace than was formerly standard practice with this type of boiler, is in effect a combination convection and radiant heat superheater in that the gases pass over it and it absorbs a certain amount of heat by radiation through the lanes between the tubes below it.

Reheat.—As steam pressures and turbine sizes increased, turbine operating difficulties were encountered that were not experienced with low or moderate pressures. These difficulties resulted from a loss in superheat at some stage of the turbine and the formation of moisture in the lower stages. This condensation, appearing as a mixture of water and gaseous steam, increased blade surface friction and led to a loss in blade efficiency in these lower stages. Since with the metals available it was not possible to overcome this difficulty through the use of higher initial steam temperatures, the so-called reheat cycle was adopted. It has not been definitely determined at what pressure reheat becomes necessary but it is generally accepted to-day that such pressure is approximately 500 lb. Future modifications in turbine design may change this pressure. (*See* discussion of experimental stations in STEAM GENERATION.)

The increase in thermal efficiency due to reheat is not great—some $2\frac{1}{2}$ to 3%, depending upon the initial steam temperature and pressure. The increase in the mechanical efficiency of the machine, however, due to the elimination of moisture in the lower stages, is sufficient to bring the total saving due to reheat

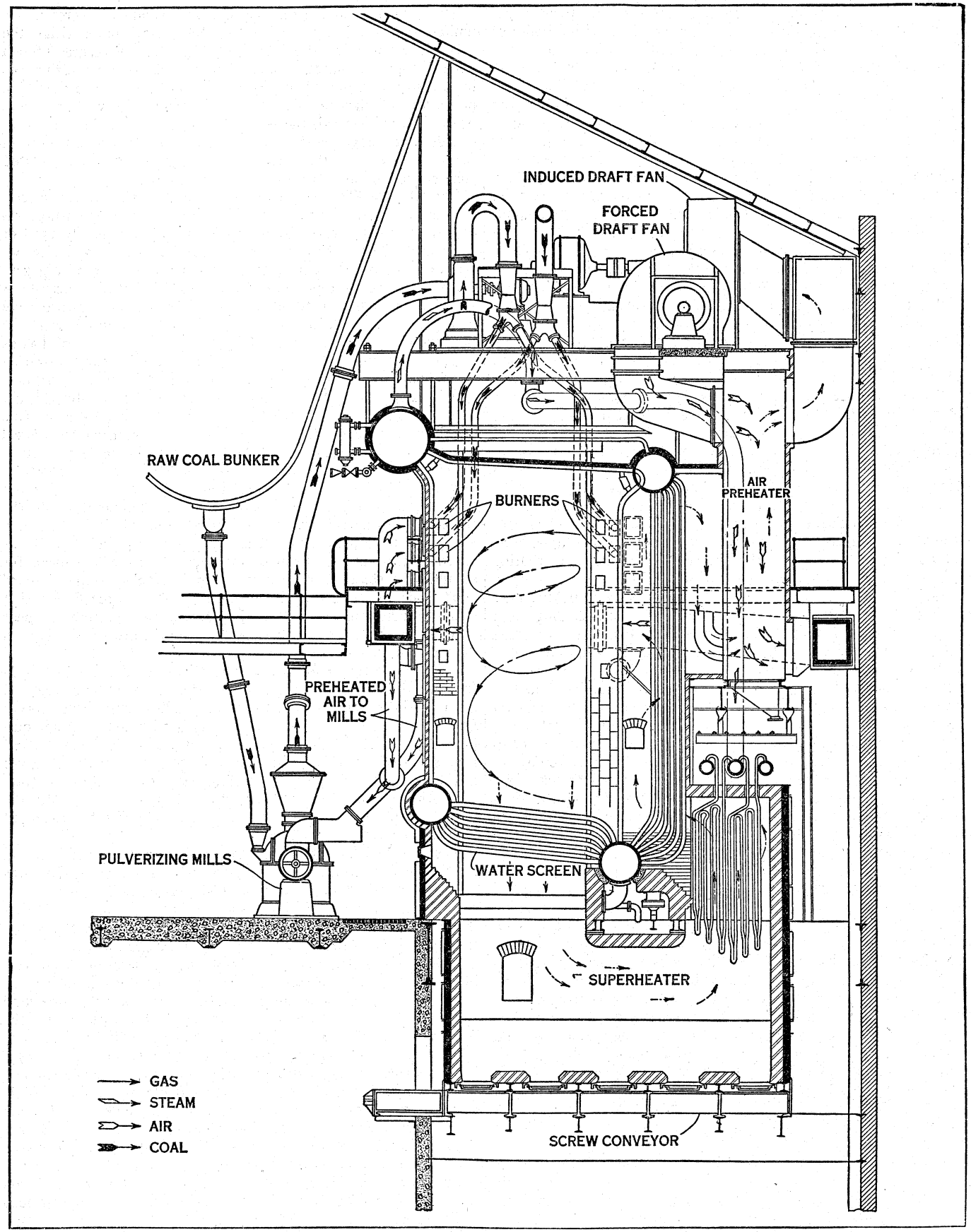

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FIG. 10.—A LARGE-CAPACITY BOILER DESIGNED TO ALLOW HEAT ABSORPTION THROUGH DIRECT RADIATION IN WHICH A RATE OF EVAPORATION PER SQ.FT. OF BOILER AND FURNACE-WALL SURFACES OF 24·6 LB. HAS BEEN ESTABLISHED. THIS BOILER USES PULVERIZED FUEL AND IS ONE OF THE WATER-TUBE TYPE, COMPLETE WITH SUPERHEATER AND HAS ASH REMOVAL SCREW CONVEYOR. ARROWS SHOW THE DIRECTION OF FLOW OF THE GAS, STEAM, AIR AND COAL, EXPLAINING THE COMBUSTION AND ABSORPTION OF THE HEAT

to some 6 or 7%, again depending upon initial temperature and pressure and the stage at which the steam to be reheated is taken from the turbine.

Two different systems of the reheat cycle are at present in use in the United States. In the first installation made, steam was taken from the primary superheaters of all the boilers serving a single machine, was exhausted at approximately 150 lb. and

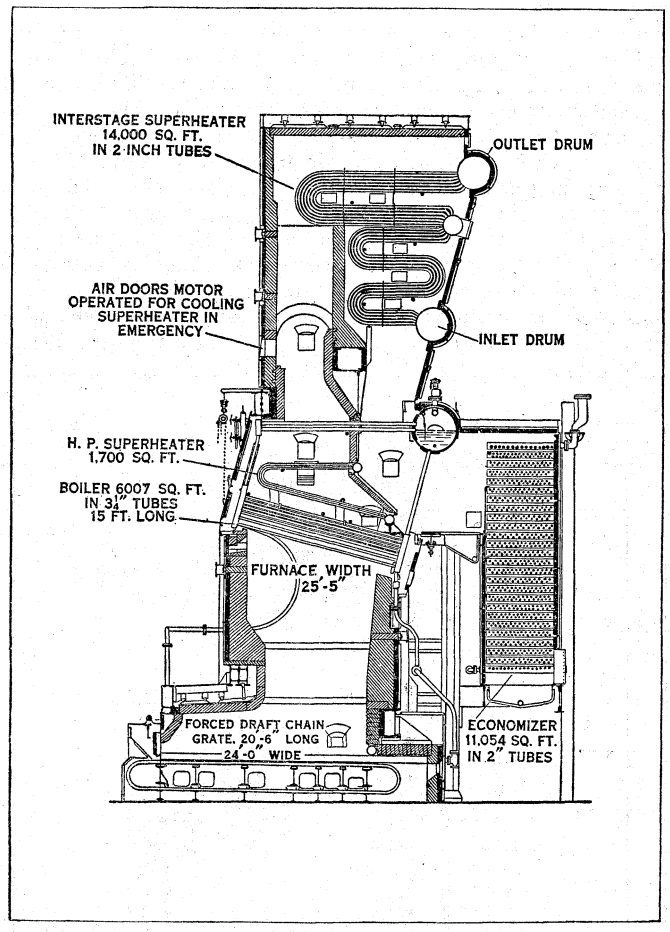

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FIG. 11.—CROSS DRUM REHEATER UNIT. THE REHEATER HANDLES STEAM FROM THREE BOILERS

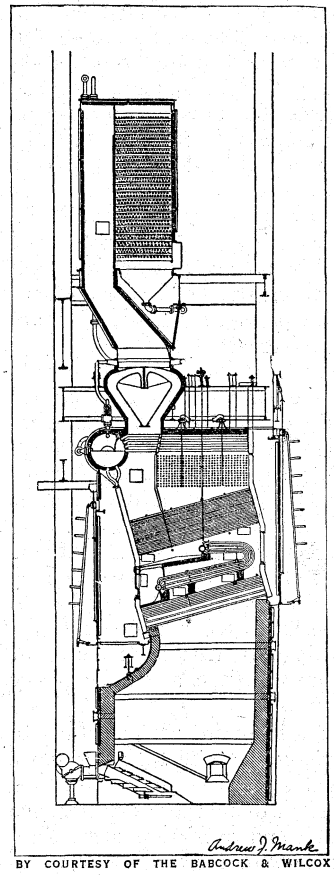
still being slightly superheated, was all returned to a special reheater boiler unit, reheated in this unit to approximately the original ultimate temperature, and then returned to the same turbine at the stage next beyond that from which it was exhausted. Fig. 11 represents a design of reheat boiler of this type.

In the second reheat system, which was developed with the superpressure boilers, a high pressure turbine is used simply as a reducing valve. In this system, steam is taken from the primary superheater to a high pressure turbine which exhausts at a pressure of some 350 or 400 lb. per sq.in., or if the installation is made in an existing plant at the existing main steam line pressure. From the high pressure turbine exhaust the steam is returned to a reheater element integral with the high pressure boiler, is reheated and returned to a lower pressure machine, or in the case of existing plants in which this class of installation is made, to the main station steam lines. Reheaters of this design have been of both the convection and radiant heat types. Fig. 12 and fig. 13 illustrate convection and radiation reheater units as used in the United States.

Live steam reheaters have also been used to a limited extent. The use of convection or radiant heat reheaters lead to a somewhat better overall plant thermal efficiency due to the fact that any desired reheat temperature may be obtained, whereas with live steam reheating the ultimate temperature is limited by the steam pressure available. On the other hand, the live steam reheater brings a simplification of piping and a saving in space that may more than offset the lower overall thermal efficiency.

In the convection and radiant heat reheaters installed up to the present time the ultimate reheat temperatures have ordinarily been approximately the same as the initial temperature to the turbine—725 or 750° F. Higher reheat temperatures are being considered. With live steam reheaters the ultimate reheat temperature possible without going to very special construction is some 20° lower than the temperature of the high pressure steam used as a heating medium.

Furnaces.—Improvements in combustion apparatus and the high duties demanded and required from a given amount of heating surface brought about changes in furnace design much more radical than in boiler design. This has been true with all classes of fuel and methods of firing, but the most radical changes have come with increased size and capacity of stokers and particularly with the development of pulverized fuel burning equipment. With the increased amounts of fuel that had to be burned to give the desired rates of steam output, furnace volumes have been greatly increased. In 1920 the average furnace volume per 10 sq.ft. of boiler heating surface in 24 representative stoker fired installations was 1·9 cu.ft. In 1926 a similar average for 24 stoker installations had increased to 3·85 cu.ft., while in 14 large pulverized fuel installations the average had increased to 8·0 cu.ft. In several of the most modern stoker fired installations the furnace volume supplied has been as great as is general with pulverized fuel. In the earlier pulverized coal furnaces, while the volumes used were large the rate of heat liberation per cubic foot was relatively low—from 10,000 to 12,000 British thermal units. In present practice the large volumes are retained but such volumes are utilized much more effectively. This has been made possible by the development in pulverized fuel burners. By the use of the principle of turbulence in mixture of coal and air, combustion takes place with much greater rapidity than in early practice and a B.T.U. liberation of 30,000 to 35,000 per cubic foot of furnace volume is now common practice. It is possible that as further improvements are made in burner design this B.T.U. release per cubic foot may be still further increased. This would result in a greater steam output from a given boiler and furnace or an equal steam output with a reduction in furnace volume.



BY COURTESY OF THE BABCOCK & WILCOX COMPANY

FIG. 12.—CROSS DRUM REHEATER UNIT. THE REHEATER HANDLES STEAM GENERATED BY A SINGLE UNIT

The same improvements in stoker and pulverized coal burner design that made possible the higher rates of B.T.U. liberation per cubic foot of furnace volume also greatly reduced the amount of excess air necessary to complete combustion. This in turn led to higher furnace temperatures and corresponding higher efficiencies. The increased use of air preheaters also tended toward higher furnace temperatures.

With the possibility of developing these higher furnace temperatures, the limiting factor in boiler output became generally accepted as furnace refractory upkeep cost, and because of the desirability of such high furnace temperatures it became necessary to develop some method of reducing furnace upkeep cost. The remedy developed was the use of furnace wall cooling, either by air or by water-cooled surface. The earlier cooled furnaces

were air-cooled and to an extent air-cooling is used satisfactorily to-day though generally with the smaller boiler units and where the B.T.U. liberation is appreciably lower than that demanded in central station practice. Water-cooled furnaces developed rapidly. As now used they consist either of bare tubes, so-called fin tubes, and tubes protected by refractory lined metal blocks.

In the case of plain bare tubes, these are usually set in recesses in the brickwork of the furnace walls though in some instances the tubes have been set out from the inside face of the walls. In one design of bare tube wall, the tubes are made to enter the headers in such manner that adjacent tubes touch, offering an all metal surface to the furnace. The fin tube furnace is made up of tubes on the sides of which steel fins are welded longitudinally and the tubes are so placed that the fins of one tube touch the fins of adjacent tubes presenting an all metal furnace wall. Another type of all metal furnace wall is made up of tubes on which blocks are cast.

Of the refractory lined water walls the Bailey wall has been most highly developed. This consists of vertical tubes to which are clamped metal blocks so ground as to give an absolute contact between block and tube. The inside face of the blocks is lined with refractory material, this refractory being used as the bottom of the mould in which the block is cast. Experience would seem to indicate that the refractory protected tube would stand a greater amount of punishment than would bare tubes, and higher rates of heat liberation in the furnace are possible with the former than with the latter. In most designs of water-cooled furnaces the combination of tubes and headers are connected directly to the circulation of the boiler thus becoming an integral part of the boiler. In a few instances the furnace water cooling surface has been made a separate boiler with its own feed line and water level. For the insulation of water walls various types of tile or commercial cements are being used with satisfactory results. The earlier water-cooled furnaces were comparatively small in volume and because of a lowering of flame temperature combustion could not be completed before the products of combustion entered the boiler heating surface proper. The flame temperatures were lowered, owing to the presence of a large amount of comparatively cold surface in the furnace.

As has been indicated furnace volumes were very generally increased due to the demands for increased total B.T.U. liberation corresponding to increased rates of steam output. With such increase in volume, together with improvements in stoker design and pulverized fuel burning equipment, the effect of furnace cooling surface on temperature was lessened. The development of refractory covered cooling tubes also tended toward increased furnace temperature. Further, a better understanding of the laws of heat absorption through radiation by furnace cooling tubes and boiler tubes exposed to radiation made it possible to properly correlate radiant heat absorbing surface and convection absorption surface. This was particularly true in the case of pulverized fuel where turbulent burners gave a great rapidity of combustion.

Economizers.—Engineers are not in entire agreement as to the advisability of economizer installations. With pressures above 350 lb. it is generally accepted that steel tube economizers are necessary. This brings up the question of interior corrosion due to dissolved oxygen in the feed water and to obviate such corrosion it is generally accepted that deaeration is necessary. At first the degree of deaeration required was not considered great, but to-day it is felt that the oxygen content of the feed to steel tube economizers should not be in excess of 0.1 cu.cm. per litre and preferably 0.0 cu.cm. Until recently it has been common economizer practice to limit the feed temperature leaving the economizer to 50° below that due to the pressure of the boiler it serves. This was to prevent the possibility of steaming in the economizer under adverse conditions with the danger of water hammer.

With the introduction and development of bleeder steam feed heating in multiple stages, the initial feed temperature to economizers became higher and higher, and the temperature range through which the economizer could function, if the feed temperature leaving the economizer was limited as described, became less. The amount of economizer surface that could be installed thus became small and the justification for such installation became questionable.

As pressures increased above 350 lb.—to 650–800 and 1,200 and above—the steam temperatures due to such pressures correspondingly increased. With such pressures the upper limit of feed temperature leaving the economizer was raised to a point such that, even with the maximum incoming feed temperature to the economizer resulting from three or four stage bleeder heating, the temperature range through which the economizer could function became sufficient in many instances to warrant the installation of an economizer of normal size. More recently a design of economizer has been developed in which steaming is permissible. Such a design with its boiler is shown in fig. 9. Economizers as now in use are in general of the counterflow type and with either plain tubes or extended surface tubes, this extended surface being in the nature of fins. In one of the latter designs the surface is lead coated to minimize exterior corrosion. Transfer rates to be expected in economizers for a given set of temperature conditions and a given amount of surface are largely dependent upon gas velocities over the surface. The gas velocity in turn determines the draft loss through the economizer. The allowable draft loss therefore is in most instances the governing factor in the amount and arrangement of economizer surface to be installed for a given set of conditions. Obviously there is some maximum gas velocity with its corresponding maximum heat transfer rate above which the added gross efficiency due to the economizer installation would be more than offset by the power required to overcome the additional frictional resistance of the gases over the surface. No general statement can be made as to where this point of maximum allowable transfer rate should be set, and it is necessary to consider each individual set of conditions as a separate engineering problem.

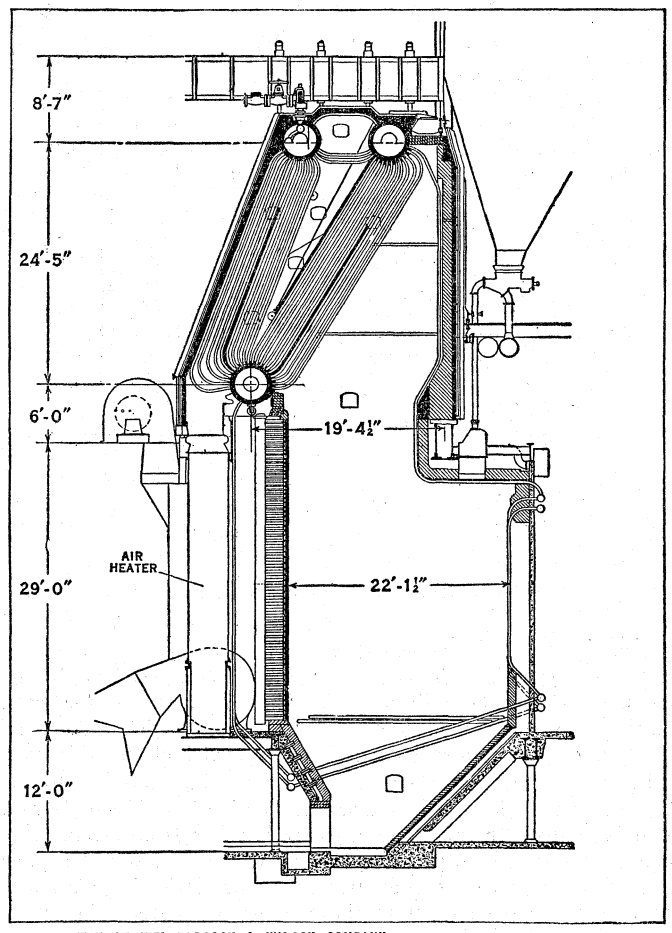


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FIG. 13.—THREE DRUM CURVE TUBE TYPE BOILER WITH RADIANT HEAT SUPER HEATER AND REHEATER

Air Preheaters.—As higher and higher rates of evaporation per square foot of boiler heating surface were demanded and as pressures were increased, exit gas temperatures became higher than were allowable from the standpoint of boiler room efficiency. Even where economizers were installed, if bleeder heating in multiple stages was used, the gas temperatures leaving the economizers were higher than allowable, due to high inlet feed temperatures. In order to reduce these exit gas temperatures to a point representing proper overall efficiency it became necessary to introduce some additional heat absorption apparatus and the solution was the development of the air preheaters. Air heaters are not new. They were used as early as 1829 in connection with metallurgical furnaces. While such heaters have been used in Europe and in marine practice for a number of years it is only within the past few years that attention has been given them in the United States. Development in this field has been slower in the United States than abroad primarily because of the relatively low fuel costs. With increasing cost of fuel, however, and with the demands for high efficiencies, and the maintaining of such efficiencies at high rates of steam output, it became necessary to develop this class of apparatus.

The ideal air heater is one that will give a maximum heat transfer rate, minimum draft loss, minimum leakage, occupy the least space and be most readily cleaned. The first two of these factors are intimately related. While the form of gas and air channels have a bearing on the transfer rate, such rate is primarily a function of gas and air velocities, and such velocities in turn govern the draft loss on both the gas and air sides. As in the case of economizers there is some velocity and corresponding transfer rate that cannot be exceeded because of excessive power required to produce the draft. The questions of space occupied, ability to clean and tightness, are features of mechanical design and vary in the preheaters of different manufacturers. Air heaters as now used in the United States may be classed under two types—tubular and plate. The regenerative design is a form of plate heater.

The question of maximum temperature of air for combustion advisable or allowable is intimately connected with that which furnace refractories or stoker or other fuel burning apparatus can withstand from the standpoint of upkeep costs—outage and replacements. The development in water-cooled furnaces has largely solved the problem of trouble with refractories resulting from high furnace temperatures, which in part, at least, are the result of the use of preheated air. Just what the limit of preheat that may safely be used with stokers has not as yet been definitely determined. Temperatures as high as 500° have been used with one type of stoker and no particular trouble reported. With another type and a particular grade of coal trouble was encountered with temperatures considerably lower than this, though such trouble was due to the action of the coal on the grates and not stoker maintenance. With pulverized coal the limit of air temperature, assuming a properly cooled furnace, would appear to be the limit of temperature under which the metal of the air heater would stand. This statement applies to the secondary air since the primary air temperature will be limited by the mills and the burners. Theoretically, the increase in overall efficiency due to the use of preheat should be higher than that represented by the gas temperature drop through the air heater. This results from the fact that the increased furnace temperatures and more rapid combustion resulting from the use of preheat will add to the efficiency represented by the temperature drop. Further, with stokers, the use of preheat has been shown to result in a reduction in the loss through unconsumed carbon in the ash.

The amount of air heater surface installed in terms of boiler heating surface has varied widely. Such amounts where economizers have been used, except in the case of steaming economizers, has ordinarily been from 80 to 120%. In one installation where no economizer was used and the air heater set directly next the boiler this percentage has been as high as 353%. In the case of the steaming economizer unit designs, the percentage of air heater surface to boiler and water-cooled furnace surface has been as high as 495%. (A. D. P.)

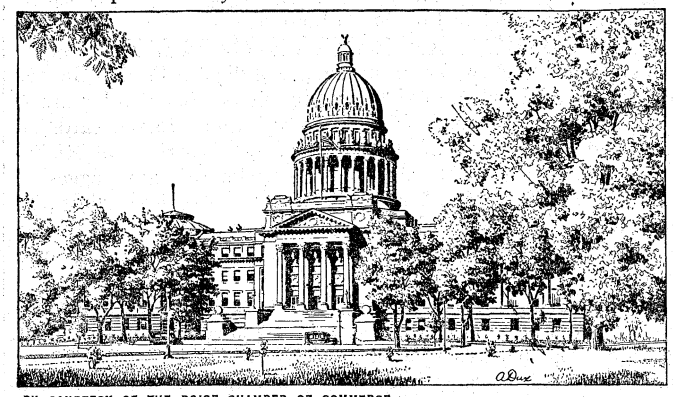
BOILING-POINT, the temperature, for any given liquid, at which the application of heat ceases to raise the temperature of the liquid and instead converts the liquid into its vapour. The boiling-point of water under normal pressure (barometric height, corrected for temperature and latitude, 760mm. mercury) is 100° C or 212° F. The effect of increasing the pressure is to raise the boiling-point; the presence of dissolved impurities also raises the boiling-point, but to a much less marked extent. (*See* VAPORIZATION.)

BOILING TO DEATH, a punishment once common both in England and on the Continent. The *Chronicles of the Grey Friars* (Camden Society, 1852) have an account of boiling for poisoning at Smithfield in the year 1522, the man being fastened to a chain and lowered into boiling water several times until he died. The preamble of the statute of Henry VIII. (which made poisoning treason) in 1531 recites that one Richard Roose (or Coke), a cook, by putting poison in some food intended for the household of the bishop of Rochester and for the poor of the parish of Lambeth, killed a man and woman. He was found guilty of treason and sentenced to be boiled to death without benefit of clergy. He was publicly boiled at Smithfield. In 1547 the act was repealed.

See W. Andrews, *Old Time Punishments* (Hull, 1890); *Notes and Queries,* vol. i. (1862), vol. ix. (1867); Du Cange (*s.v. Caldariis decoquere*).

BOISE, the capital and largest city of Idaho, United States, and the county seat of Ada county; in the south-west part of the state, 2,700ft. above sea-level and surrounded by peaks of the Boise range; on the Boise river, the Lincoln highway and the Oregon Short Line of the Union Pacific railway system. It has a municipal airport and air-mail service. The population was 5,957 in 1900; 21,393 in 1920, after several annexations of territory; was 21,544 in 1930 and 26,130 in 1940.

Boise is a local headquarters of the Federal Government as well as the administrative centre of the State, and is the trade centre for a large irrigated region, shipping chiefly wool, hides and fruit. There are two national forest offices, Federal courts (circuit and district), and a veterans' hospital, which occupies the former military post of Ft. Boise. The state soldiers' home and the state penitentiary are located there. The annual retail business of the city is estimated at $22,000,000, and the bank clearings amount to $68,260,460 a year. There are great quarries of fine sandstone near by, which have furnished material for the Capitol and other buildings. Hot water (172°) from artesian wells supplies heat for residences and public buildings and water for a swimming pool 60ft. by 25ft. in area and 3ft. to 16ft. deep. A polo team is supported there. The Arrowrock dam, 22 mi. E., is 353·5 ft. high, with a capacity of 286,500 ac.ft. of water, and has a driveway across the crest. An army air base with accommodations for 2,600 men is under construction (1941).



BY COURTESY OF THE BOISE CHAMBER OF COMMERCE

VIEW OF THE STATE CAPITOL BUILDING AND GROUNDS AT BOISE

Boise, established in 1860 when the discovery of gold brought prospectors to the vicinity, steadily grew from a frontier town to State capital. To-day it is the chief trade and manufacturing centre of south-western Idaho

Boise was founded in 1863, when Major Lugenbeel of the United States Army camped on what is now Government Island and began the construction of Camp Boise. It was incorporated in

1864. Between 1900 and 1910 it grew rapidly, following the extensive irrigation projects undertaken in southern Idaho.

BOISGOBEY, FORTUNÉ ABRAHAM DU (1824–1891), French writer of fiction, whose real surname was Castille, was born at Granville (Manche) on Sept. 11, 1824, and died Feb. 26, 1891. He served in the army pay department in Algeria from 1844 to 1848, and extended his travels to the East. Among the many famous police stories written by him are: *Les Mystères du nouveau Paris* (1876), *Le Demi-Monde sous la Terreur* (1877), *Les Nuits de Constantinople* (1882), *Le Cri du sang* (1885), *La Main froide* (1889).

BOISGUILBERT, PIERRE LE PESANT, SIEUR DE (1676–1714), French economist, was born at Rouen of an ancient noble family of Normandy, allied to that of Corneille. As judge at Montivilliers near Havre, and then as president of the *bailliage* of Rouen, he made a close study of local economic conditions. He was thus led to consider the misery of the people under the burden of taxation. In 1695 he published his principal work, *Le Détail de la France, la cause de la diminution de ses biens, et la facilité du remède. . . .* In it he drew a picture of the general ruin of all classes of Frenchmen caused by the bad economic régime. In opposition to Colbert's views he held that the wealth of a country consists not in the abundance of money which it possesses but in what it produces and exchanges. The remedy for the evils of the time was not so much the reduction as the equalization of the imposts, which would allow the poor to consume more, raise the production and add to the general wealth. In his *Factum de la France,* published in 1705 or 1706, he gave a more concise *résumé* of his ideas. But his proposal to substitute for all aides and customs duties a single capitation tax of a tenth of the revenue of all property was naturally opposed by the framers of taxes and found little support. Upon the disgrace of Vauban, whose *Dîme royale* had much in common with Boisguilbert's plan, Boisguilbert violently attacked the controller in a pamphlet *Supplément au détail de la France.* The book was seized and condemned, and its author exiled for a time to Auvergne.

In 1712 appeared a *Testament politique de M. de Vauban,* which is simply Boisguilbert's *Détail de la France.* Vauban's *Dîme royale* was formerly wrongly attributed to him. Boisguilbert's works were collected by Daire in the first volume of the *Collection des grands économistes.* His letters are in the *Correspondance des contrôleurs généraux,* vol. i., published by M. de Boislisle.

BOISROBERT, FRANÇOIS LE METEL DE (1592–1662), French poet, was born at Caen and died in Paris. He was introduced to Richelieu in 1623, and by his humour and his talent as a raconteur soon made himself indispensable to the cardinal. Boisrobert became one of the five poets who carried out Richelieu's dramatic ideas. It was Boisrobert who formally suggested the first plan of the Academy, and he was one of its earliest and most active members. He wrote a number of comedies, to one of which, *La Belle Plaideuse,* Molière's *L'Avare* is said to owe something.

BOISSARD, JEAN JACQUES (1528–1602), French antiquary and Latin poet, was born at Besançon. He studied at Louvain and, on leaving, went to Italy, where he remained for many years. He became interested in antiquities, and formed a large collection. He returned to France, but, not being allowed to profess publicly the Protestant religion, which he had embraced some time before, he withdrew to Metz, where he died on Oct. 30 1602.

His most important works are: *Poemata* (1574); *Emblemata* (1584); *Icones Virorum Illustrium* (1597); *Vitae et Icones Sultanorum Turcicorum,* etc. (1597); *Theatrum Vitae Humanae* (1596); *Romanae Urbis Topographia* (1597–1602), now very rare; *De Divinatione et Magicis Praestigiis* (1605); *Habitus Variarum Orbis Gentium* (1581), ornamented with 70 illuminated figures.

BOISSIER, MARIE LOUIS ANTOINE GASTON (1823–1908), French classical scholar, was born at Nîmes on Aug. 15, 1823. After 10 years at Angoulême, Boissier was appointed professor at the Lycée Charlemagne in Paris, and in 1861 became professor of Latin oratory at the Collège de France. He was elected a member of the French Academy in 1875, and appointed perpetual secretary in 1895. He died in June 1908. His great theme was the reconstruction of Roman society.

See Studies on Attius (1857) and Varro (1861); *Cicéron et ses amis* (1865) (Eng. trans. by A. D. Jones, 1867); *La Religion Romaine d'Auguste aux Antonins* (1874); *L'Opposition sous les Césars* (1875); *Promenades archéologiques: Rome et Pompéi* (1880; second series, 1886); *L'Afrique romaine, promenades archéologiques* (1901); *La Fin du paganisme* (1891); *Le Conjuration de Catilina* (1905); *Tacite* (1903, Eng. trans. by W. G. Hutchinson, 1906); *Madame de Sévigné* (1887); *Saint-Simon* (1892). *See* also P. Thoulouze, *Gaston Boissier* (1923).

BOISSONADE DE FONTARABIE, JEAN FRANÇOIS (1774–1857), French classical scholar, was born at Paris Aug. 12, 1774. He was in the public service 1792–95, and was restored by Lucien Bonaparte, during whose time of office he served as secretary to the prefecture of the Upper Marne. He then devoted himself to the study of Greek. From 1809–28 he was professor of Greek at the faculty of letters at Paris. In 1828 he succeeded to the chair of Greek at the Collège de France. He was librarian of the Bibliothèque du Roi, and perpetual secretary of the Académie des Inscriptions. He died Sept. 8 1857.

He produced editions of many later Greek authors, of which the chief were: Philostratus, *Heroica* (1806) and *Epistolae* (1842); Marinus, *Vita procli* (1814); Tiberius Rhetor, *De Figuris* (1815); Nicetas Eugenianus, *Drosilla et Charicles* (1819); Herodian, *Partitiones* (1819); Aristaenetus, *Epistolae* (1822); Eunapius, *Vitae Sophistarum* (1822); Babrius, *Fables* (1844); Tzetzes, *Allegoriae Iliados* (1851); and a *Collection of Greek Poets.* The *Anecdota Graeca* (1829–33) and *Anecdota Nova* (1844) are important for Byzantine history and the Greek grammarians.

A selection of his papers was published by F. Colincamp, *Critique littéraire sous le premier Empire* (1863), vol. i. of which contains a complete list of his works, and a "Notice Historique sur Monsieur B.," by Naudet.

BOISSY D'ANGLAS, FRANÇOIS ANTOINE DE (1756–1826), French statesman, was born at Saint Jean la Chambre (Ardèche), Dec. 8, 1756, and died in Paris, Oct. 20, 1826. He was elected in 1789 by the third estate of the *sénéchaussée* of Annonay as deputy to the states-general. During the Legislative Assembly he was *procureur général syndic* for the directory of the department of Ardèche. Elected to the Convention in 1792 he sat in the centre, *"le Marais,"* voting in the trial of Louis XVI. for his detention until deportation should be judged expedient for the state. During the Terror he supported Robespierre; but he was gained over by the members of the Mountain hostile to Robespierre, and his support, along with that of some other leaders of the *Marais,* made possible the ninth Thermidor. He was then elected a member of the Committee of Public Safety. He presented the report supporting the decree of the 3rd Ventose of the year III. which established liberty of worship. In the critical days of Germinal and Prairial of the year III. he showed great courage. On the first Prairial he presided over the Convention and remained unmoved by the insults and menaces of the insurgents. When the head of the deputy, Jean Féraud, was presented to him on the end of a pike, he saluted it impassively. He was reporter of the committee which drew up the constitution of the year III., and his report shows keen apprehension of a return of the Reign of Terror. His proposal (Aug. 27, 1795) to lessen the severity of the revolutionary laws, and the eulogies he received from several Paris sections suspected of disloyalty to the republic, resulted in his being obliged to justify himself (Oct. 15, 1795). As a member of the Council of the Five Hundred he became more and more suspected of royalism. He was proscribed on the 18th Fructidor, and lived in England until the Consulate. In 1801 he was made a member of the Tribunate, and in 1805 a senator. In 1814 he voted for Napoleon's abdication, which won for him a seat in the chamber of peers; but during the Hundred Days he served Napoleon, and in consequence on the second Restoration, was for a short while excluded. In the chamber he still sought to obtain liberty for the press—a theme upon which he published a volume of his speeches (Paris, 1817). He was a member of the institute from its foundation, and in 1816, at the reorganization, became a member of the Académie des Inscriptions et Belles-Lettres. He published in 1819–21 a two-volume *Essai sur la vie et les opinions de M. de Malesherbes.*

See F. A. Aulard, *Les Orateurs de la Révolution* (1906); L. Sciout, *Le Directoire* (1895); and the "Notice sur la vie et les oeuvres de M. Boissy d'Anglas" in the *Mémoires de l'Académie des Inscriptions,* ix.

BOÏTO, ARRIGO, Italian poet and composer, was born at Padua on Feb. 24, 1842, and died at Milan on June 10, 1918. While still very young he went to Milan and entered the Conservatoire, where he studied under Mazzucato. Here he made friends also with Franco Faccio, who collaborated with him in writing a cantata, *The Fourth of June,* and a mystery, *The Sisters of Italy,* performed at the Conservatoire in 1861 and 1862. Imbued with the "advanced" tendencies of Wagner, Liszt and others, he fell much under the influence at Milan of Emilio Praga, a leading modernist of the day, alike in poetry and music. And here he projected and in due course achieved one of the most important and characteristic of his own productions in the shape of his *Mefistofele,* whose reception however by the public on its first production in 1868 was anything but favourable. Seven years later it was revived successfully at Bologna. Boïto treated the Faust legend in a spirit far more nearly akin to the conception of Goethe than is found in Gounod's "Faust," but, in spite of some attractive pages, his opera lacks cohesion and dramatic interest and suggests little real inspiration. Nor can much more be said for his only other opera, *Nero,* which having been withheld from the public by the fastidious composer for years and years was finally produced at Milan (six years after his death), in 1924. For here again the high aim and ambition of the composer are more apparent in his work than any really genuine and noteworthy creative power. Much happier were Boïto's achievements as a librettist in which capacity he takes rank second to none. Of unsurpassable excellence are the "books" of *Otello* and *Falstaff* with which he provided his friend Verdi, while those of Ponchielli's *La Gioconda* and Faccio's *Hamlet* were also from his pen. His fine translations of *Rienzi* and *Tristan* and his admirable original verse and other writings testify to the exceptional powers of his mind. Both Oxford and Cambridge universities gave Boïto the honorary degree of Doctor of Music.

BOK, EDWARD WILLIAM (1863–1930), American editor and author, was born at Helder, Holland, Oct. 9, 1863, and brought to the United States when six years old. Educated in the Brooklyn public schools, he became an office boy with the Western Union Telegraph Company. Continuing his education at a night school, he entered the employ of Henry Holt & Co., publishers, in 1882, and two years later became associated with Charles Scribner's Sons, publishers, eventually becoming advertising manager. He acted as editor of the *Brooklyn Magazine* from 1882 to 1884. In 1886 he founded the Bok Syndicate Press, the success of which led to the offer of the editorship of the *Ladies' Home Journal* in 1889; under his management this magazine became one of the most successful publications in America. After 30 years as editor he retired in 1919. A year later he published *The Americanization of Edward Bok,* which won the year's award of the Joseph Pulitzer prize for the best biography, and the gold medal of the Academy of Political and Social Science. In 1923 he created the American Peace award, providing $100,000 for the best practicable plan by which the United States might co-operate with other nations to achieve and preserve the peace of the world, one-half to be paid upon the acceptance of the plan by a selected jury, and the balance upon its acceptance by the Senate. The plan of Dr. C. A. Livermore, of New York, won the award. Bok died at Lake Wales, Fla., on Jan. 9, 1930.

In addition to his autobiography Mr. Bok published, among other works: *Successward* (1895), *The Young Man in Business* (1900), *Two Persons* (1922), *A Man from Maine* (1923), *Twice Thirty* (1925), *You, a Personal Message* (1926), and *Perhaps I Am* (1928).

BOKANOWSKI, MAURICE (1879–1928), French politician. After practising as an advocate in Paris he was elected a member of the Chamber of Deputies in 1919 for the department of the Seine. He quickly became recognized as an expert on economic and financial questions and was appointed president of the finance commission of the Chamber. In 1928 he became Minister for Commerce in the Poincaré cabinet, but was killed in an aeroplane accident in September of that year.

BOKENAM, OSBERN (1393?–1447?), English author, was born, by his own account on Oct. 6, 1393. Dr. Horstmann suggests that he may have been a native of Bokeham, now Bookham, in Surrey, and derived his name from the place. In a concluding note to his *Lives of the Saints* he is described as "a Suffolke man, frere Austyn of Stoke Clare." He travelled in Italy on at least two occasions, and in 1445 was a pilgrim to Santiago de Compostela. He wrote a series of legends of holy maidens and women. These are written chiefly in seven- and eight-lined stanzas, and nine of them are preceded by prologues. Bokenam was a follower of Chaucer and Lydgate, and doubtless had in mind Chaucer's *Legend of Good Women.* His chief, but by no means his only, source was the *Legenda Aurea* of Jacobus de Voragine, archbishop of Genoa, whom he cites as "Januence." The first of the legends, *Vita Scae Margaretae, virginis et martiris,* was written for his friend, Thomas Burgh, a Cambridge monk; others are dedicated to pious ladies who desired the history of their name-saints. The Arundel ms. 327 (British Museum) is a unique copy of Bokenam's work; it was finished, according to the concluding note, in 1447, and presented by the scribe, Thomas Burgh, to a convent unnamed "that the nuns may remember him and his sister, Dame Betrice Burgh." The poems were edited (1835) for the Roxburghe Club with the title *Lyvys of Seyntys . . .* and by Dr. Carl Horstmann as *Osbern Bokenams Legenden* (Heilbronn, 1883), in E. Kölbing's *Altengl. Bibliothek,* vol. i.

BOKSBURG, a town in South Africa 15 mi. east of Johannesburg. The white population in 1936 was 15,916. It is the chief centre of the East Rand gold and coal mining. The collieries extend 11 mi. eastward from the town. The Boksburg park and lake, where boating and bathing facilities are provided, form one of the chief pleasure resorts of the eastern Witwatersrand.

BOLA, a Portuguese Guinea people related to the Bagnun, Balante, Mandjak and Papel, between the Cacheu and Geba rivers and on the island of Bolama.

See Dr. Maclaud, "Distribution des races sur la côte occidentale de l'Afrique." *Bulletin Géogr. Hist. descript.* (1906).

BOLAN PASS, an important pass on the Baluch frontier, connecting Jacobabad and Sibi with Quetta, important in the recent history of Afghanistan. By the treaty of Gandamak (1879), the Bolan route was brought directly under British control, and it was selected for the first alignment of the Sind-Pishin railway from the plains to the plateau. From Sibi the line runs west skirting the hills to Rindli, and originally followed the course of the Bolan stream. Destructive floods, however, led to its abandonment, and the railway now follows the Mashkaf valley (which debouches into the plains close to Sibi), to a junction with the Bolan at Mach. The Harnai valley to the north-east of Sibi provides another route to Quetta which, although longer, is used for ordinary traffic, the Bolan loop being reserved for emergencies. The passage between the limestone rocks is in places extremely narrow, and the pass is subject to extremes of temperature, the ice-cold wind rushing down in winter often being destructive to life.

BOLAS (plural of Span. *bola,* ball), a South American Indian weapon of war and the chase, consisting of balls of stone attached to the ends of a rope of twisted or braided hide or hemp. Charles Darwin thus describes them in his *Voyage of the Beagle:* "The *bolas,* or balls, are of two kinds: the simplest, which is used chiefly for catching ostriches [rheas], consists of two round stones, covered with leather, and united by a thin, plaited thong, about 8ft. long. The other kind differs only in having three balls united by thongs to a common centre. The Gaucho (native of Spanish descent) holds the smallest of the three in his hand, and whirls the other two around his head; then, taking aim, sends them like chain shot revolving through the air. The balls no sooner strike any object, than, winding round it, they cross each other and become firmly hitched."

BOLBEC, town, France, department of Seine-Inférieure, on the Bolbec, 19 mi. E.N.E. of Havre by rail, at the junction of four small valleys. Pop. (1936) 9,947. The town was enthusiastically Protestant in the 16th century and still has a number of Protestants. It was burned almost to the ground in 1765. Bolbec is

important for its cotton spinning, weaving, dyeing and printing, and for the manufacture of sugar.

BOLCKOW, VAUGHAN & CO. LTD. This British steel company is associated with one of the most important inventions in the iron and steel industry, the "Thomas-Gilchrist" process, which was invented as recently as 1879. This process enables steel to be made from the phosphoric ores which form by far the greater part of the world's supplies of iron ore. The phosphoric slag from this process gave to agriculture the valuable fertilizer known as basic slag.

The firm was founded in 1841 by H. W. F. Bolckow, who was born in Sulten, Mecklenburg, in 1806 and came to Great Britain in 1827, and John Vaughan, who had had experience in the iron works at Dowlais. They chose the site for their engineering works at Middlesbrough under the advice of John Harris, engineer to the Stockton and Darlington Railway, and became builders and ultimately owners of blast furnaces. In 1843 the first steamboat built at Stockton, "The English Rose," was engined by Bolckow and Vaughan. In 1846 the firm erected four blast furnaces at Witton Park, and by 1864 the firm owned ironstone mines in Cleveland, four collieries in Durham (and it is interesting to record that coal was then being raised from one of the collieries at a cost of only 3s. 4d. per ton), 17 blast furnaces at Cleveland, Middlesbrough and elsewhere, plate mills and bar iron works at Witton Park and Middlesbrough, and foundries at Cleveland and Middlesbrough.

It was in 1864 that a public issue of shares was made and the company formed. The first Directors were H. W. F. Bolckow, John Vaughan, Benjamin Whitworth and H. D. Pochin; the only connecting link in 1928 on the Board was the Hon. H. D. McLaren, a grandson of the last named. The circular of the solicitors to the promoters stated that "the production of iron during the year 1863 from 16 blast furnaces amounted to 180,000 tons of pigs. From the rolling mills about 40 tons of bar, plate, sheet iron and hoops and 38,000 tons of rails, and from the foundries about 20,000 tons of castings."

In the following years various other properties were acquired, and in 1871 the company obtained a licence from Henry Bessemer and Robert Longsden to work under the Bessemer patents. The growing demand for steel was the reason for this purchase. It had already been decided to move the works at Witton Park to the south bank of the Tees, where the new blast furnaces were smelting the Ironstone from the Cleveland hills. Steelworks were to be erected at Eston (where the works still stood in 1928), and the works at Gorton, near Manchester, were acquired to fulfil orders for steel pending the completion of the new works, where steel was produced by the acid Bessemer process, for which a pig-iron free from phosphorus was required. Iron ore properties in Spain were acquired in 1872. By 1877 the market for iron rails had disappeared and the company was making a thousand tons of steel rails a week. In 1876 the Gorton Works were sold to the Standard Iron and Steel Company, in which John Bright and other eminent men were interested, and were later acquired by Beyer Peacock and Co., Limited.

In 1878 Windsor Richards, then general manager, met Sydney Gilchrist Thomas on a visit of the Iron and Steel Institute to the Creusot Works, and experimental work was undertaken at Eston on the famous Thomas-Gilchrist process. These experiments were successful, and by 1880 four 15-ton Bessemer converters were making steel from the phosphoric Cleveland pig-iron, with an output of 3,500 tons per week. In 1884 the company began to make steel plates and adopted the Siemens open hearth acid process in 1886. In 1899 the basic open hearth furnace began to supersede the basic Bessemer converter. In 1900 the blast furnace gases were used to fire boilers, the steam going partly to mixed pressure turbines and partly to the large mill engines, whose exhaust was also utilized to drive the turbines. By this method power was generated to blow the furnaces and drive lighting and auxiliary plant and a surplus was left for pumping and traction purposes. In 1922, to find further outlets for steel, the constructional firm of Redpath Brown & Co., Ltd., was acquired.

In 1887 the number of men employed was 13,000 with a wages bill of £820,000, and in 1927 11,500 men were employed, excluding employees of subsidiary companies, and were paid £1,618,000 in wages. In 1928 the properties and plant of the company consisted of 15 open hearth furnaces, 16 blast furnaces, rail, plate and section mills, sleeper and soleplate plants, collieries, coke oven and by-product plants, ironstone mines, limestone quarries, and mines in Spain. (L. C. M.)

BOLE, an aluminous or ferruginous clay, allied to bauxite and laterite (*qq.v.*). It occurs as partings between successive ancient lava flows, as for example in Antrim, Ireland, the west of Scotland and in the Deccan, India, probably representing the soils formed by weathering during intervals between eruptions.

In the sense of stem or trunk of a tree "bole" is from the O. Norwegian *bolr, cf.* German *Bohle,* a plank. It is probably connected with a large number of words, such as "boll," "ball," "bowl" denoting a round object.

BOLERO, a lively Spanish dance, in 3–4 time with a strongly marked rhythm of which, however, the precise nature is often varied; also the music to which it is danced and other compositions cast in the same form. As danced in Spain the bolero is usually accompanied by the castanets and sometimes also by singing. In classical music the best known example is that of Chopin for pianoforte solo (op. 19). The term is also applied by ladies' dressmakers to a short sleeveless coat similar to those worn by the Spanish peasantry.

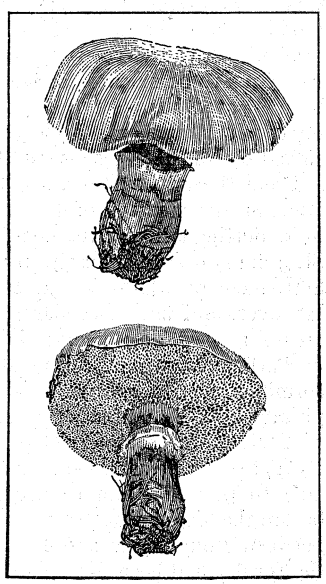
BOLESLAV I., called "Chrobry" (the Mighty), king of Poland (reigned 992–1025), was the son of Mieszko, first Christian prince of Poland, and the Bohemian princess Dobrawa, or Bona, whose chaplain, Jordan, converted the court from paganism to Catholicism. He succeeded his father in 992. A born warrior, he raised the little struggling Polish principality on the Vistula to the rank of a great power. In 996 he gained a seaboard by seizing Pomerania, and then took advantage of the troubles in Bohemia to occupy Cracow, previously a Czech city. At Gnesen Boleslav in the year 1000 entertained Otto III. so magnificently that the emperor is said to have given him the title of king, though 25 years later, in the last year of his life, Boleslav thought it necessary to crown himself king a second time. He still remained a vassal of the empire, but ecclesiastically Poland was independent when Gnesen became a metropolitan see by the favour of Pope Sylvester II. On the death of Otto, Boleslav invaded Germany, penetrated to the Elbe, occupying Stralsund and Meissen on his way, and extended his dominions to the Elster and the Saale. Henry II., however, at the diet of Merseburg, declined the money offered by Boleslav for the retention of Meissen, and from that time Boleslav was the enemy of the German king. He seized the opportunity of a revolt in Bohemia to intervene there to re-establish his cousin Boleslav the Red as duke, then enticed him to Poland, caused him to be blinded, and got the Bohemians to accept himself as duke. He found allies against Henry in Germany itself, and then, in 1004, attacked Bavaria, but without much success. His German allies sought Henry's pardon. On Henry's return from his Italian expedition he marched against Boleslav, who was expelled from Prague and made peace in 1005. A third Polish war ended in 1018 by the peace of Bautzen, greatly to the advantage of Boleslav, who retained Lusatia. He then turned his arms against Jaroslav, grand duke of Kiev, whom he routed on the banks of the Bug, then the boundary between Russia and Poland. At his death in 1025 he left Poland one of the mightiest states of Europe, extending from the Bug to the Elbe, and from the Baltic to the Danube, and possessing besides the overlordship of Russia.

See J. N. Pawlovski, *St. Adalbert* (Danzig, 1860); *Chronica Nestoris* (Vienna, 1860); Heinrich R. von Zeissberg, *Die Kriege Kaiser Heinrichs II. mit Herzog Boleslaw I.* (1868).

BOLESLAV II., called "Smialły" (The Bold), king of Poland (1039–1081), eldest son of Casimir I., succeeded his father in 1058. Poland had shrunk territorially since the age of his grandfather Boleslav I., and Boleslav II. sought to restore her dignity and importance. Boleslav's first Bohemian war proved unsuccessful, and was terminated by the marriage of his sister

Swatawa with the Czech king Wratyslav II. On the other hand Boleslav's ally, the fugitive Magyar prince Bela, succeeded with Polish assistance in winning the crown of Hungary. In the east Boleslav was more successful. In 1069 he succeeded in placing Izaslav on the throne of Kiev, obtaining, in return, Ruthenia, or "Red Russia." He proceeded then to attack his other enemies, including Bohemia, but its ruler, Wratyslav, speedily appealed to the emperor for help, and a war between Poland and the Empire was prevented only by the sudden rupture of Henry IV. with the Holy See and the momentous events which led to the humiliating surrender of the emperor at Canossa. There is nothing to show that Boleslav took any part in this struggle, though at this time he was on the best of terms with Gregory VII. On Dec. 26, 1076 Boleslav was crowned by the papal legates, a striking proof that the Polish kings did not even yet consider their title quite secure. A second successful expedition to Kiev to reinstate his *protégé* Izaslav, is Boleslav's last recorded exploit. The nobles formed a conspiracy against him, which was joined by Stanislav, bishop of Cracow, and leader of the clerical party which was strong in Poland. Boleslav, in revenge, had the bishop murdered while he was saying mass in his cathedral. Pope Gregory VII. excommunicated Boleslav, and in 1079 he and his sons were forced to flee to Hungary, where the king died in obscurity, probably in 1081.

BOLESLAV III, called "the Wry-mouthed," king of Poland (1086–1139), the son of Wladislav I and Judith of Bohemia, succeeded his father in 1102. His earlier years were troubled continually by the intrigues of his natural half-brother Zbigniev, who, till he was imprisoned and blinded, involved Boleslav in frequent contests with Bohemia and the emperor Henry V. The first of the German wars began in 1109, when Henry, materially assisted by the Bohemians, invaded Silesia. The Poles avoided an encounter in the open field, but harried the Germans so successfully around Breslau that the plain was covered with corpses. The chief political result of this great disaster was the complete independence of Poland for the next quarter of a century. It was during this respite that Boleslav devoted himself to the main business of his life —the subjugation of Pomerania (*i.e.*, the maritime province) with the view of gaining access to the sea. The struggle began in 1109, when Boleslav inflicted a terrible defeat on the Pomeranians at Nackel which compelled their temporary submission. In 1120–24 the rebellion of his vassal Prince Warceslav of Stettin again brought Boleslav into the country, but the resistance was as stout as ever, and only after 18,000 of his followers had fallen and 8,000 more had been expatriated did Warceslav submit to his conqueror. The obstinacy of the resistance convinced Boleslav that Pomerania must be Christianized before it could be completely subdued; and this important work was partially accomplished by St. Otto, bishop of Bamberg, an old friend of Boleslav's father, who knew the Slavonic languages. In his later years Boleslav waged an unsuccessful war with Hungary and Bohemia. He died in 1139, leaving four sons, between whom the kingdom was to be divided, the eldest son having overlordship of the whole.



COURTESY OF THE DOMINION BOTANIST, DEPARTMENT OF AGRICULTURE, OTTAWA

BOLETUS ELEGANS

BOLETUS, a well-marked genus of fungi (order Polyporeae, class Basidiomycetes); characterized by the central stem, the cap or pileus, the soft, fleshy tissue, and the vertical, closely-packed tubes or pores which cover the under surface of the pileus and are easily detachable. Nearly all the species grow on the ground, in woods or under trees in the early autumn. They are brown, red or yellow in colour; the pores also vary in colour from pure white to brown, red, yellow or green, and are from a fraction of to nearly an inch long. A few are poisonous; several are good for eating. One of the greatest favourites for the table is *Boletus edulis* Bull., recognized by its brown cap and white pores which become green when old. The numerous species are widely distributed, especially in forested regions.

BOLEYN (or **BULLEN**), **ANNE** (*c.* 1507–1536), queen of Henry VIII. of England, daughter of Sir Thomas Boleyn, afterwards earl of Wiltshire and Ormonde, and of Elizabeth, daughter of Thomas Howard, earl of Surrey, afterwards duke of Norfolk, was born, according to Camden, in 1507, but an earlier date (1502 or 1501) is given by some later writers. She visited France with her father about 1519, and was attached to the service of Queen Claude for a short time. She returned in 1521 or 1522 to England. Among her admirers was the poet Sir Thomas Wyatt, and among her definite suitors was Henry Percy, heir of the earl of Northumberland. A series of grants and favours bestowed by Henry on her father between 1522 and 1525 have been regarded, with little justification, as a symptom of the king's affections. Anne, however, had no intention of being the king's mistress; she meant to be his queen. There is no absolute proof that Henry's passion was anterior to the proceedings taken for the divorce in May 1527, the celebrated love letters being undated. After the king's final separation from his wife in July 1531, Anne accompanied Henry on the visit to Francis I. in 1532, while Catherine was left at home neglected and practically a prisoner. Henry married her about Jan. 25, 1533 (the exact date is unknown), their union not being made public till the following Easter. Subsequently, on May 28, their marriage was declared valid and that with Catherine null, and in June Anne was crowned at Westminster Hall.

A weak, giddy woman of no stability of character, her success turned her head and caused her to behave with insolence and impropriety, in strong contrast with Catherine's quiet dignity under her misfortunes. She, and not the king, probably was the author of the petty persecutions inflicted upon Catherine and upon the princess Mary, and her jealousy of the latter showed itself in spiteful malice. She incurred the remonstrances of the privy council and alienated her own friends and relations. But there were soon signs that Henry's affection, which had before been a genuine passion, had cooled or ceased. He resented her arrogance, and a few months after the marriage he gave her cause for jealousy, and disputes arose. Fate had prepared for Anne the same domestic griefs that had ruined Catherine. In Sept. 1533 the birth of a daughter, afterwards Queen Elizabeth, instead of the long-hoped-for son, was a heavy disappointment; next year there was a miscarriage, and on Jan. 29, 1536, the day of Catherine's funeral, she gave birth to a dead male child.

On May 1 it became known that several of Anne's reputed lovers had been arrested. On the 2nd Anne herself was committed to the Tower on a charge of adultery with various persons, including her own brother, Lord Rochford. On the 12th Sir Francis Weston, Henry Norris, William Brereton, and Mark Smeaton were declared guilty of high treason, while Anne herself and Lord Rochford were condemned unanimously by an assembly of 26 peers on the 15th. Her uncle, the duke of Norfolk, presided as lord steward, and gave sentence, weeping, that his niece was to be burned or beheaded as pleased the king. Her former lover, the earl of Northumberland, left the court, seized with sudden illness. Her father had declared his conviction of his daughter's guilt at the trial of her reputed lovers. On the 16th Anne informed Cranmer of a certain supposed impediment to her marriage with the king—according to some accounts a previous marriage with Northumberland, though the latter solemnly and positively denied it—which was never disclosed, but was pronounced, on the 17th, sufficient to invalidate her marriage. The same day all her reputed lovers were executed; and on the 19th she herself suffered death on Tower Green, her head being struck off with a sword by the executioner of Calais brought to England for the purpose. She had regarded the prospect of death with courage and almost with levity, laughing heartily as she put her hands about her "little neck" and recalled the skill of the executioner. "I have seen many men" (wrote Sir William Kingston, governor of the Tower) "and also women executed, and all they have been in great sorrow, and to my knowledge this lady has much joy and pleasure in death." On the following day Henry was betrothed to Jane Seymour.

Anne Boleyn's guilt remains unproved. To Sir William King-

ston she protested her entire innocence, and on the scaffold, while expressing her submission, she made no confession. A principal witness for the charge of incest was Rochford's own wife, a woman of infamous character, afterwards executed for complicity in the intrigues of Catherine Howard. The discovery of Anne's misdeeds coincided in an extraordinary manner with Henry's disappointment in not obtaining by her a male heir, while the king's despotic power and the universal unpopularity of Anne both tended to hinder the administration of pure justice. But it is almost incredible that two grand juries, a petty jury, and a tribunal consisting of nearly all the lay peers of England, with the evidence before them which we do not now possess, should have all unanimously passed a sentence of guilt contrary to the facts and their convictions, and that such a sentence should have been supported by Anne's own father and uncle. Anne is described as "not one of the handsomest women in the world; she is of a middling stature, swarthy complexion, long neck, wide mouth, bosom not much raised, and in fact has nothing but the English king's great appetite, and her eyes which are black and beautiful, and take great effect."

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BOLGARI or **BOLGARY**, an area in the Autonomous Tatar S.S.R. south of Kazan, 4m. from the left bank of the Volga, 55° 3′ N., 48° 5′ E. It consists of the ruins of the supposed ancient capital of the Bulgarians from the 5th to the 15th centuries, with walls, towers and numerous kurgans or burial mounds which have Arabic (1222–1341), Armenian (557, 984 and 986) and also Turki inscriptions. The tombs contained weapons, implements, utensils and silver and copper coins, bearing inscriptions, some in Arabic and others in Kufic (a kind of epigraph Arabic). Antiquities from Bolgari are preserved in museums in Kazan, Moscow and Leningrad. The city was destroyed by the Mongols in 1238 and again by Tamerlane in the 14th century; afterwards it became the capital of the Khans of the Mongol Golden Horde. In the 15th century it became part of the Kazan principality. The ruins were discovered in the time of Peter the Great and described by Pallas and Humboldt. Ibn Haukal (the Arab geographer) states that it had 10,000 inhabitants in his time (end of the 10th century).

See Ibn Fadhlan, *Nachrichten über die Wolga Bulgaren* (Ger. trans. by Frähn, St. Petersburg, 1832).

BOLI, the chief town of a vilayet of the same name in Turkey, altitude 2,500 ft., situated in a rich plain watered by the Boli Su, a tributary of the Filiyas Chai (*Billaeus*). Population 56,133. Cotton and leather are manufactured; the country around is fertile, and in the neighbourhood are large forests of oak, beech, elm, chestnut and pine, the timber of which is partly used locally and partly shipped to Istanbul. Three miles east of Boli, at Eskihissar, are the ruins of Bithynium, the birthplace of Antinous, also called Antinoopolis, and in Byzantine times Claudiopolis. In and around Boli are numerous marbles with Greek inscriptions, chiefly sepulchral, and architectural fragments. At Ilija, south of the town, are warm springs much prized for their medicinal properties.

BOLINGBROKE, HENRY ST. JOHN (1678–1751), English statesman and writer, son of Sir Henry St. John, Bart. (afterwards 1st Viscount St. John) and of Mary Rich, daughter of the 2nd earl of Warwick, was educated at Eton, and travelled abroad in 1698 and 1699. In 1700 he married Frances Winchcombe. Notorious in youth for his dissipation and extravagance, he desired, according to his friend Swift, to be thought the Alcibiades or Petronius of his age. When he entered Parliament in 1701 he declared himself a Tory, attached himself to Harley (afterwards Lord Oxford), then speaker, and soon gained an extraordinary ascendancy over the House of Commons. In May he had charge of the bill for securing the Protestant succession; he took part in the impeachment of the Whig lords for their conduct concerning the Partition treaties, and opposed the oath abjuring the Pretender. In March 1702 he was chosen commissioner for taking the public accounts. After Anne's accession he supported the bills in 1702 and 1704 against occasional conformity, and took a leading part in the disputes which arose between the two houses. In 1704 St. John took office with Harley as secretary at war, thus being brought into intimate relations with Marlborough, by whom he was treated with paternal partiality. In 1708 he quitted office with Harley on the failure of the latter's intrigue, and retired to the country till 1710, when he became a privy councillor and secretary of state in Harley's new ministry. The first business of the new Tory ministry was to make peace with France. In 1711 St. John began negotiating with Torcy, the French foreign minister, in secret, for a separate peace, and military pressure was slackened in the Netherlands. Marlborough was dismissed in Dec. 1711, and in June 1712 the duke of Ormonde, who had succeeded him in command, was ordered to withdraw the English troops from the field, leaving the Dutch and Austrians to be defeated at Denain. In August St. John, who had been created Viscount Bolingbroke, went to France, to conduct negotiations, and on March 31, 1713, the treaty of Utrecht was signed by all the allies except the emperor.

From the moment he came into office, realizing that the only hope of the survival of the Tory party after Anne's death lay in its putting the old Pretender, James III., on the English throne, St. John had set to work to bring about the repeal of the Act of Settlement by which the succession passed to Sophia, electress of Hanover, and her descendants. In 1710 Anne was persuaded to create 12 new Tory peers; the Whig influence of the dissenters in Parliament was undermined by the Act of Occasional Conformity; and Bolingbroke made an unsuccessful attempt to propitiate the Whig merchant interest by negotiating, at the Treaty of Utrecht, for commercial concessions from France and Spain. By 1712 he was corresponding with James, though he was never able to persuade him to become Protestant—a necessary step before the Tories would turn Jacobite. Meanwhile the friendship between Bolingbroke and Harley had been gradually dissolved; the former had been disappointed, in July 1711, at receiving only his viscountcy instead of the earldom lately extinct in his family, whereas Harley had been made earl of Oxford and lord treasurer, in May; Lady Masham quarrelled with Oxford, and identified herself with Bolingbroke's interests in 1714, and the latter gradually superseded Oxford in the leadership of the party. Finally there was a split in the cabinet on July 27, and Oxford was forced to resign. Bolingbroke now thought his triumph had come, and that it was time to press for the repeal of the Act of Settlement. All important military and civil posts were placed in the hands of Tories, and a new ministry was projected. But on July 28 Anne was taken ill, and on Aug. 1 she died. The Act of Settlement had not been repealed, the Tory plans were confused, and the privy council, in which Bolingbroke had never troubled to procure a Tory majority, met and proclaimed George king.

On the accession of George I. the illuminations and bonfire at Lord Bolingbroke's house in Golden square were "particularly fine and remarkable," but he was immediately dismissed from

office. He retired to Bucklebury, and is said to have now written the answer to the *Secret History of the White Staff* accusing him of Jacobitism. In March 1715 he in vain attempted to defend the late ministry in the new parliament; and on the announcement of Walpole's intended attack upon the authors of the Treaty of Utrecht he fled in disguise (March 28, 1715) to Paris, where he was well received, after having addressed a letter to Lord Lansdowne from Dover protesting his innocence and challenging "the most inveterate of his enemies to produce any instance of his criminal correspondence." Bolingbroke in July entirely identified himself with the interest of the Pretender, whose secretary he became, and on Sept. 10 he was attainted. But his counsel was neglected for that of ignorant refugees and Irish priests. The expedition of 1715 was resolved upon against his advice. He drew up James's declaration, but the assurances he had inserted concerning the security of the Church of England were cancelled by the priests. He remained at Paris, and endeavoured to establish relations with the regent. On the return of James, as the result of petty intrigues and jealousies, Bolingbroke was dismissed from his office.

In March 1716 he declared his final abandonment of the Pretender and promised to use his influence to secure the withdrawal of his friends; but he refused to betray individuals. In 1717 Bolingbroke formed a liaison with Marie Claire Deschamps de Marcilly, widow of the marquis de Villette, whom he married in 1720 after the death in 1718, of Lady Bolingbroke, whom he had treated with cruel neglect. He bought and resided at the estate of La Source, near Orleans, studied philosophy, criticized the chronology of the Bible, and was visited amongst others by Voltaire, who expressed unbounded admiration for his learning and politeness. In 1723, through the medium of the king's mistress, the duchess of Kendal, he at last received his pardon, returned to London in June or July, and placed his services at the disposal of Walpole, by whom, however, his offers to procure the accession of several Tories to the administration were received very coldly. During the following winter he made himself useful in France in gaining information for the Government. In 1725 an act was passed enabling him to hold real estate, but without power of alienating it. But Walpole succeeded in maintaining his exclusion from the House of Lords. He now bought an estate at Dawley, near Uxbridge, where he renewed his intimacy with Pope, Swift and Voltaire, took part in Pope's literary squabbles, and wrote the philosophy for the *Essay on Man.* On the first occasion which offered itself, that of Pulteney's rupture with Walpole in 1726, he tried to organize an opposition in conjunction with Pulteney and Windham; and in 1727 began his celebrated series of letters to the *Craftsman,* attacking the Walpoles, signed an "Occasional Writer." He won over the duchess of Kendal with a bribe of £11,000 from his wife's estates, and with Walpole's approval obtained an audience with George. His success seemed imminent, and Walpole prepared for dismissal. But by the king's death in June Bolingbroke's projects and hopes were ruined once more. Further papers from his pen signed "John Trot" appeared in the *Craftsman* in 1728, and in 1730 followed *Remarks on the History of England by Humphrey Oldcastle,* attacking the Walpoles' policy. The assault on the Government prompted by Bolingbroke was continued in the House of Commons by Windham, and great efforts were made to establish the alliance between the Tories and the Opposition Whigs. But the whole movement collapsed after the new elections, which returned Walpole to power in 1735 with a large majority.

Baffled and disappointed, Bolingbroke retired to France in June, residing principally at the château of Argeville, near Fontainebleau. He now wrote his *Letters on the Study of History* (printed privately before his death and published in 1752) and the *True Use of Retirement.* In 1738 he visited England, became one of the leading friends and advisers of Frederick, prince of Wales, who now headed the opposition, and although he was excluded from Parliament, was the real chief of the party of Patriots. He exercised great influence over the education of Prince George, afterwards George III., who was brought up on his *Patriot King.* This work, together with a previous essay, *The Spirit of Patriotism,* and *The State of Parties at the Accession of George I.,* was entrusted to Pope and not published. Bolingbroke returned to France in 1739, and subsequently sold Dawley. In 1742 and 1743 he again visited England and quarrelled with Warburton. In 1744 he settled finally at Battersea with his friend, Hugh Hume, 3rd earl of Marchmont, and was present at Pope's death in May. The discovery that the poet had printed secretly 1,500 copies of *The Patriot King* caused him to publish a correct version in 1749, and stirred up a further altercation with Warburton, who defended his friend against Bolingbroke's bitter aspersions, the latter, whose conduct was generally reprehended, publishing a *Familiar Epistle to the most Impudent Man Living.* In 1744 he had been very busy assisting in the negotiations for the establishment of the new "broad bottom" administration, and showed no sympathy for the Jacobite expedition in 1745. About 1749 he wrote the *Present State of the Nation,* an unfinished pamphlet. He died on Dec. 12, 1751.

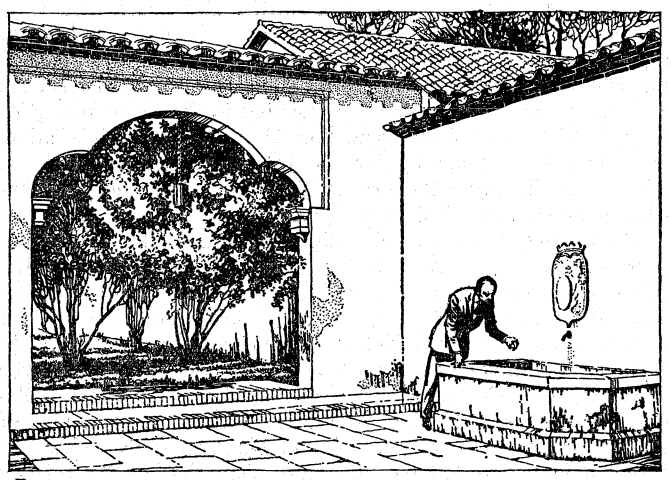
The writings and career of Bolingbroke make a far weaker impression upon posterity than they made on contemporaries. His genius and character were superficial. Burke wrote his *Vindication of Natural Society* in imitation of Bolingbroke's style, but in refutation of his principles; and in the *Reflections on the French Revolution* he exclaims, "Who now reads Bolingbroke, who ever read him through?" His most brilliant gift was his eloquence, which, according to Swift, was acknowledged by men of all factions to be unrivalled. None of his great orations has survived, a loss regretted by Pitt more than that of the missing books of Livy and Tacitus. His political works, in which the expression is often splendidly eloquent, spirited and dignified, are for the most part exceedingly rhetorical in style.

BIBLIOGRAPHY.—Bolingbroke's collected works, including his chief political writings already mentioned and his philosophical essays *Concerning the Nature, Extent and Reality of Human Knowledge, On the Folly and Presumption of Philosophers, On the Rise and Progress of Monotheism* and *On Authority in Matters of Religion,* were first published in Mallet's faulty edition in 1754 (according to Johnson's well-known denunciation, "the blunderbuss charged against religion and morality"), and subsequently in 1778, 1809 and 1841. *A Collection of Political Tracts* by Bolingbroke was published in 1748. His *Letters* were published by G. Parke in 1798, and by Grimoard, *Lettres historiques, politiques, philosophiques,* etc., in 1808; for others *see* Pope's and Swift's *Correspondence;* W. Coxe's *Walpole;* Phillimore's *Life of Lyttelton; Hardwicke Papers,* vol. ii.; *Marchmont Papers,* ed. by Sir G. H. Rose (1831); "Letters to Lord Chancellor Hardwicke" in *Add mss. Brit. Museum* (*see* Index, 1894–99), mostly transcribed by W. Sichel; Hist. mss. Comm., mss. of Marquis of Bath, Duke of Portland at Welbeck; while a further collection of his letters relating to the Treaty of Utrecht is in the British Museum. For his attempts at verse *see* Walpole's *Royal and Noble Authors* (1806), iv. 209 *et seq.* *See* also bibliography of his works in Sichel, ii. 456, 249.

A life of Bolingbroke appeared in his lifetime, 1740, entitled *Authentic Memoirs* (in the Grenville Library, Brit. Mus.), which recounted his escapades; other contemporary accounts were published in 1752 and 1754, and a life by Goldsmith in 1770. The standard biography of Bolingbroke is that by Walter Sichel (1901–02).

BOLIVAR, SIMON (1783–1830), soldier and statesman, leader of the revolutions which resulted in the independence from Spain of what are now Venezuela, Colombia, Ecuador, Panama, Peru and Bolivia, was born in Caracas, Venezuela, on July 24, 1783, and died, at the age of 47, near Santa Marta, in the republic of Colombia. Officially invested with the title of *Libertador* by the congresses of all of the above countries, founder of Greater Colombia, which he created out of the revolted colonies, hero of over 200 bloody battles, dictator president of the nation whose name (Bolivia) was adopted during his lifetime, Bolivar's life presents one of history's most colossal personal canvases of adventure and tragedy, glory and defeat. His activities covered an immense area of untracked wilderness, whose mere crossing with his armies entailed problems that would give pause to the ablest modern general with every facility at his command. Bolivar's written records, in his various addresses, proclamations and letters present the clearest picture of the conditions of the Spanish colonies at the time of the revolution that are to be found in any historical record; his analyses of the conditions of the colonials and of their political needs and destiny mark him as the wisest of the observers of his time, and a prophet who foresaw with rare precision the trend of the struggle for democracy in every political

unit of the old Spanish empire in America. His plans of government were far in advance of his time and to this day offer some of the clearest solutions of the needs and difficulties of government in the countries he freed. While violently criticized both during his life and since his death, Bolivar is recognized as one of the world geniuses of the revolutionary era of the late 18th and early 19th centuries; although perhaps not a military commander of the first order, his political acumen decided the time and manner of the



FOUNTAIN IN THE PATIO OF THE HOME AT CARACAS WHERE SIMON BOLIVAR, SOUTH AMERICAN LIBERATOR, WAS BORN, 1783

attacks which other military leaders of the revolutions in northern South America carried through to ultimate success. His use of the limited facilities in officers, men and materials which were available to him in the thinly populated wilderness of northern South America make his achievements, both in war and statecraft, the marvel of those who read his history.

Bolivar was born to aristocracy and wealth, on July 24, 1783, in Caracas, Venezuela, his father being Juan Vicente Bolivar y Ponte, and his mother Maria de la Concepcion Palacios y Blanco. His father, who was of the nobility of Spain and owner of large tracts of land and many slaves in Venezuela, died when Simon Bolivar was very young; his mother died when he was 15. His uncle and guardian, Carlos Palacios, then sent him to study in Madrid, Spain, where, in 1801, he was married to Maria Teresa Toro, niece of the marquis of Toro, a resident of Caracas and a friend of the Bolivar family. Ten months after their return to Venezuela his wife died of yellow fever, in Jan. 1803.

After her death Bolivar returned again to Europe, where, in 1805, on Mount Aventin at Rome, he pledged himself to his old friend and tutor, Simon Rodriguez, to devote his life to the freeing of Venezuela from Spain. He returned to Venezuela by way of the United States, visiting the eastern cities and meeting many Americans. He arrived in Caracas at the end of 1806. The Venezuelan revolution against Spain, like many of the revolutions in the Spanish colonies, had its genesis in the bitter quarrel between King Charles IV. and his son, Ferdinand VII., out of which Napoleon profited so largely. Bolivar and friends of his social group were the members of the Caracas junta favouring the restoration of Ferdinand after the crowning of Joseph Bonaparte as King of Spain. This junta, on April 19, 1810, forced the captain general, Vicente Emparan, to abdicate and thereupon formed the first locally chosen government in Spanish America.

Bolivar was sent to England as the diplomatic representative of the new Government. On his return he brought with him Francisco Miranda, the Venezuelan soldier of fortune who had fought under Washington and in the campaigns of Napoleon, and who held the rank of general in the emperor's armies. Miranda took an active part in the early campaigns of the Venezuelan revolution, while Bolivar entered at once into the political arena, and in one of his earliest recorded addresses advocated the change in objective which resulted in the declaration of Venezuelan independence (July 5, 1811). The adoption of a federal (or decentralized) type of republic, although opposed by Bolivar, took place within a few months, and the name of Colombia was chosen for the federation of freed colonies that was yet to be.

The Liberator.—Bolivar, in 1811, became a refugee on the island of Curaçao, meeting many of his helpers of later years. From Curaçao he went to Cartagena, in Nueva Granada (now Colombia), where he joined the revolutionary group of that viceroyalty, and published (Dec. 15, 1812), the first of the remarkable documents which are now the classics of the revolutionary literature of Spanish America. He urged upon the revolutionary bodies of Nueva Granada the necessity of destroying the power of Spain in Venezuela in order to guarantee their own success. In the field he aided in opening the Magdalena river (by the capture of Tenerife) and followed with the capture of Cucuta and Pamplona, close to the Venezuelan border. The revolutionary Government authorized him, then, to proceed against Venezuela and he started with 800 men on May 15, 1813. Opposing him were 15,000 royalists, scattered through the country, but he took both Merida and Trujillo in the face of severe odds, and at Trujillo, on June 15, 1813, proclaimed the "War to the Death to the Spaniards," for which he is bitterly criticized, although Bolivar justified the move as a military measure of the highest value.

On Aug. 6, 1813, Bolivar marched into Caracas, after covering 1,200km., fighting six pitched battles, destroying five royalist military units, and capturing 50 cannon and three ammunition depots in a period of 90 days. In Caracas he announced for the first time the personal position which he repeated many times afterward—that he sought no office and would accept none excepting "the post of danger at the head of the soldiers." Bolivar was given the official title of "Liberator" and himself established the "Military Order of the Liberators of Venezuela," in honour of his fellow revolutionaries.

The months following the successful campaign into Venezuela were filled with bloody and heroic battles. Ghastly reprisals, on both sides, took place, the bitterest opponents of the revolutionaries being the *llaneros* or plainsmen from the Orinoco led by a former pirate who called himself Boves. The battle of Araure, on Dec. 5, 1813, closed a year of notable successes for Bolivar with the virtual destruction of the royalist army of 3,500 men. The dispersed royalist units faded away, but the army of the plains, led by Boves, was an element which brought on the disasters of the year 1814. Boves was defeated in his first attack against an entrenched force of revolutionaries, at La Victoria, Feb. 12, 1814, but the discovery, after the repulse, of the horrors which his men had committed in defenceless villages apparently caused the order issued by Bolivar for the execution of 886 Spanish prisoners at La Guaira, an act which has been the subject of severest criticism, although defended by Bolivar's admirers as a justified reprisal.

The two battles of San Mateo came in March of 1814, and resulted in victories for Bolivar. Bolivar returned to the coast, where he met the Spaniards and royalists in the first battle of Carabobo, fought on May 28, 1814. It was a notable, but not a decisive, victory for Bolivar for the victory was followed quickly by a defeat at the first battle of La Puerta, on June 15, 1814, when Boves obtained his revenge for San Mateo in a victory which scattered the revolutionaries and led finally to Boves entering Caracas. He followed his atrocities there with the massacre of 3,500 of the refugees from the capital at Aragua after defeating Bolivar and his army of 3,000 with a force estimated to have numbered 8,000 to 10,000. Bolivar, in disgrace and amidst the insults of his officers, left Venezuela for Cartagena, leaving, however, a proclamation analyzing the basis of the failure, that is, the opposition of the very native-born to whom he sought to give independence. Meanwhile, Venezuela was again completely in the hands of the Spaniards.

Bolivar arrived in Cartagena on Sept. 25, 1814. He proceeded to Tunja, the seat of the revolutionary Government of Nueva Granada, to report the success, and later failure, of his campaign in Venezuela. He was received with honours everywhere.

Congress entrusted Bolivar with the task of liberating Santa Fé de Bogota, which he carried by assault and turned over to the congress, which moved from Tunja to the beautiful city that is still the capital of modern Colombia. Bolivar was then ordered

to proceed again to the coast and to capture Santa Marta, the last stronghold of the Spaniards in Nueva Granada. Delays and intrigues interfered, and the attack was not made until Spanish reinforcements had arrived, and Bolivar was defeated with the loss of 1,000 men and 100 guns.

Disgusted and disappointed, Bolivar resigned his command and sailed for Jamaica, again issuing a proclamation in which he warned against the disunion of the revolutionaries, pointing out that "No tyrant has been destroyed by your arms; they have been stained with the blood of brothers in two struggles that have produced in us an equal sorrow." While in exile in Jamaica, Bolivar wrote, on Sept. 6, 1815, the famous "Jamaica letter," which analyzes the causes of failure, and sets down the reasons for his hope for final success.

Negro President's Help.—In Jamaica a former slave of the Liberator by error stabbed to death another man sleeping in the hammock where Bolivar was accustomed to lie. From Kingston, whose authorities frowned on revolutionary activities, because of the relations of Great Britain with the Holy Alliance, Bolivar sailed to Haiti, where President Alexandre Petion gave him asylum and aid and support in his plans to return to Venezuela. In Nov. 1815 he set sail with 250 men for the island of Margarita, landed on the mainland and at Ocumare de la Costa, on July 6, 1816, proclaimed the cessation of the War to the Death and the freedom of all the slaves, thus fulfilling the promise he had made to the negro president of Haiti. He was forced to return to Haiti for help, but on Jan. 1, 1817, landed in Venezuela.

The following months were crowded with intrigue in the revolutionary ranks. Bolivar retired to Venezuelan Guiana, where a few loyal followers (including Antonio José Sucre, one day to be his ablest officer and most loyal friend and hero of the great decisive battle of Ayacucho) surrounded him. The fall of Angostura, on the Orinoco, placed Bolivar in a favourable position, and, more important, he found the tables turned, with the *llaneros* (Boves was now dead) following José Antonio Paez to the support of the revolutionary cause. Angostura now became the capital of the revolutionary Government, and Bolivar, as its head, organized a skeleton of civil administration. Small engagements and heroic and colourful skirmishes took place, with Bolivar living the life of the *llaneros* and finally penetrating into La Victoria, between Valencia and Caracas, where he called all able-bodied men to his colours. The Spanish commander, Pablo Morillo (whose arrival in Nueva Granada over three years before had brought about Bolivar's defeat and his exile to Jamaica) forced Bolivar to battle at La Puerta, on March 15, 1818, and in this second battle there defeated the revolutionary army and routed it, Bolivar himself being wounded. This was the darkest hour of the revolution in Venezuela, but Bolivar took the occasion to write to the revolutionaries of Argentina his hope and expectation that Venezuela would yet invite them to join her in the "Unity of South America," and to send a message to Nueva Granada, promising the revolutionaries there the aid of the Venezuelans in expelling the Spaniards, who were again in control in the viceroyalty.

On May 25, 1819, Bolivar set out on another of the exploits which mark his career. With the newly formed but well-disciplined "foreign legion" composed largely of British and Irish veterans of the European wars, and with a reduced army of Venezuelans (in all about 2,500 men) Bolivar started across the Andes towards Nueva Granada, to fulfil his promise of aid and rescue. Leaving the tropic plains along a route now covered by an automobile road but then passable on foot and hardly at all with animals, the "Army of Liberation" climbed to the freezing Andean passes where the icy "paramo" blows beneath the burning sun. The soldiers, their clothing worn or torn from them in crossing the flooded plains of the rainy season of the Orinoco basin, passed through the tortures of this march and arrived, worn and wasted, in the sunny savannas of Nueva Granada, only to learn that a royalist army of 5,000 men was on its way to meet them. With three days to prepare, Bolivar found arms and horses, met and routed the advance guards of the enemy and finally, at Boyaca, on Aug. 7, 1819, defeated decisively the main Spanish force. Boyaca proved the blow that broke the hold of Spain on Nueva Granada.

In Bogota, Bolivar was received with tumultuous acclaim, money and men were put at his disposal for the relief of Venezuela, and he was officially invested with the title of Liberator of Nueva Granada. The whole of the former viceroyalty was cleared of royalist control in a relatively rapid succession of victories and surrenders. Francisco de Paula Santander, the great Colombian hero, was appointed vice-president of Nueva Granada under Bolivar. Meanwhile, Bolivar, learning of dissensions and disloyalties in Angostura, returned over the same difficult road to the Venezuelan revolutionary capital, appeared before the Venezuelan congress on Dec. 14, to report formally the results of the expedition to Nueva Granada and to urge the proclamation of the new republic of Colombia, including Nueva Granada and Venezuela. On Dec. 17, 1819, the republic was proclaimed, with Venezuela, Nueva Granada and Quito (now Ecuador) as its constituent parts, and Bolivar as its president.

The Armistice.—In Jan. 1820 Bolivar at Bogota proclaimed the union of Greater Colombia. Meanwhile, the Spanish Government had authorized Morillo to open negotiations for peace. Bolivar declined to consider any peace except that based on a recognition of the independence of the colonies, but the negotiations led to a six months' armistice and the drawing up of a treaty for the prosecution of any war that might follow on the lines of civilized warfare and on the principle of the inviolability of the lives and property of non-combatants.

At this juncture Maracaibo, long the stronghold of the royalists, openly declared its adherence to the revolution, and Manuel de Latorre, the Spanish commander who had succeeded Morillo on the latter's voluntary retirement, believed that Bolivar had broken the armistice by working to bring about the defection of Maracaibo. This was denied by Bolivar, and arbitration was offered, but refused by the Spanish commander. Events then led rapidly to the decisive battle of the Venezuelan revolution. Bolivar summoned his forces and moved against Caracas. The two armies met on the plains of Carabobo for the second time, Bolivar attacking at 11 A.M. on June 24, 1821. In one hour's battle the Spaniards were defeated, the foreign legion and the *llaneros* playing decisive rôles in the final result. The second battle of Carabobo was recognized, even then, as the turning point of the struggle for Venezuelan independence, as Boyaca was in the war in Nueva Granada.

Meanwhile, a new Colombian congress had convened at Cucuta and again Bolivar offered his resignation as president and again was refused, although he declared at that time he feared peace more than war (owing to looming discords and the necessity of finding employment for the active leaders of war). He also proposed treaties to the other Latin-American republics, recognizing the former lines of the colonial divisions as the national boundaries, maintaining the sovereignty of the new States but uniting them in "perpetual confederation" and establishing an assembly of plenipotentiaries which should serve as a council, a point of contact, and as an "arbitral judge and conciliator of their disputes and differences."

During this time the tide of battle turned southward. Bolivar had sent Sucre by sea to Guayaquil, which was not included in the armistice, and now he himself planned to march overland to Quito, to complete the liberation of what is now Ecuador. En route south for this purpose he received word of the liberation of Panama, the last province of Nueva Granada to overthrow the Spanish rule. Bolivar began his march southward from Cali on March 8, 1822, with 2,000 men. The Spaniards, from the fortified town of Pasto, met the revolutionary army with a force slightly superior, at Bombona, on April 7, 1822. The revolutionaries were victorious in a battle which lasted into the night, and Pasto was occupied on June 8. On May 24, 1822, Sucre had fought the decisive battle of Pichincha and had entered Quito the following day. Bolivar joined Sucre in Quito, but on July 11 departed for Guayaquil, where some unrest was manifest in the revolutionary groups, as the issue was already joined as to whether Quito and Guayaquil should join Colombia, remain independent or join Peru.

José de San Martin (*q.v.*), the hero of the independence of Argentine and Chile and "Protector" of Peru, on July 26, arrived

at Guayaquil to meet and confer with Bolivar. What transpired at that conference was never known, but when San Martin returned to Peru, he resigned his post as "Protector" of Peru, withdrew from Lima, sailed for Chile and thence proceeded to Argentina, never again to appear in revolutionary annals. San Martin's withdrawal from Peru as well as Guayaquil was apparently a surprise to Bolivar, and on the repeated invitations of the local revolutionaries Bolivar finally sailed southward, arriving at Callao on Sept. 1, 1823. There he was again invested with the title of "Liberator," and called upon to lead the struggle against the Spanish viceroy, who was said to have 36,000 European troops at his command. Bolivar waited for his Colombians to cross the Andes and took time to train, partially, an army of some 4,000 Peruvians, giving him a total of between 8,000 and 10,000 men. The Spaniards were about 9,000 in number, 2,000 being cavalry. The battle of Junin was joined at 4 o'clock in the afternoon of Aug. 6, 1824, and was fought entirely by cavalry with sabres, not a shot being fired. The result was a bloody victory for the revolutionaries, Junin being regarded as the turning point of the struggle for the control of Peru.

Bolivar and the Supreme Power.—The decisive victory which ended forever the domination of Spain in the New World, was won on Dec. 9, 1824, at Ayacucho, Peru, under the command of Sucre, Bolivar having departed for Lima, to organize the civil Government of the republic. Following Ayacucho, Bolivar called a constitutional convention for Feb. 8, 1825. He resigned once more his supreme power in Colombia and in Peru, refused a gift from Peru of 1,000,000 pesos (then about £200,000), and later made a triumphal visit to Upper Peru, the liberation of which he had proclaimed on May 16, 1825, at Arequipa, and which had taken the name of Republica Bolivar (later to become Bolivia) in honour of the Liberator. The military victories had been won by Sucre, to whom Bolivar gave unstinted praise and honour, but Bolivar spent the time he remained in Bolivia in giving the new republic its first political organization, establishing schools, ordering a study of irrigation possibilities, removing the duty on mining machinery and distributing land to the Indians.

In Jan. 1826 Bolivar returned to Peru, reported to the congress on his work in the south, and after a short stay, started on his return to Colombia. There, in the defection of the commanders he had left in Venezuela, had already begun the long series of civil wars which were to mar the first half century of Latin American independence. He arrived in Bogota in the middle of November. He remained only two days, and continued on his way to Venezuela. En route he called a Venezuelan constitutional congress to meet in Valencia on Jan. 15, 1827. Paez, the leader of the revolt against the union and Bolivar, accepted the offer of amnesty and friendship from Bolivar, the clouds passed, and the Liberator again entered Caracas in triumph. His leniency toward Paez irritated Nueva Granada, and the movement to break up Colombia into its original parts gained headway in Nueva Granada as well as in Venezuela. Finally, in 1828, after 14 years as supreme chief and president of Nueva Granada, Bolivar's resignation was accepted by congress, at his request and in the face of criticism and intrigue by his enemies and others ambitious for power.

Bolivar's resignation did not quiet the opposition, and threats from many quarters, including Santander himself, caused Bolivar to return to Bogota at the head of an army and again assume the supreme power, a step which has given weight to the assertions of his enemies that he clung to his power for personal reasons. He arrived in Bogota on Sept. 10, 1828, and called a general convention to meet in Ocaña. This assembled on April 9, and despite Bolivar's appeals and efforts for unity, his own followers withdrew leaving the convention without a quorum. Bogota remained loyal to the Liberator and various cities of Nueva Granada, Guayaquil and Venezuela sent memorials asking that he retain his office in order to maintain the union. On Sept. 25, 1828, a plot against Bolivar's life was hatched in Bogota, the Liberator escaping but some of his guards falling in his defence. Santander and others were arrested and sentenced to death as leaders of the conspiracy, but were banished instead, through the mediation of Bolivar.

The year 1829 opened with plans for an expedition into Peru, which had turned on Colombia, after ousting Sucre from Bolivia. Marching southward once more, Bolivar met Sucre at Quito, and at Guayaquil recovered the territory taken by Peru without fighting, owing to changes in the attitude of the revolutionaries in Lima, and the recall of La Mar, the leader of the expedition against Colombia. Meanwhile, however, trouble was brewing again in Nueva Granada and Venezuela, and Bolivar, who had been critically ill in Guayaquil, turned back northward for the last time. He reached Bogota on Jan. 1830, and there turned over the presidency to Sucre. Paez, in Venezuela, had in the meantime begun a new agitation for separation from Colombia, and war was urged against Bolivar as the proposer and creator of the Colombian union. A peace commission, headed by Sucre, was not allowed to pass the Venezuelan border and Paez prepared for a campaign to "free" Nueva Granada from the grasp of the "tyrant" Bolivar. On April 27, 1830, Bolivar resigned, again, the supreme power which he had temporarily assumed in the hope of pacifying the Venezuelans. His resignation was accepted and on May 8, 1830, he left Bogota for Cartagena, intending to take ship there for Jamaica or Europe.

He passed from town to town, honoured and fêted, but was forced to wait in Cartagena, because of lack of funds to pay his passage on shipboard, his great personal fortune having been finally dissipated in the cause of the revolution. At Cartagena he heard of the murder of Sucre on June 4, this information being probably the last blow to the rapidly failing chieftain. Tuberculosis, which had long been developing, was given new impetus by a severe cold. Still, calls came for him to assume leadership once more against the elements that were breaking up the union for which he had fought and planned. Finally, seeking a change of climate, he went to a country place, San Pedro Alejandrino, three miles outside Santa Marta, where he died—after issuing one more proclamation from his deathbed—on Dec. 17, 1830.

Twelve years after his death, Bolivar's remains were carried to Caracas, where they lie in the national pantheon, on one side the empty tomb commemorating Francisco Miranda, and on the other that in which the remains of Sucre are to rest when they are returned by Ecuador to Venezuela.

BIBLIOGRAPHY.—In English, *Simon Bolivar,* by Guillermo Sherwell, published by the author for the Venezuelan Government in Washington, 1921 (also issued in Spanish) gives an excellent if highly appreciative presentation of the subject in brief form. The bibliography in Spanish is almost endless, excellent "lives" being those by Larrazabal, Aristide Rojas and, particularly, a compendium of studies issued in Madrid and Buenos Aires in 1914 under the title *Bolivar—por los mas grandes escritores Americanos, procedido de un estudio por Miguel de Unamuno.* F. Lorrain Petre is a severe critic of Bolivar, and presents the entire controversy over Bolivar's patriotism or self-aggrandizement in a judicious if not unprejudiced manner. The Venezuelan Government has published 22 volumes of the historical records bearing on Bolivar's life. Simon B. O'Leary, a commander of Bolivar's foreign legion, wrote his memoirs in English. *See* also T. R. Ybarra, *Bolivar, the Passionate Warrior* (1929); H. Angell, *Simon Bolivar* (1929); H. R. Lemley, *Bolivar* (1930). (W. THO.)

BOLÍVAR, a department of Colombia on the Caribbean sea. It has an area of 22,996 sq.mi., composed in great part of low, alluvial plains which are densely wooded. The climate is excessively warm and humid, and the population, 765,194 (census of 1938), is composed largely of mulattoes and Indians who are engaged in subsistence agriculture. In some localities the inhabitants of mixed race are estimated to constitute four-fifths of the population. The capital of the department, Cartagena (pop. 72,767 in 1938), was once the principal commercial entrepôt of Colombia. Other important towns are Magangué, pop. (1938) 9,770; Mompós 6,694; Corozal 4,519; Sincelejo 11,014; and Lorica 6,146. The department has but two railways—a line from Cartagena to Calamar (65 mi.), which connects the port of Cartagena with the Magdalena river, and another short line from Cartagena to María la Baja.

BOLÍVAR, an inland state of Venezuela, lying south of the Orinoco, with the Delta-Amacuro territory and British Guiana on the east, and the Amazonas territory and Brazil on the south. Frequent political changes in Venezuela have led to various modifications in the size and outlines of this state, which comprises

large areas of uninhabited territory. It is a country of extensive plains (*llanos*) covered in the rainy season with nutritious grass which disappears completely in the dry season, and of great forests and numerous rivers. Its area is 91,892 sq.mi. and its population in 1920 was 65,852, and in 1941 the census found 94,552. The capital is Ciudad Bolívar, formerly called Angostura, which is situated on the right bank of the Orinoco about 240 mi. above its mouth; pop. of *municipio* (1941) 19,789. Vessels of light draught easily ascend the Orinoco to this point, and a considerable trade is carried on, the exports being gold (from the famous El Callao mines), hides, balatá and forest products.

BOLIVAR, the monetary unit of Venezuela. It is equivalent at par to 32.67 cents in the currency of the United States. It is divided into 100 céntimos, while commercial accounts are kept as a rule in "pesos sencillos," an imaginary coin equivalent to four bolivars. A former unit called the venezolano is equal to five bolivars.

The bolivar, from the geographical situation of Venezuela, has its main link with the dollar, but it is also quoted regularly in London. Notes are issued by the Bank of Venezuela and by certain other banks, but the former possesses the bulk of the issue and practically all the country's stock of gold and gold assets. This last rose from 11,500,000 bolivars in 1913 to 69,200,000 in 1926, but it is impossible to say how much was actual gold, and how much was "gold exchange," etc. The world depression of the 1930s resulted in fluctuations in the exchange value of this and all other currencies until 1937. (*See* CURRENCY.)

BOLIVIA, an inland republic of South America, once a part of the Inca empire and later of the Spanish viceroyalty of Peru and known as the province of Charcas, or Upper Peru. It is the fifth largest political division of the continent, and extends, approximately, from 9° 44′ to 23° S., and from 58° to 70° W. It is bounded north and east by Brazil, east by Paraguay, south by Argentina, and west by Chile and Peru. The area as adjusted by the Chaco Arbitral Award of 1938 is unofficially computed at 419,470 sq.mi.

Physiography.—Although three-fifths of Bolivia's area consists of vast low plains, the remainder, the western part, is one of the highest inhabited districts in the world and constitutes the real Bolivia. The Andes here attain their greatest breadth and are divided into two great parallel chains enclosing a plateau whose surface lies but a few thousand feet below the summits of the mountains themselves (*see* ANDES). Between these chains lies the Altiplanicie, or Altiplano, of Bolivia, a relatively flat-floored depression 500 mi. long by 80 broad, with an elevation of about 12,000 ft., constituting the Lake Titicaca basin. The floor of this great depression, mostly composed of water-laid deposits from the bordering mountains, and appearing quite level, slopes gently southward, the southern end being about 400 ft. lower than the surface (Lake Titicaca) in the north. Its evenness is also broken by occasional hills and ridges. The margins of the basin, particularly on the east, are marked by numerous interlocking alluvial fans which have built up an almost continuous piedmont plain of fairly gentle grade. The northern and eastern sections, or fully three-fifths of Bolivia, are composed of low alluvial plains, great swamps and flooded bottom-lands, and gently undulating forest regions. In the extreme south are the Bolivian Chaco and the Llanos (open grassy plains) of Manzo, while above these in eastern Chuquisaca and southern Santa Cruz are extensive swamps and low-lying plains, subject to periodic inundations and of little value for agriculture or grazing. Considerable areas, however, which lie above the floods are rich grazing lands. Between the Sierra de Chiquitos and the Andes are the Llanos de Chiquitos, which have a higher general elevation and a more diversified surface. North of this elevation are the Llanos of Guarayos and Mojos, occupying an extensive region traversed, but poorly drained, by the Guaporé, San Miguel, Guapay, Mamoré, Yacuma, Beni and Madre de Dios rivers and containing large undrained areas, like that of Lake Rojoagua (or Roguaguado). It includes districts rich in agricultural possibilities and extensive open plains where cattle have been successfully raised since colonial times. Toward the northwest, where the plains blend into the lower slopes of the Andes, are heavy forests. Better drained than the lowlands, this region, the Yungas, is more salubrious and constitutes one of the most attractive districts of Bolivia. Though still sparsely inhabited and difficult of access, it could sustain a large population.

Hydrography.—The rivers fall into three distinct systems: Amazon (*q.v.*), Plata (*q.v.*) and Lake Titicaca. The eastern lowlands of Bolivia have many lakes, most of them little known. The great swampy plains along the Beni and the Mamoré con-



STREET SCENE IN LA PAZ, THE PLATEAU CAPITAL OF BOLIVIA
La Paz, a city of some 200,000 inhabitants, founded in 1548 by the Spaniards, has many narrow, ill-paved streets. The climate is healthy and, because of its great height above sea-level, it is often intensely cold at night

tain several lakes and lagoons, some of them large. Lake Rojoagua, whose waters probably find their way into the Beni, covers a large area, as do other little known lagoons and marshes near the Mamoré. Lake Concepción, in the Chiquitos mountains, belongs to the same hydrographic system. In the southeast there are several large shallow lakes whose character and size change with the seasons. Along the Paraguay there are several such lakes, partly produced by obstructed outlets, such as Bahía Negra, Cáceres, Mandioré, Gaiba and Uberaba, some of them navigable by small craft. Above these are the great Zarayes swamps. This region, like that of the north, is subject to inundations during the summer (November to May) when traffic is possible only by the use of boats.

The third draining system is that of the great central plateau. This is one of the most elevated of all inland basins lying at over 12,000 ft. It comprises Lake Titicaca near the north end; the Desaguadero, its outlet; Lake Pampa Aullagas or Poopó into which the Desaguadero flows; the Lake or Salt Marsh of Coipasa (connected with Poopó by the Lacahahuira, the small outlet of the latter); and the great Salar de Uyuni, independent of the rest of the system but receiving the waters of an extensive, though very arid region, at the south end. Into this system enter many short streams from the neighbouring heights, chiefly the Cordillera Real, with its immense snow fields. Having no outlet to the sea the water of this extensive basin is wholly absorbed by the dry soil and by excessive evaporation. Lake Titicaca, the most important feature of the plateau system, at an elevation of 12,507 ft., is one of the highest large lakes in the world. It is about 125 mi. long and has a maximum width of 69 (total area about 3,200 sq.mi.). The indented shore offers much topographic variety, sometimes rising abruptly, sometimes running back in low gentle slopes. It is divided into two main parts by the peninsulas of Copacabana and Huata, the narrow strait of Tiquina, between these peninsulas, connecting the two almost separated bodies of water. The southern arm, covering approximately one-fifth of the total area, is known as the Laguna de Uinamarca, the name Titicaca being applied sometimes only to the larger body. Over much of its extent, particularly in Uinamarca, the lake is so shallow that small steamers often run aground, but toward its eastern side there is a long trough 892 ft. deep at its deepest point. The level fluctuates seasonally, summer rains and melting snows accounting for a rise of 5 to 6 ft. Many islands dot the sur-

face of the lake. The largest of these, the Isla del Sol, also sometimes called Titicaca, contains highly interesting archaeological monuments, principally the ruins of well-constructed stone buildings and paved roads, remnants of the skilled workmanship of Inca or pre-Inca peoples. This island is generally considered to have been the cradle of Inca civilization, or better, perhaps, the refuge of survivors from the earlier civilization that apparently centred about the very ancient metropolis of Tiahuanaco, just east of the lake, where are extensive ruins of admirable stone constructions. From this island the founders of Cuzco and of the Inca empire are thought to have migrated. On the smaller Island of the Moon (or Coati) impressive ruins also exist. Having an outlet and a fairly constant inflow, largely of melted snow, the water of Lake Titicaca is fresh, except in the shallower parts where rapid evaporation leaves it slightly brackish. The temperature of the water is very low, being little above freezing during much of the year, but never low enough to form ice. Strong winds are often encountered and squalls are frequent during the summer thunder-storms. Where the margins of the lake are shallow the shore is fringed with a border of bull-rush (*totora*) that is excellent forage for cattle and supplies material for building reed boats, making mats and thatching. There are several excellent kinds of fish, while ducks and other water fowl abound in the shallower portions. Lake Titicaca belongs partly to Bolivia and partly to Peru, the boundary crossing near the middle from the north-east to south-west. Transportation is carried by many small native *totora* craft, by boats of imported lumber and by several small steamers. On the north-west side a railway reaches the Peruvian port of Puno, and on the south-east side a line from La Paz extends to the Bolivian port of Huaqui (or Guaqui), steamers connecting these rail heads. Only one bridge has been built across the river, at the point where it emerges from the lake, but mule trains and caravans of llamas ford it at many points. Several important old roads along which the silver, gold and other products of this region reached the Pacific coast for four centuries cross the Desaguadero in this fashion.

Lake Pampa Aullagas (Poopó) is quite different in character from Lake Titicaca. It occupies a very shallow depression in the plateau only a few feet below the general level of the surrounding land and is nowhere more than 15 ft. deep at normal stage. However, it covers about 1,000 sq.m. at low stage, and the surrounding land is so flat that the lake reaches sometimes almost to Oruro, fully 30 m. from the low-water shore. During low stage Poopó receives daily (chiefly from the Desaguadero) about 775 cu.ft. per second, while it discharges through its outlet but a little over 210 cu.ft. per second, the difference representing its apparent loss by evaporation. The Lacahahuira, the only visible outlet of Lake Poopó, moves underneath the sand and empties into the Salar de Coipasa which, at high water, covers about the same area as Lake Poopó at low water, but usually consists only of wide, marshy, salt-encrusted wastes, with a small permanent body of water in the lowest part. There is no outlet. The Salar de Uyuni is of a similar character but much larger than Coipasa. It covers not far from 3,500 sq.m., and consists wholly of salt-encrusted swamp, except as pools of water form at times in the lower places. Like Coipasa, it has no outlet. The Río Grande de Lípez is its most important affluent; the district is almost rainless.

Climate.—Though Bolivia lies wholly within the tropics it possesses every gradation of temperature from that of equatorial lowlands to the arctic cold which prevails on the summits of the snow capped Andes.

The *yungas* climatic zone comprises all the lowlands and the mountain valleys up to an elevation of 5,000 feet. The atmosphere is exceedingly humid. The mean temperature is about 77° F, with no great departures from this, and the rainfall, occurring throughout the year, is heavy (30–50 in. at least). The *valle* zone includes the deep valleys from 5,000 to 9,500 ft., has a warm climate with moderate variations in temperature and no cold weather and is semi-tropical in character and productions. The *cabecera de valle,* as the name indicates, includes the heads of the deep valleys above the *valle* zone, with elevations ranging from 9,500 to 11,000 ft.; its climate is temperate, though subject to an occasional frost in winter, and is favourable to the production of cereals and vegetables. Both in the *valle* and the *cabecera de valle* there is likely to be a scarcity of rain but there is in most cases an abundant supply of water for irrigation. The *puna,* which lies between 11,000 and 12,500 ft., includes the great central plateau. It is always cool and shows little difference between summer and winter, except in the matter of rainfall, the former season bringing only rain, while occasional snow falls in winter. The air is too cold for crops except potatoes, barley and a few others. Mean temperature is estimated at 50·4° F (La Paz). The *puna brava* extends from 12,500 ft. up to the snow limit (about 18,000 ft.) and covers a bleak, inhospitable territory, inhabited only by shepherds and miners. Above this is an Arctic zone within the tropics. In general, the tropical and temperate regions are healthful and agreeable, and have varied and abundant products. It is in these two zones that most of the white people live, as well as many of the Indians. On the *puna,* however, particularly about the borders of Lake Titicaca, there are districts of dense Indian population, some with over 100 people per square mile. Most of the distinctly Indian settlements are now found above 11,000 feet. It was here that the great cities of the Inca and pre-Inca period were situated, such as Cuzco and Tiahuanaco. Since the peoples who built them were predominantly pastoral and largely dependent upon the llama and the alpaca, they lived in the high cold zone of grass-lands inhabited by these animals. The high rate of mortality among the natives of this region is due in large part to unsanitary habits and diet rather than to climate. In the tropical *yungas* the ground is covered with decaying vegetation, and there are many good breeding places for mosquitoes; hence malaria and fevers are common. Precipitation is as varied as the temperature. East of the Cordillera Oriental, rains fall throughout the year. On the west side of this Cordillera, which extracts the moisture from the prevailing easterly winds, the elevated plateaux have a limited rainfall in the north (21 in. at La Paz), which comes only during the summer months and diminishes toward the south until the surface becomes absolutely barren. Brief and furious thunder-storms, resulting from intense convection, sometimes sweep the northern plateau and Lake Titicaca in summer.

Fauna.—The indigenous fauna corresponds closely to that of the neighbouring districts of Argentina, Brazil and Peru. Numerous species of monkeys inhabit the forests of the tropical region, together with the puma, jaguar, wildcat, coati, tapir or *anta,* sloth, ant-bear, paca (*Coelogenys paca*) and capybara. The rare *Ursus ornatus* (spectacled bear) is found among the wooded Andean foot-hills. The chinchilla (*C. laniger*) inhabits the colder plateau regions and is prized for its fur. The plateau species of the viscacha (*Lagidium cuvieri*) and the widely distributed South American otter (*Lutra paranensis*) are also hunted for their skins. The peccary, which prefers a partially open country, ranges from the Chaco to the densely wooded districts of the north. There are two or three species of deer, the most common, though not numerous, being the large marsh deer of the Chaco. The armadillo, opossum, ferret and skunk are widely distributed. Alligators are found in the tributaries of the Paraguay, lizards and turtles are numerous, and the batrachians are represented by several species. Snakes are also numerous, including rattle-snakes and the great boa-constrictors of the Amazon region. On the plateau and in the high mountains there are few reptiles.

The most important of all the Bolivian animals, however, are the guanaco (*q.v.*) and its congeners, the llama (*q.v.*), alpaca (*q.v.*), and vicuña inhabiting the mountainous regions. So dependent is the Indian upon the llama and the alpaca that the habitat of these animals very largely determined the bounds of the Inca and pre-Inca civilization. The rearing of llamas and alpacas is a recognized industry in the highlands and is wholly in the hands of the Indians, who alone seem to understand the habits and peculiarities of these interesting animals. A small domesticated variety of the cavy ("guinea pig") is very numerous and has long been raised by the natives, who are particularly fond of its flesh.

Of birds and insects the genera and species are very numerous and interesting. The high sierras are frequented by condors and eagles of the largest size, and the whole country by the common vulture, while the American ostrich (*Rhea americana*) and a species of large stork (the *bata* or *jabirú, Mycteria americana;* maximum height, 8 ft.; spread of wings, 8 ft. 6 in.) inhabits the tropical plains and valleys. Water-fowl are numerous both in the lowlands and on the plateau. Among the highland lakes are geese, ducks, grebes, and coots, divers, cormorants and gulls and rosy flamingoes. Some of the forests of the warm valleys and plains are filled with birds of beautiful plumage. Many species of humming-birds are found even far up in the mountains, and great numbers of parrots, macaws and toucans, brilliant of feather but harsh of voice, enliven the forests of the lowlands. Insect life is abundant and varied at the lower levels, but from 10,000 ft. up is largely lacking. Silkworms have been bred with success in some departments.

Like other South American states, Bolivia benefited greatly from the introduction of European animals. Horses, cattle, donkeys, sheep, goats, swine and poultry were introduced, and are now sources of food and wealth to a large part of the population. The horses and mules are largely imported from the Argentine pampas, since the plateau where most of them are used is too high for their successful breeding.

Flora.—Owing to the diversities in altitude the flora of Bolivia represents every climatic zone, from the scanty Arctic vegetation of the lofty Cordilleras to the luxuriant tropical forests of the Amazon basin. Between these extremes the diversity in vegetable life is as great as that of climate and soil. The flora has been little studied because of the inaccessibility of the inland regions. The plateau is primarily a grassland. Above 10,000 ft. few trees are found, but where there is even a light rainfall the hillsides and the high plains support a scant growth of coarse bunch grass (*Stipa ichu*) which is the principal pasture of domestic stock. This grows up to the snow line. *Ichu* grass is widely used for mats and thatching. Two other economically important plants are the *tola* and the *yareta;* the former a low shrub, the latter a highly resinous moss-like plant which grows in a compact fibrous mass. Both of these are used extensively for fuel. Among the more important cultivated plants of the *puna* region are the potato and oca (*Oxalis tuberosa*), and quinoa (*Chenopodium quinoa*) is widely grown for fodder but does not mature on the puna, while wheat can seldom be grown above 10,000 feet. It is now generally agreed that the highland district about Lake Titicaca was the native home of the potato, which constitutes the staple food, particularly above 11,000 ft., the usual limit of grains. Indian corn was cultivated in the temperate regions long before the advent of Europeans, and in such districts still is grown extensively. Wheat, barley, rye, oats, beans, peas and many vegetables, introduced from the old world, have found suitable habitats, each at its own level. Among the indigenous plants in the semi-tropical and tropical zones are the sweet potato, cassava (*Manihot utilissima* and *M. aipi*), peanuts, pineapple, guava, chirimoya, pawpaw (*Carica papaya*), ipecacuanha, sarsaparilla, vanilla, false jalap (*Mirabilis jalapa*), copaiba, tolu (*Myroxylon toluiferum*), rubber-producing trees, dyewoods, cotton and a great number of beautiful hardwoods, such as jacarandá, mahogany, rosewood, quebracho, colo, cedar and walnut. Among the fruits many of the most common are exotics, as the orange, lemon, lime, fig, date and grape, while others as the banana, caju or cashew and the avocado or alligator pear, have a disputed origin. Coca, one of the most important plants native to the country, is cultivated on the eastern slopes at 5,000 ft. to 6,000 ft. altitude, where the temperature is uniform and frosts are unknown. Quina (*Cinchona calisaya*), from which quinine is extracted, is found at 3,000 ft. to 9,000 feet. Cinchona bark forms an item of export. The most important indigenous forest product is rubber, derived principally from the *Hevea guayanensis,* which grows along river courses in the lowland regions of the north. The competition of plantation products has seriously affected the native rubber industry in these forests. Sugar cane and rice are cultivated in the warm districts.

Population.—Two-fifths of the territory (the highlands) contain three-fourths of the inhabitants. All of the large cities, and all of the large settled areas lie above 8,000 ft., many of them above 12,000. Below 6,000 ft. Santa Cruz is the only city with over 10,000 people, while the plains, as a whole, probably contain less than two persons per square mile. The population, according to official estimates of Dec. 31, 1940 (based on the last census, taken in 1900), is 3,457,000. Of this total 52.34% were classed as Indians, 13.08% as whites, 27.5% as mestizos (mixed white and Indian), 0.22% as Negroes, and 6.85% as unspecified. The Indian population is largely composed of the civilized Aymarás and Quéchuas of the Andean highlands, and of lowland Indians in the eastern forests and grasslands. The Mojos and the Chiquitos who live on the border between the forests and the grasslands of far eastern Bolivia, were organized into industrial communities by the Jesuit missions in the 17th century, and have retained something of the culture then imparted to them. Inhabiting the southern plain are the Chiriguanos, a detached tribe of the Guaranis (*q.v.*). The remaining native tribes have made little progress. Those who live in the deep forests of the Amazon valley have little contact with the whites.

The white population is descended in great part from the early Spanish adventurers and there are some Spanish and Portuguese Americans from neighbouring republics. This group, numbering only 400,000, completely dominates the country. Especially since the close of the Chaco War hostilities in 1935, the government has offered inducements to immigrants from Europe and the United States. Some Czechoslovaks, Germans, and others in small groups have settled in the eastern territories, but the total immigration has been small. Broadly speaking, the whites are landowners, and government officials, the mestizos are tradesmen, skilled workers, and minor civil servants, and the Indians labourers. The Indians, particularly, are a class apart, suspicious of changes as being merely new methods of exploitation, or else entirely apathetic.

Divisions and Towns.—There are eight departments and three territories, with populations as follows (1940 official estimates): La Paz, 887,000; Cochabamba, 653,000; Potosí, 649,000; Santa Cruz, 417,000; Chuquisaca, 407,000; Tarija, 205,000; (1941 est.) El Beni, 60,000, (1942 official estimate) Oruro, 174,500; (1936 official estimate) Colonial Territories, 58,225.

La Paz had a population of 287,029 by the municipal census of 1942. Other principal cities, with their populations according to 1942 estimates are: Cochabamba, 75,000; Oruro, 60,000; Potosí, 45,000; Sucre, 30,000; Santa Cruz de la Sierra, 25,697; Tarija, 20,000; Trinidad, 12,000. Sucre is the legal capital, and the seat of the supreme court, but La Paz, the commercial metropolis, has been the actual seat of government since the revolution of 1898. It is the highest national capital in the world (11,910 ft. altitude). Prominent smaller towns are the Huanchaca silver mining centre of Pulacayo (4,000); Uyuni (5,000), an important railway and highway junction; Viacha (3,000), important as the junction of the railway from La Paz to Mollendo, to Arica, and to Oruro and Antofagasta; Quillacollo (10,000), Punata (8,000), and Tarata (4,681), trading centres in the department of Cochabamba; and Huari, a small village east of Lake Poopó, the seat of an annual fair, making it for a week or so after Easter a city of 10,000 or over.

Communications.—There are 1,399 mi. of railways in operation, of which 1,128 mi. are owned by private interests. The trunk line of the system runs the entire length of the plateau, from La Paz southward to Oruro and connecting with the Argentine border, westward to connect with the Chilean ports of Antofagasta and Arica, and northward, via Puno, to Mollendo in Peru, and to Guaqui, a Bolivian port on Lake Titicaca, with steamship service to Peru. In 1938 an agreement was made with Brazil providing for joint construction of an international railway which would be linked at one end with a Brazilian line into the port of Santos on the Atlantic and, in Bolivia, with Santa Cruz and thence to Cochabamba. The principal highways of the country aggregate over 5,000 mi. in length, with an additional 1,000 mi. under construction or in project. In 1939 the Bolivian section of the Inter

American highway, 897m. in length, and extending from Desaguadero on the Peruvian frontier, through La Paz, Oruro, and Sucre to Yacuiba on the Argentine border, was complete (except for 14m.) to the extent of being passable in all seasons.

There are thousands of miles of navigable waters in the forested lowlands, furnishing almost the only means of transportation. Many of these streams are obstructed by rapids and fallen trees and light-draught snag-boats patrol some of them. The Madeira-Mamoré railway was built to avoid the most dangerous of the rapids, but because of the decline of rubber production the road proved unprofitable. As no maritime port can be reached without transhipment in foreign territory, Bolivia is excluded from direct commercial intercourse with other nations. Traffic rights over these routes have, however, been secured by treaties. Bolivia's outlet to the Amazon is restricted to the Madeira river, the navigation of which is interrupted by the series of falls. The Bolivian port of entry for this trade, Villa Bella, is just above the falls of the Madeira and is reached from the lower river by the Madeira-Mamoré railway. Connected with the upper Paraguay are Puerto Pacheco on Bahía Negra and Puerto Suárez (about 1,600 m. from Buenos Aires by river) on Lake Cáceres, through which passes the bulk of Bolivian trade in that direction. Puerto Suárez is connected by steam launch with the Brazilian port of Corumbá, at the end of the railway leading across Matto Grosso to São Paulo. Under the Chaco treaty of 1938, Bolivia is entitled to free-port facilities at the Paraguayan town of Puerto Franco (formerly Puerto Casado) on the Paraguay river. Due to the lack of highway and railway development commensurate with the extent of the country, airways play an important rôle in Bolivian communications. International air communication is provided by the Pan American-Grace Airways, connecting directly with Argentina and Peru, and through them with all parts of the Americas. The Lloyd Aéreo Boliviano operates 3,515m. of air routes in the interior, and maintains connections with Brazil and Peru.

The Government-owned telegraph service, which dates from 1880, had 7,993m. of line in 1939. A privately owned telephone system operates in the eight principal cities, but has no inter-urban or international connections. In 1939 there were 2,542 telephones in the entire republic, almost half of them in La Paz. International radio service is privately owned; domestic service is maintained by the Government.

Mining.—The traditional foundation of Bolivian economy is mining. Bolivia is the world's third largest producer of tin. Under the quota agreement of 1931 (effective for ten years), Bolivia's basic quota was 46,490 long tons, but it has been since reduced, due to poor world market conditions. Owing to the disruption of the Chaco war, the quota has not been reached. Exports in 1939 totalled 27,647,980 kilos. Tin normally accounts for approximately 70% of Bolivia's exports. From 85 to 95% of the tin normally goes to Great Britain (94·98% in 1934, 95·13% in 1935, 94·59% in 1936, and 86·96% in 1937), where it is smelted and re-exported. Other important mineral products are, in order: silver, tungsten, antimony, lead, zinc, copper, gold, sulphur, bismuth. Minerals are almost entirely exported, and aggregate from 90 to 95% of all exports. The following table shows the volume exported of each, its value in pounds sterling, and the percentage of the total exports:

	1937			1938		
	Fine metric tons	Pounds sterling	Percent	Fine metric tons	Pounds sterling	Percent
Tin	25,531	6,141,424	66·42	25,893	4,851,850	71·28
Silver	294	790,927	8·55	199	518,406	7·62
Tungsten	1,081	327,281	3·54	1,517	388,166	5·70
Antimony	7,127	265,510	2·87	9,448	240,261	3·53
Lead	18,288	425,349	4.60	13,225	202,402	2·97
Zinc	11,529	266,562	2·88	10,704	150,699	2·21
Copper	3,693	205,767	2·22	2,883	116,539	1·72
Gold (kilos)	(132)	39,072	0·33	(kilos:306)	69,980	1·03
Sulphur	..	8,179	0·09	..	9,646	0·14
Bismuth	31	13,606	0·15	19	7,621	0·12
Others	..	1,685	0·02	..	2,971	0·04
Total minerals		8,476,362	91·67		6,558,531	96·46

In 1937, 79·19% of the lead, 7·26% of the tin, 100% of the zinc, 73·82% of the antimony, 22·65% of the copper, 57·74% of the tungsten, 86·21% of the silver, and 73·89% of the gold exported was taken by Belgium.

The departments of Potosí and Oruro are the most important mining centres, although other departments of the country depend primarily on the industry. The department of Potosí produces about half the tin of the country. Oruro, especially, and all the other plateau region departments, however, depend largely on mining. There are strong British, Chilean, French and U.S. as well as Bolivian mining companies. The development of mining is having a marked effect upon the economic status of the Aymará and Quéchua Indians, drawing them away from the farms and promising to ameliorate their condition of peonage.

The southern part of the country, especially the departments of Santa Cruz and Tarija, is rich in petroleum, although the deposits have as yet scarcely been touched. A concession for exploitation was granted as early as 1920 to a United States corporation and by it transferred to the Standard Oil Company (N.J.). The latter made contracts with the Government in 1922, and organized a subsidiary, the Standard Oil Company of Bolivia. During the course of the next 15 years production was small (1933, 112,000bbl.; 1934, 159,000bbl.; 1935, 164,000bbl.; 1936, 105,000bbl.; 1937, 122,000bbl.). In 1936, charges of fraud were made against the Standard Oil Company by the Government, and expropriation decreed early in 1937. The case was carried to the Supreme Court of Bolivia and on March 8, 1939, a decision adverse to the company was handed down. Meanwhile, in Dec. 1936, a Government-owned company to exploit the national petroleum resources was organized; upon expropriation it took over the concession, which was valued by the company at $17,000,000. Late in 1937, a treaty with Argentina was made by which permission was obtained for a pipe line through Argentine territory, which was to be available only for oil from Government-controlled fields.

The Indians of the plateau grass-lands have been herdsmen from time immemorial and are skilful in small-scale sheep raising. Horses, formerly raised in the north, have not flourished there since the introduction of a *peste* from Brazil. The Jesuit founders of the Mojos missions stocked the Mojos and Chiquitos llanos with cattle, thus giving an unfailing supply of beef for the neighbouring inland markets; but their inaccessibility has prevented development. The fur-bearing chinchilla, a native of the higher plateaux, is also bred.

Cattle.—Cattle are raised in the more temperate regions of the east and south, sheep in La Paz and Cochabamba, and llamas, alpacas, and vicuñas on the altiplano. Livestock estimates for 1931, the most recent available, were: 2,064,000 cattle; 5,232,000 sheep; 987,000 goats; 2,000,000 llamas, alpacas, and vicuñas; 398,000 swine; 814,000 horses, mules, and asses.

Agricultural products are chiefly for domestic supply. Cereals, fruits and many vegetables are limited to the temperate intermediate valleys of the eastern Andes, where there is not sufficient tillable land to supply even local demands. Food resources therefore consist largely of indigenous plants suited to the unusual conditions of the region where most of the people live. Of these native crops, the potato, still found growing wild on the hillsides about Lake Titicaca, has probably always been the staple food for the Indians of the plateau and highlands. It is grown between heights of 11,000 and 14,500 feet. At nearly the same elevation is another indigenous plant, *quinua* (*Chenopodium quinua*), apparently not grown elsewhere, which furnishes a nutritious seed used by the Indians. Maize is seldom found above 11,000 ft., but is important in the high valleys below that level. Wheat and barley, as well as many fruits and vegetables, were introduced by the Spaniards, and are grown in the temperate and warm valleys, but only for domestic use. Sugar-cane, another Spanish importation, is used chiefly for rum, due to the limited supply. In the eastern tropical districts rice is grown on a small scale, while some tobacco and coffee is produced. Production of tobacco aggregates 1,000,000lb. annually. Cotton, with 25,000lb. annual production, is being developed. Coca (*Erythroxylon coca*) is extensively cultivated in the *yungas* valleys of Cochabamba and La Paz, and is the most important non-mineral export. Production in 1936 was around 6,000,000lb., of which 888,500lb. was exported. The most

prominent of the forest industries is rubber-collecting, begun between 1880 and 1890, and reaching a registered annual output of nearly 3,500 metric tons just before the best rubber forests became Brazilian territory in 1903. There still remain extensive rubber areas on the Beni and Madre de Díos. Rubber exports in 1936 were 1,127 metric tons. The collection of cinchona bark is one of the oldest forest industries, and the product is of the best. The industry is destructive in method, but there are probably large areas of virgin forest to draw upon. In 1936, 891 tons of quinine bark and 2,681 tons of almonds and brazil-nuts were exported.

Manufactures.—During the Chaco War, manufacturing received considerable impetus. All of the output is, however, for domestic consumption, and is in no sense sufficient to supply the demand. The principal products manufactured are: foodstuffs; beverages (particularly beer and rum); textiles; clothing; electricity; leather work; chemical products; construction materials. Foodstuffs and beverages aggregate over half the total. Almost three-fourths of the manufacturing is carried on in La Paz.

Foreign Commerce.—Exports are primarily to Great Britain, with Belgium second. Imports are machinery, raw cotton and textiles, wheat, flour, and miscellaneous foodstuffs, and cattle. Bolivia being an inland country, many of her imports are re-exports from her neighbours, Chile, Argentina, and Peru. In 1937 imports were valued at $21,621,000, exports at $45,479,000. Imports were principally from the U.S. (27·74%), Peru (15·66%), Germany (13·32%), Argentina (12·90%), Great Britain (7·87%), Belgium (4·82%), and Chile (3·87%). Exports went to Great Britain (59·91%), Belgium (23·42%), and the U.S. (7·28%). In 1938 imports were $25,574,000, exports $34,613,000; in 1939 they were, respectively, $24,237,000 and $42,851,000.

Finances.—Revenue comes mainly from mineral export duties, from import tariffs, the Government monopolies of alcohol and tobacco, and the Government's share in the income of the railways. Export duties, however, have fallen off due to the restrictions on tin and to generally unsatisfactory conditions. The budget law for 1939 estimated receipts and expenditures to balance at 300,669,865 bolivianos. Receipts were classified as follows: direct and indirect taxes, 158,617,800; receipts for special purposes, 6,534,300; various receipts, 6,238,700; national properties, 5,517,156; national services, 3,761,900; exchange control operations, 120,000,000. Expenditures were allotted as follows: national defence, 89,796,000; obligations of the State, 73,989,996; education, 25,290,000; Government, 18,768,400; public health, 17,000,000; public works, 14,656,340; treasury, 10,800,000; communications, 9,500,000; foreign relations, 9,023,980; agriculture, irrigation, colonization, 6,446,140; labour and social welfare, 6,000,000; mines and petroleum, 4,300,000; comptroller, 3,200,000; industry and commerce, 2,850,000; religion, 240,000; judiciary, 5,809,000; legislature, 3,000,000. The 1940 budget was balanced at 627,000,000 bolivianos.

Public Debt.—As of Dec. 31, 1937, the internal public debt totalled 377,731,997 bolivianos, of which 341,106,526 bolivianos represented the National Defense Loan from the Central Bank. The external debt was $91,568,639 U.S. and £838,589, including accrued interest payments due. During 1938 neither amortization nor interest payment was made. At the end of 1938, accrued interest on the external dollar loans aggregated $34,938,300.

Money and Banking.—The monetary unit is the boliviano, which is theoretically worth 13·33 to the pound sterling, and often expressed as the "boliviano of 18 pence." Since the beginning of the Chaco War, however, inflation has been so pronounced that the boliviano has declined in international exchange. In May 1940 it was officially pegged at 2½ cents U.S. "for the duration of the European war," but was unofficially quoted as low as 2 cents. Practically all the currency circulation is paper.

The sole bank of issue is the semi-state Banco Central de Bolivia, established in 1929, with 30,000,000 bolivianos authorized capital, through which all foreign exchange transactions must be handled. On Dec. 31, 1938, the Banco Central had reserves of 18% against its total of circulation and deposits. The Banco Central, under the general direction of the minister of finance, regulates the official exchange rate. Throughout 1938 this rate was maintained at 100 bolivianos to the pound sterling, but special rates are permitted to certain types of exporters and importers, and the unofficial rate was almost a third less.

Education.—Education is, by law, vested in three administrative bodies: the Ministry of Education, Fine Arts, and Indian Affairs, the National Council of Education, and the Supreme University Council. The country is divided into eight school districts, corresponding to the principal subdivisions (departments).

There are more than 2,000 primary schools with enrolment of 145,000 in 1937 as against 1,598 schools and 79,973 pupils in 1926. The three universities, located at Sucre, La Paz, and Cochabamba, offer courses leading to degrees in medicine, law, philosophy, social and natural sciences, engineering, and economics and finance. The universities, along with an institute of commerce, school of mines, and school of native languages, are under the general direction of the Supreme University Council.

The Bureau of Indian and Rural Education, created in Dec. 1934, maintains 16 regional schools with a total of 10,000 pupils, who are given courses stressing the trades and crafts. The 1939 budget allotted approximately $\frac{1}{12}$ of its total to education.

Religion.—The State religion is Roman Catholicism, but there is freedom of worship. There are six bishoprics and an archbishopric. Indian missions are entrusted to the *Propaganda Fide*. An annual appropriation of about Bs. 240,000 goes to the church. The religious orders, which have never been suppressed, maintain several convents.

Defence.—All males between 19 and 49 years of age are liable to military service. In peace time, however, only a limited number are taken into the Army, lots being drawn to fill the annual quota for training. A maximum peace time strength of 5,000 is set by law. In addition there is a national police force of 3,417. The 1939 budget allocated 89,796,000 bolivianos, 29·7% of the total, to national defence.

Government.—Under the constitution of Oct. 30, 1938, the governmental structure is arranged with executive, legislative, and judicial branches, each independent of the other. The national government is centralized on the general model of France, with eight departments and three territories. Administrative officials of these units, and of the municipalities as well, are appointed by the president.

Legislative authority is in the hands of a congress, which comprises a senate and a chamber of deputies, and meets annually at La Paz for a session of 60 to 90 days. The senate consists of three members from each department, or 24 in all, elected by popular vote and serving terms of six years. One-third of the senate is renewed every two years. The number of deputies is determined by law. They are elected by popular vote, and serve terms of four years, one-half of the membership being renewed biennially.

Executive authority is in the hands of a president and a cabinet. The president and vice-president serve four years and are ineligible for re-election. The president is required to make a tour of the country at least once during his term of office in order to study the needs of the country.

The present executive departments are: foreign affairs, immigration, and worship; interior, justice, and publicity; finance and statistics; industry and commerce; mines and petroleum; public works and communications; agriculture, irrigation and colonization; labour and social welfare; and education, fine arts and Indian affairs. Judicial authority is vested in a supreme court, district courts, and minor tribunals. The supreme court meets at Sucre, the legal capital. With this exception, the actual seat of government is, however, at La Paz, and legislative and executive functions of government are carried on there.

History.—After the defeat of the Incas by the Spaniards in the 16th century the natives were reduced to virtual serfdom and their territory was reorganized as a dependency of the Viceroyalty of Peru and known as Alto Peru or, politically, the Audiencia of Charcas. The seat of government was Chuquisaca, alternatively known as La Plata or Charcas, and now called Sucre. Then as now, the primary economic interest of the country was in mining,

and the city of Potosí was founded in 1545 by Diego Centeno, after the discovery of the colossally rich silver mines there. Half a century later Potosí had a population of 120,000 and 160,000 in 1650, and—as the mines declined—8,000 in 1825. Until the 18th century, when the city of Mexico surpassed it, it was the largest city in the New World. Its mines were long the principal source of Spain's mineral wealth from America, and its extravagant display and fabulous wealth far eclipsed that attending the famed California gold rush and the more recent oil "strikes" of Oklahoma and elsewhere, so that its very name became synonymous with great wealth. In 1776 the entire region of Charcas was detached from the Viceroyalty of Peru and made a part of the newly created Viceroyalty of Buenos Aires. In 1780–82 occurred the uprising of the Indians, led by Tupac Amaru, in an attempt (one of many) to drive out or exterminate the Europeans. The movement was conducted with great cruelty on both sides and resulted in the complete defeat of the Indians and the execution of their leader.

The inhabitants of Alto Peru joined with the other Spanish American colonies in the effort to secure political independence from Spain and to break the dominance of the European-born group. When the patriots of Buenos Aires had succeeded in liberating the interior provinces of the Río de la Plata, they turned their arms against their enemies in Upper Peru. From July 1809 till Aug. 1825 almost uninterrupted warfare was waged in the Argentine provinces of Salta and Jujuy and around Titicaca. Upper Peru was invaded by the army of Buenos Aires, which, after twice defeating the Spanish troops, was able to celebrate the first anniversary of independence near Lake Titicaca, in May 1811. Soon, however, the patriot army, owing to the dissolute conduct and negligence of its leaders, was defeated, in July 1811, by the Spanish and driven back into Jujuy. Four years of warfare were ended in 1815 by the total rout of the patriots in a battle which took place between Potosí and Oruro. Then came a revolt of the Indians of the southern provinces of Peru, and the object being the independence of the whole country, it was joined by numerous creoles. This insurrection was speedily put down by the royalists. In 1816 the Spanish general La Serna, having been appointed commander-in-chief of Upper Peru, attempted to invade the Argentine provinces in a march on Buenos Aires, but he was forced to retire by the irregular *gaucho* troops of Salta and Jujuy. For six years there was guerrilla warfare between the patriots of Upper Peru, who had taken refuge in the mountains, chiefly of the province of Yungas, and the royalist troops. In June 1823 the expedition of Gen. Santa Cruz, prepared with great zeal and activity at Lima, marched in two divisions upon Upper Peru, and in the following months of July and August the whole country between La Paz and Oruro was occupied by his forces; but later he permitted a retreat to be made before a smaller royalist army, and a severe storm converted this movement into a precipitate flight, only a remnant of the expedition again reaching Lima. In 1824, after the victory of Ayacucho, Gen. Sucre, whose valour had contributed so much to it, marched with a part of the army into Upper Peru. On the news of the victory a universal rising of the patriots took place, and before Sucre had reached Oruro and Puno, in Feb. 1825, La Paz was already in their possession, and the royalist garrisons of several towns had gone over to their side. The Spanish general Olañeta, with a diminished army of 2,000 men, was confined to the province of Potosí, where he held out till March 1825, when he was mortally wounded in an action with some of his own revolted troops. Gen. Sucre was now invested with the supreme command in Upper Peru, until the requisite measures could be taken to establish in that country a regular and constitutional government. Fifty-four provincial deputies assembled at Chuquisaca, the capital, to decide, upon the invitation of the Government of the Argentine provinces, whether they would or would not remain separate from that country. In Aug. 1825 they decided that Upper Peru should in future constitute a distinct nation, for which they chose the name Bolivia and issued at the same time a formal declaration of independence.

The first general assembly of deputies dissolved on Oct. 6, 1825, and a new congress was installed at Chuquisaca on May 25, 1826, to take into consideration the Constitution prepared by Bolivar for the new republic. A favourable committee report was made upon it and it was approved by the congress as the Constitution of the republic. Gen. Sucre was chosen president for life, according to the Constitution, but only accepted the appointment for the space of two years, and on the express condition that 2,000 Colombian troops should be permitted to remain with him. The independence did not secure a peaceful future. Repeated risings occurred, till in the end of 1827 Gen. Sucre and his Colombian troops were driven from La Paz. A new congress was formed at Chuquisaca in April 1828, which modified the Constitution given by Bolívar, and chose Marshal Santa Cruz for president; but only a year later a revolution, led by Gen. Blanco, for a time overturned the Government. Quiet being again restored in 1831, Santa Cruz promulgated the code of laws which bore his name, and brought financial affairs into some order; he also concluded a treaty of commerce with Peru. In 1835, when a struggle for the chief power had made two factions in the neighbouring republic of Peru, Santa Cruz was induced to take a part in the contest; he marched into that country, and after defeating Gen. Gamarra, the leader of one of the opposing parties, completed the pacification of Peru in the spring of 1836, named himself its protector, and had in view a confederation of the two countries. At this juncture the Government of Chile interfered actively, and espousing the cause of Gamarra, sent troops into Peru. Three years of fighting ensued till in a battle at Yungay in June 1839 Santa Cruz was defeated and exiled, Gamarra became president of Peru, and Gen. Velasco provisional chief in Bolivia. The Santa Cruz party, however, remained strong in Bolivia, and soon revolted successfully against the new head of the Government, ultimately installing Gen. Ballivián in the chief power. Taking advantage of the disturbed condition of Bolivia, Gamarra attempted to annex the rich province of La Paz, invading it in Aug. 1841 and besieging the capital; but in a battle with Ballivián his army was totally routed, and Gamarra himself was killed. The Bolivian general was now in turn to invade Peru, when Chile again interfered to prevent him. Ballivián remained in the presidency till 1848, when he retired to Valparaíso, and in the end of that year Gen. Belzú, after leading a successful military revolution, took the chief power, and during his presidency endeavoured to promote agriculture, industry and trade. Gen. Jorge Córdova succeeded him, but had not been long in office when a new revolt in Sept. 1857, originating with the garrison of Oruro, compelled him to quit the country. His place was taken by Dr. José María Linares, the originator of the revolution, who, taking into his own hands all the powers of government, and acting with the greatest severity, caused himself to be proclaimed dictator in March 1858. Fresh disturbances led to the deposition of Linares in 1861, when Dr. José M. de Achá was chosen president. New causes of disagreement with Chile had arisen in the discovery of rich beds of nitrate and guano on the coast-land of the desert of Atacama, which threatened warfare, and were only set at rest by the treaty of Aug. 1866, in which the 24th parallel of latitude was adopted as the boundary between the two republics. A new military revolution, led by José Mariano Melgarejo, broke out in 1865, and in February of that year the troops of President Achá were defeated in a battle near Potosí, when Melgarejo took the dominion of the country. After defeating two revolutions, in 1865 and 1866, the new president declared a political amnesty, and in 1869, after imposing a revised Constitution on the country, he became its dictator.

Recent History.—In Jan. 1871 President Melgarejo was in his turn expelled by a revolution headed by Col. Agustín Morales. The latter, becoming president, was himself murdered in Nov. 1872 and was succeeded by Col. Adolfo Ballivián, who died in 1874. Under this president Bolivia entered upon a secret agreement with Peru which was destined to have grave consequences for both countries. By the treaty of 1866 between Bolivia and Chile, Bolivia, besides conceding the 24th parallel as the boundary of Chilean territory, agreed that Chile should have a half share of the customs and full facilities for trading on the coast that lay between the 23rd and 24th parallels, Chile at that time being largely interested in the trade of that region. It was also agreed that Chile

should be allowed to mine and export the products of this district without tax or hindrance on the part of Bolivia. In 1870, in further consideration of the sum of $10,000, Bolivia granted to an Anglo-Chilean company the right of working certain nitrate deposits north of the 24th parallel. The great wealth which was passing into Chilean hands owing to these compacts created no little discontent in Bolivia, nor was Peru any better pleased with the hold that Chilean capital was establishing in the rich district of Tarapacá. On Feb. 6, 1873 Bolivia entered upon a secret agreement with Peru, the ostensible object of which was the preservation of their territorial integrity and their mutual defence against exterior aggression. There can be no doubt that the aggression contemplated as possible by both countries was a further encroachment on the part of Chile.

Upon the death of Adolfo Ballivián, immediately after the conclusion of this treaty with Peru, Dr. Tomás Frías became president. He signed yet another treaty with Chile, by which the latter agreed to withdraw her claim to half the duties levied in Bolivian ports on condition that all Chilean industries established in Bolivian territory should be free from duty for 25 years. This treaty was never ratified, and four years later Gen. Hilarión Daza, who had succeeded Dr. Frías as president in 1876, demanded as the price of Bolivia's consent that a tax of ten cents per quintal should be paid on all nitrates exported from the country, further declaring that, unless this levy was paid, nitrates in the hands of the exporters would be seized by the Bolivian Government. As an answer to these demands, and in order to protect the property of Chilean subjects, the Chilean fleet was sent to blockade the ports of Antofagasta, Cobija and Tocopilla. On Feb. 14, 1879 the Chilean colonel Sotomayor occupied Antofagasta, and on March 1, a fortnight later, the Bolivian Government declared war.

An offer on the part of Peru to act as mediator met with no favour from Chile. The existence of the secret treaty, well known to the Chilean Government, rendered the intervention of Peru more than questionable, and the law passed by the latter in 1875, which practically created a monopoly of the Tarapacá nitrate beds to the serious prejudice of Chilean enterprise, offered no guarantee of her good faith. Chile replied by curtly demanding the annulment of the secret treaty and an assurance of Peruvian neutrality. Both demands being refused, she declared war upon Peru. The superiority of the Chileans at sea, though checked for some time by the heroic gallantry of the Peruvians, soon enabled them to land a sufficient number of troops to meet the allied forces which had concentrated at Arica and other points in the south. The Bolivian ports were already in Chilean hands, and a sea attack upon Pisagua surprised and routed the troops under the Peruvian general Buendía and opened the way into the southern territory of Peru. Gen. Daza, who should have co-operated with Buendia, turned back, on receiving news of the Peruvian defeat, and led the Bolivian troops to Tacna in a hasty and somewhat disorderly retreat. The fall of San Francisco followed, and Iquique, which was evacuated by the allies without a struggle, was occupied. Severe fighting took place before Tarapacá surrendered, but the end of 1879 saw the Chileans in complete possession of the province.

Meanwhile a double revolution took place in Peru and Bolivia. In the former country Gen. Prado was deposed and Col. Piérola proclaimed dictator. The Bolivians followed the example of their allies. The troops at Tacna, indignant at the inglorious part they had been condemned to play by the incompetence or cowardice of their president, deprived him of their command and elected Col. Camacho to lead them. At the same time a revolution in La Paz proclaimed Gen. Narciso Campero president, and he was elected to that post in the following June by the ordinary procedure of the Constitution. During 1880 the war was chiefly maintained at sea between Chile and Peru, Bolivia taking little or no part in the struggle. In Jan. 1881 were fought the battles of Chorillos and Miraflores, attended by heavy slaughter and savage excesses on the part of the Chilean troops. They were followed almost immediately by the surrender of Lima and Callao, which left the Chileans practically masters of Peru. In the interior, however, where the Peruvian admiral Montero had formed a provisional government, the war still lingered, and in Sept. 1882 a conference took place between the latter and President Campero, at which it was decided that they should hold out for better terms. But the Peruvians soon wearied of the useless struggle. On Oct. 20, 1883 they concluded a treaty of peace with Chile (the treaty of Ancón); the troops at Arequipa, under Admiral Montero, surrendered that town, and Montero himself, coldly received in Bolivia, whither he had fled for refuge, withdrew from the country to Europe. On Nov. 9, the Chilean army of occupation was concentrated at Arequipa, while what remained of the Bolivian army lay at Oruro. Negotiations were opened, and on Dec. 11, a truce was signed between Chile and Bolivia. By this treaty Bolivia agreed to the occupation by Chile of the whole of its sea-coast, including the port of Cobija.

On May 18, 1895, a treaty was signed at Santiago between Chile and Bolivia, "with a view to strengthening the bonds of friendship which unite the two countries," and, "in accord with the higher necessity that the future development and commercial prosperity of Bolivia require her free access to the sea." By this treaty Chile declared that if, in consequence of the plebiscite (to take place under the treaty of Ancón with Peru), or by virtue of direct arrangement, she should "acquire dominion and permanent sovereignty over the territories of Tacna and Arica, she undertakes to transfer them to Bolivia in the same form and to the same extent as she may acquire them"; the republic of Bolivia paying as an indemnity for that transfer $5,000,000 silver. If this cession should be effected, Chile should advance her own frontier north of Camerones to Vitor, from the sea up to the frontier which actually separates that district from Bolivia. Chile also pledged herself to use her utmost endeavour, either separately or jointly with Bolivia, to obtain possession of Tacna and Arica. If she failed, she bound herself to cede to Bolivia the roadstead (*caleta*) of Vitor, or another analogous one, and $5,000,000 silver. Supplementary protocols to this treaty stipulated that the port to be ceded must "fully satisfy the present and future requirements" of the commerce of Bolivia.

On May 23, 1895, further treaties of peace and commerce were signed with Chile. During those ten years of Bolivia's recovery from the war, the presidency was held by Dr. Pacheco, who succeeded Campero, and held office for the full term; by Dr. Aniceto Arce, who held it until 1892, and by Dr. Mariano Bautista, his successor. In 1896 Dr. Severo Alonso became president, and during his tenure of office diplomatic relations were resumed with Great Britain, Señor Aramayo being sent to London as minister plenipotentiary in July 1897. As an outcome of his mission an extradition treaty was concluded with Great Britain in March 1898.

In December an attempt was made to pass a law creating Sucre the perpetual capital. Until this time Sucre had taken its turn with La Paz, Cochabamba and Oruro. La Paz rose in open revolt. On Jan. 17 of the following year a battle was fought some 40 m. from La Paz between the insurgents and the Government forces, in which the latter were defeated with the loss of a colonel and forty-three men. Col. Pando, the insurgent leader, having gained a strong following, marched upon Oruro, and entered that town on April 11, 1899, after completely defeating the Government troops. Dr. Severo Alonso took refuge in Chilean territory; and Col. Pando formed a provisional government. He had no difficulty in obtaining his election to the presidency without opposition. He entered upon office on Oct. 26, and proved himself strong and capable. He had to deal with two difficult settlements as to boundaries with Chile and Brazil, and to improve communication in order to revive mining and other industries. The dispute with Brazil over the rich Acre rubber-producing territory was accentuated because the majority of those engaged in the rubber industry were Brazilians who resented the attempts of Bolivian officials to exercise authority in the district. This led to a declaration of independence on the part of the State of Acre, and the despatch of a body of Bolivian troops in 1900 to restore order. There was no desire, however, on the part of President Pando to involve himself in hostilities with Brazil, and in a spirit of concession the dispute was settled amicably by diplomatic means, and a treaty signed in Nov. 1903. A new boundary line was drawn, and a portion of the

Acre province ceded to Brazil in consideration of a cash indemnity of $10,000,000.

The long-standing dispute with Chile with regard to its occupation of the former Bolivian province of Antofagasta under the Pacto de Tregua (Pact of Truce) of April 4, 1884 was more difficult to arrange satisfactorily. In 1895 there had been some prospect of Chile's conceding an outlet on the sea in exchange for a recognition of the Chilean ownership of Tacna and Arica. The discovery, however, of secret negotiations between Bolivia and Argentina caused Chile to change its conciliatory attitude. Bolivia was in no position to venture upon hostilities or to compel the Chileans to make concessions, and the final settlement of the boundary dispute between Argentina and Chile deprived the Bolivians of the hope of obtaining the support of the Argentines. President Pando and his successor, Ismael Montes, who became president in 1904, saw that it was necessary to yield, and to make the best terms they could. A treaty was accordingly ratified in 1905, which was in many ways advantageous to Bolivia, though the republic was compelled definitely to cede to Chile the maritime provinces occupied by the latter power since the war, and to do without a seaport. The government of Chile undertook to construct a railway at its own cost from Arica to the Bolivian capital, La Paz, and to give the Bolivians free transit through Chilean territory to certain towns on the coast. Chile further agreed to pay Bolivia a cash indemnity and lend certain pecuniary assistance to the construction of other necessary railways.

On Aug. 6, 1909 President Montes was succeeded by Señor Eliodoro Villazón. During their administrations the progress of Bolivia was marked and to the end of 1927 conditions in the republic were much more stable, both economically and politically, than ever before. Gen. Montes assumed office for a second term on Aug. 6, 1913, and remained president until 1917. World War I had a considerable influence upon the trade of Bolivia: imports decreased, while her exports, mainly minerals, increased very considerably in value. The country proclaimed its neutrality in 1914, but departed from this attitude in consequence of Germany's submarine policy. Diplomatic relations with Germany were severed on April 13, 1917, the reason for this action being that a German submarine had torpedoed in neutral waters a ship with the Bolivian minister to Berlin on board. The republic took no direct part in the war on the side of the Allies, but all her resources in metals were at their disposal.

Montes relinquished office on Aug. 6, 1917, and was succeeded by his former Minister of Finance, José Gutiérrez Guerra. Soon afterward, agitation for an outlet to the Pacific reached an acute stage. Apparently, President Gutiérrez Guerra's policy was aimed at a *rapprochement* with Chile over the long-standing grievance resulting from the loss of Bolivia's coastal territories. Popular indignation against this attitude led to demonstrations: Guerra was forced to resign, and was escorted out of the country to Arica. Meanwhile World War I had ended. Bolivia was represented at the Versailles conference, and signed the peace treaty of 1919 and became an original member of the League of Nations. Following the deposition in July 1920 of President Gutiérrez Guerra, the provisional government of Bolivia prosecuted the popular demand for a revision of the situation in regard to her lost territory (*see* TACNA-ARICA QUESTION).

The presidency of Dr. Bautista Saavedra (elected 1920) was productive of marked economic progress. Nevertheless some measure of political unrest was experienced both in 1924 and 1925. A revolutionary movement took place in July 1924 but was promptly suppressed by the government. Ostensibly the object was to promote the secession of the province of Santa Cruz to the neighbouring republic of Brazil, but active opposition to the policy of the Saavedra government was really the purpose of the disturbance. In Jan. 1925 Dr. José C. Villanueva, a physician who had been serving as minister of public instruction and agriculture, and Abdón Saavedra, a brother of the president, were nominated as Republican candidates for president and vice-president. The Liberal party nominated Dr. Salamanca for the presidency. After a vigorous electoral campaign the Republican candidates were elected on May 2 by an overwhelming majority. The successful candidate for the presidency should have taken office on Aug. 6, but congress refused to ratify his election on the ground that it was invalid because he had not resigned public office, as required by the constitution, at least six months before election. Meanwhile Saavedra continued in office. On Sept. 1, congress formally declared the election of May 2 null and void. President Saavedra transferred his office to Dr. Felipe Guzmán, president of the senate, to administer the government provisionally, pending a new election. In December the new election was held and Dr. Hernando Siles, a Republican, was elected.

In 1927 Bolivia and Paraguay reopened negotiations in an attempt to settle their boundary dispute in the Gran Chaco, but these ultimately broke down. Occasional armed clashes commencing in 1928 developed by 1932 into a full fledged war, continuing through 1933, 1934 and part of 1935, generally favourable to Paraguay in a military sense, and exhausting economically to both. A truce was finally arranged in June 1935, and negotiations were undertaken through the mediation of Argentina, Chile, Peru, the United States and Uruguay. Not until July 1938, however, was a definite settlement made. Under the arbitral award which followed, Bolivia renounced title to nearly 100,000 sq.mi. which she had claimed. (*See* CHACO and PARAGUAY.)

Throughout the war, Bolivia continued politically unstable. In 1930 the Siles government was overturned, and early the following year Dr. Salamanca was elected president. Extreme economic difficulties and military reverses brought about his overthrow by a coup d'état headed by his vice-president, Luis Tejada Sorzano (Nov. 28, 1934). He, in his turn, was forced from office in 1936 by Colonel David Toro, who undertook a program looking to eventual state socialism. On July 13, 1937, a bloodless *coup* brought in Lieutenant-Colonel Germán Busch a 33-year-old army officer, as provisional president. Busch became constitutional president under a new constitution in 1938. He followed a vigorous and repressive policy, interning his enemies in a concentration camp. In Aug. 1939, however, his rule came to an end when he committed suicide. The minister of national defense, Carlos Quintanilla, thereupon announced his accession to the presidency, despite provisions of the ten-month-old constitution that the vice-president should succeed. He served until April 1940 when he was succeeded by General Enrique Peñaranda, victor in the March 10 elections. Both Quintanilla and Peñaranda faced strong unrest and repeated revolutionary threats, and maintained themselves in office only by use of strong force.

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(G. M. McB.; L. W. Be.)

BOLKHOV, a town in the Orel province of the Russian Soviet Federated Socialist Republic. Lat. 53° 25′ N., Long 36° E. Population 17,532. It is a trading centre for hemp products and cattle, situated in an orchard district. It has a cathedral and near it are the ruins of the Optina Pustyn monastery.

BOLL, a term for a fruit-pod, particularly of the cotton plant. The word is in O.E. *bolla*, which is also represented in "bowl," a round vessel for liquids, a variant due to "bowl," ball, which is from the Fr. *boule*. "Boll" is also used, chiefly in Scotland and the north of England, as a measure of weight for flour = 140 lb., and of capacity for grain, 16 pecks = 1 boll. In the United States the word has become familiar through the depredations of the boll weevil (*q.v.*).

BOLLANDISTS, the Belgian Jesuits who publish the *Acta Sanctorum*, the great collection of biographies and legends of the saints, arranged by days, in the order of the calendar. The original idea was conceived by a Jesuit father, Heribert Rosweyde (*see* Hagiology). His intention was to publish in 18 volumes the lives of the saints compiled from the mss., at the same time adding sober notes. At the time of his death (1629) he had collected a large amount of material, but had not been able actually to begin the work. A Jesuit father, John Bolland, was appointed to carry on the project. In 1635 Henschenius (Godfried Henschen) was associated with Bolland, and publication began in 1643. From 1659 Papebroch (Daniel van Papenbroeck) collaborated. This was the most brilliant period in the history of the *Acta Sanctorum*. The freedom of Papebroch's criticism made him many enemies, and he had often to defend himself against their attacks. The work was continued—with some inequalities, but always in the same spirit—until the suppression of the Society of Jesus in 1773. The last volume published was vol. iii. of October which appeared in 1770.

On the dispersion of the Jesuits the Bollandists were authorized to continue their work, and remained at Antwerp until 1778, when they were transferred to Brussels, to the monastery of canons regular of Coudenberg. Here they published vol. iv. of October in 1780, and vol. v. of October in 1786, when the monastery of Coudenberg was suppressed. In 1788 the work of the Bollandists ceased. The remains of their library were acquired by the Premonstratensians of Tongerloo, who endeavoured to continue the work, and in their abbey vol. vi. of October appeared in 1794.

After the re-establishment of the Society of Jesus in Belgium the work was again taken up in 1837, at the suggestion of the Académie Royale of Belgium and with the support of the Belgian Government, and the Bollandists were installed at the college of St. Michael in Brussels. In 1845 appeared vol. vii. of October, the first of the new series, which reached vol. xiii. of October in 1883.

In 1882 the activities of the Bollandists were exerted in a new direction with a view to bringing the work more into line with the progress of historical methods. A quarterly review was established under the title of *Analecta Bollandiana* by the Jesuit fathers C. de Smedt, G. van Hooff and J. de Backer. This reached its 25th volume in 1906, and was edited by the Bollandists de Smedt, F.

van Ontroy, H. Delehaye, A. Poncelet and P. Peeters. This review contains studies in preparation for the continuation and remoulding of the *Acta Sanctorum,* inedited texts, dissertations and, after 1892, a *Bulletin des publications hagiographiques,* containing criticisms of recent works on hagiographic questions. In addition to this review, the Bollandists undertook the analysis of the hagiographic mss. in the principal libraries. Besides numerous library catalogues published in the Analecta (*e.g.* those of Chartres, Namur, Ghent, Messina, Venice, etc.), separate volumes were devoted to the Latin mss. in the Bibliothèque Royale at Brussels (2 vols., 1886–89), to the Latin and Greek mss. in the Bibliothèque Nationale at Paris (5 vols., 1889–96), to the Greek mss. in the Vatican (1899) and to the Latin mss. in the libraries of Rome (1905 *seq.*). They also prepared inventories of the hagiographic texts hitherto published, and of these appeared the *Bibliotheca hagiographica graeca* (1895), the *Bibliotheca hagiographica latina* (1899) and the *Bibliotheca hagiographica Orientalis.* These indispensable works delayed the publication of the principal collection, but tended to give it a more solid basis and a scientific stamp. In 1894 appeared part I of vol. ii for November, preceded by the *Martyrologium Hieronymianum,* edited by J. B. de Rossi and L. Duchesne; in 1931 part II of this volume appeared with H. Delehaye's commentary on H. Quentin's recension of the same martyrology. In 1925 appeared vol. iii for November.

There are three editions of the *Acta Sanctorum:* the original edition (Antwerp, Tongerloo and Brussels), 65 vols., 1643–1931; the Venice edition (1734–70) up to vol. v for September; the Paris edition (61 vols. 1863–83) up to vol. xiii for October.

See H. Delehaye, *The work of the Bollandists* (Princeton, U.S.A. and London, 1922), an excellent compendium of information; de Smedt, Art., "Bollandists," *Catholic Encyclopaedia,* vol. ii; J. B. Pètra, *Études sur la collection des Actes des Saintes* (1880).

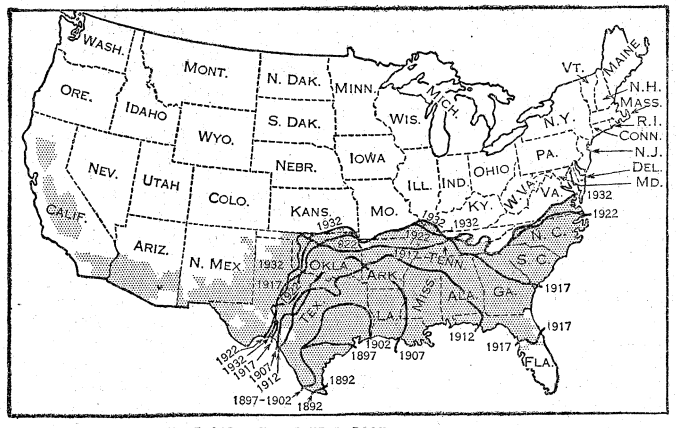
BOLLEY, HENRY LUKE (1865–), American botanist, was born in Dearborn county, Ind., on Feb. 1, 1865. He graduated at Purdue university in 1888 and was assistant botanist at the Indiana State experiment station from 1889–90, when he was named botanist and zoologist in the North Dakota agricultural college and experiment station. From 1909 he was dean of biology in the college, botanist and plant pathologist in the experiment station and state seed commissioner. He devoted himself chiefly to plant pathology, and originated various methods of disinfection for grains and also several new varieties of flax. In 1908 he published *The North Dakota Pure Seed Law* in explanation of legislation which he had originated. He also proposed a system of crop rotation based upon "the planting in series of genetically nonrelated crops, so distantly nonrelated that they do not bear each other's disease factors." He published a *List of Seed-bearing Plants of North Dakota* (1900), *Seed Disinfection and Crop Production* (1910) and numerous bulletins on potato scab, wheat rust, grain smuts, flax wilt, weed control, etc.

BOLL WEEVIL. The boll weevil, *Anthonomus grandis,* is the most serious pest of cotton in the United States. It causes an average annual loss of $230,000,000 to the cotton industry, much of which could be economically prevented by the proper use of control measures. The first home of the boll weevil was undoubtedly in southern Mexico or Central America. Before 1892 it had spread throughout the larger portion of Mexico. It occurs southward to Guatemala and Costa Rica, and in Cuba. About 1892 it crossed the Río Grande and entered the United States near Brownsville, Texas. By 1894 it had spread to half a dozen counties in southern Texas, and extended its range annually until in 1922, almost all of the most important cotton-producing sections had become infested. Practically the only cotton-growing territory remaining uninfested was the semi-arid zone including California, Arizona, New Mexico and western Texas. The 1921 estimate of the U.S. department of agriculture of the potential production of cotton prevented by weevils was 6,277,000 bales.

The adult boll weevil is about $\frac{1}{4}$ in. long, varying from $\frac{1}{8}$ to $\frac{1}{3}$ in., with a breadth about one-third of its length. This measurement includes the snout, which is approximately half the length of the body. Variation in size is dependent upon the amount of food the insect has obtained in the larval stage. Individuals from bolls (unripe pods containing lint and seed) are therefore nearly always larger than those from squares (fruit buds). Recently emerged individuals are light yellowish in colour, but this changes to a gray or nearly black shade in a few weeks' time. In the field, the most conspicuous indication of the presence of the boll weevil is the flaring and falling of numbers of squares or buds. Unfavourable climatic conditions and careless cultivation, however, frequently cause great shedding of the fruit, which is often mistaken for weevil damage. If excessive shedding be noted and the squares upon being cut open show a white, curved grub that has fed upon the contents, there is little doubt that the boll weevil has caused the damage.

The boll weevil passes the winter as an adult or beetle. With the advent of autumn weather the adult boll weevils in cotton-fields begin to seek protection against the winter. They fly in every direction, although their movements are governed partially by the prevailing winds. They may fly into hedges, woods, corn-fields, haystacks, farm buildings or other places. A number of weevils also obtain hibernating quarters without leaving the cotton-fields. These may crawl into cracks in the ground, under grass, weeds or other trash, and into the burs from which the cotton has been picked. During the winter the weevils take no food, and remain practically dormant; on warm days they may move about to a certain extent. Emergence from hibernation depends primarily upon temperature and rainfall in the spring. In the southern portions of the cotton belt emergence usually begins from the first to the middle of March, but farther north it is somewhat later. Emergence has been prolonged from the middle of March to June 28, and in more extreme cases from the middle of February to about the first of July.

In the spring and throughout the fruiting season of cotton, the eggs are deposited by the female weevils in cavities formed by eating into the buds and fruit of the plant. An egg hatches under normal conditions in about three days, and the grub immediately begins to feed. In from 7 to 12 days the larva or grub passes into its pupal stage. This stage lasts from three to five days. Then the adult emerges, and in about five days begins to breed. Climatic conditions cause considerable variation in the duration of the stages, but on an average it requires from two to three weeks for the weevil to develop from the egg to the adult. The males feed upon the squares and bolls without moving until the food begins to deteriorate. The females refrain, throughout most of the season, from depositing eggs in squares visited by other females, but late in the autumn, when all of the fruit has become infested, several eggs may be placed in a single square or boll. As many as 15 larvae have been found in a boll. The squares are greatly preferred as food and as places for depositing eggs. As long as a large supply of squares is present the bolls are not generally damaged to any serious extent. The weevil, so far as at present known, breeds in no plants other than cotton except the ornamental shrub, *Hibiscus syriacus* and the *Gossypium thurberiella,* a wild plant related to cotton found in the mountains of



FROM THE DEPARTMENT OF AGRICULTURE YEAR BOOK

MAP SHOWING THE SPREAD OF BOLL WEEVIL IN THE SOUTH

Beginning in Texas in 1892, the boll weevil scourge expanded until in 30 years it had infested practically all of the cotton producing area in the southeastern states

Arizona. In spite of the many complexities involved in the problem of weevil control, efficient methods (*see* COTTON AND THE COTTON INDUSTRY) have been developed for reducing its damage which are of practical use to growers. These are described in publications procurable on request from the U.S. department of agriculture, Washington, D.C. (B. R. C.; X.)

BOLOGNA, GIOVANNI DA (1524–1608) (Ital. for his real name, JEAN BOLOGNE or BOULLONGNE), Flemish sculptor, was born at Douai in 1524. He settled, in 1553, in Florence, where his best works still remain. The most celebrated are the single bronze figure of Mercury, poised on one foot, resting on the head of a zephyr, as if in the act of springing into the air (in the Bargello gallery), and the marble group known as the "Rape of the Sabines," which was executed for Francesco de' Medici. It is now in the Loggia de Lanzi of the ducal piazza. Giovanni was also employed at Genoa, where he executed various excellent works, chiefly in bronze. His great fountain at Bologna (1563–66) is remarkable for beauty of proportion. Noteworthy also are his two fountains in the Boboli gardens, one completed in 1576 and the other in 1585. He also cast the fine bronze equestrian statue of Cosimo de' Medici at Florence and the very richly decorated west door of Pisa cathedral.

See *La Vie et l'oeuvre de Jean Bologne, par Abel Desjardins, d'après les manuscrits recueillis par Foucques de Vagnonville* (1883, numerous illustrations; list of works).

BOLOGNA (ancient *Bononia, q.v.*), archiepiscopal see of Emilia, Italy, capital of province of Bologna, headquarters of the VI. army corps. It is at the edge of the plain of Emilia, 180 ft. above sea-level at the base of the Apennines, 82 mi. N. of Florence by rail, 63 mi. by road and 50 mi. direct, and 134 mi. S.E. of Milan by rail. Pop. town (1901) 102,122; (1936) 232,980; commune (1901) 153,501; (1936) 281,162. The Roman city, orientated on the points of the compass, with streets at right angles, can be distinguished from the outer city, fortified in 1206. The streets leading to the gates of the latter radiate from the outskirts, and not from the centre, of the former. S. Stefano, S. Giovanni in Monte and SS. Vitale ed Agricola, among the oldest churches, lie in the outer city. S. Stefano is a group of seven buildings, of different dates; the earliest, the former cathedral of SS. Pietro e Paolo, built in the middle of the 4th century with debris of Roman buildings; while S. Sepolcro (6th–7th centuries) is a circular church with ornamentation in brick and an imitation of *opus reticulatum*. The present cathedral (S. Pietro), first erected in 910, is now baroque. The largest church (Gothic) of Bologna is that of S. Petronio, the city's patron saint, begun 1390; only nave and aisles as far as the transepts were completed, measuring 384ft. long and 157ft. wide, whereas the projected length of the whole (a cruciform basilica) was over 700ft., with a breadth across the transepts of 460ft., and a dome 500ft. high over the crossing. S. Domenico contains the body of the saint, who died there in 1221. The beautiful S. Francesco (1246–60), has a fine brick campanile (end of 14th century). It was restored to sacred uses in 1887, and has been carefully liberated from later alterations. Piazza Vittorio Emanuele (formerly Piazza Maggiore), and Piazza del Nettuno lie at the centre at right angles to one another. Here are the church of S. Petronio, the massive Palazzo Comunale (1245), the Palazzo del Podestà (1245), Palazzo del Re Enzo, recently restored, and the fine bronze statue of Neptune by Giovanni da Bologna (Jean Bologne of Douai).

The famous university of Bologna was founded in the 11th century (*see* UNIVERSITIES). The students numbered between three and five thousand in the 12th to the 15th century, and in 1262, it is said, nearly ten thousand (among them were both Dante and Petrarch). Though autonomous, the university had no fixed residence; professors lectured in their own houses, or later in rooms hired or lent by the civic authorities. Only in 1520 were professors of law given apartments in a building belonging to S. Petronio; and in 1562, by order of Pius IV., the university itself was built by Carlo Borromeo, then cardinal legate. In 1564, Tasso was a student there, and was tried for writing a satirical poem. One of the most famous professors was Marcello Malpighi. The building has served as the communal library since 1838. Its courtyard contains the arms of students elected as representatives of their respective nations or faculties. The university, since 1803, is housed in part in the (16th century) Palazzo Poggi. It now has four faculties. Among its professors women have more than once been numbered.

The Museo Civico contains especially fine collections of antiquities from the neighbourhood. The important picture gallery surveys both the earlier Bolognese paintings and the works of the Bolognese eclectics (16th and 17th centuries) the Caracci, Guido Reni, Domenichino, Guercino, etc. The works of Francesco Francia (1450–1517) and Lorenzo Costa of Ferrara (1460–1535), are also of considerable merit. The great treasure is Raphael's S. Cecilia, painted for the church of S. Giovanni in Monte about 1515.

The Torre Asinelli (1109) and the Torre Garisenda (1110) are square brick towers, the former 320ft. in height and 4ft. out of the perpendicular, the latter (unfinished) 163ft. high and 10ft. out of the perpendicular. The town contains many fine private palaces (13th century onwards), mostly in brick. The streets are as a rule arcaded, and this feature has been preserved in modern additions.

Bologna prepares sausages (*mortadella*), macaroni (*tortellini*), and liqueurs, refines sugar, hulls rice, and makes railway material.

It is an important railway centre, just as the ancient Bononia was a meeting-point of important roads. Here the main line from Milan divides, one portion going on parallel to the ancient Via Aemilia (which it has followed from Piacenza downwards) to Rimini, thence to Ancona and Brindisi, and the other through the Apennines to Pistoia and Florence and thence to Rome. There is also a shorter line to Florence via Prato. Another line runs to Ferrara and Padua, another to Verona and a third to Budrio and Portomaggiore (a station on the line from Ferrara to Ravenna). Steam tramways run to Vignola, Pieve di Cento and Malalbergo.

Bologna, briefly held by the Lombards, remained generally under the exarchate of Ravenna, until this was given by Pippin (756) to the papacy. It was sacked by Hungarians in 902, but its early history is little known, and it is uncertain when it acquired its freedom and its motto *Libertas*. The first "constitution" of the commune of Bologna (1123) shows it to be free and independent. It strongly supported the Guelph cause against Frederick II. and against the neighbouring cities of Romagna and Emilia; indeed, the Bolognese kept Enzo, the emperor's son, prisoner, from 1249 till his death. But Guelph and Ghibelline struggles in Bologna itself so weakened the commune that for the next two centuries it fell under various masters, until Pope Julius II. in 1506 brought it under the papacy, where it remained (except in the Napoleonic period between 1796 and 1815 and during the revolutions of 1821 and 1831) until in 1860 it became part of the kingdom of Italy.

Among the most illustrious natives of Bologna may be noted Luigi Galvani and Prospero Lambertini (Pope Benedict XIV.). Giosuè Carducci, the poet, lived here for many years, and died here in 1907.

BOLOMETER, an instrument for measuring radiation by means of the rise in temperature of a blackened metal strip in one of the arms of a resistance bridge. In the first bolometer, invented by Langley, a Wheatstone bridge (*q.v.*) was used in conjunction with a galvanometer which showed a deflection proportional to the intensity of radiation (when the deflection was not great). Lummer and Kurlbaum's bolometer consists of four platinum gratings (each of which is made of a series of strips) inserted in the arms of a Callendar-Griffiths bridge; two of these gratings, in opposite arms of the bridge, are placed one behind another, so that the openings of one are opposite the strips of the other, and are exposed to the radiation, the other opposite pair being shielded; this arrangement doubles the effect on the galvanometer, and also compensates any extraneous temperature changes. The *spectrum bolometer* consists of a single strip set on edge, in an arm of a bridge; it is used for exploring the distribution of intensity of radiation in a spectrum. (*See* LANGLEY, SAMUEL PIERPONT; BLACK BODY; HEAT; and SUN.)

BOLSENA (anc. *Volsinii*)[1], province of Viterbo, Italy, 12m. W.S.W. of Orvieto by road, on north-east bank of Lake Bolsena. Pop. (1936) town 3,063; commune 3,996. The town is dominated by a picturesque mediaeval castle. The 11th century church of S. Christina (martyred in 278 by drowning in the lake according to the legend) has a fine Renaissance façade, constructed about 1490 by Cardinal Giovanni de'Medici (afterwards Pope Leo X.), and some good terra cottas by the Della Robbia; in catacombs beneath is the tomb of the saint. A Bohemian priest, sceptical of the doctrine of transubstantiation, was convinced by the appearance of drops of blood on the host he was consecrating on an altar of the crypt (1263). In commemoration of this Pope Urban IV. instituted the festival of Corpus Christi, and ordered the erection of the cathedral of Orvieto.

Lake Bolsena (anc. *Lacus Volsiniensis*), 1,000ft. above sea-level, 71sq.m. in area, and 480ft. deep, is almost circular, and was the centre of a large volcanic district, though probably not itself an extinct crater. Its sides show fine basaltic formation. It contains two islands, Bisentina and Martana, the latter containing remains of the castle where Amalasuntha, daughter of Theodoric, was strangled.

BOLSHEVISM, the doctrine professed by the extreme left wing of the Russian Social Democratic Party. The name is derived from the fact that at a conference of the party held in Brussels and London in 1902–3, a majority ("Bolsheviki") secured the acceptance of views urged by their leader Nikolai Lenin, the minority ("Mensheviki") largely withdrawing from control of the party's operations.

I. The Origins of Bolshevism.—The effective origins of Bolshevism may be traced back to the foundation, in 1883, of the *Group for the Emancipation of Labour* by Plekhanov and Axelrod. The latter, deeply influenced by the doctrines of Marx, which were now beginning to exercise a wide influence on Russian Socialism, broke with the older Narodniki who had counted upon a peasant revolution as the source of Russian emancipation. The group preached the doctrine that the main pivot of revolutionary success must be the organized working-class; and its consequent emphasis upon the class-structure of society makes it legitimate to regard it as the first Marxian organization in Russia.

The history of the party from 1883 until 1903 may conveniently be divided, as by Lenin, into three periods. The first, which extends until 1894, is the period of gestation; the second, which goes down to 1898, is the period of adolescence; the third, which ends with the Brussels-London conference of 1903, is the period in which the party assumed definiteness of form and outlook. In the first period, the party was mainly occupied with self-discovery and exercised comparatively insignificant influence on the working-class. Discussion circles were formed, books and pamphlets were published, the men who were subsequently to reveal themselves as leaders appeared. But the party consisted of leaders without a following. Industrial organization was too backward in Russia for a working-class movement to be possible. The leaders were convincing one another; and the discussion circles like that formed by the Bulgarian Blagoiev at St. Petersburg in 1887, had considerable influence. But the party cannot be said to have awakened any general knowledge of its significance. The second period, however, saw a large development. Having attained some clarity of doctrine, and having finally separated itself from the influence of the Narodniki, the party began to organize definite relations with the working-class. The growth of industry led to strikes on an increasing scale. District and regional committees were founded; and men of the standing of Lenin, Krassin, Martov, joined the party. Workers' Social Democratic Circles were founded in most considerable towns. By 1898 it was clear, both from the degree of organization, and the immense literary output, that the party was making its way as a national institution and had an assured future.

[1]According to the theory now generally adopted, the Etruscan Volsinii occupied the site of Orvieto, which was hence called *Urbs vetus* in late classical and mediaeval times, while the Roman Volsinii was transferred to Bolsena (*see* VOLSINII).

Two other events contributed to its development. In 1897 was founded the Bund, the union of Jewish workers in Poland and Lithuania. This body was given coherency and strength by the fact that its members suffered not merely economic, but also religious oppression. They engaged in revolutionary activity upon a large scale, and their energy made them the spear-head of the party. To it was due the organization in 1898, of the first party conference at Minsk. Nine members met there. They formed a definite organization, elected a central committee, and published an historic manifesto actually drawn up by P. Struve, who, later, deserted the party and became a reactionary.

It was not yet, however, clearly known what method the party was to follow. There were different strands of thought visible. Some members of the party believed that the first essential work was to win working-class adherents by pushing their economic claims to better industrial conditions; the vaster task of capturing the state was, in their judgment, not yet ripe. Others, of whom Lenin was the most outstanding, insisted that economic discontent must be from the outset merely the base from which the capture of the bourgeois state by the working-class is organized. The first group (Struve, Prokopovitch, Kouskova) insisted that the overthrow of tsarism was not a working-class duty; the latter should occupy itself with matters like the hours of labour and the rate of wages. From this, they were called *economists*. Their opponents (Lenin, Martov, Plekhanov), were known later as *Iskrists* from the title of their journal *Iskra* (founded in 1900).

The period from 1898 until 1903 was the most critical in the history of the party. Its numbers grew by leaps and bounds. Students poured into it from every university and technical school. Groups of every shade of socialist opinion came into existence. The growth in numbers naturally multiplied the winds of doctrine in the party. The development, moreover, of liberal bodies like the *Union for Liberation* of which Miliukov was leader, raised in an acute form the question of the relationship of the Social Democrats to the radical bourgeoisie. There were problems, further, as to how far it was desirable to encourage those isolated acts of terrorism of which Russian history at this period was so full. The party, in short, at this period was a loosely confederated system of semi-autonomous groups, doctrinally united upon the ultimate goal, but with no clear view either of method, or of order of priority in objectives. When *Iskra* was founded in 1900 the meaning of these varieties of opinion became clear.

II. The Separation of Doctrine.—The editors of *Iskra*, of whom Lenin, Plekhanov, Martov and Axelrod were the best known, set themselves certain definite tasks. Above all, they aimed at combating economism. Secondly, they set themselves clearly to distinguish between Socialists willing to use all the currents of opposition to tsarism, and those who sought to act solely through a proletarian party. In 1902, Lenin published his *What must we do?* in which, with great power, he argued for the concentration of all revolutionary energy into a centralized party of which each member should have his definitely allotted function and act as a soldier in an army. He sought to organize a revolutionary élite from which all spontaneous and individual action should have been cut away, to be replaced by a corps of professionals whose function should be directed by a central committee of strategy. Events precipitated the full discussion of this view. A growing resort to the strike weapon (sometimes, as at Kiev in 1901 successfully) and increased activity against the Socialists led to the need for a new orientation of policy. A provisional programme was drawn up, not without difficulty, and in 1902 the second congress of the party assembled in Brussels. The police interfered with its proceedings; and it was transferred after a few days to London.

The second Congress was a representative body of some 60 delegates. Most of the leading figures in the movement were there; and the discussions went to the very heart of the problems confronting it. From the outset, it was clear that there were two decisively opposed strands of opinion. The demand of the Bund for the maintenance of a separate Jewish national organization within the party, raised squarely the issue whether its

basis should be purely that of class. For the Bund, a federal structure in the party was fundamental; to Lenin and his supporters federalism simply spelt strategic weakness and a proletarian victory was impossible if organization was to take account of national differences. Upon this issue Lenin, and the future leader of the Mensheviks, Martov, were united in opposition.

But grave differences appeared. On party procedure, Lenin on the one side and Martov and Axelrod on the other took widely different views. For the former, party membership was to be reserved only for those who participated fully in its organization and fulfilled the orders it issued. For Martov, sympathetic adherence was sufficient. To Lenin, a party was meaningless unless it was a firmly coherent organization built up of authentic and similarly-minded partisans who moved along a single front to their goal. Martov took the view that this would deprive the party of the services of many, professors and students, for example, who could not fulfil the rigid demands Lenin was prepared to enforce. It cannot be said that, at the moment, the significance of the conflict was understood. Plekhanov, for instance, at that time perhaps the first of the party's theorists, did not treat it as a serious issue; and in the actual voting Martov's more liberal formula of adhesion prevailed. But the next difference went deeper still. Martov and his allies were prepared for a period of co-operation with the Liberals, on the condition that the latter should pronounce for universal suffrage. Lenin and Plekhanov protested against this view. What is vital, they urged, is the proletarian revolution. The Liberals would use the Socialists to overthrow the tsar and then take no further interest in the revolution. The Socialist must stand alone; only in that way was a Socialist revolution possible. Again the conference was undecided. It was yet significant that Martov and Lenin, thus far allies, were now on opposite sides upon fundamental questions of tactics. Their divergence was again revealed when, questions of nationalism apart, Lenin demanded a centralized, and Martov, a federal party structure. They were opposed again on the question of editorial control of *Iskra* where Lenin sought a decisive voice. He was successful by 25 votes to 23, and the two sides now took the names of Bolshevists and Menshevists.

These differences were not merely upon tactics. When the programme of the party was discussed, it was clear that the Mensheviks laid great store by such matters as universal suffrage and the Constituent Assembly and its character. To Lenin and Plekhanov (at that time a Bolshevist) these were secondary issues. What was important was the Bolshevik revolution, and to its success all other considerations must be subordinate. The hegomony of the proletariat, said Plekhanov, is fundamental. To its maintenance it may be necessary to sacrifice the freedom of the bourgeoisie and the existence of a democratically elected assembly. A successful revolution, in other words, must confront the necessity of dictatorship. For that reason the Bolshevists refused to accept Martov's demand for the abolition of the death sentence. Their view was put by Plekhanov in a single, prophetic phrase, "Do you think," he asked, "that one can leave Nicholas II. alive? If for him alone, the death penalty must be maintained."

III. The First Schism.—The necessary result of these differences was schism. The conference elected a central committee composed entirely of Lenin's supporters; and the control of *Iskra* remained exclusively in their hands. Martov returned to Russia where he founded a special bureau for his own faction and proceeded to boycott the Bolshevist Committee, while a bitter pamphlet warfare between the two sections commenced. Everything was thus ready for complete antagonism. The Russo-Japanese War and then the abortive revolution of 1905 completed the separation of the two groups. But, before its outbreak, Lenin lost control of his machine. The conversion of Plekhanov and others of the Central Committee to the Mensheviks, the arrest of other members, and the co-option of Mensheviks in their place, transferred the domination of the party to Martov and his supporters. The schism then became complete. Lenin founded a separate bureau, with a journal of its own (*Forward*) and a system of regional committees. It was to a revolutionary party thus rent in twain that there came, with dramatic suddenness, the Revolution of October 1905.

In that effort the two parties had different plans, and they drew from it different conclusions. Lenin insisted that a provisional revolutionary government must be set up to achieve the proletarian revolution. The Menshevists denied that the proletarian hour had struck. For them, at the moment, the replacement of autocracy by constitutionalism was the maximum possible achievement; and they were therefore prepared to support the Liberal bourgeoisie under Miliukov's leadership. For Lenin, the event meant that a general strike and armed insurrection were the basis of revolutionary tactics; for the Mensheviks both were premature as weapons unsuited to a class not yet conscious of its ultimate mission. The Mensheviks were prepared to sit in the Duma; the Bolsheviks proposed not only to boycott it but to call upon the masses to mobilize against its convocation. And from the actual events, each insisted that its own view had been vindicated. The Mensheviks believed that the Soviets (councils of workers) born spontaneously in the workshops of St. Petersburg proved the value of the administrative autonomy on which they relied as a principle of organization. The Bolshevists, on the contrary, drew the inference that the spontaneity shewed (1) the class-consciousness of the workers, but also (2) the necessity of giving it point by rigid direction. For Lenin, too, the soviets of 1905 were inadequate because they were confined to the industrial workers, and did not combine with the soldiers and the peasants. To the Mensheviks, the root of the failure of 1905 was the exaggerated claims of the proletariat, which they ascribed to Bolshevist demagogy; to Lenin, however, the failure lay, not in the claims made, but in the inadequate way in which force was applied to their exploitation. Revolution, moreover, would only succeed as the outcome of a suitable international situation. It would be necessary, further, to have the sympathy of the peasants and rigorously to prevent the betrayal of victory by the bourgeoisie. Already, that is to say, 1905 had, for Lenin, laid down the fundamental basis of the Revolution of November, 1917.

IV. The Effects of 1905.—The chief result of 1905 was to create an impassable abyss between Bolshevists and Menshevists. Yet, for a time, there was a loose collaboration between them. The Triple Entente gave the Russian autocracy a new lease of life; and the existence of the Duma created a platform which, however feeble, they were driven by opinion to use in common. Yet joint action only intensified disagreement. A party grew up within the Menshevists who believed in ending illegal action; and, among the Bolshevists, there were those who drew from the futility of the Duma the inference that the revolutionary elements should withdraw from participation therein. For a time, the scene was dominated by the Menshevists. They took the view, in the phrase of the time, that Russia had arrived at 1849, not 1847. The way now lay direct to constitutional monarchy—as in the rest of Western Europe—and the Russian social democracy must tread the path of its European neighbours. They were agreed in insisting that the awakening of the peasant was more important than they had hitherto imagined; but they were agreed in little else. The Menshevists believed that Russia had settled down to a gradual change towards parliamentary democracy; Lenin and his followers argued that new conflict was imminent. When the Cadets dominated the first elections to the Duma, the Menshevists were enthusiastic; they demanded a responsible Cadet ministry on the European model; and they conducted a strong campaign in its favour. The Bolshevists were indifferent or hostile; and in the London Conference of 1907 it became clear that effective co-operation was impossible. Lenin was prepared to take part in parliamentary systems; and he attacked their opponents on the ground that it was essential to disabuse the workers of their value by experience of them. But he urged participation only the more surely to destroy. After the Paris meeting of 1910, the two sections no longer made even the pretence of collaboration. When 1917 came, the divergent paths they followed had been made inevitable by the differences of 15 years.

V. The Consolidation of Doctrine.—The history of the Bolshevist party after the first Revolution of 1917 is the history of Russia itself. Here it is necessary to explain how the evolution thus far summarized has issued in a corpus of doctrine. Broadly, it may be said that they start from the Marxist assumptions which they inherited from the pioneers of 1883 and give to them the connotation suggested by their special Russian experience. They start from the belief in the inevitable triumph of the working-class. The battle between the workers and the bourgeoisie is inevitable because these classes have nothing in common. War between them is thus the logic of the facts; and its inevitability arises from the fact that no class is ever persuaded peacefully to abdicate. Nor can the fight be waged constitutionally. Such a struggle only leaves intact the heart of the capitalist citadel. The concessions won by peaceful conflict never go to the root of the matter. A democratic community is unreal so long as the machinery of the state and the means of production are in the hands of the bourgeoisie. The business, therefore, of the workers is to separate from the latter and to fight it. That is their essential historic mission. By doing so, they realize themselves and make possible the destruction of the capitalist state.

Bolshevism must, however, be carefully distinguished from Blanquism and terrorism. The former pinned its faith to sudden mass-action without regard to time and place; the latter had confidence in the exemplary value of isolated acts such as assassination. The Bolshevist is more realistic. A successful revolution, in his view, was the outcome of careful preparation applied to a suitable conjuncture of circumstances. Insurrection, as Marx said, is an art; and Lenin laid down five rules as its guiding principles. Insurrection, first, must never be played with; once it has begun, it must be carried on to the bitter end. When, secondly, the time has been chosen, the revolutionists must mass at the proper place forces superior to those of the enemy; otherwise they will be overwhelmed. Once begun, thirdly, the offensive is fundamental, because, as Marx pointed out, "the defensive is death to the insurrection." Surprise, fourthly, is fundamental; and the moment to choose is when the forces of government are scattered. Moral superiority, finally, is vital; and the announcement of daily, even hourly, successes has great importance in depressing the enemy, in consolidating the offensive, and in keeping the masses on your side. Surrounding all must be the ultimate perspective of audacity without which supreme success is impossible. Revolution, therefore, may be said, from the angle of Socialism, to depend on three conditions. First, it must be not a conspiracy, nor a party-move, but the rise of the revolutionary working-class. Secondly, it must have the masses on its side, and must therefore build its appeal on their most urgent demands. Thirdly, it must break out at the crux of rising activity among the friends of revolutionary change, and at the moment of greatest indecision on the part of the enemy.

The working-class is thus brought to power. The Bolshevist insists that the preservation of power involves the Dictatorship of the Proletariat. It is essential to crush out opposition and to shatter the institutions of the defeated regime. Revolution is war, and until there is complete acquiescence in the victor's terms, the methods of war alone are suitable to it. "The enemy," says Trotsky, "must be made harmless, and this means he must, in wartime, be destroyed." For, willing the end, the Bolshevist cannot wipe his hands of the means. Hesitation, weakness, pity, a false worship of democracy, only stimulate the forces of counter-revolution and prevent the consolidation of the new regime. The dictatorship is exercised by the Communist party because (1) its members have been tried and can be trusted and (2) they represent the real will of the workers which has been suppressed and obscured by capitalism. The dictatorship is a trust for the revolution which, in its turn, is a fulfilment of the mission to which the working-class is historically called.

Violence therefore wins the revolution and dictatorship consolidates it. The transition to Socialism is accomplished in two stages. In the first, the oppression of classes disappears, and, with it, the state which is merely the instrument of class-oppression. The proletariat seizes power and by using it to destroy the class-structure of society ceases to be a proletariat. The instruments of production are socialized. But coercive power is still necessary because the minds and hearts of men are not easily accustomed to the new regime. Government therefore continues, though growing acceptance of the new society means growing democratization of social processes. This, however, does not mean parliamentarism, which is merely a bourgeois form of government, but the Soviet system (a council of soldiers, workers, and poorer peasants) which combines the advantages of the territorial with the virtues of producers' representation. Formal democracy is replaced in the first stage by what the Bolshevist calls "the revolutionary dynamic of living forces"; which means that all elements in society except the working-class are deliberately excluded from power. Great industrial enterprises, the banks, the means of communication, and the large landed estates must be confiscated. Wholesale commerce should be nationalized; foreign trade must become a government monopoly. The means of propaganda, the press and education, must be confined to working-class direction. Small business may be left untouched, because it is futile to think that Communism can be established at a stroke. Measures must be taken to associate intellectual technicians with the new order and to neutralize the peasant classes by organizing the poorer, while repressing sternly the antagonism of the richer peasants. So, *mutatis mutandis,* with the poorer bourgeoisie of the towns.

Bolshevism cannot be said to have any clear view of the ultimate social order it proposes to establish. It has taken over from Marx phrases like the demand "from each according to his powers, to each according to his needs," and the "administration of things instead of the administration of persons." But it is mainly occupied with the immediate revolutionary task. It conceives, moreover, of the revolution thus established as a world-revolution made in each country on similar conditions to those in Russia. For this purpose the formation of a world Communist Party rigorously directed from a single centre and sternly disciplined from above is fundamental. To advance the revolution advantage must be taken of national, racial and economic discontent where these exist; but propaganda in relation to them must seek always to move them to significance in terms of the class-war. Union should be sought with the reformist working-class parties, but always on the understanding that they are bound to fail, and that if they arrive in power the Communist must separate from them and fight them. Finally, it is to be noted that Bolshevism regards religion as a capitalist instrument used as an anodyne for the workers and seeks wherever possible to destroy its influence.

VI. Conclusion.—Upon the wisdom or rightness of these views it is not necessary here to pronounce. They have been put into operation in Russia; they have been attempted elsewhere; and history alone can give a verdict upon them. Here it is only necessary to remark two things. Bolshevism accepted the general outlines of the Marxian philosophy (historic materialism, the theory of class-war, the inevitability of a proletarian revolution as the outcome of capitalist exploitation of surplus value) and developed them in detail in terms of the special Russian experience. At every point, the deductions made by Lenin and his disciples are, clearly enough, less general principles of universal validity than special assumptions built upon a special environment they profoundly knew. They ignore most of the things that Western Europe has sought for as desirable; personal freedom, government according to law, the subordination of the executive to the judiciary, the national choice of the government. They attribute no special worth to human personality as such; and they conceive of violence as sanctified by the use to which it is put. Its adherents are moved by a profound faith in the unquestionable rightness of their cause; and its history has been as full as any of self-sacrifice and martyrdom. It proceeds in the conviction that it is based on a number of incontrovertible truths; of which the human and eternal passion for equality is ultimately the most profound. To give effect to that passion, it seeks to make an entirely new re-assessment of human

motives, in which what is the predominant fact is the relegation of the pecuniary incentive to a comparatively subordinate place. It assumes that violence sufficiently prolonged can give birth to acceptance of its principles; and that fraternity is the outcome of violence. It argues that there is an inevitable logic in history which makes the transference of social power to the working-class inescapable. Obviously, the appeal it makes is great to all who, from economic, or racial, or religious reason feel themselves unjustly oppressed. It is characterized by the optimism which is the mark of all intensely dogmatic creeds, and that optimism gives a self-confidence to its adherents to which few competing systems can pretend. How far it is a passing phase, how far a necessary part, of social change it is too early to pronounce. Quite obviously, as the experience of Russia has shown, experiment with it is costly; and it is not clear that a nation without the means of self-sufficiency could survive an attempt at its application. Its origins, moreover, in a period when autocracy had to be fought, and its success in a period of military defeat, have given its theses an inelasticity, on the one hand, and a special colour, on the other, which are both extremely important and too little considered by Bolshevist writers themselves. But it is the historic nature of all particulars to seek to prove that they are universal by nature.

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BOLSOVER, urban district, Derbyshire, England, 5½ mi. E. of Chesterfield, on branch lines of the L.M.S. and L.N.E. railways. Pop. (1938) 10,190. Area 7.07 sq.mi. The castle round which the town grew up was founded by William Peverel shortly after the conquest, but the existing building, a fine castellated residence, was erected on its site in 1613. The town itself was fortified, and traces of early works remain. The church of St. Mary is of Norman and later date; it contains some interesting early stone-carving, and monuments to the family of Cavendish, who acquired the castle in the 16th century. Coal-mining and quarrying are carried on in the neighbourhood. About ½ mi. to the south is New Bolsover, known as the Model Village.

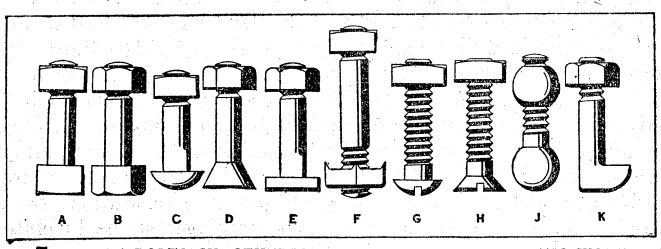
BOLSWARD, town, province of Friesland, the Netherlands, 6½ mi. W.N.W. of Sneek. Pop. (1940) 6,831. It is mentioned in 725, when it was situated on the Middle sea. When this receded, a canal was cut to the Zuider Zee and in 1422 it was made a Hansa town. The mediaeval constitution of Bolsward was in some ways peculiar. The Jongema family had certain hereditary rights in the administration, defined in the charter of 1464; *e.g.*, the head of the family sat for two years with the *scabini* and the third year with the councillors. An influential position was assigned in civic legislation and administration to the clergy. The Great Church of St. Martins (1446–66) contains some good carving. The so-called Small church dates from *c.* 1280, and is the remnant of a Franciscan convent. Bolsward also possesses a Renaissance town hall (1614–18). It trades in agricultural produce, especially butter. Germans took the town in 1940.

BOLT, an O.Eng. word (*cf.* Ger. *Bolz,* an arrow), for a "quarrel" or cross-bow shaft, or the pin which fastened a door. From the swift flight of an arrow comes the verb "to bolt," as applied to a horse, to bolting food, etc., and such expressions as "bolt upright"; also the American use of "bolt" for refusing to support a candidate nominated by one's own party. From the sense of "fastening together" is derived the use of the word "bolt" as a definite length (in a roll) of a fabric (40ft. of canvas).

From another "bolt" or "boult," to sift (O.Fr. *buleter,* from the Med.Lat. *buretare* or *buletare*), come such expressions as in Shakespeare's *Winter's Tale,* "The fann'd snow, That's bolted by the northern blasts twice o'er."

Bolt in Engineering.—In engineering a bolt is a pin or bar which serves to lock or unite parts, at the same time permitting of easy disconnection, as distinct from a rivet. Bolts occur in locks, safes and strong-room doors, being sometimes movable, sometimes fixed, and form a portion of the mechanism of a rifle, certain automatic pistols and other articles. A soldering-iron is called a bolt. Bolts for purposes of union of wood and metal objects are used in many millions per year, and a big industry is engaged in the production, with machines for forging, turning, threading and finishing, as well as making the nuts. Black bolts are those threaded, but otherwise left as forged, bright bolts are finished all over, while for extra strength high-tensile steel is employed, and case-hardening is applied when wear must be defeated, as against frequent applications of the wrench, or if the bolt acts as a pivot. The smallest bolts are those for accurate scale models, about $\frac{1}{32}$ in. diameter; the largest hold the heads and bases of armour-plate forging presses together, those on a Davy Brothers 12,000-ton press being 29in. diameter by 35ft. long and each weighing 38 tons. An ingenious method is adopted to tighten some big bolts which hold the frames of hydraulic rivetters and shearing machines together, instead of relying on mechanical means alone. The bolts are heated before the final assembly and the nuts run down. On cooling, each bolt shrinks in length, giving an immense tightening effect, fit to withstand the enormous pressures, from 12,000 to 14,000 tons.

Most industries have their special bolts, but the diagram shows main types for general purposes in wood-work, engineering structures and machines, building, agricultural machinery, stoves, etc. A has square head and nut, B hexagon, for easier application of the wrench in confined places. Round heads are often used instead of hexagon, as for connecting-rods. C is the cup-head or coach-bolt, also made with conical head, and required in wood or metal. The countersink or tire, D, leaves a flush surface, a frequent necessity. The cheese or deck bolt, E, has its round head sunk into wood for a similar reason, F, the fang-bolt, has a large nut with spikes to sink into wood, whilst the bolt head is turned round. For thin metal work, chutes, galvanized iron and stoves, G and H are employed, the one being a mushroom

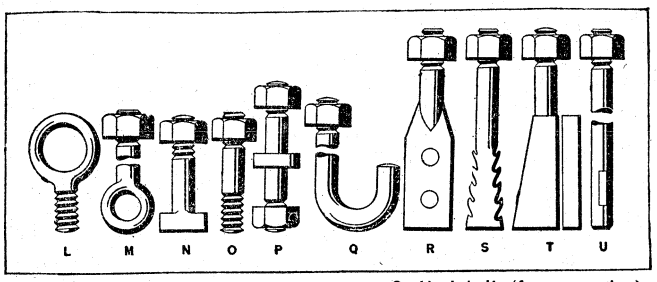


TYPES OF BOLTS IN GENERAL USE FOR WOOD AND METAL-WORK

A. Square-head
B. Hexagon-head
C. Cup-head or coach-bolt
D. Countersink or tire
E. Cheese-head or deck
F. Fang-bolt
G. Mushroom-head
H. Stove or spout
J. Ball-bolt
K. Hook-bolt

head, the other stove or spout. The second type, when with square head, is a plough bolt. In the conveying industry thin large diameter heads of these shapes are forged with spikes underneath; called then band or elevator bolts. If a swivel movement is necessary a bolt or nut will be finished with a curve, or a ball bolt, J, is applied. The hook-bolt, K, holds parts if a hole cannot be put through one member, or variations in position are wanted from time to time. The eye-bolt, L, screws into heavy parts of machinery to be lifted by the crane. M is also an eye-bolt, but fitted to swivel on a pin, and so throw the bolt away through a slot in a cover or other top detail, for rapid disconnection. If the threaded part is longer, a straining-bolt results, for tightening wires or stays. The tee-head bolt N slides in a tee-

slot in one member to be united. O is a stud-bolt, permanently screwed in by the tail, while P, the collar-bolt, is a form of stud secured through a plate by the lower nut. The hook-bolt, Q, mainly for suspension purposes, may be double, forming a U-bolt. For attachment to the sides of timber and other work, the strap-bolt, R, has two or three holes. The term rag, or lewis-bolt, applies to S, grouting or lead being poured in the hole to secure the head,



L. Eye-bolt
M. Swivel eye-bolt (or, if longer, straining-bolt)
N. Tee-head
O. Stud-bolt
P. Collar-bolt
Q. Hook-bolt (for suspension)
R. Strap-bolt
S. Rag or Lewis-bolt
T. Lewis-bolt
U. Cotter or anchor-bolt

for attachment of iron work walls or foundations. T is also a lewis-bolt, inserted in a slot cut with dovetail side, and the packing-strip added, so that tightening the nut locks the whole. An expansion bolt (to go in walls) has a springy casing with spikes, that expands by a taper when the head is screwed home. The cotter or anchor-bolt U also serves chiefly for foundations, a large iron plate lying above the slot into which a cotter is inserted. The rigid stay-bolt is really a rivet, screwed into boilers to unite the fire-box and shell, and then rivetted over permanently.

BOLTON, DUKES OF. The title of duke of Bolton was held in the family of Powlett or Paulet from 1689 to 1794. CHARLES POWLETT, the 1st duke (*c.* 1625–1699), who became 6th marquis of Winchester on his father's death in 1675, had been member of parliament for Winchester and then for Hampshire from 1660 to 1675. An ardent Whig in Charles II.'s reign, he supported William of Orange in 1688 and was restored to the office of lord-lieutenant of Hampshire and created duke of Bolton in April 1689. He was an eccentric man, famed for his grotesque extravagances. He died in Feb. 1699, and was succeeded by his elder son, CHARLES, 2nd duke of Bolton (1661–1722), who had also been a supporter of William of Orange. He was lord-lieutenant of Hampshire and of Dorsetshire, a commissioner to arrange the union of England and Scotland and was lord justice in 1696, and lord-lieutenant of Ireland, 1717–22. His third wife was Henrietta (d. 1730), a natural daughter of James, duke of Monmouth. According to Swift, this duke was "a great booby." His eldest son, CHARLES, 3rd duke of Bolton (1685–1754), filled many public offices and attained high rank in the British army. His opposition to Sir Robert Walpole deprived him of several of his offices in 1733; but some of them were afterwards restored to him, and he raised a regiment for service against the Jacobites in 1745. He was a famous gallant, and his second wife was the singer, Lavinia Fenton (d. 1760), who had previously been his mistress.

BOLTON or **BOULTON, EDMUND** (1575?–1633?), English historian and poet, brought up a Roman Catholic and educated at Trinity Hall, Cambridge, afterwards residing in London at the Inner Temple. In 1600 he contributed to *England's Helicon.* He was a retainer of the duke of Buckingham, and through his influence secured a small place at the court of James I. The most important of his numerous works are *Hypercritica* (1618?), a short critical treatise valuable for its notices of contemporary authors, reprinted in Joseph Haslewood's *Ancient Critical Essays* (vol. ii., 1815); *The Roman Histories of Lucius Iulius Florus* (translated, 1618); *Nero Caesar, or Monarchie Depraved* (1624), with special note of British affairs.

BOLTON (BOLTON-LE-MOORS), municipal, county and parliamentary borough, Lancashire, England, 11 mi. N.W. of Manchester. Pop. (1938) 169,400. Area 23.9 sq.mi. It is served by the L.M.S.R., and divided by the Croal, a small tributary of the Irwell, into Great and Little Bolton; it is surrounded by high moorland. Although of early origin, its appearance is wholly modern. The earliest form of the name is Bodleton or Botheltun. The manor was granted by William I to Roger de Poictou, and passed through the families of Ferrers and Pilkington to the Harringtons of Hornby castle, who lost it with their other estates for their adherence to Richard III. In 1485 Henry VII granted it to the first earl of Derby. The manor of Little Bolton seems to have been, at least from Henry III's reign, distinct from that of Great Bolton, and was held till the 17th century by the Botheltons or Boltons. The site of the church of St. Peter has long been occupied by a parish church (there was one there in the 12th century), but the existing building dates only from 1870. In 1251 William de Ferrers obtained a charter for a weekly market and a yearly fair, but gradually this annual fair was replaced by four others chiefly for horses and cattle. The New Year and Whitsuntide show fairs arose during the 19th century. In the Civil War Bolton sided with the parliament, and in 1643 and 1644 the royalist forces assaulted the town. The town was incorporated in 1838 and became a county borough in 1888. From early days Bolton was famous for its woollen manufactures. In Richard I's reign an aulneger, whose duty it was to measure and stamp all bundles of woollen goods, was appointed. The industry flourished so greatly that when, in 1566, deputies were appointed to assist the aulnegers, Bolton is again named. Leland in his *Itinerary* (1558) recorded the fact that Bolton made cottons, which were in reality woollen goods. Real cotton goods were not made in Lancashire till 1641, when Bolton is named as the chief seat of the manufacture of fustians, vermilions and dimities. Velvets were first made here about 1756, by Jeremiah Clarke, and muslins and cotton quiltings in 1763. The inventors of spinning machinery, Arkwright and Crompton, were both born in the parish. Spinning factories were erected, the first in Bolton about 1780. Bleaching has been carried on since the early 18th century, and large iron works grew up in the late 19th century. In 1791 a canal was constructed from Manchester to Bolton, and by an act of parliament (1792) Bolton Moor was enclosed. The borough owns 500 ac. of parks and grounds, besides the 15th century Smithills Hall and estate of 2,000 ac., bought in 1938. A civic centre, including library, art gallery and museum, was opened in 1939, and much surrounding property was purchased to improve the area.

BOLTON ABBEY, village, W. Riding of Yorkshire, Eng., 22 mi. N.W. of Leeds and 5½ mi. from Ilkley by the L.M.S.R. Pop. of parish (1931) 193. It takes its name, inaccurately, from the great foundation of Bolton Priory, the ruins of which stand near the right bank of the upper Wharfe in a valley beautifully wooded and enclosed by hills. Part is transitional Norman; the nave, which is perfect, is Early English and Decorated. Transepts and choir are ruined, and remains of domestic buildings are slight. The manor of Bolton Abbey with the rest of the district of Craven was granted by William the Conqueror to Robert de Romili, who evidently held it in 1086, although no mention is made in the Domesday survey. William de Meschines and Cicely de Romili, his wife, heiress of Robert, founded and endowed a priory at Embsay or Emmesay, near Skipton, in 1120, but it was moved here in 1151 by their daughter Alice de Romili, wife of William FitzDuncan. The manor was sold in 1542 to Henry Clifford, 2nd earl of Cumberland, and descended to the dukes of Devonshire.

BOLTRAFFIO (BELTRAFFIO), GIOVANNI ANTONIO (1467–1516), Italian painter of the Lombard school, influenced by Leonardo da Vinci. He belonged to a distinguished Milanese family and occupied important civic posts in his native town, painting as an accomplished amateur, rather than as an artist by profession. His epitaph, which was removed from S. Paolo in Compito in Milan to the Archaeological museum, states that in his early youth he studied painting, but in his later years was occupied with other work besides art. Leonardo came to Milan in 1485, and Boltraffio became one of his ardent followers, conforming closely to his master's designs in his early work. He was a distinguished portraitist. In 1500 he was commissioned to paint an altarpiece (now in the Louvre) for the church of the

Misericordia, near Bologna, by Giacomo Casio, a merchant and poet, whose portrait Boltraffio painted several times (Chatsworth, England; Brera Gallery, City of Milan). The National Gallery, London, possesses a "Madonna and Child" which, according to Morelli, is the master's best work, two pictures from the Salting Bequest and a portrait from the Mond Collection. Other works are in Milan (Brera Gallery and Poldi-Pezzoli Collection), Bergamo and in the Borromean palace on the Isola Bella. In Rome he painted a fresco in the church of S. Onofrio representing the "Madonna with the Founder" (1513). In the Nuns' Choir of San Maurizio, Milan, are 26 medallions of holy women painted in fresco by Boltraffio. His drawings can be studied in the Ambrosiana, Milan.

See G. Carotti, *Le Gallerie Nazionale Italiane IV* (1899); J. P. Richter, *Mond Collection* (1910); F. Malaguzzi Valeri, *La Corte di Lodovico il Moro* (1923).

BOLYAI, WOLFGANG (1775–1856), Hungarian mathematician, poet and dramatist, was born at Szekler-Land, and died at Maros-Vásárhely, where he was a professor in the Reformed college, and where his son Johann was born. W. Bolyai studied for a few months at Jena, before proceeding in 1796 to Göttingen where he became a close friend of C. F. Gauss, a 19-year-old student at the time. The two young men discussed the foundations of mathematics, particularly those of Euclidean geometry; and on his return home in 1799, Bolyai attempted to prove Euclid's postulate of parallels. Gauss detected the error in Bolyai's attempt, but Bolyai persisted in his efforts, although he admitted that he was probably wasting his time.

BOLYAI, JOHANN (1802–1860). Up to the age of 10, Johann Bolyai knew no mathematics. By 13, under his father's teaching, he had mastered the calculus and analytic mechanics. At 15 he entered the Royal Engineering college at Vienna, to prepare for service in the army engineering corps, which he joined at the age of 20. In the army, young Bolyai divided his time between his duties, duelling, violin playing and mathematics. In 1823, in his 22nd year, he sent his father the draft of his *Absolute Science of Space,* a complete and consistent system of geometry constructed without assumption of Euclid's parallel postulate. That such a non-Euclidean geometry should be logically possible showed that the postulate of parallels is independent of Euclid's other postulates, and that attempts to prove the postulate by Euclidean geometry are necessarily futile. The new geometry was printed as an appendix to an elementary work on the foundations of mathematics (*Tentamen,* etc.) by W. Bolyai, and published in 1831. Johann's pleasure in his epochal achievement was spoiled by the discovery that he had been largely anticipated by Gauss who, however, made no public claim to the new geometry. As early as 1826, N. I. Lobachewsky also had anticipated Johann. Bolyai and Lobachewsky were unaware of each other's existence while both were working toward the same end. The creation of non-Euclidean geometry has been compared with the Copernican revolution in astronomy for its profound influence on philosophy and science. (E. T. B.)

BOLZANO (formerly BOZEN), provincial capital of Venezia Tridentina, Italy, at the confluence of Talavera and Isarco, above the junction of the latter with the Adige. It lies at a height of 869 ft., on the Brenner railway, 58 mi. S. of that pass and 35 mi. N. of Trento. Pop. (1936) 41,722 (town), 45,505 (commune). The city, before 1918 entirely German, was rapidly Italianized thereafter. Bolzano boasts of a fine Gothic 14th and 15th century cathedral. The famous *Minnesänger,* Walther von der Vogelweide, according to some accounts, was born (*c.* 1170) at a farm above Ponte all'Isarco, 14 mi. to the north.

Situated at the junction of the Brenner route from Germany to Italy with that from Switzerland down the Upper Adige valley, Bolzano has always had very considerable transit trade.

The *pons Drusi* (probably over the Adige just below Bolzano) is mentioned in the 4th century by the Peutinger Table. In the 7th to 8th centuries Bolzano was held by Bavarian counts. In 1027, with the rest of the diocese of Trent, it was given by emperor Conrad II to the bishop of Trent. From 1028 the local counts were vassals of the bishops, but after Tirol fell to the Habsburgs (1363) their power grew at the expense of that of the bishops. In 1381 Leopold granted the privilege of a town council; in 1462 the bishops resigned all jurisdiction to the Habsburgs and it was merged with the Tirol till 1918.

BOMA (properly MBOMA), Africa, port on N. bank of Congo about 60 mi. from its mouth, the administrative capital of Belgian Congo up to 1927. Pop. about 500 whites, 3,000 natives. It was founded as a slave mart and entrepôt for the lower Congo in the 16th century, chiefly by the Dutch, though British, French and Portuguese had factories and the last put forward claims to sovereignty (*see* AFRICA). In 1884 the natives of Boma granted a protectorate of their country to the International Association of the Congo. A narrow-gauge railway connects Boma with Dungo.

BOMB, a term formerly used for an explosive shell (*see* AMMUNITION) fired by artillery. The word is derived from the Gr. *βόμβος,* a hammering, buzzing noise, *cf.* "bombard" (*q.v.*). At the present day it is most frequently used of a shattering or incendiary grenade (*q.v.*), or an explosive vessel actuated by clockwork or trip mechanism, employed to destroy life or property. In naval warfare, before the introduction of the shell gun, explosive projectiles were carried principally by special vessels known as bomb-vessels, bombards or, colloquially, bombs.

In geology, the name "bomb" is given to certain masses of lava which have been hurled forth from a volcanic vent by explosive action. In shape they are spheroidal, ellipsoidal or discoidal; in structure they may be solid, hollow or more or less cavernous, while in size they vary from that of a walnut to masses weighing several tons. It is generally held that the form is partly due to rotation of the mass during its aerial flight, and in some cases the bomb becomes twisted by a gyratory movement. According, however, to Dr. H. J. Johnston-Lavis, many of the so-called bombs of Vesuvius are not projectiles, but merely globular masses formed in a stream of lava; and in like manner Prof. J. D. Duna showed that what were regarded as bombs in Hawaii are in many cases merely lava-balls that have not been hurled through the air.

BOMBACACEAE, a family of dicotyledonous plants, all trees, and often deciduous, allied to the Malvaceae, and characteristic of the tropics of both hemispheres. The flowers are often large and showy. Nineteen genera and somewhat more than 100 species are recognized, including *Adansonia,* the African baobab (*q.v.*), *Bombax* with about 30 species in tropical America, and the closely allied *Gossampinus* with 12 species in the Indo-Malaysian region. *Ceiba* with 10 or more species is largely American, and its fruits produce the kapok (*q.v.*) of commerce. *Ochroma lagopus* is the South American balsa (*q.v.*), noted for its very light wood, while the Malayan *Durio zibethinus* bears the noted durian (*q.v.*), a fruit remarkable for its distinctive odour.

See R. C. Bakhuizen van den Brink "Revisio Bombacacearum," *Bull. Jard. Bot. Buitenzorg,* iii, 6:161–232. t. 26–38 (1924).

BOMBARD, the name in various forms, of a mediaeval musical instrument ("bombard," "bumhart," "pumhart," "pommer"), the forerunner of the base oboe or schalmey. A small primitive oboe called *bombarde,* with eight holes but no keys, is still used among the Breton peasants.

Also a primitive type of cannon used in the middle ages—whence the verb "to bombard" and "bombardment."

BOMBARDIER, originally an artilleryman in charge of a bombard, now an air corps man in charge of bombing in a bomber plane, a gunner or artilleryman in the land forces or a noncommissioned officer in the British artillery.

BOMBARDMENT, the concentration of artillery fire against fortifications, troops in position or towns and buildings. In its strict sense the term was formerly applied only to the bombardment of defenceless or undefended objects, houses, public buildings, etc., the object of the assailant being to dishearten his opponent, and specially to force the civil population and authorities of a besieged place to persuade the military commandant to capitulate before the actual defences of the place have been reduced to impotence. The term was loosely employed to describe artillery attacks upon forts or fortified positions in preparation for assaults by infantry, and this use has now become customary and authoritative. The object of such a bombardment, preliminary to the assault, is to destroy the defences, to destroy or neutralize the weapons of the defence and to demoralize the defenders.

BOMBARDON or BASS TUBA, the name given to the bass and contrabass of the brass wind in military bands, called in the orchestra bass tuba. The bombardon was the very first bass wind instrument fitted with valves and was the outcome of the application of valves to the bugle family whereby the saxhorns were also produced. The radical difference between the saxhorns and the tubas (including the bombardon) is that the latter have a sufficiently wide conical bore to allow of the production of fundamental sounds in a rich, full quality of immense power. When the brass wind instruments with conical bore and cup-shaped mouthpiece first came into use, it was a well-understood principle that the tube of each instrument must theoretically be made twice as long as an organ pipe giving the same note; for example, the French horn sounding the 8ft. C of an 8ft. organ pipe, must have a tube 16ft. long. After the introduction of pistons, instrument makers experimenting with the bugle, which has a conical bore of very wide diameter in proportion to the length, found that baritone and bass instruments constructed on the same principle gave out the fundamental full and clear. A new era in the construction of brass wind instruments was thus inaugurated. The bombardons possess a chromatic compass of $3\frac{1}{2}$ to 4 octaves but the lowest notes produced by the valves are very difficult to obtain, for the lips seldom have sufficient power to set in vibration a column of air of such immense length, at a rate of vibration slow enough to synchronize with that of notes of such deep pitch.

BOMBAY, capital of Bombay Presidency, British India, standing at the southern end of Bombay island, 18° 55′ N., 72° 54′ E. The island, running roughly north and south is 11 mi. long by 3 mi. broad. It is separated at the northern end from Salsette only by a tidal creek crossed by causeways. At the southern end of the island is the well-known Back bay, a shallow basin 2 mi. across and 3 mi. deep; and around this lies Bombay.

The shape of this end of the island is roughly that of a thumb and long index finger, pointing downwards, and bent slightly inwards. The thumb, on the west side of the bay, is a rocky ridge, some 200ft. high, named Malabar hill. At the extreme point is Government House, with its luxuriant grounds, the cold weather residence of the governor of the presidency. Along the ridge and on its slopes are the beautiful residences of the wealthier citizens of Bombay, both European and Indian, commanding superb views east and west.

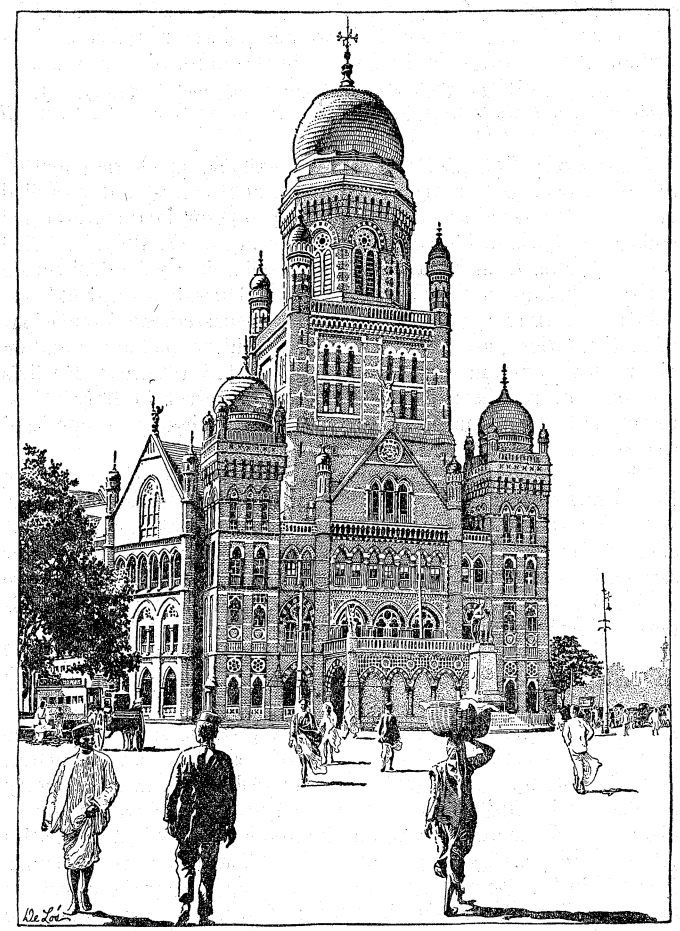
The other side of the bay is a long tapering tongue of land terminating in a lighthouse. The upper end is linked to the bazaar, or Indian city proper; then comes the Fort, now merely a memory, naming the area containing the great business houses, banks, shipping offices, etc.; finally comes Colaba, the cantonments, or military quarters of Bombay. Between this side of the island and the mainland is the great waterway constituting Bombay harbour, 7m. wide at the opening and narrowing as it runs north to the creek.

There are few more beautiful and impressive sights than the approach to Bombay from the sea up this noble waterway studded with mountainous islands, the stately buildings of the city on the left, and away to the right the palm-fringed shore of the mainland, rising gradually to the peaks of the western Ghats in the distance. No city in the world has a finer waterfront than Bombay. The great public offices looking over Back bay are not individually distinguished for architectural merit, but they have a cumulative effect of great dignity.

Bombay's position, as the gateway of India, its magnificent natural harbour, and the enterprise of its inhabitants, have made Bombay one of the first cities of the world. The Indian city, or bazaar, is well built and unusually handsome, with fine wide thoroughfares, a perfect hive of industry. In the Fort area, the commercial buildings will compare with those in most other cities, while of really outstanding merit are the Victoria railway terminus, the post office, the museum and the Royal Institute of Science.

University.—Modelled upon the plan of London university, the University of Bombay was originally constituted as only an examining body in 1857. In 1913 lectures were added for post-graduate students in history, economics, philosophy, Sanskrit and Persian. In 1919 a school of sociology and economics was established for research. New buildings costing over eight lakhs of rupees were completed in 1923. The university is still mainly concerned with examinations and has affiliated to it a number of institutions in Ahmadabad, Baroda, Bombay, Dharwar, Junagarh, Karachi, Poona, Sangli and Surat.

Population of Bombay (1941 census) 1,489,883. Area 30 sq.mi. It includes, besides Europeans, Mahrattas, a relatively small but highly influential group of Parsees, Arab traders from the



MUNICIPAL BUILDING AT BOMBAY, THE GATEWAY TO INDIA

Bombay, situated on a small island off the coast of western India, has long been an important point of contact between the East and West. Railroads serve as a medium for local trade, while its splendid port facilities, organized by the East India company in 1668, make it a centre of international commerce. Its bazaars are famous for the richness and variety of their display

Persian gulf, Afghans, Sikhs, Tibetans, Cingalese and many others including Baghdad Jews. There is quite a considerable Japanese colony, chiefly interested in cotton, and large enough to have a club of its own, but Chinese have not yet settled there in any number. The two languages of Bombay are Marathi and Gujarati, but most people understand and speak the *lingua franca,* generally known as *Bombay Bāt,* a colloquial and ungrammatical form of Hindustani, containing an admixture of local and even of English words. The Parsees number only 100,000 and occupy a position of influence out of all proportion to their numbers, being endowed with great natural ability, combined with a thoroughly Western initiative and progressiveness. The names of Tata, Wadia, Petit, Jijibhoy, etc., are of world wide repute in the spheres of commerce and philanthropy, and many of the greatest business houses of Bombay are owned by them.

The dockyard, originally built in 1736, has a sea-face of nearly 700yd. and an area of about 200 acres. There are five graving docks, three of which together make one large dock 648ft. long, while the other two make a single dock 582ft. long. There are also four building slips opposite the Apollo Bandar (landing place) on the south-east side of the enclosure. Bombay is the only Indian port with tides large enough to permit of docks

on the great scale. Prince's dock (1875–79), Victoria dock (1887–88), Alexandra dock (begun 1905), are important features of the port's accommodation. In recent years a deep-water pier has been built for the discharge of bulk petrol, with a pipe connection at Sewri, and the sea wall of the Alexandra dock has been extended for 1,500ft., forming the new Ballard pier, or mole. Steamers now come alongside the mole, whence passengers can reach the centre of the city in a few minutes, or can step into well-equipped trains waiting on the mole, and can proceed, without changing, northwards to Delhi and Peshawar, eastwards to Calcutta, and south-east to Madras.

The harbour defences have been remodelled and supplied with the heaviest guns. Docks are to be built on a large area of reclaimed land to the north of the present docks. Other recent activities of the Bombay Port Trust include the building of a line to connect the great Indian Peninsular and the Bombay, Baroda, and Central India railways at a point 6m. from the city, to take over traffic and convey it direct to the docks and depots as required. The total length with sidings is over 100 miles.

Electric Power.—The remarkable electric power works of the Tata hydroelectric scheme were opened in 1915. The monsoon rainfall in the western Ghats is impounded in three lakes at Lonavla, and falls to a general station where 40,000 h.p. is generated by five turbines and more power will be available as the scheme develops.

It is conveyed for 42 mi. by aerial transmission cables to a receiving station on Bombay island, whence it is distributed to mills and other customers.

Further hydroelectric developments are in progress near the present lakes, where the Andhra river has been dammed to form a lake 12 mi. long. Power is supplied not only to the Bombay mills but also to the Bombay tramways and suburban railways.

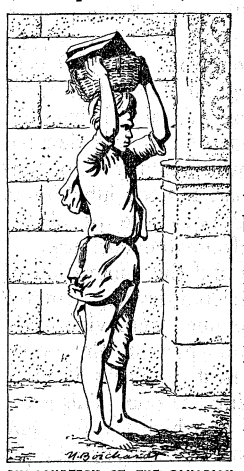
Trade and Commerce.—Bombay suffered to a smaller extent than any other Indian port from the two World Wars, though shipping was seriously affected by mines. It is the centre of the cotton and textile industry; there are 72,266 looms and 3,456,233 spindles in Bombay island, and 153,000 hands are employed in the 82 spinning and weaving mills. The preponderating share of trade is in Indian hands and most of the mills have Indian managers. Bombay is also the chief distributing centre in western India for imported cotton goods. Other industries are dyeing, tanning, and brass and silver work.

Bombay's position on the west coast and her magnificent natural harbour have resulted in the development of a great seaborne trade. The principal exports are raw cotton, grain and seeds, and the principal imports piece goods, metals and machinery.

Local Government.—The port of Bombay is administered by the Bombay Port Trust, consisting of a board of trustees, some nominated by Government and the others elected by the Chamber of Commerce, Indian Merchants Chamber, Municipality and Millowners' Association. The Municipal Corporation consists of 72 members, of whom 16 are nominated by Government, 36 are elected by the wards, and 20 are elected by the Chamber of Commerce, etc. Europeans and Indians are on an equal footing as regards eligibility.

Bombay is the seat of a thriving university, established in 1857. It is an examining body and has faculties in arts, law, medicine and engineering. It also confers a degree of commerce. The Improvement Trust deals with town planning and the general improvement of the city.

History.—The name of the island and city of Bombay is derived from Mumba (a form of Parvati), the goddess of the Kolis, a race of husbandmen and fishermen who were the earliest known inhabitants, having occupied the island probably about the beginning of the Christian era. Bombay originally consisted of seven islands (the *Heptanesia* of Ptolemy) and formed an outlying portion of the dominions of successive dynasties dominant in western India; Satavahanas, Mauryas, Chalukyas and Rashtrakutas. In the Maurya and Chalukya period (450–750) the city of Puri on Elephanta island was the principal place in Bombay harbour. The first town built on Bombay island was Mahikavati (Mahim), founded by King Bhima, probably a member of the house of the Yadavas of Deogiri, as a result of Ala-ud-din Khilji's raid into the Deccan in 1294. It remained under Hindu rule until 1348, when it was captured by a Mohammedan force from Gujarat; and the islands remained part of the province (later kingdom) of Gujarat till 1534, when they were ceded by Sultan Bahadur to the Portuguese. The island did not prosper under the feudal rule of the Portuguese and it had a population of only 10,000 when ceded to the British, who had fought for it in 1614–15 and in 1626, while the directors of the East India company had urged Cromwell to buy Bombay in 1654 because of its excellent harbour and protection from land attacks. It finally came into British hands as part of the dowry of the infanta Catherine of Portugal, on her marriage to Charles II. The Bombay Portuguese, especially the religious orders, resisted the cession, and the British occupied it only in 1665. In 1668 the Crown transferred it to the East India company, which placed it under the factory of Surat.



BY COURTESY OF THE CANADIAN PACIFIC STEAMSHIP CO.

NATIVE LABOURER IN THE STREETS OF BOMBAY

Gerald Aungier (or Angier), who succeeded Sir George Oxenden as president of Surat in 1669 and died in 1677, was the pioneer of modern developments. He succeeded in fortifying town and shore against threatened attacks from the mainland by Mahrattas, and from the sea by Malabar and Dutch seamen, and he also had to cope with Portuguese who still occupied Salsette island and had established a customs barrier in the channel between Bombay and the shore. In 1672 Aungier transferred his headquarters to Bombay and promulgated a liberal scheme of administration, including protection of all castes in the celebration of their religious ceremonies and prohibition of any compulsion of natives to carry burdens against their will. Bombay increased rapidly; Hindu capitalists (banya) soon needed a special quarter and Parsis and Armenians flocked to the place. In eight years the population grew from 10,000 to 60,000 and diseases of crowded areas spread, so Aungier, in 1675, initiated works for draining the foul tidal swamps and, failing the consent of the company to the erection of a regular hospital, he turned the law court into an infirmary. He also established a scheme of courts.

Even under Aungier the Siddi admirals of the Moguls had asserted their right to use Bombay harbour as winter quarters for their fleet, though they had failed to secure it as a base against the Mahrattas. Under his weak successor (Rolt, 1677–82), the English waters, the value of which had now been proved, became the battle-ground between the rival navies, and for some years Bombay lay at the mercy of both. The company's rule, moreover, was exposed to another danger. The niggardly policy of the board of directors, more intent on peaceful dividends than on warlike rule, could not but be galling to soldiers of fortune. A mutiny at Bombay in 1674 had only been suppressed by the execution of the ringleader; and in 1683 a more formidable movement took place under Richard Keigwin, a naval officer who had been appointed governor of St. Helena in reward for the part played by him in the capture of the island from the Dutch in 1673. Keigwin, elected governor of Bombay by popular vote, issued a proclamation in the king's name, citing the "intolerable extortions, oppressions and exactions" of the company, and declaring his Government under the immediate authority of the Crown. He ruled with moderation, reformed the system of taxation, obtained notable concessions from the Mahrattas, and increased the trade of the port by the admission of "interlopers." But he failed to extend the rebellion beyond Bombay; and, when a letter arrived, under the royal sign manual, ordering him to surrender the fort to Sir John Child, appointed admiral and captain-general of the company's forces, he obeyed.

Meanwhile the company had decided to make Bombay their chief centre in the East Indies, but this was delayed by plague and was accomplished only in 1708. An alliance with the Siddis secured a base of supplies on the mainland (1733), and the Mahratta conquest of Bassein and Salsette (1737–39) removed Portuguese rivalry. French wars in 1744–48 and 1756–63 led to strengthening of fortifications, a city wall having been already built in 1718. Bankot was acquired by alliance with the peshwa (1755) and this ensured supplies, while Watson and Clive (1756) took Vijayadrug and this secured protection from piracy. Dock-building (1750–62) was followed by the beginning of cotton trade with China (1770); the result of a famine in China being that the Chinese Government forced an increase of the area devoted to grain. Administrative reform and town-planning also contributed to the growth of the city, which had 113,000 inhabitants in 1780. A mainland famine in 1803 drove more people to Bombay, and a great fire led to replanning on extended lines.

The British victory over the Mahrattas and the annexation of the Deccan opened a new period of unrestricted development for Bombay. At this time, too (1819) its fortunes were vigorously fostered by Mountstuart Elphinstone, and in 1838 the population had risen to 236,000. But in the next 50 years it more than doubled itself, the figures for 1891 being 821,000. This great leap was due to the influence of railways, of which the first line was completed in 1853, the opening of the Suez canal, and the foundation of cotton factories. In 1866–67 the tide of prosperity was interrupted by a financial crisis, due to the fall in the price of cotton on the termination of the American war. Bombay, however, soon recovered herself, and in 1891 was more prosperous than ever before; but during the ensuing decade plague (*q.v.*) caused a decline in both her population and her trade. The city has recovered once more.

Bombay and environs have undergone considerable development recently owing to the activities of the development directorate appointed in 1920. Large schemes were put in hand destined eventually to house 250,000 of the poorer inhabitants and relieve the existing overcrowding, to open up new areas, and to add 2 sq.m. to the area of the city by reclamation of land in Back bay and East Colaba.

The progress of the development scheme came in for strong criticism and was the subject of an official enquiry in 1926, which centred principally round the reclamation in Back bay. Here it was proposed to take advantage of the curve on the eastern side of the bay and to build a sea wall, 4m. long, from Colaba point to Marine Lines, thus enclosing an area of 1,300ac. which would be reclaimed and added to the city. It gradually became evident, however, that the original estimates both as regards time and cost would be seriously exceeded. As the result of the enquiry it was decided to proceed at present with only the two end sections of the reclamation, that from Colaba point to the Afghan church, and that from the Marine Lines to the Clock Tower. Good progress was made with the section at the Colaba end and a large part was handed over to the military authorities in 1927. The question as to whether the remaining portion of the reclamation shall be proceeded with is left for future decision.

Of the other schemes for the improvement of Bombay, South Salsette island is being developed, and the industrial and residential colonies which have been established along the two railways and the arterial roads from Bombay have become very popular resorts.

The Mahim scheme is complete, comprising two main avenues and cross roads, with a road from Worli. The reclamation scheme between Mazagon and Sewri is also finished, and the cotton, grain and oil depots have been moved from Colaba. Previously raw cotton had been carried on carts from the goods yards to the Cotton Green at Colaba, but now the Bombay Port Trust has provided railway communications between the railway station, the docks, and the depot at Sewri, which has sheds to hold 3,000,000 bales of cotton. X.

BOMBAY DUCK, a small fish (*Saurus ophiodon*), inhabiting the Bombay and Malabar coasts. Dried and salted, it is much esteemed both as food and as a relish.

BOMBAY FURNITURE. "Bombay blackwood furniture" is manufactured in the city of Bombay and in the towns of Surat and Ahmadabad in India. The wood used is Shisham or blackwood (*Dalbergia*), a hard-grained dark-coloured timber which with proper treatment assumes a beautiful natural polish. Some of the articles, such as small tables and ornamental stands, are of exceedingly graceful contour, and good examples are highly prized by collectors. The carving at its best is lace-like in character, and apart from its inherent beauty is attractive on account of the ingenuity shown by the worker in adapting his design in detail to the purpose of the article he is fashioning. "Bombay boxes" are inlaid in geometrical patterns on wood. The inlaying materials consist of wire, sandal wood, sapan wood, ebony, ivory and stags' horns, and the effect produced by the combination of minute pieces of these varied substances is peculiar and distinctive.

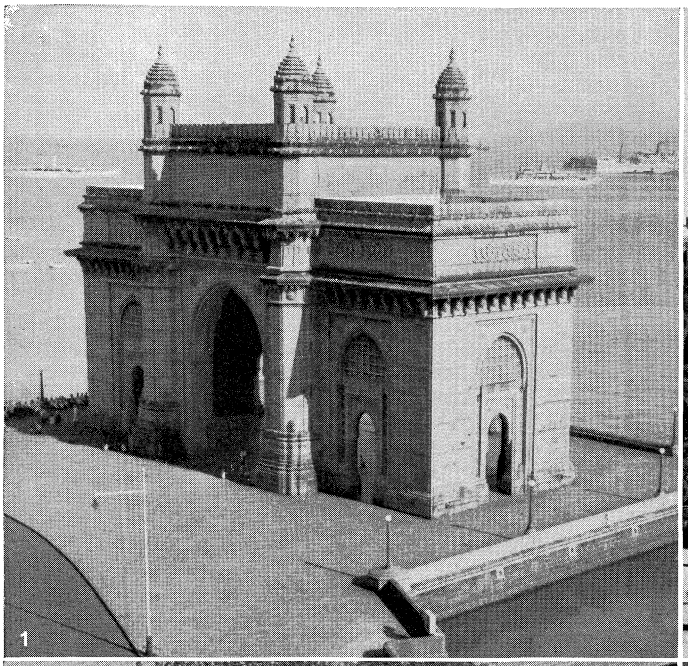
BOMBAY PRESIDENCY, a province or presidency of British India, consisting partly of British districts, and partly of native states under the administration of a governor. It extends from 13° 53′ to 24° 40′ N., and from 68° 20′ to 76° 30′ E., and is bounded on the N. by Sind and Rajputana; on the E. by Indore, the Central Provinces and Hyderabad; on the S. by Madras and Mysore, and on the W. by the Arabian sea. Within these limits lie the Portuguese settlements of Diu, Damaun and Goa, and the native state of Baroda which has direct relations with the government of India. The Bombay Presidency formerly included the Aden Protectorate and Sind, but the former was detached in 1932 and the latter in 1936. Total area of province proper, excluding Indian states, is 76,443 sq.mi.; pop. (1941) 20,849,840. Including the states the area is 132,700 sq.mi.; pop. 29,998,126. The province is divided into three commissionerships and 20 districts. The three divisions are the northern or Gujarat, the central or Deccan, and the southern or Carnatic. The 20 districts are: Bombay City, Bombay Suburban, Ahmedabad, Broach, Kaira, Panch Mahals, Surat, Thana, Ahmednagar, Khandesh (two districts) Nasik, Poona, Satara, Sholapur, Belgaum, Bijapur, Dharwar, Kanara, Kolaba, and Ratnagiri. There are 151 Indian States which are administered either by political agents or by the collectors of the districts in which the smaller states are situated. The chief groups are the Western Indian States agency (Cutch, Kathiawar and Palanpur), Mahi Kantha agency (51 states), Rewa Kantha agency (62 states), and Cambay (Kaira) agency. Others (agencies in brackets) are Bansda, Dharampur and Sachin (Surat), Janjira (Kolaba), Jawhar (Thana), Sawantwari (Belgaum), Akalkot (Sholapur), Bhor (Poona), Aundh and Phaltan (Satara), Surgana (Nasik), Jath (Bijapur), Savanur (Dharwar), Kolhapur with nine feudatories, and the Southern Mahratta country States. Daphlapur lapsed to Jath in 1917. The native States under the supervision of the Government of Bombay are divided, historically and geographically, into two main groups.

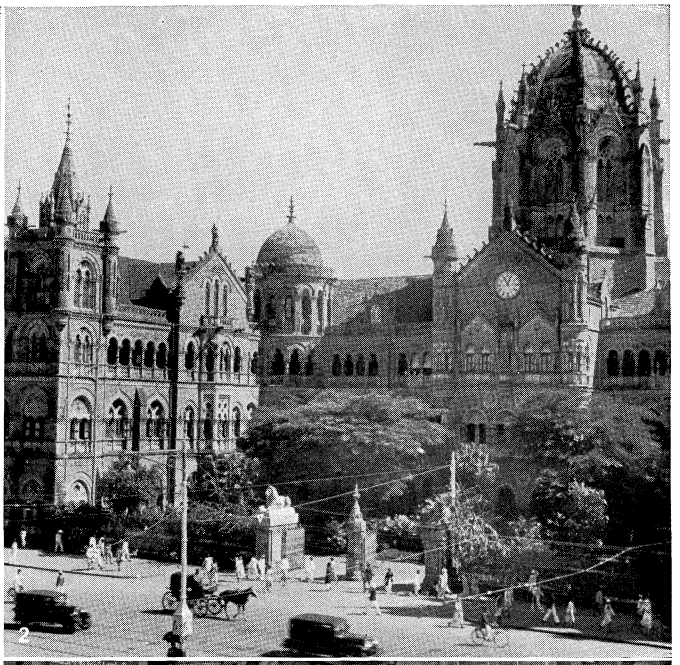
The northern or Gujarat group includes the territories of the Gaekwar of Baroda, with Cutch, Palanpur, Rewa Kantha and Mahi Kantha. These territories, with the exception of Cutch, have an historical connection, as being the allies or tributaries of the Gaekwar in 1805, when final engagements were concluded between that prince and the British Government. The southern or Mahratta group includes Kolhapur, Akalkot, Sawantwari, and the Satara and southern Mahratta Jagirs, and has an historical bond of union in the friendship they showed to the British in their final struggle with the power of the peshwa in 1818. The remaining territories may conveniently be divided into a small cluster of independent zamindaris, situated in the wild and hilly tracts at the northern extremity of the Sahyadri range, and certain principalities which, from their history or geographical position, are to some extent isolated from the rest of the presidency.

The province of Sind was transferred from the presidency in 1936, but in view of the long administrative tradition which has linked it with Bombay, it has been thought desirable to discuss both Bombay proper and Sind as a single unit.

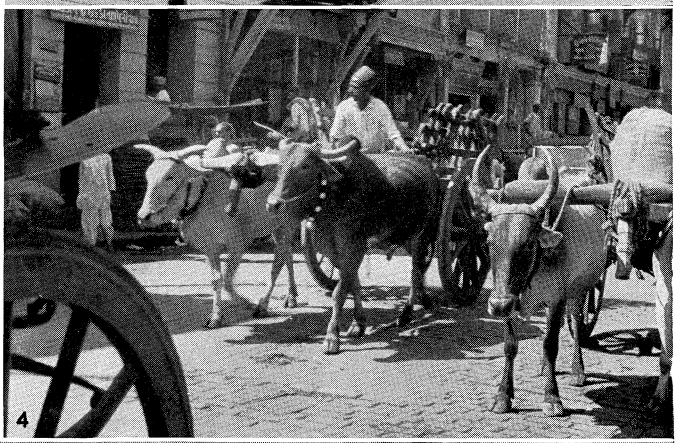
Physical Aspects.—Bombay Presidency and Sind form a long strip of land along the Indian ocean from the south of the Punjab to the north of Mysore. The coast is rock-bound and difficult of access; and though it contains several bays forming fair-weather

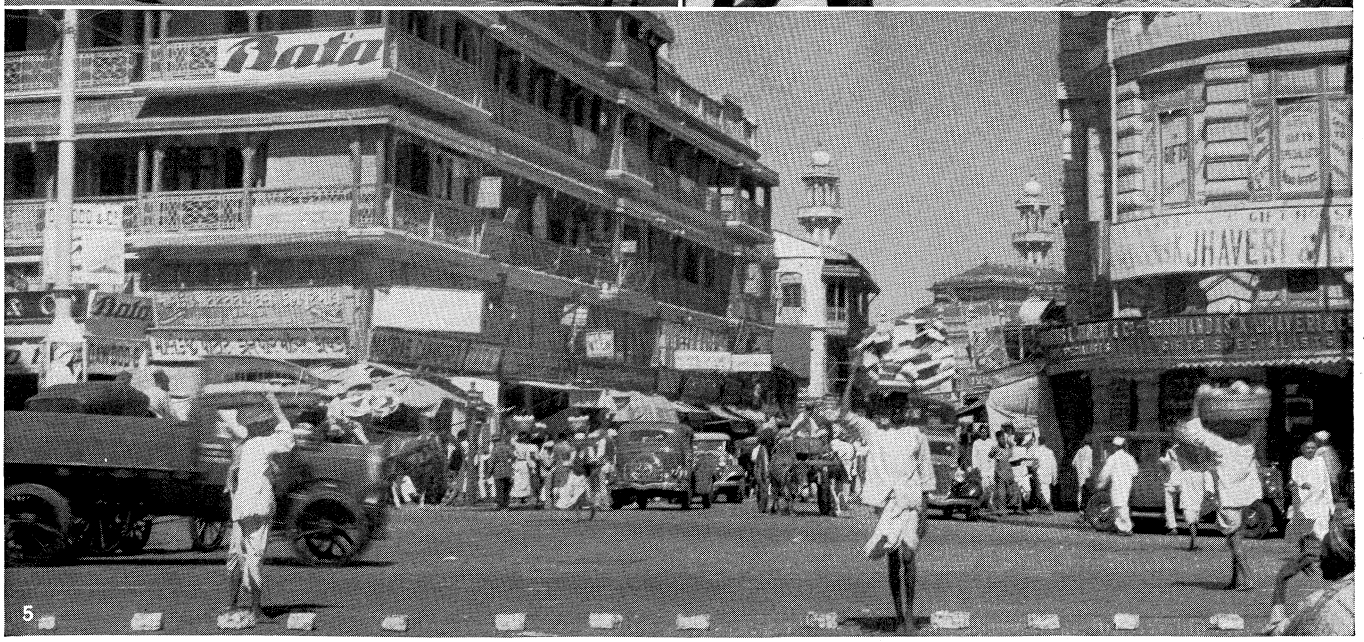
BOMBAY











PHOTOGRAPHS, (1-4) FRITZ HENLE, (5) DEANE DICKASON FROM EWING GALLOWAY

SCENES IN BOMBAY

1. The gate on the water front
2. Victoria station
3. A public fountain
4. Oxcarts hauling merchandise
5. A street intersection in the main business district

ports for vessels engaged in the coasting trade, Bombay, Karachi in Sind, Marmagoa and Karwar alone have harbours sufficiently land-locked to protect shipping during the prevalence of the south-west monsoon. The coast-line is regular and little broken, save by the gulfs of Cambay and Cutch, between which lies Kathiawar.

A range of hills, known as the Western Ghats, runs down the coast, at places rising in splendid bluffs and precipices from the water's edge, at others retreating inland, and leaving a flat fertile strip of 5–50mi. between their base and the sea.

Mountains.—In the north of the region on the right bank of the Indus, the Hala mountains, a continuation of the great Suleiman range, separate British India from the dominions of the khan of Kalat. Leaving Sind, and passing by the ridges of low sandhills—the leading feature of the desert east of the Indus—and the isolated hills of Cutch and Kathiawar, which form geologically the western extremity of the Aravalli range, the first extensive mountain range is that separating Gujarat from the States of central India. The rugged and mountainous country south of the Tapti forms the northern extremity of the Sahyadri or Western Ghats. This great range of hills, sometimes overhanging the ocean, and generally running parallel to it at a distance nowhere exceeding 50mi., with an average elevation of about 1,800ft., contains individual peaks rising to more than double that height. They stretch southwards for upwards of 500mi., with a breadth of 10–20 miles. The western declivity is abrupt, the land at the base of the hills being but slightly raised above the level of the sea. As is usually the case with the trap formation, they descend to the plains in terraces with abrupt fronts. The landward slope is in many places very gentle, the crest of the range being sometimes but slightly raised above the level of the plateau of the Deccan. Their best-known elevation is Mahabaleshwar, 4,500ft. high, a fine plateau, 37mi. from Poona, covered with rich vegetation, and used by the Bombay Government as its summer retreat. In the neighbourhood of the Sahyadri hills, particularly towards the northern extremity of the range, the country is rugged and broken, containing isolated peaks, masses of rock and spurs, which, running eastward, form watersheds for the great rivers of the Deccan. The Satpura hills separate the valley of the Tapti from the valley of the Nerbudda, and the district of Khandesh from the territories of Indore. The Satmala or Ajanta hills, which are rather the northern slope of the plateau than a distinct range of hills, separate Khandesh from the Nizam's dominions.

Plains.—The more level parts of the region consist of 5 well demarcated tracts—Sind, Gujarat, the Konkan, the Deccan and the Carnatic. Sind, or the lower valley of the Indus, is very flat, with but scanty vegetation, and depending for productiveness on irrigation. Gujarat, except on its northern parts, consists of rich, highly cultivated alluvial plains, watered by the Tapti and Nerbudda, but not much subject to inundation. The Konkan lies between the Western Ghats and the sea. It is a rugged and difficult country, intersected by creeks, and abounding in isolated peaks and detached ranges of hills. The plains of the Deccan and Khandesh are watered by large rivers, but as the rainfall is uncertain, they are generally, during the greater part of the year, bleak and devoid of vegetation. The Carnatic plain, or the country south of the River Kistna, consists of extensive tracts of black or cotton soil in a high state of cultivation.

Rivers.—The chief river of western India is the Indus, which enters the presidency from the north of Sind and flowing south in a tortuous course, falls into the Arabian sea by several mouths. In the dry season the bed varies at different places from 480–1,600 yards. The flood season begins in March and continues till September, the average depth of the river rising from 9–24ft., and the velocity of the current increasing from 3–7mi. per hour. Next to the Indus comes the Nerbudda. Rising in the Central Provinces, and traversing the dominions of Holkar, the Nerbudda enters the presidency at the north-western extremity of the Khandesh district, flows eastwards, and after a course of 700mi. from its source, falls into the gulf of Cambay, forming near its mouth the alluvial plain of Broach, one of the richest districts of Bombay. The Tapti enters the presidency a few miles south of the town of Burhanpur, flows eastwards through the Khandesh, Rewa Kantha and Surat, and falls into the gulf of Cambay, a few miles west of the town of Surat. Besides these there are many minor streams. The streams which, rising in the Sahyadri range, or Western Ghats, flow westwards into the Arabian sea are of little importance. During the rains they are formidable torrents, but with the return of the fair weather they dwindle away and during the hot season, with a few exceptions, they almost dry up. Clear and rapid as they descend the hills, on reaching the lowlands of the Konkan they become muddy and brackish creeks. The Kanarese rivers have a larger body of water and a more regular flow than the streams of the Konkan. One of them, the Sharawati, forcing its way through the western ridge of the Ghats, plunges from the high to the low country by a succession of falls, the principal of which is 890ft. in height. The Sahyadri or Western Ghats also throw off to the eastwards the two rivers, the Godavari and the Kistna.

Lakes.—The Manchar lake is situated on the right bank of the Indus. During inundations it attains a length of 20mi. and a breadth of 10mi., covering a total area estimated at 180 square miles. The remarkable Runn or lake of Cutch is a salt marsh, an inland lake, or an arm of the sea with an area of 8,000 sq.mi. according to the season of the year, and forms the western boundary of the province of Gujarat. When flooded during the rains it unites the gulfs of Cutch and Cambay, and converts the territory of Cutch into an island.

Geology.—South of Gujarat nearly the whole of Bombay is covered by the horizontal lava flows of the Deccan Trap series, and these flows spread over the greater part of the Kathiawar peninsula and extend into Cutch. In Cutch and Kathiawar they are underlaid by Jurassic and Neocomian beds. The Jurassic beds are marine and contain numerous Ammonites, but the beds which are referred to the Neocomian include a series of sandstones and shales with remains of plants. Several of the plants are identical with forms which occur in the upper portion of the Gondwana system. Tertiary limestones, sandstones and shales overlie the Deccan Trap in Cutch, but the greatest development of deposits of this age is to be met with on the western side of the Indus (*see* SIND). The plain of Sind and of eastern Gujarat is covered by alluvium and wind-blown sand.

Climate.—Great varieties of climate are met with in the presidency. In its extreme dryness and heat, combined with a sandy soil, Upper Sind resembles the African deserts. The mean maximum temperature at Hyderabad, in Lower Sind, during the six hottest months of the year is 98° in the shade, and the water of the Indus reaches blood-heat; in Upper Sind it is even hotter, and the thermometer has been known to register 130° in the shade. In Cutch and Gujarat the heat, though less, is still very great. The Konkan is hot and moist, the fall of rain during the monsoon sometimes approaching 300 inches. The tableland of the Deccan above the Ghats, on the contrary, has an agreeable climate except in the hot months, as has also the southern Mahratta country. Bombay island itself, though in general cooled by the sea breeze, is oppressively hot during May and October. The south-west monsoon generally sets in about the first week in June.

Forests.—The Bombay Presidency proper possesses numerous though scattered forest reserves, which occupy large tracts mainly in the Sahyadri hills and Western Ghats. Over 12% of the total area of the presidency is forested. Another great class of forests, those of the alluvial plains, is found in Sind, on or close to the banks of the Indus. Besides the timber trees (teak, blackwood, etc.) there are others which are valuable for their fruit and nuts. The jungle tribes collect gum from several varieties of trees, and in Sind the Forest Department derives a small revenue from lac. The palms of the presidency consist of coco-nut, date, palmyra and areca catechu.

Population.—In the 1941 census, the population of the province proper was 20,849,840, the two chief communities were:

Hindu outcastes	1,855,148
Hindus (caste)	14,700,242
Moslems	1,920,368

The 1931 census cited 90,667 Zoroastrians (Parsees) and 330,803 Christians, but the 1941 census did not enumerate persons by religions but by communities.

In Sind Islam has been the predominant religion from the earliest Arab conquest in the 8th century. In Gujarat the predominant religion is Hinduism, though petty Mohammedan kingdoms have left their influence in many parts of the province. The Deccan, the home of the Mahrattas, and the Carnatic are largely Hindu. The Konkan is notable for various Christian castes, owing their origin to Portuguese rule; while in the Carnatic, Lingayatism, a Hindu reformation movement of the 12th century, is embraced by many of the population. The Mahrattas are the dominating race next to the Europeans and number (1931), with Kunbis, 5,803,775.

Languages.—Among the many languages of the presidency, the chief are Sindhi in Sind, Cutchi in Cutch, Mahratti in the northern, central and southern division, with Hindi in the northern division and Kanarese in the southern.

Agriculture.—Jwar (great millet) and bajra (spiked millet) are the staple food grains in the Deccan and Khandesh. Rice is the chief product of the Konkan. Wheat, grown mostly in Sind, is exported to Europe in large quantities. Gram is the most important of the pulses, a sesamum, mustard, linseed and ground nut of the oil seeds. Of fibres far the most important is cotton, which has been much improved by the introduction of several better varieties.

Manufactures.—The chief feature of the modern industrial life of Bombay is the great development in the growth and manufacture of cotton. The industry has received further impetus from the provision of electric power. The tendency to replace native crafts by modern industrial establishments continues, and finer yarn is spun and more bleached fabrics are produced. About eighty per cent of the cloth woven in British India comes from the presidency, the industry being confined mostly to Bombay city, Ahmedabad and Sholapur, with nearly two-thirds of the total number of looms in the first named. Silk goods are manufactured in Ahmedabad and Bombay, but the industry is declining. The custom of investing savings in gold and silver ornaments gives employment to many goldsmiths; the metal is usually supplied by the customer, and the goldsmith charges for his labour. Paper is made in Bombay city, Poona and Surat. Ahmedabad and Surat are famous for their carved wood-work and metal-work. Many of the houses in Ahmedabad are covered with elaborate wood-carving and excellent examples exist elsewhere. Large quantities of salt are produced, but no other minerals save building stone and a little manganese. Seaborne trade is concentrated on Bombay and Karachi, though efforts have been made to develop Murmagao as a port for the South Mahratta district.

Railways and Irrigation.—All the railways of the presidency, with the exception of the North-Western line, which enters Sind from the Punjab and finds its natural terminus at Karachi, concentrate at Bombay city. The other chief lines are the Great Indian Peninsula, Indian Midland, Bombay, Baroda and Central India, Rajputana-Malwa and Southern Mahratta systems. In the presidency proper irrigable areas cover less than $\frac{1}{10}$ of the total cultivated area, although large works have recently been completed, notably on the Godavari river and in the Western Ghats. In Sind, over $\frac{1}{6}$ of the total area of the province was irrigated in 1936, and this area was increased with the final development of the Lloyd barrage scheme, which now irrigates 5.45 million acres.

Army.—Under Lord Kitchener's rearrangement of the Indian army in 1904 the old Bombay command was abolished and its place was taken by the Western Army Corps. As a result of measures taken in 1918 and aiming at decentralization, Bombay now forms part of the southern command, with headquarters at Poona. A brigade is also stationed at Ahmedabad. The Sind brigade, with headquarters at Karachi, is under the western command.

Education.—The University of Bombay, established in 1857, is a body corporate, consisting of a chancellor, vice-chancellor and fellows. The governor of Bombay is *ex officio* chancellor. An elected syndicate with the director of public education as an *ex officio* member is the executive body, and a senate, divided into faculties, the legislative. In 1937 primary schools numbered 12,901, with 1,335,889 scholars, and secondary schools 639 with 127,807 scholars. There are 14 colleges, including medical, veterinary, engineering, agricultural, science, law and commercial colleges. The Education Act of 1923 enables municipalities to enforce primary education, the control of which has been taken over since 1918 by 34 municipal and 21 district boards. Bombay shows (1941 census) 30% literacy for males and 9% for females; this is an all-over increase of 100% over the 1931 census.

Administration.—Bombay is one of the provinces which received the new form of government under the Government of India Act of 1919; and the form of government was again altered in 1937, when the province became an autonomous region, in common with the other provinces of British India. Administration is carried on by a governor, with a dual legislature consisting of an Upper House or Legislative Council of 26 elected and 3 or 4 nominated members, and a Lower House or Legislative Assembly of 175 elected members. The political administration of the native States is under the superintendence of British Agents placed at the principal native courts; their position varies according to the relationship between the state and the paramount power. Since the acts of 1919 and 1926, municipal self-government has been developed in the province; the elective element has been augmented, and the number of municipalities was increased to 130 in 1937. The administration of justice throughout the presidency is conducted by a high court at Bombay, consisting of a chief justice and 13 puisne judges, along with district judges and stipendiary and honorary magistrates. The administration of the districts is carried on by collectors, assistant collectors and a varying number of supernumerary assistants.

HISTORY

It is believed that about 1000 B.C. an export trade from western India to the Red sea by way of East Africa existed, and that before 750 B.C. a trade had sprung up with Babylon by way of the Persian Gulf. It was by this latter route that the traders brought back to India the Brahmi alphabet, the art of brick-making and the legend of the Flood. Later still the settlement of Brahmans along the west coast had already Aryanized the country in religion, and to some extent in language, before the Persian conquest of the Indus valley at the close of the 6th century B.C. The Persian dominion did not long survive; and the march of Alexander the Great down the Indus paved the way for Chandragupta and the Maurya empire. On the death of Asoka in 231 B.C. the empire of the Mauryas broke up, and their heritage in the west fell to the Andhra dynasty of the Satavahanas of Paithan on the Godavari, a Dravidian family whose dominion by 200 B.C. stretched across the peninsula from the deltas of the Godavari and Kistna to Nasik and the Western Ghats. About A.D. 210, however, their power in the west seems to have died out, and their place was taken by the foreign dynasty of the Kshaharatas, the Saka satraps of Surashtra (Kathiawar), who in 120 had mastered Ujjain and Gujarat and had built up a rival kingdom to the north. Since about A.D. 40 the coast cities had been greatly enriched by trade with the Roman empire, which both the Satavahanas and the satraps did much to encourage; but after the fall of Palmyra (273) and the extinction of the main Kshaharata dynasty (*c.* 300) this commerce fell into decay. In the next century and a half, short-lived Saka dynasties succeeded one another until, about 388, the country was conquered by the Guptas of Magadha, who kept a precarious tenure of it till about 470, when their empire was destroyed by the White Huns, or Ephthalites (*q.v.*), who, after breaking the power of Persia and assailing the Kushan kingdom of Kabul, poured into India, conquered Sind, and established their dominions as far south as the Nerbudda.

Under the Hun tyranny, which lasted till the overthrow of the White Huns on the Oxus by the Turks (*c.* 565), native dynasties had survived, or new ones had established themselves. A new power, too, appeared from the north; the Gurjaras (ancestors, it is supposed, of the Gujar caste), who had probably entered India with the White Huns, established their power over Gujarat and (*c.* 600) overran north-eastern Kathiawar, made the rajah of Valabhi their tributary, and established a branch at Broach (585–740). During the short-lived empire of Harsha (d. 647 or 648), Malwa, Gujarat and Kathiawar were subject to his sway; but

the southern boundary of his kingdom was the Nerbudda, south of which the Chalukyas in the 7th century, having overcome the Rashtrakutas and other rivals, had absorbed the smaller kingdoms into their empire. In 710–711 (A.H. 92) the Arabs invaded India, and in 712 conquered and established themselves in Sind; they did not, however, attempt any serious attack on the Gurjara and Chalukya empires, confining themselves to more or less serious raids. In 770 they destroyed the city of Valabhi and, as already mentioned, brought its dynasty to an end. Meanwhile the Chalukyas, after successfully struggling with the Pallavas (whose capital was taken by Vikramaditya II., *c.* 740), had in their turn succumbed to their ancient rivals the Rashtrakutas, who succeeded to the bulk of their dominions, including Gujarat, where they had set up a branch line. For some two centuries (*c.* 750–950) there was a balance of power between the Gurjaras and Rashtrakutas, neither kingdom being strong enough to encroach on the other to any extent. The Rashtrakutas were, moreover, debarred from large schemes of conquest by dissensions with the branch dynasty which they had set up in Gujarat. Under them the Konkan and the coast farther south were governed by chiefs of the Silahara family, whose rule is mainly notable for the revival of trade with the Persian gulf and, doubtless as a result of this, the arrival in 775 on the west coast of a number of Parsee refugees, who found, in a country where three religions were already equally honoured, the toleration denied to them in Mussulman Persia. But in the 10th century the Rashtrakuta power began to break up, in 961 Mularaja Solanki (Chalukya) conquered the kingdom of Anhilvada (Anhilvara) in Gujarat, where his dynasty reigned till 1242; and twelve years later the Chalukyas once more overthrew the Rashtrakutas in the Deccan, establishing their capital at Kalyani, while a branch line was set up in southern Gujarat. Farther south the Silaharas, however, continued to rule the coast, and succeeded in maintaining their independence until after the final fall of the Chalukyas in 1192.

In 1023 Mahmud of Ghazni had already invaded Gujarat with a large army, destroyed the national Hindu idol of Somnath, and carried away an immense booty. Mohammed Ghori also invaded Gujarat, and left a garrison in its capital. But it was not till after the Mussulman power was firmly established in northern India that the Mohammedan sovereigns of Delhi attempted the conquest of the south. In 1294 the emperor Ala-ud-din first invaded the Deccan, and in 1297 he conquered Gujarat. In 1312 the Mohammedan arms were triumphant through the Mahratta country; and seven years later the whole of Malabar fell a prey to the invaders. In the middle of the 14th century the weakness of the Delhi sovereigns tempted the governors of provinces to revolt against their distant master, and to form independent kingdoms. In this way the Bahmani kingdom was established in the Deccan, and embraced a part of the Bombay presidency. Ahmednagar and Gujarat also became the seats of a new kingdom. In 1573 Akbar conquered Gujarat and reannexed it to the empire; in 1599 he effected the reconquest of Khandesh, and in 1600 that of Ahmednagar. During the latter part of the 17th century the Mahrattas rose to power, and almost every part of the country now comprising the presidency of Bombay fell under their sway. In 1498 the Portuguese came first to Calicut, their earliest possession in the presidency being the island of Anjidiv. After their victory at Diu over the Egyptian fleet their mastery of the Indian ocean was undisputed, and they proceeded to establish themselves on the coast. They captured Goa in 1510, Malacca in 1511, and Ormuz in 1515. They next took advantage of the decay of the kingdom of Gujarat to occupy Chaul (1531), Bassein with its dependencies, including Bombay (1534), Diu (1535) and Daman (1559).

The first English settlement in the Bombay presidency was in 1618, when the East India Company established a factory at Surat, protected by a charter obtained from the emperor Jahangir. In 1626 the Dutch and English made an unsuccessful attempt to gain possession of the island of Bombay, and in 1653 proposals were suggested for its purchase from the Portuguese. (*See* BOMBAY.)

In 1803 the Bombay presidency included only Salsette, the islands of the harbour (since 1774), Surat and Bankot (since 1756); but between this date and 1827 the framework of the presidency took its present shape. The Gujarat districts were taken over by the Bombay government in 1805 and enlarged in 1818; and the first measures for the settlement of Kathiawar and Mahi Kantha were taken between 1807 and 1820. The dominions of Poona, Ahmednagar, Nasik, Sholapur, Belgaum, Kaladgi and Dharwar, were included in the presidency, the settlement of which was completed by Mountstuart Elphinstone, governor from 1819 to 1827. His policy was to rule as far as possible on native lines, avoiding all changes for which the population was not yet ripe. The period that followed is notable mainly for the enlargement of the presidency through the lapse of certain native states, by the addition of Aden (1839) and Sind (1843), and the lease of the Panch Mahals from Sindhia (1853). Outbreaks among the troops at Karachi, Ahmedabad and Kolhapur were quickly put down, two regiments being disbanded, and the rebellions in Gujarat, among the Bhils, and in the southern Mahratta country were local and isolated. Under Sir Bartle Frere (1862–67) agricultural prosperity reached its highest point, as a result of the American Civil War, and the consequent enormous demand for Indian cotton in Europe. The money thus poured into the country produced an epidemic of speculation known as the "share mania" (1864–65), which ended in a commercial crisis and the failure of the bank of Bombay (1866). Sir Bartle Frere encouraged the completion of the great trunk lines of railways, and with the funds obtained by the demolition of the town walls (1862) he began the magnificent series of public buildings that now adorn Bombay.

During recent times the entire history of Bombay has been sadly affected by plague and famine. The great cities of Bombay, Karachi and Poona suffered most severely. At Bombay, in March 1898, a riot begun by Mohammedan weavers was not suppressed until several Europeans had been fatally injured. In Nasik district, in January 1898, the native chairman of the plague committee was brutally murdered by a mob. Bombay, like the Central Provinces, suffered from famine twice within three years. The failure of the monsoon of 1896 caused widespread distress throughout the Deccan, over an area of 46,000sq.m. with a population of 7 millions. In 1899 the monsoon again failed in Gujarat, where famine hitherto had been almost unknown; and the winter rains failed in the Deccan, so that distress gradually spread over almost the entire presidency. The worst feature was a virulent outbreak of cholera in Gujarat, especially in the native states. The Bombay government exhausted its balances in 1897, and was subsequently dependent on grants from the government of India. The financial condition has so far improved that the presidency annually makes grants to the Central Government.

In 1932 Aden, previously a political part of the presidency, became a separate province, and, in 1937, a colony administered by a governor responsible to the Colonial office.

See S. M. Edwardes, *The Rise of Bombay* (1902); James Douglas, *Bombay and Western India* (1893); Sir William Lee-Warner, *The Presidency of Bombay* (Society of Arts, 1904); *The Imperial Gazetteer of India* (1908); V. A. Smith, *The Early History of India* (revd. S. M. Edwardes, 1924); J. Abbott, *Sind* (1924).

BOMBAZINE or **BOMBASINE,** a stuff originally made of silk or silk and wool, and now also made of cotton and wool or of wool alone. Good bombazine is made with a silk warp and a worsted weft. It is twilled or corded and used for dress material. Black bombazine has been used largely for mourning, but the material has gone out of fashion. The word is derived from the obsolete French *bombasin,* applied originally to silk but afterwards to "tree-silk" or cotton. Bombazine is said to have been made in England in Elizabeth's reign, and early in the 19th century it was largely made at Norwich.

BOMBERG, DANIEL (d. 1549), a famous Dutch Christian printer of Hebrew books. His chief activity was in Venice between 1516 and 1549 (the year of his death). Among other great enterprises, he published the *editio princeps* (1516–17) of the rabbinical Bible (Hebrew text with rabbinical commentaries, etc). He also produced the first complete edition of the Talmud (1520–23).

BOMBPROOF, in military language, a shelter proof against penetration by shells.

BOMBYCILLIDAE: *see* WAXWING.

BONA, Bône, a seaport of Algeria, in 36° 52′ N., 7° 48′ E., chief town of an *arrondissement* in the department of Constantine, 220 mi. by rail west of Tunis, and 136 mi. N.E. of Constantine. The town, with modern ramparts outside the Arab wall, is in the coastal plain of Bona at the foot of the wooded gneissose Edough. Its general character is that of a flourishing French city. At the northern end is the quasi-Byzantine cathedral of St. Augustine. The Grand Mosque is built out of ruins of the ancient Hippo. The Kasbah (citadel) stands on a hill north-east of the town. The inner harbour, covering 25 ac., has quays at which vessels drawing 22 ft. can moor. Beyond is a spacious outer harbour, built 1857–68 and enlarged 1905–07. Bona communicates with Marseilles direct and ranks after Algiers and Oran in Algeria. It imports general merchandise and manufactures, and exports especially phosphates, iron and zinc, but also barley, sheep, wool, cork and esparto. There are manufactories of native garments, tapestry and leather. Narrow gauge (1.055 m.) railway lines run to Philippeville and to La Calle; an electrified standard gauge line to Duvivier. The draining of marshes at the mouths of the Seybuse and Bujema rivers, which enter the sea to the south of Bona has improved the sanitary condition of the town, which has the advantage of abundant water from the Edough. There are cork woods and marble quarries, and the valley of the Seybuse and neighbouring plains are rich in cotton and other agricultural produce. The population of the town of Bona (1936) was 83,275; Europeans, 45,048.

Bona is identified with the ancient *Aphrodisium,* the seaport of *Hippo Regius* or *Ubbo,* the ruins of which are about a mile to the south of the town.

In the first three centuries of the Christian era Hippo was one of the richest cities in Roman Africa. St. Augustine lived here as priest and bishop for 35 years. Hippo was captured by the Vandals under Genseric in 431, after a siege of 14 months, during which Augustine died. Only the cathedral, together with Augustine's library and mss., escaped the general destruction. The town was partly restored by Belisarius, but sacked by the Arabs in the 7th century. The place was named Hippo Regius (Royal) by the Romans because it was a favourite residence of the Numidian kings. Bona (Arabic *annaba,* "the city of jujube trees") was built by the Arabs, and the rulers of Tunis built the Kasbah in 1300.

From the beginning of the 14th to the middle of the 15th century it was frequented by Italians and Spaniards, and in the 16th it was held for some time by Charles V, who strengthened its citadel.

Thereafter it was held in turn by Genoese, Tunisians and Algerines. From the time of Louis XIV to the Revolution, the French *Compagnie d'Afrique* maintained a very active trade with the port. The town was taken by the French in 1832. Its growth after the discovery of iron at Ouenza and phosphates at Tebessa (1883) was rapid. Bona was an important Allied army base (1942–44).

BONACCI, LEONARDO: *see* LEONARDO OF PISA.

BONA DEA, the "good goddess," an old Roman deity of fruitfulness, both in the earth and in women. She was identified with Fauna, and by later syncretism also with Ops and Maia—the latter no doubt because the dedication-day of her temple on the Aventine was on May 1 (Ovid, *Fasti,* v. 149 *et seq.*). This temple was cared for, and the cult attended, by women only, and the same was the case at a second celebration, at the beginning of December, in the house of a magistrate with *imperium,* which became famous owing to the profanation of the mysteries by P. Clodius (*q.v.*) in 62 B.C., and the political consequences of his act. Wine and myrtle were tabooed in the cult of this deity, and myths grew up to explain these features of the cult. Herbs with healing properties were kept in her temple, and also snakes, the usual symbol of the medicinal art. Her victim was a sow (*porca*), as in the cults of other deities of fertility, and was called *damium,* and we are told that the goddess herself was known as Damia and her priestess as *damiatrix.* These names are almost certainly Greek; Damia is found worshipped at several places in Greece, and also at Tarentum, where there was a festival called *Dameia.* It is thus highly probable that on the cult of the original Roman goddess was engrafted the Greek one of Damia, perhaps after the conquest of Tarentum (272 B.C.).

See W. W. Fowler, *Roman Festivals* (1899); G. Wissowa, *Religion und Kultus der Römer* (1912).

BONA FIDE (Lat. "in good faith"), in law, a term implying the absence of all fraud. It is usually employed in conjunction with a noun, *e.g., "bona fide* purchaser," connoting the absence of notice of a defect in title; *"bona fide* holder" of a bill of exchange (*q.v.*); *"bona fide* traveller" under the licensing acts (*see* LIQUOR LAWS AND LIQUOR CONTROL).

BONALD, LOUIS GABRIEL AMBROISE, VICOMTE DE (1754–1840), French philosopher and politician, was born at Le Monna, near Millau in Aveyron. He emigrated in 1791, joined the army of the prince of Condé, and soon afterwards settled at Heidelberg. There he wrote his first important work, the highly conservative *Théorie du pouvoir politique et religieux* (1796; new ed., Paris 1854), which was condemned by the Directory. In 1806 he was associated with Chateaubriand and Fiévée in the conduct of the *Mercure de France.* After the Restoration he was a member of the council of public instruction, and from 1815–22 sat in the chamber as deputy. His speeches were on the extreme conservative side; he even advocated a literary censorship, and was a champion of ultra-montanism. In 1822 he was made minister of State, and presided over the censorship commission. In 1830 he retired to Le Monna, where he died.

Bonald was one of the leading writers of the theocratic or traditionalist school, which included de Maistre, Lamennais, Ballanche and d'Eckstein. His writings are mainly on social and political philosophy, and form a defence of political absolutism. They are based ultimately on the principle of the divine origin of language. In his own words, "L'homme pense sa parole avant de parler sa pensée;" the first language contained the essence of all truth. From this he deduces the existence of God, the divine origin and consequent supreme authority of the Holy Scriptures, and the infallibility of the church.

His son, LOUIS JACQUES MAURICE (1787–1870), cardinal (1841), was condemned by the council of State for a pastoral letter attacking Dupin the elder's *Manuel de droit ecclésiastique.*

Besides the *Théorie* above mentioned, the Vicomte de Bonald published *Essai analytique sur les lois naturelles de l'ordre social* (1800); *Législation primitive* (1802); *Du divorce considéré au XIXe siècle* (1801); *Recherches philosophiques sur les premiers objets de connaissances morales* (1818); *Mélanges littéraires et politiques, démonstration philosophique du principe constitutif de la société* (1819, 1852). The first collected edition appeared in 1817–19; the latest is that of the Abbé Migne (1859).

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BONANZA, a sudden source of great wealth; term taken from the Spanish, meaning fair weather or prosperity. The first appearance of this word in the English language was in the south-western United States, where the direct contact with Spanish vernacular gave rise to its application in mining terms, indicating a rich ore body or lode, especially of silver and gold. It is now applied to anything that yields a large income.

BONAPARTE, the name of a family made famous by Napoleon I. (*q.v.*), emperor of the French. The French form Bonaparte was not commonly used, even by Napoleon, until after the spring of 1796. The original name was Buonaparte, which was borne in the early middle ages by several distinct families in Italy. One of these, which settled at Florence before the year 1100, divided in the 13th century into the two branches of San Miniato and Sarzana. A member of this latter, Francesco Buonaparte, emigrated in the middle of the 16th century to Corsica, where his descendants continued to occupy themselves with the affairs of law and the magistracy.

CARLO BUONAPARTE [Charles Marie de Bonaparte] (1746–1785), the father of Napoleon I., took his degree in law at the University of Pisa, and after the conquest of Corsica by the

French became assessor to the royal court of Ajaccio and the neighbouring districts. In 1764 he married Letizia Ramolino, a beautiful and high-spirited girl, aged 14, descended from an old Corsican family. The first two children, born in 1765 and 1767, died in infancy; Joseph (*see* below), the first son who survived, was born in 1768, and Napoleon in 1769. Simple and frugal in her tastes, and devout in thought and manner of life, Letizia helped to bind her children to the life of Corsica, while her husband, who died in 1785, a schemer by nature, a Voltairian by conviction, pointed the way to careers in France.

Though endowed with immense wealth and distinguished by the title of *Madame Mère,* Letizia continued to live through all the years of the Empire, mainly in retirement, and always in the exercise of a strict domestic economy. After the events of 1814 she joined the emperor in the island of Elba and returned with him to Paris during the Hundred Days. After Waterloo, she took up her residence at Rome, under the protection of Pope Pius VII., who treated her with great kindness and consideration. In 1818 she addressed a pathetic letter to the powers assembled at the congress of Aix, petitioning for Napoleon's release, on the ground that his mortal illness had removed any possibility of his ever again becoming a menace to the world's peace. The letter remained unanswered, the powers having reason to believe that its terms had been previously concerted with Napoleon. Henceforth, saddened by the death of Napoleon, of her daughters Pauline and Elisa, and of several grandchildren, she lived a life of mournful seclusion. She died in 1836.

For the Bonaparte family in general, and Carlo and Letizia, see *Storia genealogica della famiglia Bonaparte . . . scritta da un Samminiatese* (D. Morali) (Florence, 1846); F. de Stefani, *Le antichità dei Bonaparte; precede per una introduzione* (L. Beretta) (Venice, 1857); L. Ambrosini and A. Huard, *La Famille impériale. Hist. de la famille Bonaparte depuis son origine jusqu'en 1860* (1860); C. Leynadier, *Histoire de la famille Bonaparte de l'an 1050 à l'an 1848 (continuée jusqu'en 1866 par de la Brugère)* (1866); A. Kleinschmidt, *Die Eltern und Geschwister Napoleons I.* (1876); D. A. Bingham, *The Marriages of the Bonapartes* (1881); F. Masson, *Napoléon et sa famille* (1897–1900); A. Chuquet, *La Jeunesse de Napoléon* (1897–99); T. Nasica, *Mémoires sur l'enfance et la jeunesse de Napoléon;* Baron H. Larrey, *Madame Mère* (1892); Walter Geer, *Napoleon and His Family* (1927); Emil Ludwig, *Napoleon* (Eng. trans., 1927).

The brothers and sisters of Napoleon I., taken in order of age, are the following:—

I. Joseph (1768–1844), was born at Corte in Corsica on Jan. 7, 1768. He was educated at the college at Autun in France, returned to Corsica in 1784, and studied law at Pisa. Like his brothers, he embraced the French or democratic side, and on the victory of the Paolist party sought refuge in France. He settled at Marseilles and married Mlle. Julie Clary, daughter of a merchant of that town. Joseph went on a mission to Genoa in 1795 in connection with plans for the recovery of Corsica. In 1796 he accompanied Napoleon in the early part of the Italian campaign, and had some part in the negotiations with Sardinia which led to the armistice of Cherasco (April 28). He took part in the French expedition for the recovery of Corsica, and helped the commissioner of the French Republic, Miot de Melito, in the reorganization of that island. In March 1797 he was appointed by the Directory minister to the court of Parma, and then to Rome. Discords arose between the Vatican and the French Republic, and it is clear that Napoleon and the French Directory ordered Joseph to encourage revolutionary movements in Rome. On Dec. 28, 1797, a disturbance took place opposite the French embassy, which led to the death of the French general Léonard Duphot. Joseph returned to Paris, and became one of the members for Corsica in the Council of Five Hundred.

Before the *coup d'état* of Brumaire he helped Napoleon in making overtures to Siéyès and Moreau, but otherwise did little. He was a member of the council of state and of the *Corps Législatif.* He concluded at Mortfontaine, a convention with the United States (1800). He also presided over the negotiations which led to the Treaty of Lunéville with Austria (Feb. 9, 1801); and he and Maret represented France in the lengthy discussions with the British envoy, Lord Cornwallis, which resulted in the signature of the Treaty of Amiens (March 25, 1802). On the question of the consolidation of Napoleon's power as First Consul for life (Aug. 1, 1802) with the chief voice in the selection of his successor, the brothers disagreed. As neither Joseph nor Napoleon had a male heir, the eldest brother claimed to be recognized as heir, while Napoleon wished to recognize the son of Louis Bonaparte. On the proclamation of the French empire (May 1804) the friction became acute. Napoleon offered to make Joseph king of Lombardy if he would waive all claim of succession to the French throne, but met with a firm refusal.

Meanwhile Joseph had striven in vain to avert a rupture with England, which came about in May 1803. In 1805 he acted as chief of the French Government while Napoleon was campaigning in Germany. Early in 1806 he was sent to Naples to expel the Bourbon dynasty. By the decree of March 30, 1806, Napoleon proclaimed Joseph king of Naples, but allowed him to keep intact his claims to the throne of France. The memoirs of Count Miot de Melito, whom Joseph appointed minister of war, show how great were the difficulties with which the new monarch had to contend—an almost bankrupt treasury, a fickle and degraded populace, Bourbon intrigues and plots, and frequent attacks by the British from Sicily. During his brief reign at Naples, Joseph abolished the relics of feudalism, reformed the monastic orders, reorganized the judicial, financial and educational systems, and initiated several public works.

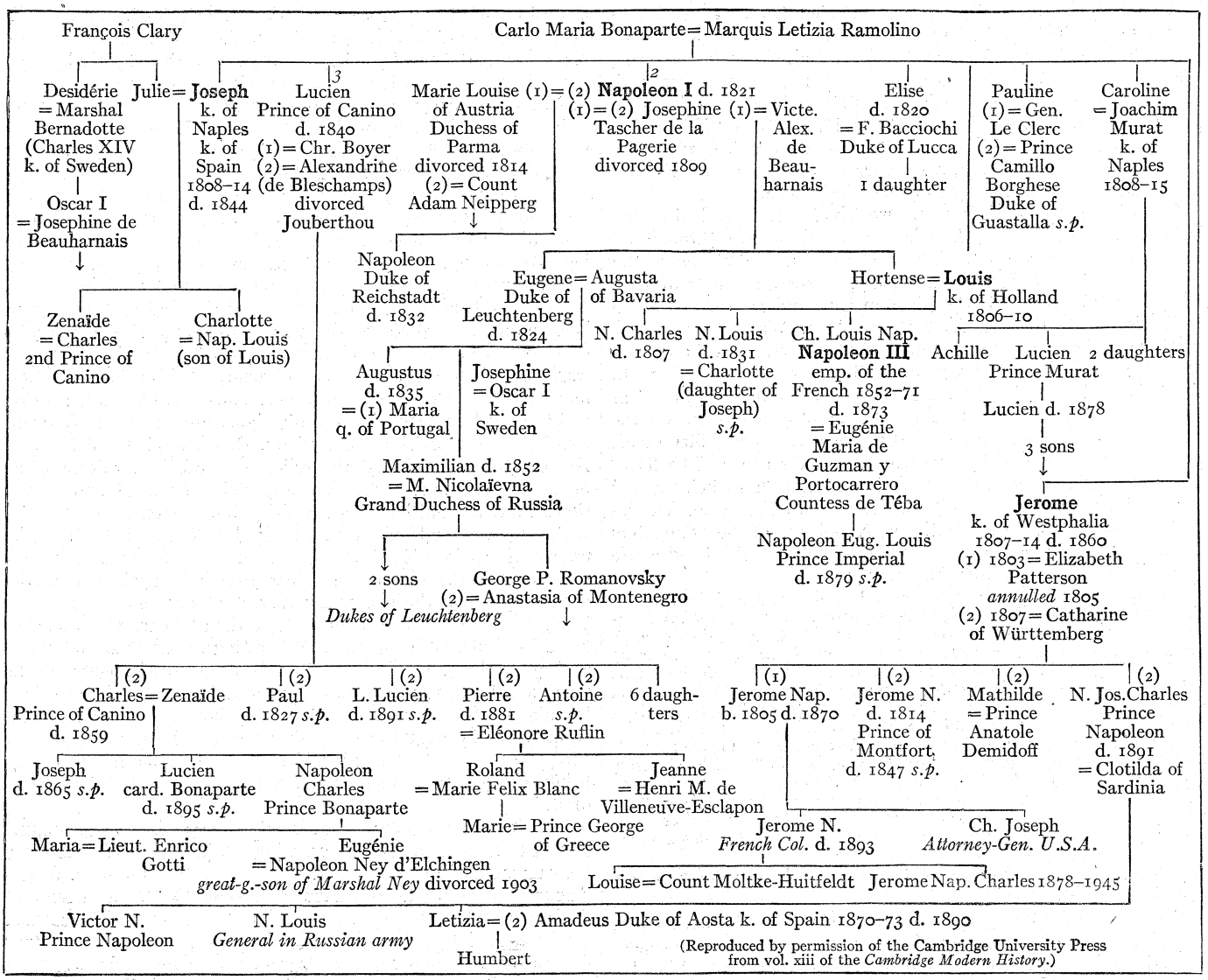
But he was suddenly called away by Napoleon to take the crown of Spain (May 1808). There his difficulties were far greater. For the fortunes of King Joseph in Spain and in the eventful years of the Peninsular War, *see* Spain and Peninsular War. His sovereignty was little more than titular. Compelled to leave Madrid hastily in Aug. 1808, owing to the Spanish success at Baylen, he was reinstated by Napoleon at the close of the year; and he was thereafter kept in a subordinate position which led him on four occasions to offer to abdicate. After his flight from Spain in 1813 the emperor wrote to the minister of war (July 11, 1813):—"His [Joseph's] behaviour has never ceased bringing misfortune upon my army; it is time to make an end of it."

Napoleon was equally dissatisfied with his brother's conduct as lieutenant-general of France, while he himself was conducting the campaign of 1814 in the east of France. On March 30, Joseph empowered Marmont to make a truce with the assailants of Paris if they should be in overpowering strength. On the surrender of the capital Joseph at once retired. The part which he played during the Hundred Days (1815) was also insignificant. After the surrender of his brother to the captain of H.M.S. "Bellerophon" at Rochefort, Joseph went to the United States. In 1830 he pleaded for the recognition of the claims of the duke of Reichstadt (king of Rome) to the French throne. He afterwards visited England, and for a time resided at Genoa and Florence. In the latter city, the cradle of his race, he died on July 28, 1844. In person he somewhat resembled Napoleon, but utterly lacked his strength and energy. He was too mild, supine and luxurious for the tasks thrust upon him by his brother. Yet his correspondence and memoirs prove that he retained for Napoleon warm feelings of affection.

Of the many works dealing with Joseph Bonaparte we may cite Baron A. du Casse, *Mémoires et correspondance politique et militaire du roi Joseph* (1854), and *Les Rois frères de Napoléon* (1883); J. S. C. Abbott, *History of Joseph Bonaparte* (1869); G. Bertin, *Joseph Bonaparte in America; Joseph Bonaparte jugé par ses contemporains* (anon.); the *Memoirs of Count Miot de Melito* (trans. ed. General Fleischmann, 1881); R. M. Johnston, *The Napoleonic Empire in Southern Italy* (with an excellent bibliography, 1904); *Correspondence of Napoleon with Joseph Bonaparte* (1856).

II. Lucien (1775–1840), prince of Canino, was born at Ajaccio on May 21, 1775. He followed his elder brothers to the schools of Autun and Brienne, but, being debarred by defective sight from the army, went to the seminary at Aix in Provence (1786). His excitable and volatile disposition agreed ill with the discipline of the place, and on the outbreak of the Revolution in 1789 he returned to Corsica, and became the leading speaker in the Jacobin club at Ajaccio. Lucien urged his brothers to break with Paoli, and headed a Corsican deputation which went to France

HOUSE OF BONAPARTE



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↓ =descendants not shown; *s.p.*=*sine prole* (*i.e.* legitima) only inserted when of some importance; (1)(2)(3)=when next to name indicates order of marriage. When above name indicates child of first or second marriage; *1*, *2* (ital.)=order of birth.

to denounce Paoli and to solicit aid for the democrats. In the south of France he worked hard for the Jacobinical cause. In May 1794, he married Catherine Boyer. The *coup d'état* of Thermidor (July 28, 1794) compelled him to accept a small post at St. Chamans. There he was arrested and imprisoned for a time until Napoleon procured his release, and found him a post as commissioner in the French army campaigning in Germany. Lucien disliked the army, and was sent to Corsica. In 1798 he entered the Council of Five Hundred at Paris as deputy for Corsica. He was president of that body on the 19th Brumaire (Nov. 10) 1799, when Napoleon overthrew the national councils of France at the palace of St. Cloud. The refusal of Lucien to put the vote of outlawry, for which the majority of the council clamoured, his opportune closing of the sitting, and his appeal to the soldiers outside to disperse *les représentants du poignard*, turned the scale in favour of his brother.

By a strange irony this event, the chief event of Lucien's life, was fatal to the cause of democracy of which he had been the most eager exponent. In one of his earlier letters to his brother Joseph, Lucien stated that he had detected in Napoleon "an ambition not altogether egotistic but which surpassed his love for the general weal; . . . in case of a counter-revolution he would try to ride on the crest of events." Lucien's suspicion of his brother became a dominant feeling; and the relations between them became strained during the period of the consulate (1799–1804). He accepted office as minister of the interior, but was soon deprived of it owing to political and personal differences with the First Consul. Napoleon then appointed him ambassador to the court of Madrid (Nov. 1800), where he again fell into disgrace with his brother. He returned to Paris, and again opposed Napoleon's schemes. Lucien's next proceeding completed the breach between the two brothers. His wife had died in 1800; he became enamoured of a Mme. Jouberthou and despite the express prohibition of the First Consul, secretly married her at his residence of Plessis on May 25, 1803. At that time Napoleon was pressing Lucien to marry the widow of the king of Etruria, and he now ordered him to leave French territory. Lucien departed for Italy with his wife and infant son, after annoying Napoleon by bestowing on her publicly the name of Bonaparte.

For some years he lived in Italy, chiefly at Rome. In Dec. 1807 the emperor sought to come to an arrangement by which Lucien would take his place as a French prince, provided that he would annul his marriage. This step Lucien refused to take; and after residing for some time at his estate of Canino, from which he took the papal title of prince of Canino, he left for America. Captured by a British ship, he was taken to Malta and thence to England, where he resided under some measure of surveillance up to the peace of 1814. Returning to Rome, he offered Napoleon his help during the Hundred Days (1815), stood by his side at the "Champ de Mai" at Paris, and was the last to defend his prerogatives at the time of his second abdication. He spent the rest of his life in Italy, and died at Rome on June 29, 1840. He

wrote an epic, *Charlemagne, ou l'Église délivrée* (2 vols. 1814), also *La Vérité sur les Cent Jours* and *Memoirs*, not completed.

For sources *see* T. Jung, *Lucien Bonaparte et ses mémoires* (1882–83); an anonymous work, *Le Prince Lucien Bonaparte et sa famille* (1888).

III. MARIANNE ELISA (1777–1820), born at Ajaccio on Jan. 3, 1777, married (May 5, 1797) Felix Bacciochi. In 1805, Napoleon bestowed upon her the principality of Piombino and shortly afterwards Lucca; in 1808 her importunities gained for her the grand duchy of Tuscany. Her pride and ability had a great influence on the administration and on Italian affairs in general. Her relations with Napoleon were frequently strained; and in 1813–14 she abetted Murat in his enterprises (*see* MURAT, JOACHIM). After her brother's fall she retired, with the title of countess of Compignano, first to Bologna and afterwards to Santo Andrea near Trieste, where she died on Aug. 6, 1820.

See J. Turquan, *Les Soeurs de Napoléon* (1896); P. Marmothan, *Élisa Bonaparte* (1898); E. Rodocanachi, *Élisa Bonaparte en Italie* (1900).

IV. LOUIS (1778–1846) was born at Ajaccio on Sept. 2, 1778. His elder brother Napoleon supervised his education and in 1795 procured for him admission to the military school at Châlons. Louis went through the Italian campaign of 1796–97 with Napoleon and acted as his aide-de-camp in Egypt in 1798–99. In 1802 the First Consul married him to Hortense Beauharnais, a forced union which led to most deplorable results. In 1804 Louis was raised to the rank of general, and entered the council of state. In the next year he became governor of Paris and undertook various military and administrative duties.

After the victory of Austerlitz (Dec. 2, 1805) Napoleon proclaimed Louis king of Holland (June 6, 1806). From the first the emperor reproached him with being too easy with his subjects. Their relations were embittered by a violent jealousy which Louis conceived against his wife. In 1808 the emperor offered Louis the throne of Spain then vacant; but on Louis refusing to accept it the honour went to Joseph. In 1809 Napoleon virtually resolved to annex Holland, in order to stop the trade which the Dutch secretly carried on with England. At the close of the year Louis went to Paris, partly in order to procure a divorce from Hortense and partly to gain better terms for Holland. He failed in both respects. After the collapse of negotiations with Great Britain in the spring of 1810, the emperor again pressed Louis hard, and finally sent French troops against the Dutch capital. Thereupon Louis fled from his kingdom and finally settled at Töplitz in Bohemia. On July 9, 1810, Napoleon annexed Holland to the French empire. Louis spent the rest of his life chiefly at Rome, concerning himself with literary and philosophic studies and with the fortunes of his sons. Their devotion to the national and democratic cause in Italy in 1830–31 gave him much pleasure, which was overclouded by the death of the elder, Napoleon Louis, in the spring campaign of 1831 in the Romagna. The failure of his other son, Charles Louis Napoleon (afterwards Napoleon III.), to wrest the French crown from Louis Philippe by the attempts at Strasbourg and Boulogne also caused him disappointment. He died on July 25, 1846. His sons were Napoleon Charles (1802–07), Napoleon Louis (1804–31), and Charles Louis Napoleon (1808–73), afterwards emperor of the French as NAPOLEON III. (*q.v.*).

The chief works on the life and reign of Louis are le comte de Saint-Leu, *Documents historiques et réflexions sur le gouvernement de la Hollande* 2nd ed. (1820); F. Rocquain, *Napoléon Ier et le Roi Louis, d'après les documents conservés aux archives nationales* (1875); Baron A. du Casse, *Les Rois frères de Napoléon* (1883); A. Garnier, *La Cour de Hollande sous le règne de Louis Bonaparte, par un auditeur* (Paris and Amsterdam, 1823); T. Jorissen, *Napoléon Ier et le roi de Hollande (1806–1813)* (Paris and The Hague, 1868); Loosjes, *Louis Bonaparte, Koning van Holland* (1888); L. Wichers, *De Regeering van Koning Lodewijk Napoleon* (1806–10) (Utrecht, 1892); *Memoirs of Queen Hortense*, ed. by Prince Napoleon and Jean Hanoteau (1928).

V. MARIE PAULINE (1780–1825), the gayest and most beautiful member of the family, was born at Ajaccio on Oct. 20, 1780. At 17 she married General Leclerc, a staff officer of Napoleon, and accompanied him to St. Domingo, where he died of yellow fever in 1802. Returning to Paris she married Prince Camillo Borghese (Aug. 23, 1803) and went with him to Rome. She soon tired of him, returned to Paris and gratified her whims in ways that caused some scandal. In 1806 she received the title of duchess of Guastalla. Her off-hand treatment of the new empress, Marie Louise, led to her removal from court in 1810. Nevertheless in 1814 she repaired with "Madame Mère" to Elba, and is said to have expressed a wish to share Napoleon's exile in St. Helena. She died in 1825 of cancer. Canova's statue of her as Venus reclining on a couch is well known.

See J. Turquan, *Les soeurs de Napoléon* (1896).

VI. MARIA ANNUNCIATA CAROLINE (1782–1839) was born at Ajaccio on March 25, 1782. Early in 1800 she married Joachim Murat, whose interests she afterwards advanced with all the power of her ambitious and intriguing nature. He became governor of Paris, marshal of France (1804), grand duke of Berg and of Cleves (1806), lieutenant of the emperor in Spain (1808), and early in the summer of that year king of Naples. The distance of this capital from Paris displeased Caroline; her relations with Napoleon became strained, and she associated herself with the equivocal movements of her husband in 1814–15. Before his tragic end at Pizzo on Oct. 13, 1815, she had retired to Austrian territory. She died on May 18, 1839.

See J. Turquan, *Caroline Murat, reine de Naples* (1899). *See* also under MURAT, JOACHIM.

VII. JEROME (1784–1860) was born at Ajaccio on Nov. 15, 1784; he shared the fortunes of the family in the early years of the French Revolution, was educated at Juilly and was called to the side of his brother, then First Consul of France, in 1800. While in the Consular Guard he fought a duel with the younger brother of General Davout and was wounded. Soon afterwards he was transferred to the navy and cruised in the West Indies, where he left his ship and travelled through the United States. At Baltimore he married Elizabeth Patterson. When in 1805 Jerome brought his wife to Europe, the emperor ordered her to be excluded from his states. Jerome vainly sought to bend his brother's will in an interview at Alexandria. In May 1805 he received command of a small squadron in the Mediterranean, while his wife proceeded to Camberwell, where she gave birth to a son. In November Jerome returned to service in the navy. Napoleon made him a prince of France, and gave him command of a division of South Germans in the campaign of 1806. After Jena, Jerome received the surrender of several Prussian towns. An imperial decree having annulled the Patterson marriage, the emperor united Jerome to the princess Catherine of Württemberg; and in pursuance of the terms of the Treaty of Tilsit (July 7, 1807) made him king of Westphalia. In the Russian campaign Jerome was entrusted with a movement which might have brought the southern Russian army into grave danger; on his failure (which was probably due to his lack of energy) the emperor promptly subjected him to the control of Marshal Davout, and Jerome returned to Cassel. In 1813, on the fall of the Napoleonic régime in Germany, Jerome retired to France, and in 1814 spent some time in Switzerland and at Trieste. Returning to France in 1815, he commanded a division on the French left wing at Waterloo and attacked Hougoumont with great pertinacity. On Napoleon's second abdication Jerome proceeded to Württemberg, was threatened with arrest unless he gave up his wife and child, and was kept under surveillance at Goppingen; finally he was allowed to proceed to Augsburg, and thereafter resided at Trieste, or in Italy or Switzerland. His consort died in 1835. He returned to France in 1847, and after the rise of Louis Napoleon to power, became successively governor of the Invalides, marshal of France and president of the senate. He died on June 24, 1860. His children were Jerome Napoleon (*see* XIV.), Mathilde (*see* XII.) and Napoleon Joseph Charles Paul (born in 1822); the last was afterwards known as Prince Napoleon (*see* XI. below) and finally became the heir to the fortunes of the Napoleonic dynasty.

The chief works relating to Jerome Bonaparte are: Baron Albert du Casse, *Mémoires et correspondance du roi Jérôme et de la reine Cathérine* (1861–66) and *Les Rois frères de Napoléon* (1883); M. M. Kaisenberg, *König Jerome Napoleon;* W. T. R. Saffell, *The Bonaparte-Patterson Marriage;* August von Schlossberger, *Briefwechsel der Königin Katharina und des Königs Jerome von Westfalen mit König*

Friedrich von Württemberg (Stuttgart, 1886–87), supplemented by du Casse in *Corresp. inédite de la reine Cathérine de Westphalie* (1888–93); A. Martinet, *Jérôme Napoléon, roi de Westfalie* (1902); P. W. Sergeant, *The Burlesque Napoleon* (1905).

VIII. Charles Lucien Jules Laurent (1803–1857), prince of Canino, son of Lucien Bonaparte, born on May 24, 1803, and died July 29, 1857, was a scientist rather than a politician and a correspondent of many learned societies. He married his cousin, Zénaïde Bonaparte, daughter of Joseph, in 1822. At the age of 22 he began the publication of an *American Ornithology* (4 vols., Philadelphia, 1825–33), which established his scientific reputation. A series of other works in zoology followed. He took part in the political agitation in Italy, and he declared himself at Venice in favour of the independence of Italy and the expulsion of the Austrians. He entered the Junto of Rome in 1848 and was elected deputy by Viterbo to the national assembly. The failure of the revolution forced him to leave Italy in July 1849. He gained Holland, then France, where he turned again to science. His principal works were, *Conspectus systematis ornithologiae, mastozologiae, erpetologiae et amphibologiae, Ichthyologiae* (Leyden, 1850), *Tableau des oiseaux-mouches* (Paris, 1854), *Ornithologie fossile* (Paris, 1858). Eight children survived him: Joseph Lucien Charles Napoleon, prince of Canino (1824–65), who died without heirs; Cardinal Lucien Louis Joseph Napoleon; five daughters; Napoleon Charles Grégoire Jacques Philippe, who married the princess Ruspoli, by whom he had two daughters.

IX. Louis Lucien (1813–1891), son of Lucien Bonaparte, was born at Thorngrove, Worcestershire, England, on Jan. 4, 1813. He passed his youth in England, not going to France until 1848, when, after the revolution, he was elected deputy for Corsica (Nov. 28, 1848); his election having been invalidated, he was returned as deputy for the Seine in June, 1849. He sat in the right of the Legislative Assembly, but had no direct part in the *coup d'état* of his cousin on Dec. 2, 1851. Napoleon III. named him senator and prince, but he took hardly any part in politics during the Second Empire, and after the proclamation of the Third Republic in 1870 he withdrew to England. There he busied himself with philology, and published notably some works on the Basque language. He died on Nov. 3, 1891, leaving no children.

X. Pierre Napoleon (1815–1881), son of Lucien Bonaparte, was born at Rome on Oct. 11, 1815. He joined the rebels in the Romagna (1830–31); was then in the United States, where he went to join his uncle Joseph, and in Colombia with General Santander (1832). Returning to Rome he was taken prisoner by order of the pope (1835–36). He finally took refuge in England. At the revolution of 1848 he returned to France and was elected deputy for Corsica to the Constituent Assembly. He declared himself an out-and-out republican and voted even with the Socialists. He pronounced himself in favour of the national workshops and against the *loi Falloux*. His attitude contributed greatly to give popular confidence to his cousin Louis Napoleon (Napoleon III.), of whose *coup d'état* on Dec. 2, 1851, he disapproved; but he was reconciled to the emperor and accepted the title of prince. The republicans at once abandoned him. From that time on he led a debauched life, and lost all political importance. In Jan. 1870 a violent incident brought him again into prominence. As the result of a controversy with Paschal Grousset, the latter sent him two journalists to provoke him to a duel. Pierre Bonaparte took them personally to account, and during a violent discussion he drew his revolver and killed one of them, Victor Noir. The High Court acquitted him of murder, and criticism then fell upon the Government. Pierre Bonaparte died in obscurity at Versailles on April 7, 1881. He had married the daughter of a Paris working-man, Justine Eleanore Ruffin, by whom he had, before his marriage, two children: (1) Roland Napoleon (b. 1858) and (2) Jeanne, wife of the marquis de Vence.

XI. Napoleon Joseph Charles Paul, commonly known as Prince Napoleon, or by the sobriquet of "Plon-Plon,"[1] (1822–1891), was the second son of Jerome Bonaparte, king of Westphalia, by his wife Catherine, princess of Württemberg, and was born at Trieste on Sept. 9, 1822. After the French Revolution of 1848 he was elected to the National Assembly as a representative of Corsica, and (his elder brother, Jerome Napoleon Charles, dying in 1847) assumed the name of Jerome. Notwithstanding his ostensible opposition to the *coup d'état* of 1851, he was designated, upon the establishment of the Empire, as successor to the throne if Napoleon III. should die childless. Privately he professed himself the representative of the Napoleonic tradition in its democratic aspect, and associated mainly with men of advanced political opinions. At court he represented the Liberal Party against the empress Eugénie. In 1854 he took part in the Crimean campaign as general of division. Returning to France he undertook the chief direction of the National Exhibition of 1855, in which he manifested great capacity. In 1858 he was appointed minister for the colonies and Algeria, but his activity was diverted into a different channel by his sudden marriage in Jan. 1859 with the princess Marie Clotilde of Savoy, daughter of Victor Emmanuel, a prelude to the war for the liberation of Italy. In this war Prince Napoleon commanded the French corps that occupied Tuscany, and it was expected that he would become ruler of the principality. The next few years were chiefly distinguished by remarkable speeches. Unfortunately his indiscretion equalled his eloquence: one speech (1861) sent him to America to avoid a duel with the duke d'Aumale; another (1865), in which he justly but intemperately protested against the Mexican expedition, cost him all his official dignities. The fatal war of 1870 was resolved upon during his absence in Norway, and was strongly condemned by him. After the fall of the Empire he lived in comparative retirement until in 1879 the death of Napoleon III.'s son, the Prince Imperial (*see* XIII. below) made him direct heir to the Napoleonic succession. His part as imperial pretender was unfortunate and inglorious, and before his death he was virtually deposed in favour of his son Prince Napoleon Victor. He died at Rome on March 17, 1891. In the character of his intellect, as in personal appearance, he bore an extraordinary resemblance to the first Napoleon, possessing similar insight, and the gift of distinguishing the essential from the non-essential. He was a warm friend of literature and art.

His eldest son, Prince Napoleon Victor Jérome Frédéric (1862–1926), became at his death the recognized head of the French Bonapartist Party. The second son, Prince Louis Napoleon, an officer in the Russian army, showed a steadier disposition, and was more favoured in some monarchist quarters; in 1906 he was made governor of the Caucasus.

XII. Mathilde Letitia Wilhelmine (1820–1904), daughter of Jerome, and sister of Prince Napoleon (XI.), was born at Trieste on May 20, 1820; after being almost betrothed to her cousin Louis Napoleon she was married in 1840 to Prince Anatole Demidov. His conduct, however, led to a separation within five years. After the election of Louis Napoleon to the presidency of the republic she did the honours of the Élysée till his marriage. She continued to live in Paris, having great influence as a friend and patron of men of art and letters, till her death on Jan. 2, 1904.

XIII. Napoleon Eugene Louis Jean Joseph (1856–1879), Prince Imperial, only son of the emperor Napoleon III. and the empress Eugénie, was born at Paris on March 16, 1856. He was a delicate boy, but when the war of 1870 broke out his mother sent him to the army. After the first defeats he had to flee from France with the empress, and settled in England at Chislehurst, completing his military education at Woolwich. On his father's death (Jan. 9, 1873) the Imperialists proclaimed him Napoleon IV., and he became the official Pretender. The Bonapartist leaders thought that he should win his crown by military prestige, and he was persuaded to attach himself as a volunteer to the British expedition to Zululand in Feb. 1879. While out on a reconnaissance with a few troopers he was surprised by Zulus, and killed (June 1, 1879). His body was brought back to England, and buried at Chislehurst.

XIV. The Bonapartes of Baltimore are a branch of the family in America, descended from Jerome Bonaparte by his union with Elizabeth (1785–1879), daughter of William Patter-

[1] Derived, it is supposed, from the nickname "Plomb-plomb," or "Craint-plomb" (fear-lead), given him by his soldiers in the Crimea.

son, a Baltimore merchant, probably descended from the Robert Paterson who was the original of Sir Walter Scott's *Old Mortality*. The marriage (*see* under VII. above) took place at Baltimore on Dec. 24, 1803. It was valid according to American law, and Pope Pius VII. refused to declare it void. Nevertheless Jerome was forced to separate from his wife, and after a stay in England she returned to Baltimore. She died in 1879. Jerome's only child by this marriage was Jerome Napoleon Bonaparte (1805–1870), who was born in England, but resided chiefly in Baltimore. He was on good terms with Jerome, who for some time made him a large allowance, and father and son occasionally met. His elder son, also called Jerome Napoleon Bonaparte (1832–93), entered the French army, with which he served in the Crimea and in Italy.

Charles Joseph Bonaparte (1851–1921), younger son of the first Jerome Napoleon Bonaparte, and a grandson of Jerome, king of Westphalia, attained a distinguished place in American politics. Born at Baltimore on June 9, 1851, and educated at Harvard university, he became a lawyer in 1874 and was elected president of the National Municipal League and occupied other public positions. He was secretary of the Navy in President Roosevelt's cabinet from July 1905 to Dec. 1906, and then attorney-general of the United States until March 1909. He died on June 28, 1921.

See A. H. Atteridge, *Napoleon's Brothers* (1909); J. B. Bishop, *Charles Joseph Bonaparte* (1922).

BONAR, HORATIUS (1808–1889), Scottish Presbyterian divine, was born in Edinburgh on Dec. 19 1808, and died there on July 31 1889. He was appointed parish minister of Kelso in 1837, and at the disruption of 1843 became minister of the newly formed Free Church, where he remained till 1866, when he went to the Chalmers memorial church, Edinburgh. In 1883 he was moderator of the general assembly of his church. Bonar's best work was done in hymnology, and he published three series of *Hymns of Faith and Hope* between 1857 and 1866 (new ed., 1886).

See *Horatius Bonar, D.D., a Memorial* (1889).

BONAVENTURA, SAINT (JOHN OF FIDANZA) (1221–1274), Franciscan theologian, was born at Bagnorea, Tuscany. He became a Franciscan about 1243 and studied at Paris under Alexander of Hales and John of Rochelle to whose chair he succeeded in 1253, having been lecturing from 1248. His opposition to the masters of the university who, under the leadership of William of Saint-Amour, sought to exclude the mendicants from teaching, was successful owing to the intervention of Alexander IV., and as a result he received the degree of doctor in 1257, some few months after he had been appointed general of his Order. He sought to reconcile the *Spirituales* and the *Relaxti*, his revised constitutions of the Order being promulgated by the General Chapter of Narbonne (1260). In 1265 he declined the archbishopric of York. In 1273 Gregory X., whose election he had been instrumental in procuring, made him cardinal and bishop of Albano, and insisted on his presence at the great Council of Lyons (1274). At this meeting he died. Bonaventura, deservedly known as "Doctor Seraphicus," was canonized in 1482 by Sixtus IV. and ranked as sixth among the doctors of the Church by Sixtus V. in 1587.

Bonaventura combined the character of a man of action with that of a philosopher, theologian and mystic. In philosophy, contrary to his friend St. Thomas, he strongly adhered to the Augustinian school with its Platonic elements, and, mindful of the Paris condemnations, accepted Aristotle only in so far as his teaching was compatible with revelation and tradition. Hence, like his Franciscan predecessors, he attributed to primary matter an imperfect actuality, and held that it was endowed with *rationes seminales* or aptitudes for the forms which it receives during the processes of becoming. Not matter alone, but the union of matter and form is the principle of individuation. Likewise in psychology, his Franciscan training is evident. Man, like all other beings, has a plurality of forms corresponding to the grades of perfection in him, but his unity is preserved by the subordination of the lower forms to the highest form, the rational soul. The most important of the lower forms is the *forma corporeitatis* (like Grosseteste, he regards it as *lux*) which, by giving actuality to the human body as to all bodies, preserves the independence of the soul and ensures its spirituality and immortality. Bonaventura also supports the hylomorphic composition of the soul, and regards the faculties as distinguished from its essence in a manner between the real distinction of St. Thomas and the identity theory of Alcher of Clairvaux. The soul's knowledge of the corporeal world is produced by the action of the active and the passive intellect on the material derived from objects by the senses. To acquire certitude this knowledge must be conformed, with the aid of Divine illumination, to the *rationes aeternae*, the ideas in the Divine mind, wherein the fullness of all sense objects is contained. In addition to this knowledge, we can have a knowledge of spiritual beings through innate species which enable the soul to know itself and in so knowing itself to know God, of whom it is the image. The existence of God is also provable by *a posteriori* arguments, by Anselm's ontological argument and by Augustine's argument from the nature of truth.

To complete philosophical speculation, which in its concern for all things leads to God, we need the imperfect but certain knowledge of God given in faith, for the soul's faculties of knowing and loving, though of Divine origin, have been contaminated by its union with the body. Faith, in its turn, is the foundation of the mystical contemplation of God, which Bonaventura regards as the glorious end of man and develops at great length after the inspiration of the pseudo-Dionysius and the Victorines. This contemplation, which requires the restoration of the image of God in the soul and the practice of prayer, meditation and the theological virtues, especially charity, by Divine grace originates in the discernment of the traces of God in the corporeal world and passes through the recognition of His image in the soul to an apprehension of His being and His infinite goodness. The perfect beatific vision is reserved for the next life.

The best known of Bonaventura's works are the commentary on the *Sentences* of the Lombard, *Itinerarium Mentis ad Deum, Breviloquium, De Reductione Artium ad Theologiam, Soliloquium, De Triplici Via, De Septem Itineribus Aeternitatis, Hexaëmeron,* and a life of St. Francis. Of the several editions, the best is that by the Franciscans of Quaracchi, *Opera Omnia,* 10 vols. (1882–1902).

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BONCHAMPS, CHARLES MELCHIOR ARTUS, MARQUIS DE (*c.* 1760–1793), Vendéan leader, was born at Jouverteil, Anjou, May 10 1760. He gained his first military experience in the American War of Independence, and on his return to France was made a captain of grenadiers in the French army. In the spring of 1793 he was chosen leader by the insurgents of the Vendée, and to his counsels may be attributed in great measure the success of the peasants' arms.

He was present at the taking of Bressuire, Thouars and Fontenay, and at Fontenay he was wounded; but dissensions among their leaders weakened the insurgents, and at the bloody battle of Cholet (Oct. 16 1793) the Vendéans sustained a severe defeat, and Bonchamps was mortally wounded. He died the next day. A statue of him by David d'Angers stands in the church of St. Florent.

BOND, SIR EDWARD AUGUSTUS (1815–1898), English librarian, was born at Hanwell, Dec. 31, 1815, the son of a schoolmaster. He was educated at Merchant Taylors' school, and in 1832 obtained a post in the Public Record Office. In 1838 he entered the manuscript department of the British Museum. In 1854 he became assistant keeper of mss., and in 1867 was promoted to the post of keeper. His work in re-organizing the manuscript department was of lasting value, and to him is due the classified catalogue of mss. and the improved efficiency of the department. From 1878–88 he was principal librarian. Under his supervision were erected the new buildings of the "White wing," which provide accommodation for prints, drawings, manuscripts,

and newspapers, and the purchase of the Stowe mss. was concluded while he remained in office. He founded, in conjunction with Sir E. Maunde Thompson, the Palaeographical Society, and first made classical palaeography an exact science. He was created K.C.B. the day before his death, on Jan. 2, 1898. He edited four volumes of facsimiles of Anglo-Saxon charters from 679 to the Conquest, *The Speeches in the Trial of Warren Hastings* (1859–61), and a number of other interesting historic documents.

BOND, SIR ROBERT (1857–1927), son of John Bond (a Devonshire man and founder of the Newfoundland branch of William Hounsell and Co.), was educated at Queen's college, Taunton, and Edinburgh university, where he studied law. He returned to Newfoundland and entered politics in 1882, when he was elected to the House of Assembly. In 1884 he became Speaker, and in 1889 Colonial Secretary under the Liberal ministry. From 1890 to 1914 he was engaged in negotiations with the French Government on the question of fishing rights, and was also largely responsible for the Hay-Bond Treaty which settled the American fishing claim. In 1900, while still Colonial Secretary, he became Prime Minister, and held these offices until 1909, when the newly formed People's Party came into power. He then used his gift of forceful eloquence as leader of the Opposition until 1914, when he resigned his seat as a protest against the divided aims of a section of the Opposition, the "Coakerites." He died on March 16, 1927, at St. John's, Newfoundland.

BOND, in English law, an obligation by deed. Its design is to secure that the obligor, *i.e.,* the person binding himself by the bond, will either pay a sum of money, or do or refrain from doing some act; and for this purpose the obligor binds himself in a penalty to the obligee, with a condition added that, if the obligor pays the sum secured (which is usually half the penalty) or does or refrains from doing the specified act, the bond shall be void: otherwise it shall remain in full force. This condition is known as the defeasance because it defeats or undoes the bond.

If the condition is not performed, *i.e.,* if the obligor does not pay the money by the day stipulated, or do or refrain from doing the act provided for, the bond becomes forfeit or absolute at law, and charges the obligor and his estate (*see* Conveyancing Act 1881, s. 59). In old days, when a bond was forfeit, the whole penalty was recoverable at law and payment *post diem* could not be pleaded to an action on it, but the court of chancery early interposed to prevent oppression. It held the penalty of a bond to be the form, not the substance of it, a pledge merely to secure repayment of the sum bona fide advanced, and would not permit a man to take more than in conscience he ought, *i.e.,* in case of a common money bond, his principal, interest and expenses. This equitable relief received statutory recognition by an act of 1705 which provided that, in case of a common money bond, payment of the lesser sum with interest and costs shall be taken in full satisfaction of the bond. In cases of special conditions, the court of equity will relieve from a penalty, but if the sum agreed to be paid on default is held to be real damages, it will not interfere. The leading case is *Kemble* v. *Farren* (1829) 6 Bingham 148.

Bonds were and still are given to secure performance of a variety of matters other than the payment of a sum of money at a fixed date. They may be given and are given, for instance, to guarantee the fidelity of a clerk, of a rent collector, or of a person in an office of public trust, or to secure that an intended husband will settle a sum on his wife in the event of her surviving him, or that a building contract shall be carried out, or that a rival business shall not be carried on by the obligor except within certain limits of time and space. The same object can often be more conveniently attained by a covenant and covenants have largely superseded bonds, but there are cases where security by bond is still preferable to security by covenant.

Bonds given to secure the doing of anything which is contrary to the policy of the law are void. It was not without design that Shakespeare laid the scene of Shylock's suit on Antonio's bond in a Venetian court; the bond would have had short shrift in an English court.

Post Obit Bonds.—A post obit bond is one given by an expectant heir or legatee, payable on or after the death of the person from whom the obligor has expectations. Such a bond, if the obligee has exacted unconscionable terms, may be set aside.

Bottomry Bonds.—A bottomry bond is a contract of hypothecation by which the owner of a ship, or the master as his agent, borrows money for the use of the ship to meet some emergency, *e.g.,* necessary repairs, and pledges the ship (or keel or bottom of the ship, *partem pro toto*) as security for repayment. If the ship safely accomplishes her voyage, the obligee gets his money back with the agreed interest; if the ship is totally lost, he loses it altogether. A *Respondentia Bond* is one in which the cargo alone is charged.

Lloyd's Bonds.—Lloyd's bonds are instruments under the seal of a railway company, admitting the indebtedness of the company to the obligee to a specified amount for work done or goods supplied, with a covenant to pay him such amount with interest on a future day. They are a device by which railway companies were enabled to increase their indebtedness without technically violating their charter. The name is derived from the counsel who settled the form of the bond.

Debenture Bonds.—Debenture bonds are bonds secured only by the covenant of the company without any floating or fixed charge on the assets. (*See* COMPANY LAW: *Debentures.*)

Recognizance.—A recognizance differs from a bond in being entered into before a court of record and thereby becoming an obligation of record.

Heritable Bond is a Scots law term, meaning a bond for money, joined with a conveyance of land, and held by a creditor as security for his debt.

For goods "in bond" *see* BONDED WAREHOUSE.

BONDAGER, a word meaning, generally, a servant, but specially used in the south of Scotland and Northumberland as the term for a female outworker whom a married farm-labourer, living in a cottage attached to the farm, undertakes as a condition of his tenancy to supply for field-labour, sometimes also to board and lodge. The origin of the system was a dearth of field-labour.

BONDE, GUSTAF, COUNT (1620–1667), Swedish statesman, advocated a pacific policy at a time when war on the slightest provocation was the watchword of every Swedish politician. In 1659 he succeeded Herman Fleming as lord high treasurer, and was one of the council of regency appointed to govern Sweden during the minority of Charles XI. In 1661 he presented to the senate a plan which aimed at rendering Sweden altogether independent of foreign subsidies, by a policy of peace, economy and trade-development, and by further recovery of alienated estates.

His budget in the following year, framed on the same principles, subsequently served as a guide to Charles XI. Bonde's tenacity of purpose enabled him for some years to fulfil his programme; but the ambition of the oligarchs, and the fear and jealousy of innumerable monopolists who rose in arms against his policy of economy, by the resumption of the alienated Crown lands, proved at last too strong for Bonde, while the costly and useless expedition against Bremen in 1665, undertaken contrary to his advice, completed the ruin of the finances. He practically retired from the Government some time before his death.

See Martin Veibull, *Sveriges Storhetstid* (Stockholm, 1881).

BONDED DEBT, that portion of the indebtedness of a government or subdivision of government, or of a business, firm or corporation which is represented by outstanding bonds. This is often known as the "funded debt." The bonds representing the bonded or funded debt create a fixed financial charge in the form of interest, which, in a business, must be met at each period to prevent foreclosure; hence, care must always be taken to avoid issuing more bonds than can be properly cared for.

BONDED WAREHOUSE. A warehouse in which goods liable to customs or excise duties may be stored without the duty being paid, subject to supervision by revenue officers and to security being given for eventual payment of duty if the goods are not exported. Bonded warehouses constitute an important feature of the revenue machinery in all fiscally-developed countries, their function being to enable merchants to hold stocks of dutiable goods without paying the duty until these goods are to be put

on the home market, and without paying it at all if they are exported. In the latter case merchants avoid the lock-up of capital in the payment of duties, and in the former case the period between payment of duty by the merchant and his recoupment by his customer is minimized, thus reducing the amount of working capital required. Customs duties are of greater antiquity than excise (internal) duties, and the original use of bonded warehouses was for the storage of imported goods, on which customs duties fall. There are, however, examples of the use of bonded warehouses for goods liable to excise duties.

A bonded warehouse is essentially a place for the storage of goods, but operations necessary for their preservation during storage, simple forms of treatment to improve their condition and their preparation for sale or exportation, are permitted. Examples are the "repacking" of goods into packages of different sizes; blending and bottling wines or spirits; fortifying wine with added spirit. As a rule manufacturing processes are not allowed to be carried on in bonded warehouses, but there are exceptions, *e.g.*, the smelting and refining of crude ores in the United States. Goods for the home market pay duty according to the tariff in force at the time of withdrawal from a bonded warehouse. Allowance is made for unpreventable losses in warehouse attributable to such causes as evaporation, leakage, etc., and merchants are only required to pay duty upon the quantity remaining at the time of withdrawal.

Origin and History.—In the United Kingdom, the beginnings of the bonded warehouse system go back to 1700, when provision was made for the "wrought silks" of India and Persia, the use of which at home was prohibited, to be deposited in bonded warehouse for re-exportation. In 1709 pepper and in 1742 rum, were allowed to be deposited in bond, either for subsequent re-exportation or home consumption. Tea, rice and tobacco followed, and in 1803 a general warehousing act brought further extensions. The consolidation of customs acts in 1825 brought the bonded warehouse system to something approaching its modern scope. The main customs law as to bonded warehouses is contained in the Customs Consolidation Act, 1876 (39 and 40 Vict., cap. 36), although alterations of detail have been effected by later acts. The principal statutory provisions relating to excise bonded warehouses are contained in the Spirits act, 1880 (43 and 44 Vict., cap. 24). British spirits are regularly deposited in bonded warehouses for storage and maturing. The Customs and Inland Revenue act, 1881, as amended by the Revenue act, 1898, allowed imported goods, *i.e.*, goods subject to customs duties, to be deposited in excise warehouses, and goods liable to excise duties in customs warehouses. Since the amalgamation of the customs and excise departments in 1909 the distinction between customs warehouses and excise warehouses has ceased to exist.

Bonded warehouses in the United Kingdom are provided, not by the Government, but by private individuals or companies—frequently port authorities—who charge merchants for the storage of their goods. Every bonded warehouse must be approved by the commissioners of customs and excise, and its construction must conform to rules designed to secure that goods cannot be taken out without the knowledge of the revenue officers. A bonded warehouse may be approved for the storage either of dutiable goods in general or of one or more specified classes of dutiable goods. There are bonded warehouses at all the principal seaports and also at many inland places. The bond required as security for the duty on the goods is entered into by the proprietor of the warehouse.

The doors of bonded warehouses are locked outside working hours with revenue locks, in addition to those affixed by the proprietor; but the proprietor remains solely responsible for the safe custody of the goods and the revenue officers are concerned only to see that none pass into consumption without paying the proper duty. Goods not liable to any duty, and goods, the importation of which into the United Kingdom is prohibited, may not be deposited in bonded warehouses. "Forestalling," or the withdrawal of abnormal quantities of goods on the eve of a budget with a view to escaping an expected increase of duty, may be prevented by the commissioners of customs and excise, who are empowered by law to restrict the quantities which may be withdrawn at such times. Facilities are given for the inspection of goods and the taking of samples by the owner or prospective purchasers, and goods may be sold "in bond" to await withdrawal by the purchaser when he requires them.

With regard to bonded warehouses in other countries, the general statements in the opening paragraph above sufficiently describe the essential conditions, although there is some diversity in details of practice. To mention one important particular, the provision of bonded warehouses is not invariably left to private enterprise, but may be undertaken by the State or a municipality.

United States.—In the United States the bonded warehousing system was inaugurated in 1846 when it was provided by law that goods might be deposited in public warehouses for a period not exceeding a year. The time was subsequently extended to three years, and varying types of warehouses were authorized.

The secretary of the Treasury in the United States is in charge of the warehousing system with authority to make rules. In general, warehouses may be (1) Government owned or leased, and under the direct control of the collector of customs; (2) private importers' bonded warehouses established as a special provision for a large importer; (3) private bonded warehouses, doing a general storage business or dealing with specific articles such as grain or wines, permission being secured from the secretary of the Treasury and the goods remaining under the control of Government officials; and (4) manufacturing warehouses in which goods intended for export may be manufactured from imported materials without the payment of duty.

Goods remaining in custody for over three years may be sold under regulations prescribed by the secretary of the Treasury. At any time within three years they may be withdrawn upon payment of the duties and discharges, or may be shipped in a manner prescribed by the secretary of the Treasury to another port and held there under the same circumstances as if originally imported at that place.

For the statutory provisions governing bonded warehouses *see* the *Code of the Laws of the United States of America*, Title 19, Subtitle IV., Part 4.

BONDFIELD, MARGARET GRACE (1873–), British politician, was born March 17 1873, at Chard, Somerset. She early became an assistant in a draper's shop at Brighton, but soon she moved to London, and in 1898 became assistant secretary of the National Union of Shop Assistants. In 1921 she succeeded Mary Macarthur as secretary of the National Federation of Women Workers. She was made chairman of the Trades Union Congress in 1923, and in November of that year was elected M.P. for Northampton. In the Labour Government of 1924 she was parliamentary secretary to the Ministry of Labour, and did notable work as British Government delegate on the Governing Body of the International Labour office and at the Sixth Session (Geneva, 1924) of the International Labour Conference, especially in connection with the development by international agreement of facilities for the utilization of the spare time of the workers, on which subject a general Recommendation, which has proved of great value, was adopted by the Conference. She was M.P. for Wallsend, 1926–31, and minister of labour 1929–31, being the first woman in a British cabinet.

See M. A. Hamilton, *Margaret Bondfield* (1924).

BONDING, in brickwork or masonry, the building of the bricks or blocks in such fashion that the joints of successive courses or layers do not vertically coincide and so weaken the structure. This rule of avoiding adjacent vertical joints is termed "breaking joint." There are various ways of laying bricks to secure good bonding. (*See* BRICKWORK.)

BONDU, a French protectorate in West Africa, dependent on the colony of Senegal. Bondu lies between the Faleme river and the upper course of the Gambia, between 13° and 15° N., and 12° and 13° W. The country is plateau, dissected in the southern and central parts, which are generally unproductive, and covered with stunted woods. The lower country is more fertile, and grows baobab, tamarind and various fruit-trees. The Bondu streams flow rapidly during the rains but are empty in the dry season. The

inhabitants are mostly Fula, though the trade is largely in the hands of Mandingos. Mohammedanism is fairly generally distributed. Mungo Park, in 1795, was the first European to visit the country. The royal residence was then at Fatteconda, but was moved before 1818 to Bulibani, a small clay walled town. In 1845 the king signed a treaty recognizing French sovereignty over his country. It was at first disregarded by the natives, but in 1858 Bondu came definitely under French control. (*See* SENEGAL.)

BOND VALUE TABLES, tabulations from which may be ascertained the value of bonds of definite maturity when bought to produce a certain rate of yield. The tables are usually found in book form, generally show bond maturity up to 50 years, with stipulated interest rates from 3% to 7%, and with various fractional yields. There are quite a number of such books published in the United States, varying slightly in terms, rates and yields covered.

In some, the order is reversed and the tables show what the yield will be when the bond is bought at some definite price.

BONE, HENRY (1755–1834), English enamel painter, born at Truro. He was employed by London jewellers for small designs in enamel, and in 1800 the beauty of his pieces attracted the notice of the Royal Academy, of which he was admitted an associate; in 1811 he was made an academician. Up to 1831 he executed many beautiful miniature pieces of much larger size than had been attempted before in England; among these are 85 portraits of the time of Queen Elizabeth, of different sizes, from 5 by 4 to 13 by 8in., now at Kingston Lacey, Wimborne, Dorsetshire. These, and pieces in the Wallace Collection, London, were his greatest works.

BONE, SIR MUIRHEAD (1876–), British painter and etcher, born at Glasgow on March 23, 1876, son of David Drummond Bone, a journalist. He first studied architecture and then art in the evening classes of the Glasgow school of art. Being attracted by the picturesque aspect of buildings he executed drawings of views in his native town. It is as an etcher whose method is that generally of dry-point and as a draughtsman with pencil, charcoal and sepia that Bone has become known. In 1899 he issued a *Portfolio* with etchings of Glasgow. He moved to London in 1901 where the exhibition of his works in 1903 established his fame. In 1904 ten of his dry-points were published by Obach. His work displays a devotion for every form of intricate scaffolding; thus his famous etching "The Great Gantry" (1906) is a study of Charing Cross railway station after the accident to the roof in 1905, with a network of scaffolding set up for reconstruction. This and his "Ayr Prison," "Building," "The Shot Tower," "Liberty's Clock" are among the finest things in dry-point. During the war he was appointed official artist at the western front and with the fleet. He was knighted in May 1937.

He illustrated several books: Gertrude Bone's *Children's Children* (1907) and James Bone's *The London Perambulator* (1925).

See Campbell Dodgon, *Etchings and Drypoints by Muirhead Bone* (1909).

BONE, the hard tissue constituting the framework of the animal skeleton. For anatomy *see* SKELETON and CONNECTIVE TISSUES.

BONE, INDUSTRIAL USES OF. There is an application for every constituent of bones, the by-product of the meat trade, in various branches of industry. Besides the direct use of bones for such articles as buttons, knife-handles, etc., there is a large range of valuable secondary products. The mineral matter—phosphates, lime—is of value as artificial manure and as a component of porcelain; the fat is worked up by the soap-maker and chandler, and the gelatinous constituents are the source of much of the glue and gelatin of commerce. Further, by dry distillation, not only bone charcoal, a valuable purifying medium, but ammonia and bone-tar are obtained.

Degreasing.—For all purposes the *degreasing* of the bones is the first process to be carried out. The leg and thigh bones, termed "marrows" (containing 18–20% of fat), are the most valuable and are treated separately. The ends are sawn off and worked up with other bones; the marrows are steeped in weak brine for three days to free them from fibrous matter, blood, etc., and are then simmered in hot water for six hours. The boiling period is kept to a minimum lest the bones become too soft for working. The fat which rises to the surface is skimmed off. It is pale in colour and is used in pharmacy for the manufacture of pomades, and by the soap-maker. The boiled out bones are cooled, individually scrubbed to clean them, dried and sold to the button and fancy goods trade, finding their chief markets in Germany and France. The shavings and scrapings from the bone-carvers are treated for high-grade gelatin, while the fine meal from the drills, etc., finds a use in poultry- and dog-foods.

The feet of sheep, horses and cattle (the hoofs having been removed) are also treated separately by the simple boiling process. These bones yield oils which are largely consumed in the manufacture of the more delicate grades of leather. *Neat's foot oil* (strictly the oil from the feet of cattle only), when separated from any deposited solid stearine, is used as a lubricant for delicate machinery such as clocks, guns, etc., being valued on account of its low solidifying temperature ("cold test" 25°–28°F.).

The open boiling process only recovers about one-half of the fat contained in the bones, and is unsuitable for old and putrid bones, on account of the inferior yield and because of the offensive odour emitted from the vats. A better yield is obtained by treating the broken bones in autoclaves with open steam under two or three atmospheres pressure. If the steaming is not unduly prolonged only a small amount of the glue-yielding constituents is leached out, and a good quality fat results if fresh bones are employed. Bones contain, on an average, 12% of fat, of which 70% is recoverable by this method.

The grease may be pressed, yielding *fatty bone oil* which resembles neat's foot oil in its properties and is used for the same purposes.

Whale bone oil is extracted by similar treatment, but usually at the blubber-refining stations.

Benzine Process.—Practically the whole of the fat contained in bones can be recovered without any loss of gelatinous material by the *benzine extraction process*. The fat is extracted by digesting the bones with petroleum ether (benzine) or Scotch shale oil (boiling point 212°–270°F.). The grease recovered from the extract by distilling off the solvent is dark in colour, of rank odour, and consequently unsuitable for soap-making, although on the continent a certain amount of extracted bone-fat is used for this purpose. The bulk of the product passes to the candle-maker, who recovers the fatty acids which are satisfactorily bleached by distillation.

The degreased bones are passed on to the glue makers, benzine-extracted bones being very suitable. The gelatinous material is extracted by digestion with steam and hot water in open vessels, or with direct steam under pressure in autoclaves.

The weak glue liquors which are obtained as a by-product from the boiling process of degreasing can be partially concentrated, until on cooling they set to a jelly containing 75% water; this jelly is marketed as *size*. The glue liquors from the degelatinizing treatment are clarified if necessary with alum, and may be bleached with sulphurous acid gas; they are then evaporated (preferably under vacuum) to such a concentration (equivalent to about 33% dry glue) that on cooling in shallow troughs the solution "jellies." The jelly is cut into cakes and dried to give *glue*. Off-colour and twisted cakes are ground to a powder and marketed as *concentrated size*. Besides its use in joinery and furniture-making, there is a large consumption of glue in the paper and book-binding trades; the great textile industries absorb considerable quantities of glue and size for dressing and finishing yarns, sizing woollen threads, stiffening carpets, etc. There are numerous minor applications of glue, including use in preserving ropes, in the preparation of caoutchouc substitutes, etc.

Liquid Glues.—These are glues treated with acids, such as phosphoric, acetic or nitric acid. In the presence of acid the gelatinizing property is lost and the glue solution remains liquid when cold, but the adhesiveness is unimpaired.

Gelatin.—This is prepared from bones pre-treated with hydrochloric acid to remove the phosphate of lime. Carefully picked, spongy-bones are chosen and well cleansed. The decalcified bones

are treated with hot water and steam; the fat being skimmed off, the gelatin is obtained by evaporation of the aqueous liquors. Gelatin is used for photographic emulsions, as a culture medium in bacteriology, for culinary purposes and for the clarifying of wines and beers; it is also employed as a dressing for white fabrics, silks and straw hats.

The residual degreased and degelatinized bones are ground to a meal and used as fertilizer, being valuable on account of the phosphate of lime content. Raw bones are rarely used by the farmer. More often the bone-meals are converted into "superphosphates." To effect this the ground bone-residues are treated with sufficient sulphuric acid to convert the insoluble tri-calcium phosphate $Ca_3(PO_4)_2$ of the bones into the more soluble mono-calcium phosphate $CaH_4(PO_4)_2$ which is more readily assimilated by the plants.

Dissolved Bones.—This is the term strictly applicable to the superphosphate manufactured from degreased bones only; not being degelatinized, these bones furnish nitrogen to the soil without the necessity for compounding with additional ammoniacal salts. The expression is loosely used for superphosphate fertilizers made chiefly from bones.

Animal Charcoal.—One of the most valuable products from bones is *animal charcoal* (or *boneblack*) which is obtained as a residue from the carbonization of degreased bones (which may be partly degelatinized as well) out of contact with air. The bones are carbonized in retorts (usually horizontal ⌒ section) very similar in design to coal-gas retorts. The volatile products comprise a gas suitable for illumination and heating, a tar, and aqueous ammoniacal liquors. The tar is redistilled, giving a volatile product condensing to "bone oil" ("Dippel's oil," "oil of hartshorn"). There is no practical use for this "bone oil," which is a mixture of pyridine and fatty amine derivatives with a most offensive odour, except as a fuel for the factory boilers. There remains in the tar-still a valuable pitch (amounting to 14 lb. per ton of bones treated) which is used in the manufacture of black varnishes such as Brunswick black. The ammonia liquors are steam-distilled and the ammonia recovered as sulphate from sulphuric acid collectors; the product is impure but suitable for fertilizer.

The residual charcoal, which is the most valuable product of the carbonization, is removed from the retorts into closed iron coolers, and protected from exposure to air until cold. It is then crushed and graded. Bone charcoal is employed as a decolourizing and refining medium, chiefly in the sugar industry, which consumes enormous quantities; it was used in France to decolourize beet-sugar solutions as early as 1812. The fine dust charcoal is sifted out and used in the preparation of blackings and "ivory black." In sugar-refining the "char" is required from lentil to nut-size; about one ton is needed to decolourize one ton of sugar, but the char can be revivified by washing and reburning (out of contact with air) for a life of about two years. When the decolourizing power is exhausted the *spent char* is discarded by the sugar manufacturer, but finds a ready market as a source of superphosphate; or it may be calcined in air to *bone ash.*

Bone Ash.—This, also obtained by burning fresh bones, is composed of calcium phosphate; it is used to make cupels for assaying, and is an important constituent of the paste used for "English bone china" (English soft porcelain). When treated with sulphuric and phosphoric acids, bone ash yields a substitute for cream of tartar in baking powders.

BIBLIOGRAPHY.—*See* Lewkowitsch, *Oils, Fats and Waxes* (1923) for Bone Fat; Thorpe, *Dictionary of Applied Chemistry* (1923) for Bone Oil; T. Lambert, *Bone Products and Manures* (1925).

(E. L.; G. H. W.)

BONE BED, a term loosely used by geologists to denote any stratum or deposit which contains bones. It is applied therefore not only to those interstratified layers occurring at definite geological horizons, but also to the brecciated and stalagmitic deposits found on the floors of caves. The stratified deposits are frequently associated with current bedding and probably indicate a sorting out and segregation of the heavier bony material accompanying partial or complete removal of the finer sediment by the action of currents. A well known bone bed of this nature, the Ludlow Bone Bed, composed of fragments of spines, teeth and scales of ganoid fish, occurs at the base of the Downton Castle Sandstone in Britain.

BONE-LACE, a kind of lace made upon a cushion from linen thread; the pattern is marked out with pins, round which are twisted the different threads, each wound on its own bobbin. The lace was so called from the fact that bobbins were formerly made of bone. (*See* LACE.)

BONER or **BONERIUS, ULRICH** (fl. 14th century), Swiss writer of fables, was born in Berne. He was descended from an old Bernese family, and, as far as can be ascertained, became a monk; yet, as he subsequently married, it appears that he received the "tonsure" only and was thus entitled to the benefit of the *clerici uxoriati,* who, on divesting themselves of the clerical garb, could return to secular life. He is mentioned in records between 1324 and 1349, but neither before nor after these dates. He wrote, in Middle High German, a collection of fables entitled *Der Edelstein* (*c.* 1349), one hundred in number, which were based principally on those of Avianus (4th century) and the *Anonymus* (edited by I. Nevelet, 1610). This work he dedicated to the Bernese patrician and poet, Johann von Rinkenberg, advocatus (*Vogt*) of Brienz (d. *c.* 1350). It was printed in 1461 at Bamberg—the first book printed in the German language.

Der Edelstein has been edited by G. F. Benecke (1816) and Franz Pfeiffer in vol. iv. of *Dichtungen des deutschen Mittelalters* (Leipzig, 1844); a translation into modern German by K. Pannier will be found in Reclam's *Universal-Bibliothek* (Leipzig, 1895). *See* also C. Waas, *Die Quellen der Beispiele Boners* (Giessen, 1897).

BONES, DISEASES AND INJURIES OF. The more specific diseases affecting the bones of the human body are treated under separate headings (*see* TUBERCULOSIS; VENEREAL DISEASES, etc.); in this article injuries, inflammations and tumours of bone are dealt with.

There are two kinds of bone, the compact, which is dense and hard and forms the shafts of the long bones of the limbs and fingers, and the cancellous, which is bone of a more open, spongy structure, and forms the ends of the long bones and the whole of such bones as the vertebrae and those of similar shape. Every bone is closely invested by a thin, fibrous sheath—the periosteum—which adheres closely to it and affords attachment for muscle and tendons. It also plays a part in the production of new bone, not only during the period of growth but also in conditions of injury and disease. A typical long bone consists of a shaft composed of compact bone and of two articular ends formed of cancellous bone, the line of union between them being known as the epiphyseal line, which is a narrow zone of actively-growing bone cells. It is here that growth in the length of the bone occurs until adult life is reached, when the epiphysis disappears and no further increase in length is possible. Injury or disease of the epiphyseal line may result in cessation of growth forthwith, or in certain rare cases it may produce excessive growth with the result that the affected limb becomes longer than its fellow. In rickets (*q.v.*) the epiphyseal line becomes widened and very irregular, thus producing the characteristic changes at the wrist and in the ribs. The shaft of a long bone is hollow and is filled with marrow, a fatty tissue possessing numerous blood vessels which branch in all directions and enter the bone through tiny channels for the purpose of supplying it with nourishment.

Injuries of bone vary considerably, the kind and extent depending upon the nature and the force of the violence producing them. At one end of the scale is the simple bruise resulting from a slight injury which tears a few minute blood vessels in the periosteum, and allows the escape of a small quantity of blood into the surrounding tissues, including the space between the periosteum and the bone; the effused blood is soon absorbed, the swelling goes down, and recovery is complete. But not always, for sometimes a little permanent swelling remains as a result of the escape of blood between the bone and the overlying periosteum, which is thereby excited into activity and produces a layer of new bone upon the surface of the old. At the other end of the

scale is the complete shattering of a bone by a fragment of shell or a rifle bullet fired at close range.

Fractures (*q.v.*) constitute by far the largest proportion of injuries to bone. In the aged the bones become more brittle and break as the result of a degree of violence which in earlier life might almost pass unnoticed. In the very young the opposite condition obtains, for the bones are relatively soft and the fracture may be of the Greenstick variety, in which the bone bends instead of breaking completely through.

There is a rare disease known as fragilitas ossium, in which for some unknown reason the bones are unduly fragile, and fractures repeatedly follow trivial injuries.

Fractures are also described as being simple and compound. A simple, or, as it is now usually called, a closed fracture, is one where the overlying skin is not injured, or at least not injured in such a way as to establish communication between the broken bone and the external air. A fracture is described as compound, or open, when the overlying skin is damaged in such a way as to expose the injured bone to the danger of infection by microbes gaining entrance from the outside air through the broken skin.

The detection of a fracture depends upon intelligent appreciation of the symptoms following the injury. These may be very obvious, for the limb may be grossly deformed and shortened by overlapping of the fragments, and on examination a grating feeling may be elicited—crepitus—when the broken ends are moved. But in some cases the swelling of the soft parts is so great that it is difficult for the medical attendant to determine whether a fracture is present or not. It is in these cases that X-rays have developed one of their greatest uses in medicine, and it is an almost universal custom to have an X-ray photograph taken in all cases of injury to bone.

Treatment of Fractures.—As soon as the presence of a fracture is detected it is essential to get the broken ends into close apposition with one another by one of the numerous means available. It may be possible to effect this by ordinary manipulation, with or without an anaesthetic, but in many cases this proves impossible and more radical measures have to be adopted. An operation is then undertaken on the following general lines.

The site of the fracture is exposed by an incision through the overlying soft parts and the fractured ends of the bone are brought into close contact with one another; they are then held in position temporarily by means of special bone forceps. It is then necessary to decide what particular method shall be utilized for the purpose of obtaining permanent fixation. A complicated fracture in a large bone like the thigh bone affords plenty of scope for the ingenuity of the surgeon. He may decide to fix the broken ends together with wire of silver, or some similar material of sufficient tensile strength to bear the strain, and sufficiently soft to admit of easy manipulation; but in all probability, with so large and strong a bone to deal with, he will not pin his faith on wire but will adopt the more difficult but more certain method of *plating*.

Plating consists in bridging the fracture with a narrow steel plate from three to six inches in length which is fixed by several screws to the uninjured bone above and below the fracture. This method of fixation of fractures with wire or metal plates has the disadvantage that the foreign body necessarily left in the limb may subsequently give rise to trouble and have to be removed. This difficulty has led to the development of still another method by means of plates fashioned from beef-bone and fixed by beef-bone screws or pegs. These are carefully prepared from the leg bones of the ox, are sterilized by boiling, and have this great advantage, that after their work is done they are slowly absorbed by the tissues and in time completely disappear.

Operations of this character are serious undertakings only embarked upon after careful consideration of all the factors in the case, and after failure to adjust and maintain the bone in position by simpler means. They are not of course confined to the treatment of recent fractures, but are also applicable to old-standing cases of non-union or mal-union which have resulted from ineffective or inefficient treatment. Such non-union or mal-union frequently arises from causes outside the control of the medical attendant, as for example in cases of compound fracture resulting from gunshot wounds or other causes, where injury to the soft parts precludes successful and immediate treatment of the fracture itself.

Inflammations of bone fall into two categories, the acute and the chronic. The acute forms include the simple and evanescent conditions resulting from slight injuries, but they also include the disease known as acute osteomyelitis, the most violent and the most serious inflammatory condition of bone. Generally speaking, it is a disease of young people and is due to infection of the interior of the bone by staphylococcus pyogenes aureus—the same microbe that causes boils and carbuncles; indeed, this disease might in a sense be well described as a carbuncle of bone. Owing to the confined space available, the pus resulting from the inflammation is formed under so much pressure that great pain, high temperature and great constitutional disturbance soon manifest themselves. The pus rapidly makes its way up and down the marrow cavity and also outwards through the bone, and so collects under the periosteum which it strips from the bone, thus depriving it of some of its blood supply. The simultaneous destruction of blood vessels in the marrow by the pressure of pus may be so complete as totally to deprive the affected part of the bone of its essential blood supply and cause its death, or necrosis, the dead portion of bone subsequently becoming separated from the living and forming a sequestrum. Since this disease nearly always affects the bone near a joint it is often mistaken at its onset and treated for acute rheumatism, even by skilled observers. This is a serious matter, for osteomyelitis is so grave a disease and is so apt to be complicated by general blood-poisoning (septicaemia) that delay in its detection may cost the limb or even the life of the patient. The appropriate treatment is immediate incision over the affected area, the evacuation of the pus found under the periosteum, and the opening up of the marrow cavity in order to permit of free escape of the poisonous products from the interior of the bone. But no matter how prompt and how successful the treatment may be, recovery is slow and healing long delayed.

Chronic inflammations of bone may be produced by a variety of infective agents, including the organisms of syphilis and typhoid, but by far the most common and most important is the tuberculosis bacillus which especially selects the cancellous ends of the long bones or such cancellous bones as the vertebrae for its attacks, producing the slow destructive effect known as tuberculous caries. The treatment of this disease has fortunately undergone a revolution in recent years, for the drastic and crippling operations formerly in use are now replaced by a régime which includes complete rest of the affected part and, very limited and conservative surgical operations for the purpose of evacuating abscesses, combined with sunlight treatment, real or artificial. When persevered with, such methods almost always effect a cure in every case. Prof. Rollier of Leysin has been a pioneer in the development of this line of attack upon the tuberculosis of bone, and great success has been obtained at his clinic in the Swiss mountains. Similar methods of treatment have been proved to be possible in our English climate, and at the Treloar Home for Cripples at Alton a high degree of success has been obtained.

Tumours, or new growths of bone are comparatively rare diseases. Of the simple or non-malignant new growths of bone the only one of real importance is the cyst, which develops in the long bones of young people and grows so slowly and imperceptibly that its presence may be entirely unsuspected until the bone becomes so weakened that it is fractured by some trivial injury. Treatment consists in opening the cyst and scraping out the lining membrane, the resulting cavity being filled with a graft of healthy bone taken from the patient's shin. In a few recent cases a graft of fatty tissue taken from the abdominal wall has proved successful.

Malignant tumours (*see* TUMOUR) may arise primarily in bones, and are then known as sarcomas. There are two main varieties of sarcoma affecting bones, the endosteal or myeloid, and the periosteal. The former arises almost always within the articular ends of the long bones and forms a tumour of very peculiar character. It slowly expands the bone in which it arises

and destroys its interior, so that in due course a large swelling is produced which consists of the tumour itself, covered by a layer of bone so thin that the mere pressure of the examining finger gives rise to the sensation known as egg-shell crackling, and may, indeed, fracture it.

The malignancy of endosteal growths is rather limited, for although if untreated they go on growing indefinitely, and may destroy life by their local effects, they do not give rise to secondary growths in other parts of the body, and in consequence are often spoken of as semi-malignant. They are healed by complete removal of the part of the bone in which they originate, though this often means the sacrifice of the affected limb.

When dealing with periosteal sarcoma we are faced with an entirely different set of circumstances. As its name implies it grows from the outer surface of the bone, generally a long bone of the lower limb, and it is malignant in the highest possible degree. The most usual treatment is amputation of the affected limb, but even then the disease is apt to return in the stump or else in the form of secondary deposits in the lungs. On the whole periosteal sarcoma is a terribly fatal disease, for no matter how prompt and how radical the treatment may be, the percentage of cases that may be regarded as cured is smaller than in almost every other kind of malignant growth.

Cancer or carcinoma cannot originate in bone, but does occur with some frequency as a secondary phenomenon during the course of such disease as cancer of the breast, prostate, thyroid and kidney. Small fragments of the original growth become detached and are distributed by the blood or lymph to the bones of the arms or thighs or spine. A characteristic of this condition, owing to the replacement of healthy bone by cancer tissue, is the occurrence of so-called spontaneous fractures, *i.e.*, fractures resulting from the muscular strain of ordinary movements. When this stage in the course of a cancer case is reached, the patient is beyond the help of medicine and surgery, and nothing can be done, in our present state of knowledge, beyond measures directed to the relief of pain.

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BONESET (*Eupatorium perfoliatum*), a North American plant of the family Compositae. It is also called thoroughwort, ague-weed and Indian sage, common in wet places from Nova Scotia to Manitoba and southward to Florida and Texas. It is a coarse, rough, hairy perennial, 2 ft. to 6 ft. high, with lance-shaped, taper-pointed, toothed, wrinkled, very veiny leaves, 4 in. to 8 in. long, which are joined together at their bases around the stem. In August the plants bear small, tubular, white flowers in numerous heads which are arranged in a flattish much-branched cluster 4 in. to 7 in. wide. Boneset was formerly in high repute for its medicinal properties and is still used in household medicine by many persons. (*See* EUPATORIUM.)



BY COURTESY OF THE WILD FLOWER PRESERVATION SOCIETY

BONESET, A HAIRY HERB COMMON IN WET PLACES IN THE EASTERN UNITED STATES AND CANADA

BONESETTING: *see* MANIPULATIVE SURGERY.

BO'NESS (strictly BORROWSTOUNNESS), a small burgh and seaport of West Lothian, Scotland, on the south shore of the Firth of Forth, 17 mi. N.W. of Edinburgh and 24 mi. by rail, the terminus of the L.N.E.R.'s branch line from Manuel. Pop. (est. 1938) 10,394. Area, 1.1 sq.mi. It has an extensive harbour and imports pit-props and exports coal, but Grangemouth, higher up the firth, has limited its trade, in which it ranked next to Leith in the 18th century. The chief industry is coal-mining, some of the pits extending for a long distance beneath the firth. The manufactures of earthenware and chemical manures are also important. Traces of the wall of Antoninus may be seen especially near Inveravon. Kinneil estate was bought for recreation purposes.

BONFIGLI, BENEDETTO, 15th century Italian painter, was born at Perugia. The most important of his extant works are a series, in fresco, of the life of St. Louis of Toulouse, in the communal palace of Perugia.

BONFIRE, a large fire lit in the open air. The earliest known instance of the derivation of the word occurred as *ban fyre ignis ossium* in the *Catholicon Anglicum* (1483). Other derivations have been sought for the word. Thus some have thought it *Baal-fire,* passing through *Bael, Baen* to *Bane.* Others have declared it to be *boon*-fire, a "contribution" fire, every one in the neighbourhood contributing a portion of the material.

Whatever its origin, the word has long had several meanings—(*a*) a fire of bones; (*b*) a fire of corpses, a funeral pile; (*c*) a fire for immolation, such as that in which heretics and proscribed books were burnt; (*d*) a large fire lit in the open air, on occasions of national rejoicing, or as a signal of alarm, such as the bonfires which warned England of the approach of the Armada. Throughout Europe the peasants from time immemorial have lighted bonfires on certain days of the year, and danced around or leaped over them. The earliest proof of the observance of these bonfire ceremonies in Europe is afforded by the attempts made by Christian synods in the 7th and 8th centuries to suppress them as pagan. Thus the third Council of Constantinople (680), by its 65th canon, orders: "Those fires that are kindled by certaine people on new moones before their shops and houses, over which also they use ridiculously and foolishly to leape, by a certaine antient custome, we command them from henceforth to cease."

Leaping over the fires is mentioned among the superstitious rites used at the Palilia (the feast of Pales, the shepherds' goddess) in Ovid's *Fasti* (q.v.). The lighting of the bonfires in Christian festivals was significant of the compromise made with the heathen by the early church. In Cornwall bonfires are lighted on the eve of St. John the Baptist and St. Peter's Day; sometimes effigies are burned in these fires, and there are grounds for believing that in ancient times human sacrifices were actually made in the bonfires. Spring and midsummer are the usual times at which these bonfires are lighted, but in some countries they are made at Hallowe'en (Oct. 31) and at Christmas.

See J. G. Frazer, *Golden Bough,* vol. iii.

BON-GA (sand-pictures): *see* BON-SEKI.

BONGARS, JACQUES (1554–1612), French scholar and diplomatist, was born at Orleans and brought up in the reformed faith. He served Henry IV. of France in a long series of diplomatic missions both before and after his accession to the throne. Bongars' works are: an abridgement of Justin's abridgement of the history of Trogus Pompeius (1851); collections of contemporary accounts of the crusades and of Hungarian chronicles, entitled *Gesta Dei per Francos* (Hanover, 1611), and *Rerum Hungaricarum scriptores varii* (Frankfort, 1600); and *Epistolae* (Leyden, 1647, Fr. trans. 1668–70). The largest collection of his ms. papers is at Berne, but others are in Paris libraries.

See H. Hagen, *Jacobus Bongarsius* (Bern, 1874); L. Anquez, *Henri IV. et l'Allemagne* (1887).

BONGHI, RUGGERO (1828–1895), Italian scholar, writer and politician, was born at Naples. He was professor of Greek at Pavia (1859), of Latin literature at Florence (1865), and of ancient history at Rome from 1876 onwards. Elected deputy in 1860 he became celebrated by the biting wit of his speeches, and by the acrimony of his polemical writings. Minister for public instruction in 1873–76, he reformed the Italian educational system, suppressed the privileges of the University of Naples, founded the Vittorio Emanuele library in Rome, and prevented the establishment of a Catholic university in the capital. A bitter critic of King Humbert, both in the *Perseveranza* and in the *Nuova Antologia,* he was, in 1893, excluded from court, only securing readmission shortly before his death. In foreign policy a Francophil, he combated the Triple Alliance.

BONGO, a tribe of Nilotic negroes, also known as DOR or DERAN, probably related to the Zande tribes of the Welle district, inhabiting the south-west portion of the Bahr-el-Ghazal province, Sudan. The Bongo lived in countless little independent and peaceful communities. Their huts are well built, and sometimes 24ft. high. The Bongo are a race of medium height, inclined to be thick-set, with a red-brown complexion and black hair. Schweinfurth declares their heads to be very round. The women incline to steatopygia in later life, and this with the tail of bast which they wore, gave them, as they walked, the appearance of "dancing baboons." The Bongo men formerly wore only a loin-cloth, and many dozen iron rings on the arms (arranged to form a sort of armour), while the women had simply a girdle, to which was attached a tuft of grass. Both sexes now largely use cotton cloth as dresses. The tribal ornaments consist of nails or plugs which are passed through the lower lip. The women often wear a disk several inches in diameter in this fashion, together with a ring or a bit of straw in the upper lip, straws in the *alae* of the nostrils, and a ring in the *septum*. The Bongo are not great cattle-breeders, but employ their time in agriculture, cultivating sorghum, tobacco, sesame and durra. The Bongo eat the fruits, tubers and fungi in which the country is rich, and almost every creature—bird, beast, insect and reptile, with the exception of the dog. Earth-eating is common among them. They are skilled in the smelting and working of iron. Iron forms the currency of the country, and is employed for all kinds of useful and ornamental purposes. Bongo spears, knives, rings, and other articles are frequently fashioned with great artistic elaboration. They have a variety of musical instruments—drums, stringed instruments, and horns—and they indulge in a vocal recitative which seems intended to imitate a succession of natural sounds. Marriage is by purchase; and a man is allowed to acquire three wives, but not more. Tattooing is partially practised. As regards burial, the corpse is bound in a crouching position with the knees drawn up to the chin; men are placed in the grave with the face to the north, and women with the face to the south. The form of the grave consists of a niche in a vertical shaft. The tombs are frequently ornamented with rough wooden figures representing the deceased. Of the immortality of the soul they have no defined notion; and their only approach to a knowledge of a beneficent deity consists in a vague idea of luck. They have a most intense belief in a great variety of petty goblins and witches, which are essentially malignant. Arrows, spears and clubs form their weapons, the first two distinguished by a multiplicity of barbs. Euphorbia juice is used as a poison for the arrows. Shields are rare. Their language is musical, and abounds in the vowels *o* and *a*; its vocabulary of concrete terms is rich, but the same word has often a variety of meanings. The grammatical structure is simple.

See G. A. Schweinfurth, *The Heart of Africa* (London, 1873); W. Junker, *Travels in Africa* (Eng. edit., London, 1890–1892).

BONGO (*Taurotragus* [subgenus *Boöcercus*] *eurycerus*), a large African antelope (*q.v.*). Both sexes bear twisted horns and are rich chestnut, the body marked with narrow white stripes, the chest with a white crescent. The bongo is related to the bushbucks and lives in dense forests.

BONHAM, a city in the northeastern part of Texas, U.S.A., 14mi. S. of the Red river and 62mi. N.N.E. of Dallas; the county seat of Fannin county. It is served by the Texas and Pacific railway. The population in 1930 was 5,655 and in 1940 was 6,349. Corn and cotton are the leading crops of the district. The city has a large cotton mill, cotton gins, textile mills, a cheese factory, iron foundry, a mattress factory and other industrial plants. The first settlement was made in 1836. The town was incorporated in 1850, and was named after J. B. Bonham of South Carolina, who was killed in the Alamo.

BONHEUR, ROSA (MARIE ROSALIE) (1822–1899), French animal painter, was born at Bordeaux on March 22 1822, the daughter of an artist, Raymond Bonheur (d. 1849). She was the eldest of four children, all of whom were artists, and studied in Paris. Rosa Bonheur's paintings of animals were remarkable for the firm handling of the subjects, and the extraordinary accuracy of the drawing. She had regularly exhibited in the Salon from 1840 onwards, but her fame dates from the Paris exhibition of 1855. Of her many works the most famous are perhaps: "Ploughing in the Nivernais" (1848), in the Luxembourg gallery; "The Horse Fair" (1853) in the Metropolitan Museum, New York (replica in the National Gallery, London); and "Hay Harvest in Auvergne" (1855). Rosa Bonheur was the first woman to receive (1894) the Grand Cross of the Legion of Honour. She died at By, near Fontainebleau, on May 25 1899.

See Laruelle, *Rosa Bonheur, sa vie, ses oeuvres* (1885); Roger-Miles, *Rosa Bonheur* (1900).

BONHEUR DU JOUR, the name for a lady's writing-desk, so called because, when it was introduced in France about 1760, it speedily became intensely fashionable. The bonheur du jour is always very light and graceful; its special characteristic is a raised back, which may form a little cabinet or a nest of drawers, or may simply be fitted with a mirror. The top, often surrounded with a chased and gilded bronze gallery, serves for placing small ornaments. Beneath the writing surface there is usually a single drawer. The details vary greatly, but the general characteristics are always traceable. The bonheur du jour has never been so delicate, so charming, so coquettish as in the quarter of a century which followed its introduction. The choicer examples of the time are inlaid with marqueterie, edged with exotic woods, set in gilded bronze or enriched with panels of Oriental lacquer.

BONI, GIACOMO (1859–1925), Italian archaeologist and classical scholar, was born in Venice April 25 1859. He entered the Venice Academy of Fine Arts, where he graduated as an architect, after which he studied practical mechanics in England. On returning to Venice he became assistant in the work of restoring the Ducal Palace, and in 1888 inspector of fine arts in Rome. Ten years later he undertook the excavations in the Forum and the Palatine with which his name is chiefly associated. He also erected the Museo Forense in the church of Santa Francisca Romana. In 1914 he undertook excavations on the Palatine. Boni was made Senator in 1923 by Sig. Mussolini. He was the author of a large number of essays, pamphlets and articles on archaeological and kindred subjects and also on botany. He died in Rome July 7 1925.

BONI: *see* CELEBES.

BONIFACE, SAINT (680–754), the apostle of Germany, whose real name was Wynfrith, was born of a good family at Crediton or Kirton in Devonshire. While still young he became a monk, and studied first at Exeter, then at Nutcell near Winchester, under the abbot Winberht. He soon distinguished himself both as scholar and preacher, but in 716 he followed the example of other Saxon monks and set out as missionary to Frisia. He was soon obliged to return, however, probably owing to the hostility of Radbod, king of the Frisians, then at war with Charles Martel. At the end of 717 he went to Rome, where in 719 Pope Gregory II. commissioned him to evangelize Germany and to counteract the influence of the Irish monks there. Crossing the Alps, Boniface visited Bavaria and Thuringia; but upon hearing of the death of Radbod he hurried again to Frisia, where, under the direction of his countryman Willibrord (d. 738), the first bishop of Utrecht, he preached successfully for three years. About 722 he visited Hesse and Thuringia, won over some chieftains, and converted and baptized great numbers of the heathen. Having sent special word to Gregory of his success, he was summoned to Rome and consecrated bishop on Nov. 30, 722, after taking an oath of obedience to the pope. Then his mission was enlarged. He returned with letters of recommendation to Charles Martel, charged not only to convert the heathen but to suppress heresy as well.

Charles's protection, as he himself confessed, made possible his great career. Armed with it he passed safely into heathen Germany and began a systematic crusade, baptizing, overturning idols, founding churches and monasteries, and calling from England monks and nuns, some of whom have become famous: St. Lull, his successor in the see at Mainz; St. Burchard, bishop of Würzburg; St. Gregory, abbot at Utrecht; Willibald, his biographer; St. Lioba, St. Walburge, St. Thecla. In 732 Boniface was created archbishop. In 738 for the third time he went to Rome. On his

return he organized the church in Bavaria into the four bishoprics of Regensburg, Freising, Salzburg and Passau. Then his power was extended still further. In 741 Pope Zacharias made him legate, and charged him with the reformation of the whole Frankish church. With the support of Carloman and Pippin, who had just succeeded Charles Martel as mayors of the palace, Boniface set to work. As he had done in Bavaria, he organized the east Frankish church into four bishoprics, Erfurt, Würzburg, Buraburg and Eichstädt, and set over them his own monks. In 742 he presided at what is generally counted as the first German council. At the same period he founded the abbey of Fulda, as a centre for German monastic culture, placing it under the Bavarian Sturm, whose biography gives us many picturesque glimpses of the time, and making its rule stricter than the Benedictine. Then came a theological and disciplinary controversy with Virgil, the Irish bishop of Salzburg, who held, among other heresies, that there were other worlds than ours. Virgil must have been a most remarkable man; in spite of his leanings toward science he held his own against Boniface, and was canonized after his death. Boniface was more successful in France. There a certain Adalbert or Aldebert, a Frankish bishop of Neustria, had caused great disturbance. He had been performing miracles, and claimed to have received his relics, not from Rome, like those of Boniface, but directly from the angels. Planting crosses in the open fields he drew the people to desert the churches, and had won a great following throughout all Neustria. Opinions are divided as to whether he was a Culdee, a representative of a national Frankish movement, or simply the charlatan that Boniface paints him. At the instance of Pippin, Boniface secured Adalbert's condemnation at the synod of Soissons in 744; but he, and Clement, a Scottish missionary and a heretic on predestination, continued to find followers in spite of legate, council and pope, for three or four years more.

Between 746 and 748 Boniface was made bishop of Mainz, and became metropolitan over the Rhine bishoprics and Utrecht, as well as over those he had established in Germany—thus founding the pre-eminence of the see of Mainz. In 747 a synod of the Frankish bishops sent to Rome a formal statement of their submission to the papal authority. The significance of this act can only be realized when one recalls the tendencies toward the formation of national churches, which had been so powerful under the Merovingians. Boniface does not seem to have taken part in the anointing of Pepin as king of the Franks in 752. In 754 he resigned his archbishopric in favour of Lull, and took up again his earliest plan of a mission to Frisia; but on June 5, 754, he and his companions were massacred by the heathen near Dockum. His remains were afterwards taken to Fulda.

St. Boniface has well been called the proconsul of the papacy. His organizing genius, even more than his missionary zeal, left its mark upon the German church throughout all the middle ages. The missionary movement which until his day had been almost independent of control, largely carried on by schismatic Irish monks, was brought under the direction of Rome. In so welding together the scattered centres and binding them to the papacy, Boniface was actuated by simple zeal for unity of the faith, and not by a conscious political motive.

Though pre-eminently a man of action, Boniface has left several literary remains. We have above all his Letters (*Epistolae*), difficult to date, but extremely important from the standpoint of history, dogma, or literature; *see* Dümmler's edition in the *Monumenta Germaniae historica* (1892). Besides these there are a grammar (*De octo partibus orationibus*, ed. Mai, in *Classici Auctores*, t. vii.), some sermons of contested authenticity, some poems (*Aenigmata*, ed. Dümmler, *Poetae latini aevi Carolini*, i. 1881), a penitential, and some *Dicta Bonifacii* (ed. Nürnberger in *Theologische Quartalschrift*, Tübingen, vol. 70, 1888), the authenticity of which it is hard to prove or to refute. Migne in his *Patrologia Latina* (vol. 89) has reproduced the edition of Boniface's works by Giles (London, 1884). (J. T. S.)

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BONIFACE (*Bonifacius*), the name of nine of the popes.

BONIFACE I., pope from 418 to 422. At the death of Pope Zosimus, the Roman clergy were divided into two factions, one of which elected the deacon Eulalius, and the other the priest Boniface. The imperial government, in the interests of public order, commanded the two competitors to leave the town, reserving the decision of the case to a council. Eulalius having broken his ban, the emperor Honorius decided to recognize Boniface, and the council was countermanded.

BONIFACE II., pope from 530 to 532, was by birth a Goth, and owed his election to the nomination of his predecessor, Felix IV., and to the influence of the Gothic king. The Roman electors had opposed to him a priest of Alexandria called Dioscorus, who died a month after his election, and thus left the position open for him. Boniface endeavoured to nominate his own successor, thus transforming into law, or at least into custom, the proceeding by which he had benefited; but the clergy and the senate of Rome forced him to cancel this arrangement.

BONIFACE III., pope from Feb. 15–Nov. 12, 606. He obtained from the emperor Phocas recognition of the "headship of the church at Rome," which signifies, no doubt, that Phocas compelled the patriarch of Constantinople to abandon (momentarily) his claim to the title of oecumenical patriarch.

BONIFACE IV. (Saint) was pope from 608 to 615. He received permission from the emperor Phocas to convert the Pantheon at Rome into a Christian church.

BONIFACE V., pope from 619 to 625, did much for the christianizing of England. Bede mentions (*Hist. Eccl.*) that he wrote encouraging letters to Mellitus, archbishop of Canterbury, and Justus, bishop of Rochester, and quotes three letters—to Justus, to Eadwin, king of Northumbria, and to his wife Aethelberga. William of Malmesbury gives a letter to Justus of the year 625, in which Canterbury is constituted the metropolitan see of Britain for ever.

BONIFACE VI. was elected pope in April 896, and died 15 days afterwards.

BONIFACE VII. was pope from Aug. 984 to July 985. His family name was Franco. In 974 he was substituted by Crescentius and the Romans for Benedict VI. who was assassinated. He was ejected by Count Sicco, the representative of the emperor Otto II., and fled to Constantinople. On the death of Otto (983) he returned, seized Pope John XIV., threw him into prison, and installed himself in his place.

BONIFACE VIII. (Benedetto Gaetano), pope from 1294 to 1303, was born of noble family at Anagni, studied canon and civil law in Italy and possibly at Paris. After being appointed to canonicates in both of these countries, he accompanied Cardinal Ottobuono to England in 1265 for the purpose of reconciling Henry III. and the baronial party. Later he became advocate and notary at the papal court and in 1281 was made cardinal-deacon, and in 1291 cardinal-priest (SS. Sylvestri et Martini). After helping the ineffective Celestine V. to abdicate, he was chosen pope at Naples on Dec. 24, 1294, and crowned at Rome in Jan. 1295. By his attempt to exercise his authority in temporal as well as in spiritual affairs, he involved the papacy in many controversies with leading European powers. The policy of supporting the interests of the house of Anjou in Sicily proved a grand failure. The attempt to build up great estates for his family made most of the Colonna his enemies. Until 1303 he refused to recognize Albert of Austria as the rightful German king. Assuming that he was overlord of Hungary, he declared that its crown should fall to the house of Anjou. He humbled Eric VIII. of Denmark, but was unsuccessful in the attempt to try Edward I., the conqueror of Scotland, on the charge of interfering with a papal fief; for parliament declared in 1301 that Scotland had never been a fief of Rome. The most noted conflict of Boniface, was that with Philip IV. of France. In 1296 by the bull *Clericis laicos*, the pope forbade the levying of taxes, however disguised, on the clergy without his consent. Forced to recede from this position by the retaliating ordinances of Philip,

Boniface canonized the king's grandfather Louis IX. (1297). The hostilities were later renewed; in 1302 Boniface himself drafted and published the indubitably genuine bull *Unam sanctam,* one of the strongest official statements of the papal prerogative ever made. The weight of opinion now tends to deny that any part of this much-discussed document save the last sentence bears the marks of an infallible utterance. The French vice-chancellor Guillaume de Nogaret was sent to arrest the pope, against whom grave charges had been brought, and bring him to France to be deposed by an oecumenical council. The accusation of heresy has usually been dismissed as a slander; but recent investigations make it probable, though not quite certain, that Boniface privately held certain Averroistic tenets such as the denial of the immortality of the soul. With Sciarra Colonna, Nogaret surprised Boniface at Anagni, on Sept. 7, 1303, as the latter was about to pronounce the sentence of excommunication against the king. After a nine hours' truce the palace was stormed, and Boniface who had been saved by Nogaret from the vengeful Colonna, imprisoned for three days, until released by the citizens of Anagni. He was conducted to Rome, only to be confined by the Orsini in the Vatican, where he died in Oct. 1303. Dante, who had become embittered against Boniface while on a political mission in Rome, calls him the "Prince of the new Pharisees" (*Inferno,* 27, 85), but laments that "in his Vicar Christ was made a captive," and was "mocked a second time" (*Purgatory,* 20, 87 f.). Boniface patronized the fine arts, interested himself in the Vatican library and founded the University of Rome.

BONIFACE IX. (Piero Tomacelli), pope from 1389 to 1404, was born at Naples of a poor but ancient family. He was able to restore Roman authority in the major part of the papal states, and in 1398 put an end to the republican liberties of the city itself. Boniface won Naples, which had owed spiritual allegiance to the antipopes Clement VII. and Benedict XIII. of Avignon, to the Roman obedience. In 1403 he ventured at last to confirm the deposition of the emperor Wenceslaus by the electors and the choice of Rupert. Negotiations for the healing of the Great Schism were without result. In spite of his inferior education, the contemporaries of Boniface trusted his prudence and moral character; yet when in financial straits he sold offices, and in 1399 transformed the annates into a permanent tax. In 1390 he celebrated the regular jubilee, but a rather informal one held in 1400 proved more profitable. Though probably not personally avaricious, he was justly accused of nepotism.

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Special literature on *Unam Sanctam:* C. Mirbt, *Quellen zur Geschichte des Papsttums* (2nd ed., Tübingen, 1901), 148 f.; *Kirchenlexikon* xii. (1901) 229–240, an exhaustive discussion; H. Finke, 146–190; J. H. Robinson, *Readings in European History,* vol. i. (Boston, 1904), 346 ff. *On Clericis laicos:* Gee and Hardy, *Documents Illustrative of English Church History* (1896), 87 ff. (W. W. R.)

BONIFACE OF SAVOY (d. 1270), elected archbishop of Canterbury in 1243, through the favour of Henry III., whose queen, Eleanor of Provence, was his niece. Boniface spent much of his time on the Continent attending to family affairs and made little impression on Church or State. In 1250 he provoked the English bishops by claiming the right of visitation in their dioceses. In the barons' war he at first took the side of the national party but later supported the king.

See Matthew Paris, *Chronica Majora;* François Mugnier, *Les Savoyards en Angleterre* (Chambéry, 1890).

BONIFACIO, maritime town in S. Corsica, 2 mi. W. of Cape Pertusato, southernmost point of the island. Pop. (1936) 3,344. Bonifacio overlooks the strait of that name separating Corsica from Sardinia and occupies a remarkable site near the base of a narrow peninsula paralleling the main coast. The peninsula, about 1 mi. long, rises from the sea in low limestone cliffs and thus nearly encloses a narrow natural harbour. The fortifications and citadel, which date from the 16th and 17th centuries, block the landward end of the peninsula. Founded about A.D. 828 by a Tuscan marquis as a defense against Saracen pirates, in the 11th century it became subject to Pisa, and in the 12th was taken by the Genoese. It withstood a protracted siege by Alphonso V of Aragon in 1420. In 1554 it fell into the hands of the Franco-Turkish army. St. Dominic, built (13th century) by the Templars, and the cathedral of Santa Maria Maggiore (12th century), are the chief buildings. Trade is chiefly with Sardinia in cereals, wine and cork. Cork-cutting, tobacco manufacture and fishing are the main industries. Olives are cultivated nearby, and there are oil works in the town.

BONIFACIUS (d. 432), the Roman governor of the province of Africa who is believed to have invited the Vandals into that province (429), though that action is by Procopius attributed to his rival Aëtius. Whether he really invited the Vandals or not, there is no doubt that he soon turned against them and bravely defended the city of Hippo from their attacks. In 432 he returned to Italy, was received into favour by Placidia, and appointed master of the soldiery. Aëtius, however, resented his promotion, the two rivals met, perhaps in single combat, and Bonifacius, though victorious, received a wound from the effects of which he died three months later.

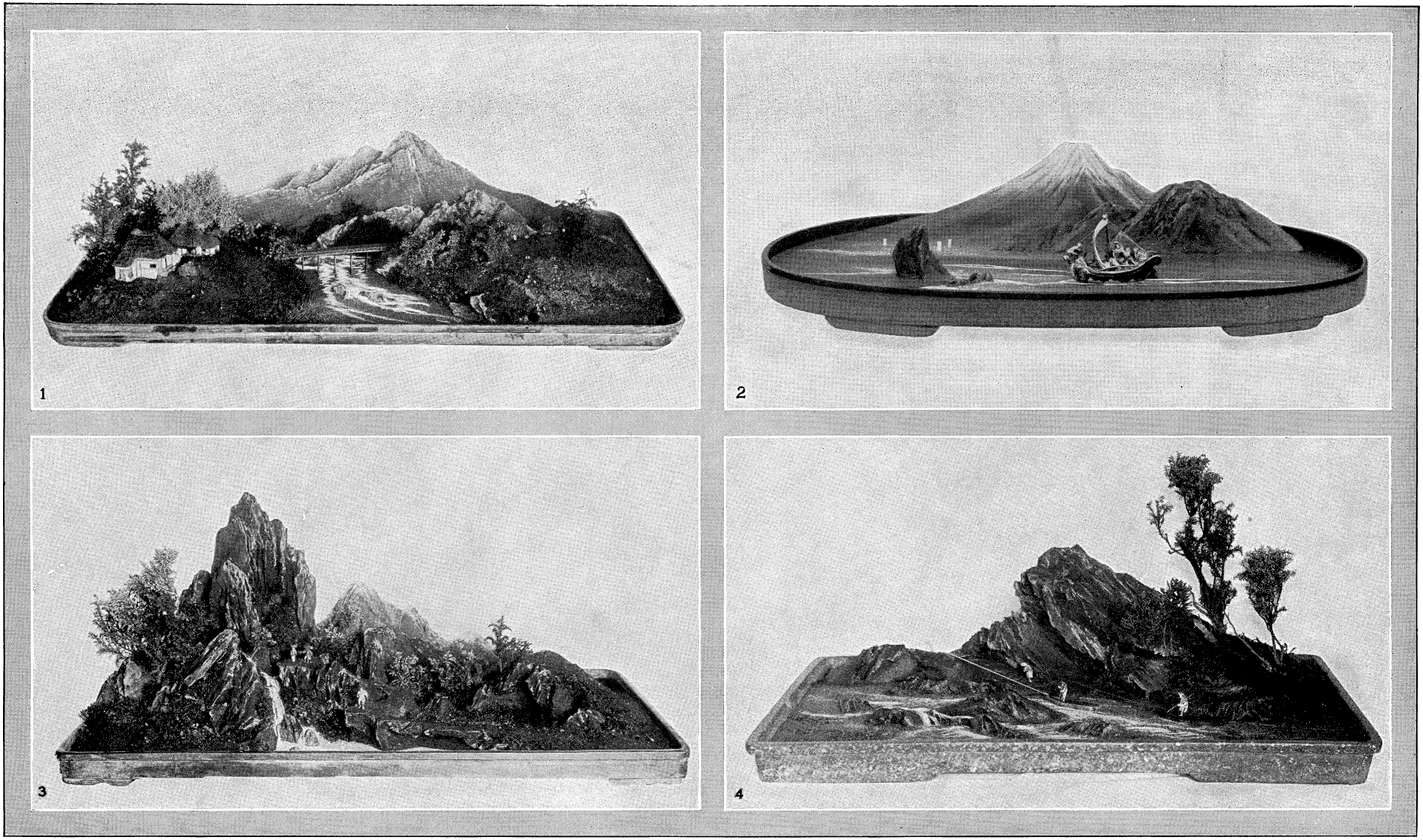
See Gibbon, *Decline and Fall of the Roman Empire,* vol. iii. pp. 505–506, edited by J. B. Bury (London, 1897), and E. A. Freeman's article in *Eng. Hist. Rev.,* July 1887.

BONINGTON, RICHARD PARKES (1801–1828), English painter, was born at Arnold, near Nottingham, Oct. 25, 1801. His father, one time governor of Nottingham gaol, was also a drawing-master.

In 1817 the family moved to Calais where the father started business in connection with the Nottingham lace trade. Here young Bonington became acquainted with Louis Francia, the friend of Girtin, who grounded him in the principles of English water-colour painting. Moving to Paris, he studied and copied the Dutch and Flemish masters in the Louvre. In 1820 he entered the studio of Baron Gros, which was a meeting-place of revolutionary spirits.

In France at that time the classicist art of David was still predominant, but Géricault and Delacroix were preparing the romantic movement. Bonington met Delacroix at the Louvre and the two formed a close friendship. Both had the same passion for the new conception of historical painting, both studied the costumes and the new histories of the middle ages and the early Renaissance which attracted the writers and actors of the day. Bonington, who from his early youth in Nottingham had loved the theatre, clearly showed the influence of the stage on his designs. Repeated visits to London kept him in touch with English contemporary art when Constable was developing his own original conception of landscape painting. Bonington painted his first landscapes from nature in Normandy and Picardy. In 1822, on a visit to Venice, he produced a series of Venetian pictures. He received the gold medal in the Salon of 1824. On his return to England, his works exhibited at the British Institution in 1826 and at the Royal Academy in 1828, excited admiration and he was befriended by Sir Thomas Lawrence. He died of consumption in London on Sept. 23, 1828. His early death deprived England of one of the fairest promises in the field of art, for although he had studied in France he belonged to both countries. His sparkling and luminous colour was a quality unknown in France at that time and was rivalled among English water-colourists only by Constable and Turner. Thus he brought the knowledge of English art to France, and linked the new vision of English landscapes to the art of the Barbizon school. Moreover, he possessed a dexterity in execution which has since become, among both artists and art-lovers, a tradition in English painting.

Bonington's best known works are "Henry IV. and the Spanish Ambassador" in the Wallace collection, London, and "Francis I. and the Duchesse d'Etampes" in the Louvre, Paris. Nowhere can



BY COURTESY OF JIRO HIRADA

MINIATURE LANDSCAPES MODELLED ON TRAYS OF BRONZE, CONCRETE OR PORCELAIN

1. A rolling landscape modelled from earth or a substitute for earth. Sand is used for the water and the scene is embellished with tiny plants representing trees, and with miniature houses and a bridge
2. A seascape, the mountains are modelled with a spatula and sand is used for the sea
3. A rocky landscape, with a waterfall; tiny figures are climbing the steep cliff
4. A landscape on the edge of the sea; little figures can be seen in the boats

his art be studied so well as in the Wallace collection which has 11 oil and 25 water-colours. The Louvre and the National Gallery, the Victoria and Albert museum, the Tate gallery, the British Museum print room, and most galleries in England possess specimens of his work. He produced a number of lithographs, of which "Rue de la grosse Horloge à Rouen" is the most famous.

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BONIN ISLANDS: *see* OGASAWARA-JIMA.

BONITO (*Sarda sarda*), a fish of the mackerel family, abundant in the Mediterranean and in the warmer parts of the Atlantic ocean. It is similar in form to the tunny (*q.v.*), but is a smaller fish, not exceeding 3oin. in length. The colour is steel blue above, silvery below, with numerous narrow dark stripes running obliquely downward and forward from the back. The name is given to *S. chilensis* of the Pacific ocean and to the little tunnies (*Euthynnus* and *Katsuwonus*).

BONITZ, HERMANN (1814–1888), German scholar, was born at Langensalza in Saxony. He held many important teaching posts and took great interest in higher education; he reorganized the schools and universities of Austria and was chiefly responsible for the system of teaching and examination in use in the high schools of Prussia after 1882. But it is as a commentator on Plato and Aristotle that he is best known outside Germany.

His most important works in this connection are: *Disputationes Platonicae Duae* (1837); *Platonische Studien* (3rd ed., 1886); *Observationes Criticae in Aristotelis Libros Metaphysicos* (1842); *Observationes Criticae in Aristotelis quae feruntur Magna Moralia et Ethica Eudemia* (1844); *Alexandri Aphrodisiensis Commentarius in Libros Metaphysicos Aristotelis* (1847); *Aristotelis Metaphysica* (1848–49); *Über die Kategorien des A.* (1853); *Aristotelische Studien* (1862–67); *Index Aristotelicus* (1870). Other works: *Beiträge zur Erklärung des Thukydides* (1854), *des Sophokles* (1856–57); *Über den Ursprung der homerischen Gedichte* (5th ed., 1881). Full bibliography in the obituary notice by T. Gompertz in *Biographisches Jahrbuch für Altertumskunde* (1890).

BONIVARD, FRANÇOIS (1496?–1570), Genevan politician, the hero of Byron's poem, *The Prisoner of Chillon*, was born in Seyssel of an old Savoyard family. Bonivard has been described as "a man of the Renaissance who had strayed into the age of the Reformation." His real character and history are, however, widely different from the legendary account which was popularized by Byron. Son of Louis Bonivard, Lord of Lune, he succeeded his uncle as prior of the Cluniac priory of St. Victor, close to Geneva. He naturally, therefore, opposed the increasing power of the duke of Savoy, aided by his relative, the bishop of the city. He was imprisoned by the duke at Gex from 1519 to 1521, lost his priory, and became more and more anti-Savoyard. In 1528, supported by the city of Geneva, he took up arms against those who had seized his ecclesiastical revenues, but in 1530 he was again seized by the duke and imprisoned for four years underground, in the castle of Chillon, till he was released (March 29, 1536) by the Bernese, who then wrested Vaud from the duke. Becoming a Protestant, Bonivard obtained a pension from Geneva and was four times married. He was entrusted in 1542 with the task of compiling a history of Geneva from the earliest times. In 1551 his ms. of the *Chroniques de Genève* (ending in 1530) was submitted to Calvin for correction; but it was not published till 1831, when it was edited by Dunant. The best edition is that of 1867. He also wrote *De l'Ancienne et Nouvelle Police de Genève* (1555).

BON-KEI ("tray-landscape"), generally acknowledged to be an evolution of *hako-niwa* (*q.v.*), is a popular branch of the Japanese art of making miniature landscapes with earth or its substitutes, representing trees, grass, houses, figures, etc., on bronze, concrete or porcelain trays and used as decorations for windows or rooms. The art is occasionally called *bon-tei* (tray-garden), and the name *bon-kei* is then given to another branch popularly known as *bon-seki* (*q.v.*), but this is not generally accepted. *Bon-kei*, in its present phase, has not been in existence very long, having taken a new life at the dawn of the 20th century, when *keto-tsuchi*, a sort of peat, was introduced by Idzumi Chisen as a substitute for earth for modelling not only hills, but rocks and stones also. Nowadays actual stones are hardly ever used. As the art gained popularity, all sorts of devices were tried, including old newspapers soaked in water, as substitutes for the earth. Usually, on a round, oval or rectangular tray of from 1 to 3ft. in extreme dimension, hills, rocks and ground are modelled with *keto-tsuchi*, newspaper preparation, or earth by means of a spatula, and then are painted to give an appearance of snow, a water-fall or distant scenery, the nearer parts being covered with fine moss and planted with vegetation of appropriate size and form. Different coloured earth is strewn to indicate a path, and sand is used to represent water. The views may be embellished with miniature houses, towers, bridges, figures, birds, etc., of baked clay. *Bon-kei* very strongly resembles *hako-niwa*, though the latter is meant to be kept for years, while the former is primarily to meet a temporary need (though with care it may be preserved for months in its original freshness and proportion), and is very quickly made; it is entirely different from *bon-seki*, in which neither earth nor vegetation is used.

BONN, town of Rhenish Prussia, Germany, on the left bank of the Rhine, 15 mi. S. by E. from Cologne. Pop. (1885) 35,989; (1905) 81,997; (1939) 101,391. The river is here crossed by a fine bridge (1898), 1,417 ft. in length, flanked by an embankment $2\frac{1}{2}$ mi. long, parallel with which is the Coblenzer-strasse, with villas and gardens, which add greatly to the appearance of the town from the river. Bonn (*Bonna* or *Castra Bonnensia*), a Roman military settlement, was the scene, in A.D. 70, of a defeat of the Romans. Greatly reduced by successive barbarian inroads, it was restored about 359 by the emperor Julian. In the centuries that followed the break-up of the Roman empire it again suffered, and was finally devastated in 889 by bands of Norse raiders. Fortified again in the 13th century, from 1265 to 1794 it was the residence of the electors of Cologne. During the various wars of the 16th, 17th and 18th centuries, the town was frequently besieged. Occupied by the French after 1794, it was made over by the Congress of Vienna (1815) to Prussia. The fortifications were dismantled in 1717. The central part of the town, with its narrow streets, contains the Münster (minster), built of grey stone, in Romanesque and Transition styles (12th and 13th centuries). It is surmounted by five towers, of which the central (315ft.) is a landmark in the Rhine valley. The Minoritenkirche dates from 1278–1318, but the other churches are more recent. The town hall on the market square dates from 1737 and there is a fine block of law-court buildings. The finest building, however, is the famous university (1786–1818), which occupies the larger part of the southern frontage of the town. Originally the electoral palace of the archbishops of Cologne, it was constructed about 1717 out of the materials of the old fortifications, and remodelled after the town came into Prussian possession. There are five faculties—a legal, a medical, and a philosophical, and one of Roman Catholic and one of Protestant theology. The museum contains a valuable collection of Roman relics discovered in the neighbourhood. An academy of agriculture, with a natural history museum and botanic garden, is established in the palace of Clemensruhe at Poppelsdorf, reached by a long avenue of double rows of chestnut trees. A splendid observatory, long under the charge of Friedrich Wilhelm Argelander, stands on the south side of the road. On the Kreuzberg, above the suburb of Poppelsdorf, is a 17th century church and Franciscan monastery, approached by a flight of "holy steps," in imitation of those at Rome. Only one tower, "Der alte Zoll," commanding a magnificent view of the Siebengebirge, remains of the old fortifications. Beethoven was born in Bonn, and a statue was erected to him in the Münsterplatz in 1845. In 1889 a museum of Beethoven relics was opened in the house where he was born. The chief manufactures are stoneware and office furniture. Numbers of foreign residents are attracted by the scenery and by the educational facilities.

BONNAT, LÉON JOSEPH FLORENTIN (1833–1922), French portrait-painter, was born at Bayonne on June 20, 1833, and died on Sept. 8, 1922. He studied under Madrazo at Madrid, and under Cogniet in Paris. His earlier works were genre and historical paintings in which his study of old Spanish art was

evident. The long series of characteristic portraits began in 1875. In these he drew inspiration from Velasquez and the Spanish realists. He painted Thiers, Victor Hugo, Carnot, Taine, Pasteur and other contemporaries, some 200 in all, the finest of these being perhaps the portrait of Léon Cogniet in the Luxembourg. In 1888 he became professor of painting at the École des Beaux-Arts, and in 1905 director.

BONNER, EDMUND (?1500–69), bishop of London, was perhaps the natural son of George Savage, rector of Davenham, Cheshire, by Elizabeth Frodsham, who was afterwards married to Edmund Bonner, a sawyer of Hanley in Worcestershire. This account, which was printed with many circumstantial details by Strype (*Eccles. Mem.,* III. i. 172–173), was disputed by Strype's contemporary, Sir Edmund Lechmere, who asserted on not very satisfactory evidence (*ib. Annals,* I. ii. 300) that Bonner was of legitimate birth. He was educated at Broadgates Hall, now Pembroke college, Oxford, graduating bachelor of civil and canon law in June 1519. He was ordained about the same time, and admitted D.C.L. in 1525. In 1529 he was Wolsey's chaplain, and he was with the cardinal at Cawood at the time of his arrest. Subsequently he was transferred, perhaps through Cromwell's influence, to the service of the king, and in Jan. 1532 he was sent to Rome to obstruct the judicial proceedings against Henry in the papal curia. In Oct. 1533 he was entrusted with the unmannerly task of intimating to Clement VII., while he was the guest of Francis I. at Marseilles, Henry's appeal from the pope to a general council.

Towards the end of that year he was sent to further what he called "the cause of the Gospel" (*Letters and Papers,* 1536, No. 469) in north Germany; and in 1536 he wrote a preface to Gardiner's *De vera Obedientia,* which asserted the royal supremacy. After a brief embassy to the emperor in the spring of 1538, Bonner superseded Gardiner at Paris, and began his mission by sending Cromwell a long list of accusations against his predecessor (*ib.* 1538, ii. 144). He was almost as bitter against Wyatt and Mason, whom he denounced as a "papist," and the violence of his conduct led Francis I. to threaten him with 100 strokes of the halberd. He seems, however, to have pleased his patron, Cromwell, and perhaps Henry, by his energy in seeing the king's "Great" Bible in English through the press in Paris. He was already king's chaplain; his appointment at Paris had been accompanied by promotion to the see of Hereford, and before he returned to take possession he was translated to the bishopric of London (Oct. 1539).

Hitherto Bonner had been known as a somewhat coarse and unscrupulous tool of Cromwell. In the Reformation only the repudiation of papal control appealed to him; and he was one of those numerous Englishmen whose views were faithfully reflected in the Six Articles. He became a staunch conservative, and, apart from his embassy to the emperor in 1524–43, was mainly occupied during the last years of Henry's reign in brandishing the "whip with six strings."

The accession of Edward VI. opened a fresh and more creditable chapter in Bonner's career. Like Gardiner, he could hardly repudiate that royal supremacy, in the establishment of which he had been so active an agent; but he began to doubt that supremacy when he saw to what uses it could be put by a Protestant council, and either he or Gardiner evolved the theory that the royal supremacy was in abeyance during a royal minority. The ground was skilfully chosen, but it was not legally or constitutionally tenable. Both he and Gardiner had, in fact, sought from the young king fresh licences to exercise their ecclesiastical jurisdiction; and, if he was supreme enough to confer jurisdiction, he was supreme enough to issue the injunctions and order the visitation to which Bonner objected. Moreover, if a minority involved an abeyance of the royal supremacy in the ecclesiastical sphere, it must do the same in the temporal sphere, and there could be nothing but anarchy. It was on this question that Bonner came into conflict with Edward's government. He resisted the visitation of Aug. 1547 and was committed to the Fleet, but he withdrew his opposition and was released in time to take an active part against the government in the parliament of Nov. 1547. In the next session, Nov. 1548–March 1549, he was a leading opponent of the first Act of Uniformity and Book of Common Prayer. When these became law he neglected to enforce them, and on Sept. 1 1549, he was required by the council to maintain at St. Paul's Cross that the royal authority was as great as if the king were 40 years of age. He failed to comply, and after a seven days' trial he was deprived of his bishopric, by an ecclesiastical court over which Cranmer presided, and sent to the Marshalsea. The fall of Somerset in the following month raised Bonner's hopes, and he appealed from Cranmer to the council. After a struggle the Protestant faction gained the upper hand, and on Feb. 7 1550, Bonner's deprivation was confirmed by the council sitting in the Star Chamber, and he was further condemned to perpetual imprisonment.

He was released by Mary's accession, and was at once restored to his see. He very vigorously restored Roman Catholicism in his diocese, made no difficulty about submitting to the papal jurisdiction which he had forsworn, and in 1555 began the persecution to which he owes his fame. His apologists explain that his action was merely "official," but Bonner was one of those who brought it to pass that the condemnation of heretics to the fire should be part of his ordinary official duties. The enforcement of the first Book of Common Prayer had also been part of his official duties; and the fact that Bonner made no such protest against the burning of heretics as he had done in the former case shows that he found it the more congenial duty.

Many of his victims were forced upon him by the council, which sometimes thought that he had not been severe enough (see *Acts of the P.C. 1554–1556,* pp. 115, 139; *1556–1558,* pp. 18, 19, 216, 276). So completely had the State dominated the Church that religious persecutions had become State persecutions. Bonner is seen at his worst in his brutal jeers at Cranmer when he was entrusted with the duty of degrading his former chief. It is a more remarkable fact that, in spite of his prominence, neither Henry VIII. nor Mary should ever have admitted him to the privy council. He seems to have been regarded by his own party as a useful instrument, especially in disagreeable work, rather than as a desirable colleague.

On her accession Elizabeth refused to allow him to kiss her hand; but he sat and voted in the parliament and convocation of 1559. In May he refused to take the oath of supremacy, acquiring, like his colleagues, consistency with old age. He was sent to the Marshalsea, and a few years later was indicted on a charge of praemunire on refusing the oath when tendered him by his diocesan, Bishop Horne of Winchester. He challenged the legality of Horne's consecration, and a special act of parliament was passed to meet the point, while the charge against Bonner was withdrawn. He died in the Marshalsea in 1569.

Bibliography.—See *Letters and Papers of Henry VIII.* vol. iv.-xx.; *Acts of the Privy Council* (1542–69); *Lords' Journals,* vol. i.; Wilkins' *Concilia;* Foxe's *Acts and Monuments,* ed. Townsend; Burnet, ed. Pocock; Strype's Works; Gough's *Index to Parker Soc. Publ.;* S. R. Maitland's *Essays on the Reformation;* Froude's and R. W. Dixon's Histories; Pollard's *Cranmer* and *England under Somerset;* other authorities cited in *Dict. Nat. Biogr.*

BONNET, CHARLES (1720–1793), Swiss naturalist and philosophical writer, was born at Geneva on March 13 1720, of a French family. He made law his profession, but his favourite pursuit was the study of natural science. In 1740 his paper to the Academy of Sciences containing a series of experiments establishing what is now termed parthenogenesis in *aphides* or tree-lice, obtained for him the honour of being admitted a corresponding member of the academy. In 1741 he began to study reproduction by fusion and the regeneration of lost parts in the freshwater hydra and other animals; and in the following year he discovered that the respiration of caterpillars and butterflies is performed by pores, to which the name of *stigmata* has since been given. In 1743 he was admitted a fellow of the Royal Society; and in the same year he became a doctor of laws.

In 1745 appeared his *Traite d'insectologie,* and in 1754 his *Recherches sur l'usage des feuilles dans les plantes;* in which he suggests that plants possess powers of sensation and discernment. But Bonnet's eyesight, which threatened to fail altogether,

caused him to turn to philosophy. In 1754 his *Essai de psychologie* was published anonymously in London. This was followed by the *Essai analytique sur les facultés de l'âme* (Copenhagen, 1760), in which he develops his views regarding the physiological conditions of mental activity. He returned to physical science, but to the speculative side of it, in his *Considérations sur les corps organisés* (Amsterdam, 1762), designed to refute the theory of epigenesis, and to defend the doctrine of pre-existent germs. In his *Contemplation de la nature* (Amsterdam, 1764–65) he sets forth the hierarchy of all creatures, and in his *Palingénésie philosophique* (Geneva, 1769–70), treats of the past and future of living beings, and supports the idea of the survival of all animals.

Bonnet's life was uneventful, and he seems never to have left Switzerland. Between 1752 and 1768 he was a member of the council of the republic. He died at Genthod, near Geneva, May 20, 1793.

Bonnet's complete works appeared at Neuchâtel in 1779-83, partly revised by himself. An English translation of certain portions of the *Palingénésie philosophique* was published in 1787, under the title, *Philosophical and Critical Inquiries concerning Christianity*. *See* also A. Lemoine, *Charles Bonnet* (1850); the duc de Caraman, *Charles Bonnet, philosophe et naturaliste* (1859); Max Offner, *Die Psychologie Charles Bonnet* (Leipzig, 1893); Joh. Speck, in *Arch. f. Gesch. d. Philos.* x., xi. (1897), p. 58 foll., xi. (1898), pp. 1–211; J. Trembley, *Vie privée et littéraire de Charles Bonnet* (Bern, 1794).

BONNET, originally a soft cap or covering for the head, the common term in English till the end of the 17th century; this sense survives in Scotland, especially as applied to the cap known



FROM KELLY, "HISTORIC COSTUME," BY PERMISSION OF B. T. BATSFORD, LTD.

FRENCH BONNET, 1782; ENGLISH BONNET, 1774; GERMAN BONNET, 1770

as a "glengarry." The "bonnet" of a ship's sail now means an additional piece laced on to the bottom, but it seems to have formerly meant a piece laced to the top, the term "to vail the bonnet" being found at the beginning of the 16th century to mean "strike sail" (*cf.* Fr. *aval*er), to let down. "Bonnet" came to be used of a type of head-covering for women fitting closely to the head; hence, the term is also applied to certain protective devices, as in a steam-engine or safety-lamp, or in slang use to a gambler's accomplice, a decoy. A common British use is of the covering which protects the engine of a motor-car from the weather.

BONNEVAL, CLAUDE ALEXANDRE, Comte de (1675–1747), French soldier of fortune, known as Ahmed Pasha. He entered the Royal Marine Corps at 13, and at 16 transferred to the army. He served until 1704, when he was court-martialled for insolence. He then took service under Prince Eugène, and, with a short interval, served in the Austrian army until 1724, when his ungovernable temper again brought him into disgrace. He then entered the Turkish service and took the name of Ahmed, reorganized the Turkish artillery, and was made a pasha. He served in the sultan's wars against Russia and Persia, and died in Constantinople on March 23, 1747.

The *Memoirs* published under his name are spurious. *See* Prince de Ligne, *Mémoire sur le comte de Bonneval* (1817); and A. Vandal, *Le Pacha Bonneval* (1885).

BONNEVILLE, BENJAMIN L. E. (*c.* 1795–1878), American military engineer and explorer, was born in France about 1795. He emigrated to the United States and graduated at the U. S. Military Academy at West Point in 1815. In 1831–36, having obtained leave of absence from the army, he conducted an exploring expedition to the Rocky Mountains. After being cut off from civilization for several years, he returned with a valuable account of his adventures, which was edited by Washington Irving and published under the title *The Rocky Mountains: or Scenes, Incidents, and Adventures in the Far West; from the Journal of Captain Benjamin L. E. Bonneville of the Army of the United States* (2 vol., 1837), subsequent editions bearing the title *The Adventures of Captain Bonneville, U.S.A., in the Rocky Mountains and the Far West.* He became a major in 1845, and was breveted lieutenant-colonel for gallantry during the Mexican War. He became a colonel in 1855, commanded the Gila river expedition against the Apaches in 1857, and from 1858 to 1861 commanded the department of New Mexico. He was retired in 1861, but served during the Civil War as recruiting officer and commandant of barracks at St. Louis, Mo., receiving the brevet rank of brigadier-general in 1865. He died at Fort Smith, Ark., on June 12 1878. The extinct glacial lake which once covered what is now north-western Utah has been named in his honour.

BONNEY, THOMAS GEORGE (1833–1923), English geologist, son of the master of Rugeley grammar school, was educated at Uppingham school and St. John's college, Cambridge, and held various academic posts and ecclesiastical preferments. He became secretary and afterwards president of the Geological Society (1884–86), secretary of the British Association (1881–85), president of the Mineralogical Society and of the Alpine Club. In addition to many papers published in the *Quarterly Journal of the Geological Society* and *Geological Magazine,* he wrote several works on geology.

See *Geological Magazine* for Sept. 1901 (with bibliography).

BONNIVET, GUILLAUME GOUFFIER, Seigneur de (*c.* 1488–1525), French soldier, was brought up with Francis I. of France, and after the young king's accession he became one of the most powerful of the royal favourites. In 1518, as the head of the French embassy in England, he acted as proxy for the Dauphin in his marriage with Princess Mary. He was the implacable enemy of the constable de Bourbon and contributed to his downfall. In command of the army of Navarre in 1521, he occupied Fuenterrabia and was probably responsible for its non-restoration and for the consequent renewal of hostilities. He succeeded Marshal Lautrec in 1523 in the command of the army of Italy and entered the Milanese, but was defeated and forced to effect a disastrous retreat, in which the chevalier Bayard perished. He was one of the principal commanders of the army which Francis led into Italy at the end of 1524 and died at the battle of Pavia on Feb. 24, 1525. According to Brantôme, Bonnivet was the successful rival of the king for the favours of Madame de Châteaubriand and is said to have been the hero of the fourth story of the *Heptameron.*

Bibliography.—Bonnivet's correspondence in the Bibliothèque Nationale, Paris; memoirs of the time; complete works of Brantôme, vol. iii., published by Ludovic Lalanne for the Société de l'Histoire de France (1864 *seq.*). *See* also Ernest Lavisse, *Histoire de France,* vol. v., by H. Lemonnier (1903–04).

BONOMI, GIUSEPPE (1739–1808), English architect, was born at Rome on Jan. 19, 1739, and died in London on March 9, 1808. He already had a considerable reputation in Italy when he came in 1767 to England and began to practise. Bonomi was largely responsible for the revival of classical architecture in England. His most famous work was the Italian villa at Roseneath, Dumbartonshire, designed for the Duke of Argyll. In 1804 he was appointed honorary architect to St. Peter's at Rome.

His son, Giuseppe Bonomi (1796–1878), studied art in London at the Royal Academy, and is best known as an illustrator of the leading Egyptological publications of his day. From 1824 to 1832 he was in Egypt, making drawings of the monuments in the company of Burton, Lane and Wilkinson. In 1833 he visited the mosque of Omar, returning with detailed drawings, and from 1842 to 1844 was again in Egypt, attached to the Prussian gov-

ernment exploration expedition under Lepsius. He assisted in the arrangement of the Egyptian court at the Crystal Palace in 1853, and in 1861 was appointed curator of the Soane Museum. He died on March 3, 1878.

BONONCINI or **BUONONCINI, GIOVANNI BATTISTA** (1672–1750?), Italian musical composer, was the son of the composer Giovanni Maria Bononcini (1640–1678), best known as the author of a treatise entitled *Il Musico Prattico* (Bologna, 1673), and brother of the composer Marc' Antonio Bononcini (1675–1726), with whom he has often been confused. He was born at Modena in 1672, but the date of his death is uncertain. He was a pupil of his father and of Colonna, and produced his first operas, *Tullo Ostilio* and *Serse,* at Rome in 1694. In 1696 he was at the court of Berlin, and between 1700 and 1720 divided his time between Vienna and Italy. In 1720 he was summoned to London by the Royal academy of music, of which Handel was director. In London he was not in favour at court, where German musicians were preferred, but he enjoyed the patronage of many great houses, and the Marlboroughs gave him a home and a stipend. During the years of his residence in London he produced many operas. His chief success was *Astarte,* originally produced in Rome in 1714 and now revived. About 1731 it was asserted that he had a few years before produced a madrigal by Lotti as his own work, and after a long and bitter controversy he was obliged to leave the country. He remained for several years in France, and in 1748 was summoned to Vienna to compose music in honour of the peace of Aix-la-Chapelle. He then went to Venice as composer to the opera there but the end of his career is unknown.

Bononcini has been mainly remembered on account of his rivalry with Handel in London, but he was in himself a musician of considerable merit, and seems to have influenced the style, not only of Handel but even of Alessandro Scarlatti. Either he or his brother was the inventor of that sharply rhythmical style conspicuous in *Il Trionfo di Camilla* (1697), the success of which at Naples probably induced Scarlatti to adopt a similar type of melody. It is noticeable in the once popular air of Bononcini, *L'esperto nocchiero,* and in the air *Vado ben spesso,* long ascribed to Salvator Rosa, but really by Bononcini. Works attributed to Bononcini include 22 operas, five oratorios and many masses, cantatas, etc.

BONONIA (mod. BOLOGNA), an important town of Gallia Cispadana (*see* AEMILIA VIA), in Italy. It was said by classical writers to be of Etruscan origin, and to have been founded, under the name Felsina, from Perusia by Aucnus or Ocnus. Excavations have shown that the site of Bologna was previously occupied by several (perhaps four) isolated hamlets of the Villanova culture (1050–500 B.C.), the cemeteries of which have been found on all sides of the city. About 500 B.C. the Etruscans founded the city of Felsina, and several large Etruscan cemeteries have been found. It was, indeed, their most important city north of the Apennines. In 196 B.C. it was in the possession of the Boii, and had probably by this time changed its name of Bononia; and in 189 B.C. it became a Roman colony. After the conquest of the mountain tribes, its importance was assured by its position on the Via Aemilia, by which it was connected in 187 B.C. with Ariminum and Placentia, and on the road, constructed in the same year, to Arretium; while another road was made, perhaps in 175 B.C., to Aquileia. It thus became the centre of the road system of north Italy. In 90 B.C. it acquired Roman citizenship. In 43 B.C. it was used as his base of operations against Decimus Brutus by Mark Antony, who settled colonists here; Augustus added others later, constructing a new aqueduct from the Letta, a tributary of the Renus, which was restored to use in 1881. After a fire in A.D. 53 the emperor Claudius made a subvention of 10 million sesterces (£100,000). It was able to resist Alaric in 410 and afterwards belonged to the Greek exarchate of Ravenna. Of remains of the Roman period, however, there are none above ground, though various discoveries have been made from time to time within the city walls, the modern streets corresponding closely with the ancient lines. Remains of the bridge of the Via Aemilia over the Renus have also been found—and also of a massive prolongation of it, of late date, in the construction of which a large number of Roman tombstones were used, the river itself having moved to the west.

See D. Randall MacIver, *Villanovans and Early Etruscans* (Oxford, 1924) 1–37 for the archaeology of the early periods; and his art. VILLANOVANS.

BON-SAI (potted dwarf tree). Strictly speaking, the name applies only to dwarf trees planted in shallow vessels, those in deeper pots being called *hachi-uye* (pot-planted). But both are known as *bon-sai,* irrespective of the vessels they grow in. The growth of the plants is controlled by pruning, fertilization, etc., so that the trees are trained into the stately shapes of ancient big trees, the vacant space in the pot suggesting plains or distant mountains. The trunk of the tree, the spread of the roots, the distribution of branches, all of which may be used to give an aged appearance to the tree, are especially important. Without showing any trace of artificiality, each tree should develop its own characteristics. The deciduous should have the dignity of age either with or without the leaves, as in nature, though in some the leaves, while in others the flowers or fruits, may constitute the main attraction, according to the season. The *bon-sai* may consist (1) of a single tree (*ippon-dachi*) either in an upright or leaning attitude; (2) of two trunks (*ai-oi*) growing out of a single stump, or planted closely together to appear as such; (3) of groups (*yose-uye*) of similar or different kinds of trees to suggest a forest or wooded mountain side; it may also have (4) high exposed roots (*ne-agari*); (5) trees or vines drooping down (*kengai*) as if overhanging from a cliff; or (6) roots growing out of and embracing a rock (*ishi-zuki*). The pot in which the trees are planted plays an important part in the scheme, shapes and sizes being determined by the kinds of plants contained. The pots are generally plain, but some have considerable decoration in relief or in painting. They are of earthenware, with a hole in the bottom for drainage lest the roots rot, in shape round, oval, rectangular, octagonal or lobed, etc., of varying depths, and chosen to be in harmony with and in right proportion to the tree. For centuries the Japanese have cultivated the art of dwarfing trees, using them as ornaments for rooms, and *bon-sai* still remains a hobby among the aristocrats as well as among the working people of Japan.

BON-SEKI (tray-stone) is the Japanese art of creating a landscape on a tray with stone and sand. Its origin in Japan is traced to the reign of the empress Suiko (593–628) when stones of rare shapes were presented to the court from China. Placed on a board or tray, the stone was admired on account of its beautiful lines or shape that might, perhaps, suggest a stately mountain or a tremendous precipice. Furthermore, the people appreciated it for its own qualities—its solid reality, its unchanging and lasting virtues which they believed to have a power of "softening the hardened hearts of men." Later, sand was used in conjunction with the stones to suggest mountains and water, and the art of arranging them came to be known by the name *bon-zan* (tray-mountain). A further development led to its use to represent sentiments of poems or to reproduce famous scenes in all their complicated phases, showing distant ranges of mountains as well as nearer hills, with villages, temples and pagodas overlooking a shimmering lake or sea, with sailing boats and flying geese, etc., all portrayed by means of stones, pebbles and sand. When the art attained this stage of development it was for a time called *bon-kei* (*q.v.*) by some. That name was soon dropped, however, for the original name *bon-seki, bon-kei* being given to another branch of the art, a development of *hako-niwa* (*q.v.*), in which earth, or its substitutes, and living vegetation were used to make a landscape on a tray.

In *bon-seki,* it is needless to say, the selection of the stone is of greatest importance. One that resembles a mountain or a range of mountains, an island or a chain of isles, is highly valued. However well shaped it may be, if it has been chiselled to get the desired form it is despised as a "dead stone"; it must be natural, and those found in mountain streams are considered to be the best. Greenish stones are used for a spring landscape to suggest a fresh verdure; black ones for summer, indicative of dark shad-

ows; reddish ones for autumn, suggestive of tinted hill-sides; whitish ones for winter, to denote snow. Black stones, however, from the provinces of Kii, Satsuma and Echigo are most commonly used for all scenes, irrespective of seasons, as they go well with the white sand. The desirable size of the principal stone is considered to be about 7 or 8in. long, and 4 or 5in. high, though a considerable latitude is allowed in practice. Stones of smaller sizes are also necessary to get variation and perspective. The bottom of the stone is usually sawn flat for stability and is covered with silk so that it may not scratch the surface of the lacquered tray. Besides the principal stones there are *soye-ishi* (auxiliary stones), *sute-ishi* (thrown-away stones), sacrificed to emphasize the more important ones, and *ashirai* (small stones for creating details of the scene). Agate, ruby, serpentine and rock crystals of various shades are also used, though very rarely, for forming islands or as *ashirai*.

Sand is indispensable to *bon-seki*. White sand from the provinces of Bizen and Bingo has been popular, but now-a-days crushed calcareous spar is most generally used. It is generally prepared in ten different grades. Grades from 1 to 5 are used to add details to the scenery, the 6th, 7th and 8th grades for making promontories and seashore, the 9th for streams and waves, and the 10th, the finest, for mists, snow or clouds. Not only calcareous spar, but also agate and corals are granulated and used as sand, though rarely, except the red coral for the rising sun to distinguish it from the moon.

Black lacquered trays are generally preferred, either oval (with extreme length and width of about 16 and 10in. respectively) or fan-shaped in a smaller size, with low borders, or rectangular, without any border.

Brushes are used very effectively by some masters of this art, but plumes are indispensable. Feathers of hawks, cranes, swans and herons are employed for various purposes. One kind is used to sweep the sand together or remove unnecessary sand from the tray, another, with the aid of a small ruler, to make mists. Still another is required to mark streams and waves of different varieties, for each season has its characteristic waves; for spring they are peacefully long and continuous near the beach and higher off the shore; for summer, ripples cover the calm sea; for autumn, they are rough, intermingled with more peaceful ones; for winter waves, the feather is brushed roughly to right and left, making a choppy sea with roaring surges. The directions of wind peculiar to each season must not be overlooked; the front of the principal stone is always considered as facing south. Other paraphernalia required in *bon-seki* include sieves to sift different grades of sand, a metal spoon and a tube for the sand, a pair of chop-sticks to manage small pebbles, forms for making crescent or full moon, and miniature models in silver or bronze bridges, temples, pagodas, etc.

Bon-seki has had a long history, for it was already in vogue at the time of Ashikaga Yoshimasa (1436–90) and the period that followed, when *cha-no-yu*, commonly known as ceremonial tea, being "a cult founded upon the adoration of the beautiful amidst sordid facts of everyday life," flourished. As in other branches of Japanese art, there arose different styles or "schools," some of the more prominent being Takeya-ryu, Kiyohara-ryu, Tōzan-ryu, Hōshō-ryu, Ikuta-ryu, Uda-ryu, Sekishyu-Tōyama-ryu, Kōno-ryu and Hosokawa-ryu. The last-mentioned school is most active at present, having for its chief master Katsuno Hakuyen, of Nagoya, who revived the school with his rare talent, and established branches all over Japan and her colonies.

There is a special kind of *bon-seki* called *kake-gaku* (hanging picture) or *tome-ye* (fastened painting). The sand is mixed with powdered paste and the completed picture steamed, so that it sticks to the tray. Usually a fine grade of sand is used for this purpose, though recently some masters have contrived to stick even stones by means of gum arabic. There is a similar art known as *bon-ga* (tray-pictures), an evolution of *suna-ye* (sand-painting), which men on the street were accustomed to practise at various times in Japanese history, record showing that the custom existed in the era of An-ei (1772–81). Sands, not only of natural colours, but artificially dyed, are used in depicting almost any subject: trees and houses, flowers and birds, natural scenes and historical events—a pictorial art in sand. *Bon-ga* is distinct from *bon-seki*, though the latter sometimes appropriates for itself what is practised in the former, and the former does not enjoy either the artistic prestige or the popularity of the latter. Still another branch of art in which sand is used is *suijo-sunaye* (sand-pictures-on-water), or *sui-ga* (water-picture) for short. Using wax-coated sand of different colours, the artist draws pictures on the water contained in a tray. In order to prevent the rippling of the water, which would prevent the sand from floating, pulverized white cowpeas and alum are previously stirred in. This art was in vogue in the era of Bunkwa (1804–18), but is now seldom practised.

Apart from *bon-seki*, there still prevails among the Japanese their ancient custom of enjoying rare stones by themselves. While some of them are too large, others may be used in *bon-seki* as well. They call these stones *ki-seki* (rare or strange stones), or merely *ishi* (stone), and some are among heirlooms of ancient families. Provided with individual wooden stands, they are placed on one's writing desk or in *tokonoma* (alcoves in the guest room), that the gazer may be led into reveries by the fancies their shapes suggest, such as mountains, immense cliffs or some natural phenomena. A stone with a white streak or vein may suggest a waterfall, the sound of which may be heard, or rather felt, in the momentary solitude of one's room, for "heard melodies are sweet, but those unheard are sweeter."

Some stones are placed on a tray with low-growing grass or bamboo in order to emphasize the immensity of nature suggested by the stone. Another way of enjoying them, which has been for centuries and still is popular among the Japanese, is known as *sui-seki* (water-stone). A natural stone of desirable shape is placed in a porcelain or bronze tray or dish with sand and water. Months and years of patient watering and care may, according to the kind of stone used, bring forth a thin coating of moss, enlivening the stone with a verdure like a mountain or an island with forest and meadows. (J. Har.)

BONSTETTEN, CHARLES VICTOR DE (1745–1832), Swiss writer, was born at Berne and educated in his native town, at Yverdon, and (1763–66) at Geneva, where he came under the influence of Rousseau and of Charles Bonnet, and imbibed liberal sentiments. Recalled to Berne by his father, he was soon sent to Leyden, and then visited (1769) England, where he became a friend of the poet Gray. After his father's death (1770) he made a long journey in Italy, and on his return to Berne (1774) entered political life. From 1779 onward he held various administrative posts, but in 1798 had to leave Switzerland on account of his political opinions. He spent the years 1798 to 1801 in Denmark, with his friend Frederika Brun, and then settled down in 1803 in Geneva for the rest of his life. There he enjoyed the society of many distinguished persons, among whom was (1809–17) Madame de Staël. It was during this period that he published his most celebrated work, *L'Homme du midi et l'homme du nord* (1824), a study of the influence of climate on different nations, the north being exalted at the expense of the south. But his best known works are his descriptions of Switzerland, especially the *Lettres pastorales sur une contrée de la Suisse* (1779).

Lives by A. Steinlen (Lausanne, 1860), by C. Morell (Winterthur, 1861), and by R. Willy (Bern, 1898). His correspondence with Frederika Brun was published in 1829 in Frankfurt a.M. *See* also vol. xiv. of Sainte-Beuve's *Causeries du Lundi*.

BONTOC IGOROT, the name of a powerful, head-hunting tribe of the island of Luzon. The divisions of the tribe are political and exogamic; intensive agriculture is the means whereby subsistence is obtained as, owing to the hilly nature of the Bontoc territory, game is scarce. The language is somewhat complicated in structure and has a good vocabulary.

See Seidenadel, *A First Grammar of the Language of the Bontoc Igorot* (Chicago, 1909); A. E. Jenks, *The Bontoc Igorot* (*Ethnologic Survey Publication*, Manila, 1905), and various publications of the Science Museum, University of the Philippines, Manila.

BONUS, a term used in business or finance to describe an exceptional, occasional, or gratuitous addition to customary payments. It is a jocular and effective application of the Lat. *bonus*,

for *bonum,* "a good thing." When a joint-stock company makes an exceptional profit, and enlarges its dividend temporarily, it pays a "bonus" to its shareholders to distinguish between the extra and the customary payment. When new shares are created out of reserves, and distributed to shareholders, they are termed bonus shares. Similarly, life insurance companies often distribute, out of accumulated surplus (*see* LIFE INSURANCE), bonus additions to the face value of policies.

After World War I a strong effort was made in the United States to secure a national bonus for veterans in compensation for financial losses supposedly incurred by them through their service. A measure providing such compensation, though deferring its payment until 1945, was passed in 1924 over president's veto. On the subsequent movement for immediate payment *see* UNITED STATES OF AMERICA: *History;* AMERICAN LEGION.

BONUS, EMPLOYEE, a phrase used especially in the United States to designate an award in addition to the contractual wage. It is usually intended as a stimulus to extra effort but sometimes represents the desire of the employer to share with his workers the fruits of their common enterprise. Related to bonus, but considered under other headings, are such activities as profit-sharing, stock ownership, prizes, savings plans, extra holidays, vacations with pay, free transportation, luncheons, suggestion systems and "cost of living" bonus.

The use of the bonus as a means for stimulating employees to greater efforts received a marked impetus during the period of World War I when labour shortage made it imperative that maximum production per individual be obtained. Early schemes were simple in structure and took into account quantity of production with some provision for penalizing the worker for deficiency in quality of performance. Since then, bonus plans have increased in complexity, and various factors other than quantity and quality are considered. They have also been extended to cover other classes of workers than those employed on direct production. Bonus plans have been developed for practically all classes of employees including supervisory and executive staff.

As illustrative of variety in the application of the bonus idea in the United States the following examples are cited:—

Attendance bonus, usually a stipulated percentage of and paid in addition to regular salary for perfect attendance over a given period of time. Ten per cent of a week's salary for a month of perfect attendance is typical.

Annual or Christmas bonus, a type which has grown in favour rapidly where it has been difficult, if not impossible, to measure individual output, but where the company wished to express its appreciation for extra efforts put forth by all of its employees during a successful business year.

Economy or efficiency bonus, a type based on a predetermined schedule or comparative standard whereby employees are rewarded for increased economy in the use of material, reduction in operating costs, reduction in waste, elimination of errors, etc.

Group bonus, paid on the basis of the activities of the group as a whole and divided among the individuals according to some predetermined arrangement. This type of plan is frequently used to reward the so-called nonproductive type of wage earner and often for distributing bonus payments to executives. It is distinguished from the annual bonus type in that it employs some measurable quantity as a basis and is paid more than once a year.

Production or quality bonuses, a stipulated payment for a predetermined volume of production or maintenance of quality standard or both. This is perhaps the earliest known type of plan and the one most readily applied because of its direct relationship to measurable accomplishment.

Length of service bonus, usually given as a mark of appreciation for continuity of service where it is undesirable to further increase the wage scale.

Safety bonus, used to focus attention upon the accident-reduction problem. Usually a group type of bonus.

Sales bonus, used as an additional stimulus beyond that provided by commissions or to reward those connected with sales though not in the commission class.

There has been an increasing interest in the development of bonus plans for executives and those in supervisory positions. This type of bonus is usually paid annually when a lump sum is divided among the executives in accordance with some predetermined plan. However, due to the world-wide depressed condition of business and general unemployment during the period 1931–35, many bonus plans were seriously curtailed. In the late 1930s bonus plans became more widely used again, and they were heavily relied upon as a stimulus for increased war production during World War II. The devising and application of bonus plans presents many problems and difficulties. The bonus must be large enough to be attractive and to give a sense of adequate reward. The requirements for earning the bonus must be such as to be beyond question as to fairness and once established, must not be needlessly altered. This is particularly true with respect to increasing the requirements for earning the bonus. Necessary adjustments must be made with great care and explained to the employees. It has also been found wise to maintain the identity of the bonus as distinguished from regular wages; otherwise it loses its incentive power. Most bonuses are paid separately on this account. It is also necessary that all employees who can reasonably claim to have the right to partake in a bonus plan, be included. *See* WAGE-SYSTEMS IN INDUSTRY.

(O. G. S.; X.)

BONZE, the European name for the members of the Buddhist religious orders of Japan and China. The word is loosely used of all the Buddhist priests in those and the neighbouring countries. (Port. *bonze* from Chinese *bon-tze.*)

BOOKBINDER, the workman in a printing house or bindery by whom the printed sheets as they come from the press are folded, stitched or sewed together, covered and made up into their final form as books or pamphlets. Although originally a handicraft, practically all bookbinding operations to-day are performed by machine. The exceptions are blank book work, repairing damaged books and very small editions of *de luxe* works. In such cases the work is performed by craftsmen commonly known in the trade as "hand binders," who are perhaps the most skilled workmen in the whole printing and publishing industry. In the manufacture of a book by hand, the binder receives the sheets folded either by hand or machine. He assembles the sections into complete books and sews them together, using a sewing frame in which the sections are securely held and yet accessible. After being sewn, the books are placed in a vise and given a rounded back with a hammer. Meanwhile, the operation of case making—making the stiff or flexible cover of the book—has been going on. These are built up of board covered with cloth or leather. The ornamentation of the cover with the title of the work, and decoration of gold leaf applied with small heated tools and dies is also part of the binder's work. Having completed the case the binder then "cases in"—makes fast the sewed sections in the cover, either by gluing down the tapes to which the book is sewed, which is customary in heavy or expensive books, or by pasting the end sheets of the first and last sections. Some of the other operations in the finishing of a book are head banding, marbling, edge guilding and edging. The above includes only the barest outlines of the binder's work. There are many styles of binding such as full, half, quarter, check, flexible and hard, each of which has its own peculiar technique. In modern bookbinding, whether pamphlet or edition, all the above operations are performed by machinery and the average "bookbinder" knows little of hand work. He sets and operates folding, gathering, sewing, stitching, case making and covering machines, trimming and gold stamping machines, and is a highly skilled machine operator. Hand work, such as tipping and feeding machines, hand-gathering and padding, is largely unskilled and is performed by low-paid bindery girls.

(R. T. W.)

BOOKBINDING, the art of fastening sheets of paper (vellum, cloth, papyrus, etc.), together to make into portable form a written or printed treatise.

HISTORY

Bookbinding began in the Christian era with the change from the continuous roll or volume to the book made up of sepa-



BY COURTESY OF THE DIRECTOR OF THE VICTORIA AND ALBERT MUSEUM

THE GOSPELS OF CHARLEMAGNE

This German binding, of the late 10th or early 11th century, is made of beechwood overlaid with gold. Around the centre figure of Christ enthroned are three borders, each set with precious stones, the outer one being further enriched with rectangles of cloisonné enamels. The specimen is characteristic of the precious bindings put on valuable religious books during the early and middle ages, and is one of the few examples extant

BOOKBINDING



BY COURTESY OF THE DIRECTOR OF THE VICTORIA AND ALBERT MUSEUM

LEATHER BINDING OF THE 15TH CENTURY

This binding of the late 15th century consists of wooden boards covered with blind tooled brown leather. The diaper is enclosed by a border adorned with rose plants within lozenges. At the head is the title in Gothic letters, "BARTHOLOMEUS." The four raised-brass ornamental corners and centre boss are frequently met with in bindings of this period and served to protect the surface of the leather from rubbing. The covers are held together by two brass clasps. The work is unsigned but bears a similarity to work attributed to Antony Koberger of Nuremberg

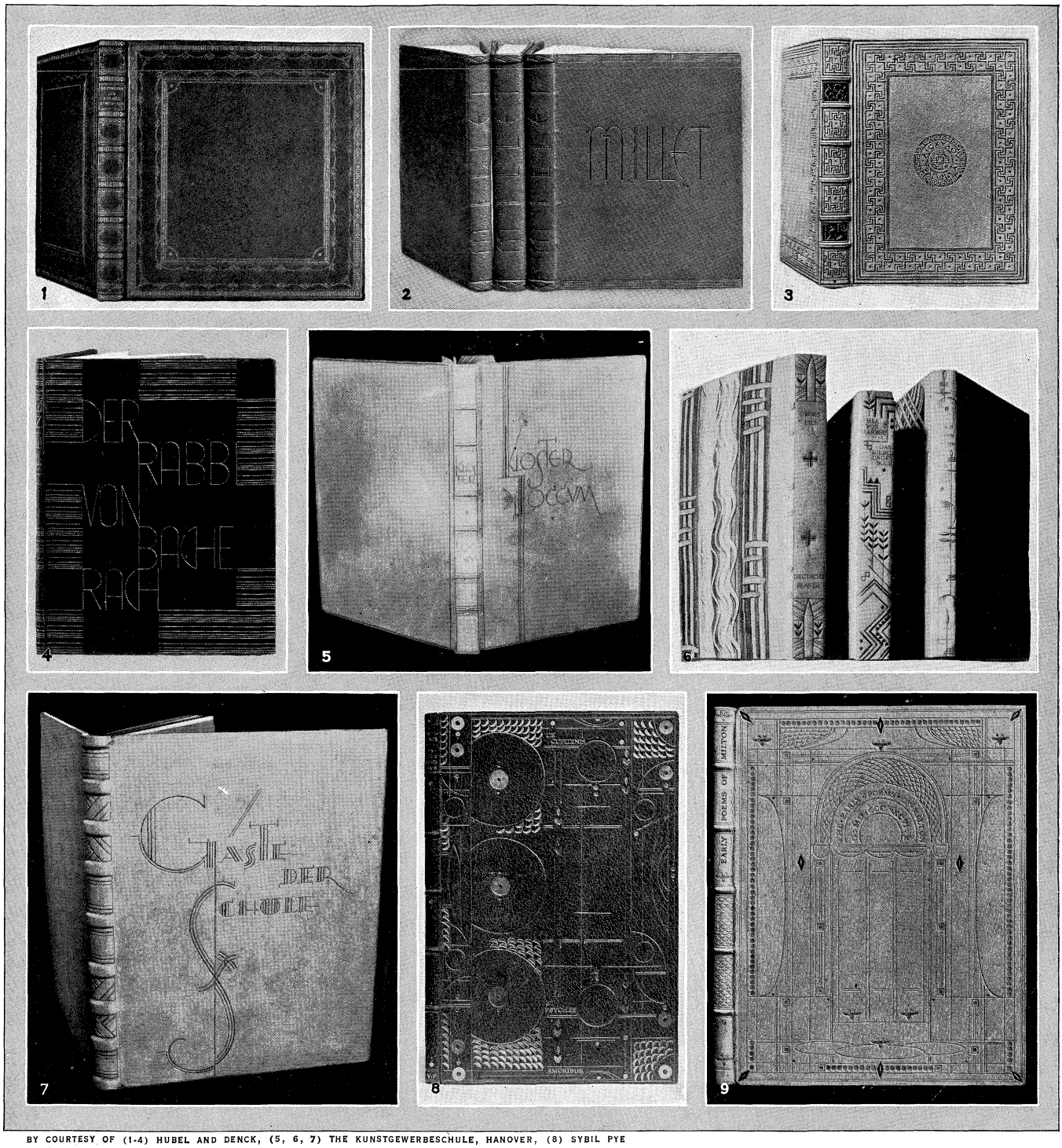


BY COURTESY OF (1, 5) THE DIRECTOR OF THE VICTORIA AND ALBERT MUSEUM, (2) THE SOCIETY OF ANTIQUARIES OF LONDON, (3, 4, 6) THE TRUSTEES OF THE BRITISH MUSEUM

ENGLISH AND EUROPEAN BINDINGS 7TH TO THE 16TH CENTURIES

1. MS. Gospel of St. John found at the head of St. Cuthbert's body in 1104 when the shrine of 698 was opened. St. Cuthbert died in 687. The binding is red leather with repoussé design and painted blue and yellow lines impressed by hand
2. Winchester Doomsday Book ("Liber de Terris Regis Reddentibus Langabulum et Brugium in Winton"), of the 12th century. The binding is dark brown leather and is blind-tooled with individual stamps. Manuscript on vellum. Size, 9¾ by 6¾
3. "Il Petrarca," a 15th century binding of Venetian workmanship, one of the very early examples of gold tooling in Europe
4. Sixteenth century binding with interlaced geometrical design made for Jean Grolier, viscount d'Aguisy, whose library of 8,000 volumes was the finest of his time. The back has six bands. The cover carries the inscription "Io Grolierie et Amicorum"
5. Sixteenth century brown calf binding with gold tooled panel, designed about 1529 by Geoffrey Tory, royal printer and binder for Francis I of France
6. "Fanfare" binding of red morocco bearing the arms of Jacques Auguste de Thou and attributed to Nicholas Eve, the first of the Eve family of binders. De Thou was the most celebrated patron of binding during the last part of the 16th century, and many of his 8,000 volumes were bound in the "fanfare" manner

BOOKBINDING



BY COURTESY OF (1-4) HUBEL AND DENCK, (5, 6, 7) THE KUNSTGEWERBESCHULE, HANOVER, (8) SYBIL PYE

EXAMPLES OF MODERN BOOKBINDING

1, 2, 3 and 4. Modern German bindings
5. Vellum binding with hand gilding
6. Half-vellum bindings with hand painted paper
7. Half-vellum binding with blind lettering and vellum doublure
8. Binding in green Levant morocco, with gold tooling
9. White pigskin binding with blind and gold tooling, a Vale Press book

rate sheets. Early books are composed of single sheets—of vellum at first, of paper later—folded once and collected into gatherings or sections of convenient size. The leaves were held together in the section form by sewing through the central fold; the sections were held together in proper order by sewing them on to flexible bands or thongs at right angles to the backs. Later books only differ in that the section is usually a large single sheet folded several times so that the outer folds require cutting.

Origin of Bookbinding.—To keep the leaves flat and uninjured, early books, which were large, were placed between thin wooden boards. Soon it was found as convenient as it was simple to join book and boards together, by fixing to the boards the ends of the bands holding together the sections. By the time a leather covering had been added to hide and protect the back of the sections, overlapping or completely covering the boards, all the elements of the modern book, half-bound or fully bound, had been evolved. A greater variety of materials is now used, but the principle of construction remains the same.

Early Decoration.—The covers of the bound book lent themselves readily to ornamentation and decoration. Already in the letters of St. Jerome reference is made to jewelled bindings, so that books were being sumptuously ornamented by the 4th century of the Christian era. Costly bindings were often destroyed for their valuable materials; but examples survive, mostly in churches and museums, of books covered or decorated with precious metals, enamels, jewels or carved ivory panels. The earliest is the 7th century Gospels of Theolinda at Monza in Northern Italy. Famous examples are the so-called Gospels of Charlemagne (Plate I.) in the Victoria and Albert Museum, London, and the Lindau Gospels in the J. Pierpont Morgan collection, New York. Others exist in libraries such as the British Museum and the Bibliothèque Nationale.

These precious bindings are, and always were, unusual; they are mostly found on devotional books intended for royal personages or for the service of the church. The ordinary book, covered wholly or partly with leather over boards, was decorated with patterns of lines or stamps, or both. The earliest surviving decorated leather binding on a book, belonging to the same period as the earliest known precious binding, is on St. Cuthbert's Gospel-book (Plate III., fig. 1), taken from his coffin when it was transferred to the new Durham cathedral in 1104, and now preserved at Stonyhurst college. This is ornamented with *repoussé* and painted line-work, and stands quite by itself. The other early decorated bindings are impressed with small stamps in blind (*i.e.*, ungilt) in more or less elaborate patterns, and, apart from isolated examples, date from the century in which St. Cuthbert's Gospel-book was found. Fine examples of these bindings were made during that century at Winchester (Pl. III., fig. 2) and Durham, and later, at Oxford, Cambridge and London. Such bindings with small stamps, supplemented at the very end of the period by roll stamps, were the prevailing fashion in all the European countries from the 12th to the 15th century; but in the Germanic countries (Pl. II.), cut leather bindings also were produced by incising a pattern in the leather, the outline being sometimes emphasized by stippling the background.

With the introduction of printing into Europe about the middle of the 15th century the number of books produced suddenly increased enormously, involving a corresponding increase in the number of people employed in binding. The making and binding of books was transferred from the monasteries to the houses of printers and binders, and soon the names, initials or devices of printers or binders are found stamped on book-covers. Advances were made in the art of binding, styles of decoration developed and as books circulated freely, were copied in other countries.

Famous Styles.—About a quarter of a century after the invention of printing, the greatest advance was made in artistic bookbinding in Europe by the introduction, probably through Venice, of gold-tooling from the East, where it had been practised much earlier. The art quickly developed in Italy, and spread to other countries. The celebrated Venetian printer, Aldus Manutius, was the first to give his name to a style in this new art; but in general, the early styles are called not after their producers, who are unknown, but after famous collectors, or reputed collectors. "Canevari" bindings, which have in the centre a cameo stamp of Apollo driving a chariot, were so-called after their supposed collector Demetrio Canevari, physician to Pope Urban VIII. Their real collector has recently been shown to have been Pier Luigi Farnese, son of the succeeding Pope, Paul III. Many of the finest Italian and French bindings were made for Jean Grolier, viscount d'Aguisy, treasurer of France in 1545, and bear upon them the legend *Portio mea domine sit in terra viventium* and *Io. Grolierii et Amicorum* (Pl. III., fig. 4). Although not uniform in origin or appearance, these are known as Grolier or Grolieresque bindings. "Maioli" bindings are named after Thomas Maiolus, another famous collector of the period, who used similar inscriptions to Grolier's. Until quite recently he was considered to be an Italian, Tommaso Maioli, but he is now claimed to be a Frenchman, Thomas Mahieu, and identified with the secretary of Catherine de'Medici.

Italian gold-tooled bindings were imitated in other countries. In England, Thomas Berthelet, printer and binder to Henry VIII., was amongst the first to produce gold-tooled bindings "in the Venetian manner," while Thomas Wotton, as a collector, is an English counterpart to Grolier. In Germany, on the other hand, blind stamping, especially with panels on pigskin, continued in general use. In Italy itself fine bindings long continued to be made for great patrons like popes and cardinals, but recent investigations suggest that the supremacy in binding was passing to France earlier than is generally supposed. Grolier and Maioli bindings were produced in France under those patrons of the arts, Francis I. and Henry II. The royal printer and binder for the former, Geoffrey Tory, who also worked for Grolier, designed a decoration for bindings made for his books (Pl. III. fig. 5) which includes his device of the *pot cassé*. Fine bindings were made for Henry II., for his queen, Catherine de'Medici, and for his mistress, Diane de Poitiers, and from this time onwards French binders and families of binders have excelled in technical skill and initiative. Later royal binders, Nicholas and Clovis Eve, developed "fanfare" binding (Pl. III., fig. 6) usually associated with their name. Le Gascon in the early 17th century developed the *pointille* style, where the dotted line replaces the solid line; and the Padeloup and Derome families of the late 17th and the 18th century developed the *dentelle* binding, so called from their lace-work borders.

In England, after Berthelet's time, fine bindings were made for royal and noble patrons, and usually decorated with their arms or badges. Meantime velvet and embroidered bindings, common to most countries, increased in vogue and became especially popular during the Stuart period. In gold-tooled leather bindings a characteristic native style was not evolved until the late 17th century, when Samuel Mearne, royal binder to Charles II., devised the "cottage" design, so-called from its walls and its roof appearance. Along with the richly decorated binding of Mearne and his followers, the characteristic blind-tooled black leather binding, with dark, instead of gilt edges, became fashionable for religious books in England, for some half a century. English binding deteriorated during the 18th century, but it was redeemed towards the end of the century by a brilliant and original artist, Roger Payne, who with his fine small tools and original designs, with their proper appreciation of blank spaces, is the most inspiring of the English book binders. During his time John Edwards of Halifax worked on different lines; he was famous for his transparent vellum bindings covering delicate paintings, and, with John Whitaker, for "Etruscan" bindings, so called from their classical borders and other ornamentations that were carried out in the classical tradition.

Modern Work.—The 19th century witnessed the development of decoration by machinery, whole covers being impressed in blind or gold by means of metal dies, a practice which was greatly extended with the introduction of machine-made cloth bindings. But these developments hardly affected high-class bindings. In France, from the beginning of the century onwards, binding and decoration have been more remarkable than ever for their technical perfection, at the hands of a long line of artists: Bozérian

Thouvenin, Bauzonnet, Trautz, Lortic, Niedrée, Duru, Capé, Chambolle, Cuzin, Michel and others.

In England the most original binder of last century was Charles Lewis (Thomas Grenville's binder), while others followed traditional styles, sometimes rather mechanically, notably Kalthoeber, Staggemeier, Walther, Hering, Bedford and the existing firms of Rivière and Zaehnsdorf. But towards the end of the century an artistic revival took place, inspired by William Morris, who was responsible for the modern revival in printing. The practical founder of the modern school was T. J. Cobden-Sanderson, who established the Doves Press and bindery; a series of his fine bindings is in the British Museum. His most successful pupil is Douglas Cockerell, whose increasing output, revealing originality, combined with a sense of the craft's historic background, confirms his position as the head of the bookbinders of to-day. Mention may also be made of Charles Ricketts, especially for his work on the Vale Press books (Plate IV., fig. 9) and of a recent convert to the decoration of bindings, Glyn W. Philpot, R.A. A number of women bookbinders, Miss Adams (Mrs. Webb), Miss E. M. MacColl, Miss Sarah Prideaux, Miss Sybil Pye, Miss Mary Robinson and others, have helped to increase the prestige of the modern English school, which has influenced the course of artistic binding on the Continent and in the United States. In France and Germany, and to a lesser extent elsewhere, besides work on sounder lines (*see* Plate IV.), there is an increasing output of bindings which exceeds the true limits of book decoration, partly under the influence of modernist tendencies in other branches of art. (*See* BOOKS: *Modern American;* BOOKS: *Modern English;* BOOK-PLATES.)

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THEORY AND PRACTICE

A book is said to be bound when the sewing cords or tapes are firmly attached to the boards independently of the covering material; books are said to be cased when the cover or case is made apart from the book. In English-speaking countries most books of any importance are issued cased in cloth and a very small percentage of these books are rebound. On the European continent where books are generally issued in paper wrappers binding for private customers is much more usual. While machinery of great complexity has been invented to cope with the casing of the immensely increased output of books resulting from the introduction of paper-making and printing machinery, hand binding is still done by methods and with simple appliances that have changed but little during 400 years.

Classes of Bookbinding.—The letterpress bookbinding trade is now divided into two main branches: publishers' or printers' binders who deal by machinery with the casing of large numbers of identical volumes; miscellaneous binders who deal with the binding of individual books with comparatively little help from machinery. The library binders who rebind books for the public and other libraries occupy a position between the two, while account-book or stationery binders form a trade apart, using rather different and generally sounder methods than those used by the letterpress binders.

The miscellaneous binder is called upon to deal with many classes of books; books of value that require careful repair and strong protective covers; memorial and ceremonial books that may have highly decorated bindings; books for hard use that have to be bound strongly and cheaply; books that merely need to be held together tidily for occasional reference; memorandum and ms. books; diaries; etc.

For fine binding good leather is the best and most usual covering material as it has the quality of being readily moulded to the shape of the book while wet and by its toughness and flexibility it strengthens the back without impeding the opening of the book.

Tools Used.—The chief tools of the hand binder are (1) the sewing frame (*see* fig. 1) on which the folded sections of a book are sewn to upright cords or tapes, (2) the lying or cutting press (*see* fig. 2) used for backing and cutting books, (3) the standing

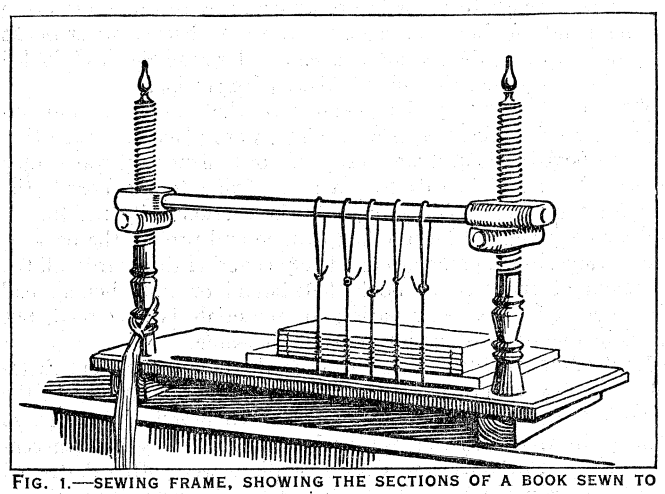


FIG. 1.—SEWING FRAME, SHOWING THE SECTIONS OF A BOOK SEWN TO THE VERTICAL CORDS

press used for pressing books during the process of binding. For the lettering and decoration of the covers brass stamps set in wooden handles are used. These are engraved with a letter or decorative device and are pressed on to the prepared leather when hot. Stamps too large to be struck by hand are called

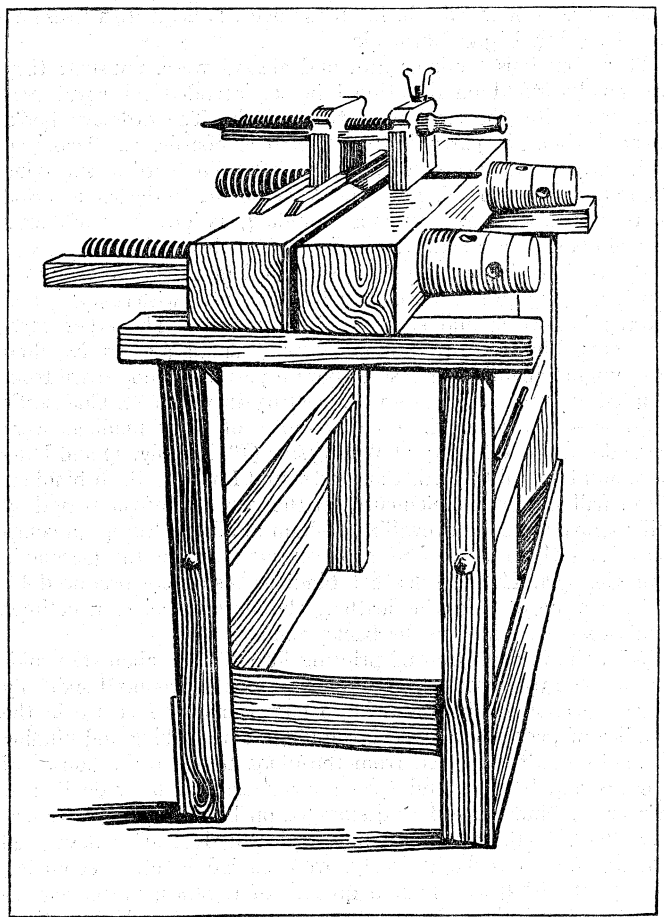
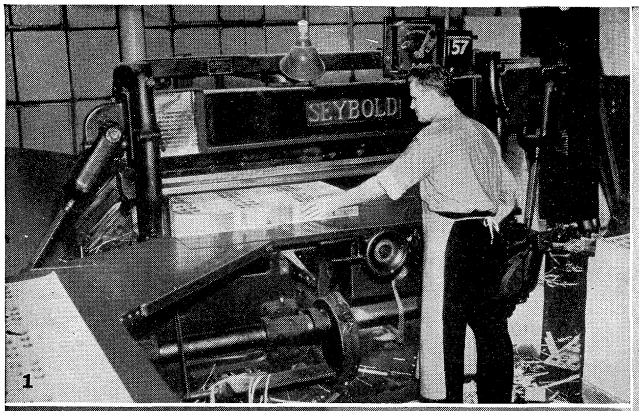


FIG. 2.—LYING PRESS AND PLOUGH IN WHICH THE EDGES OF THE BOOK ARE CUT

blocks and are impressed with the aid of a press with a heated platten called a blocking press. When there are several books of one title to be lettered brass type is sometimes set up in a holder and a line impressed by one operation. Long straight lines are made with a wheel called a fillet; a wider wheel called a roll, with



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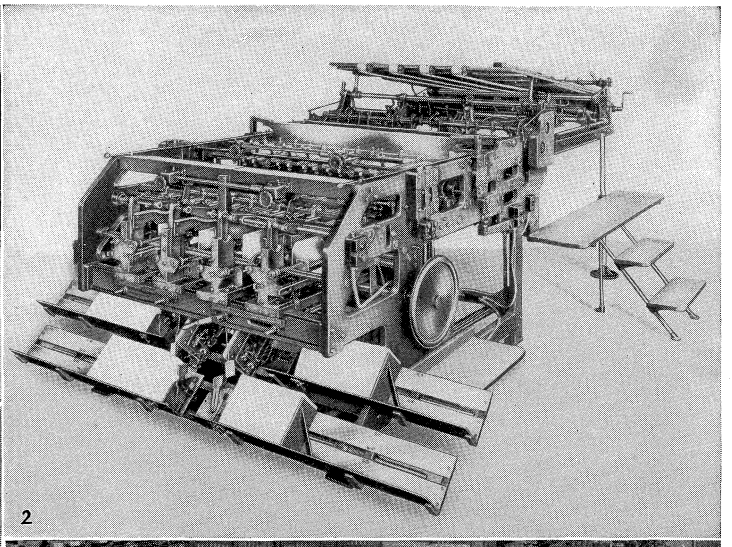
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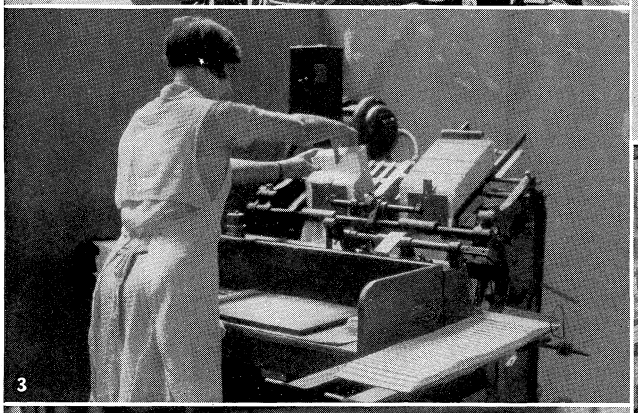
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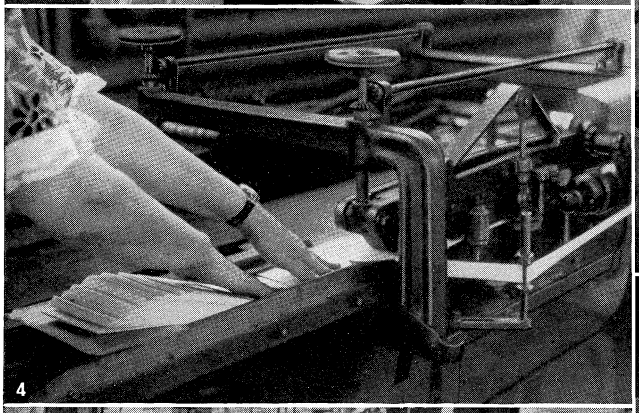
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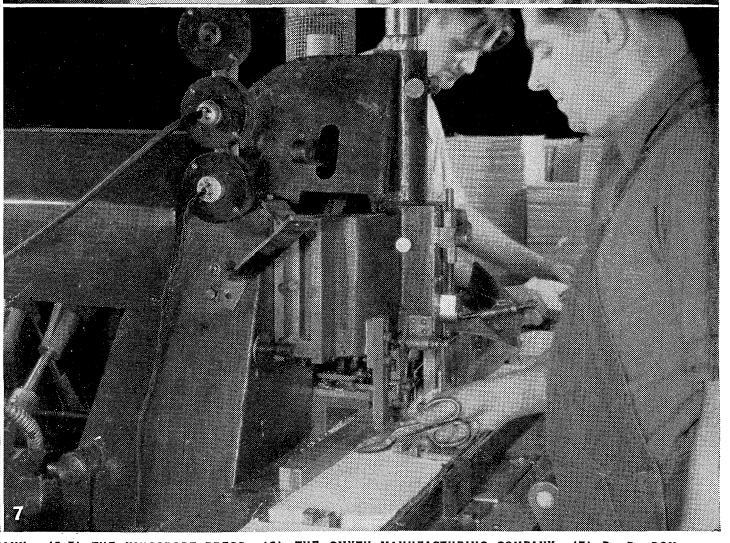
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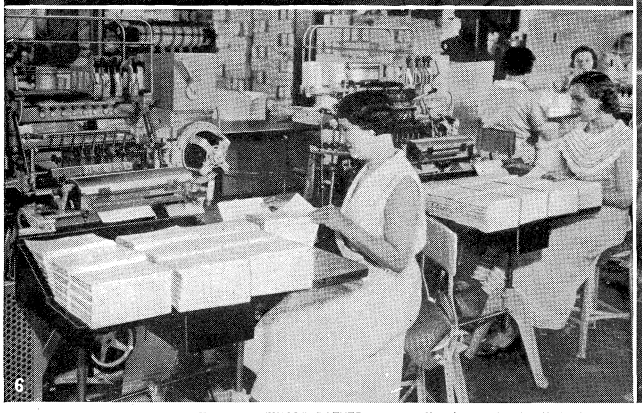
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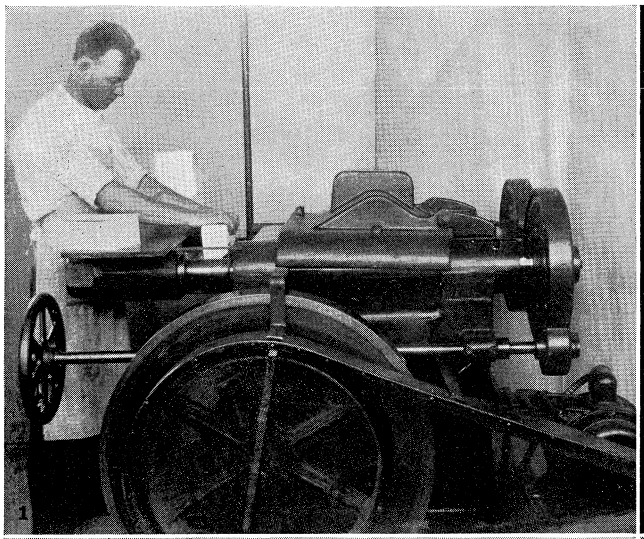
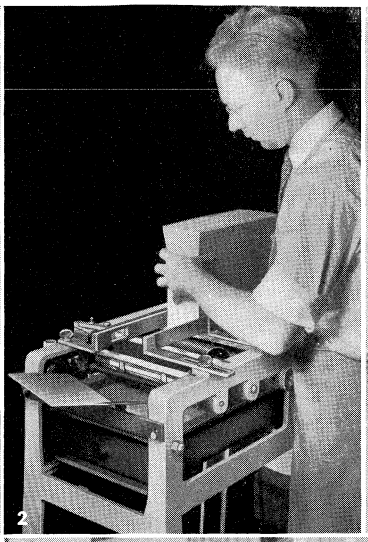
BY COURTESY OF (1) HARRIS-SEYBOLD-POTTER COMPANY, (2) DEXTER FOLDER COMPANY, (3-5) THE KINGSPORT PRESS, (6) THE SMYTH MANUFACTURING COMPANY, (7) R. R. DONNELLEY & SONS COMPANY

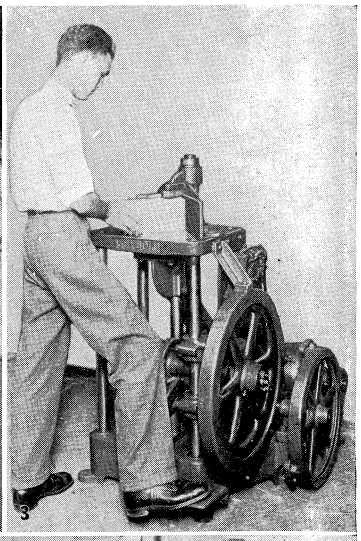
PRELIMINARY STEPS IN BOOKBINDING

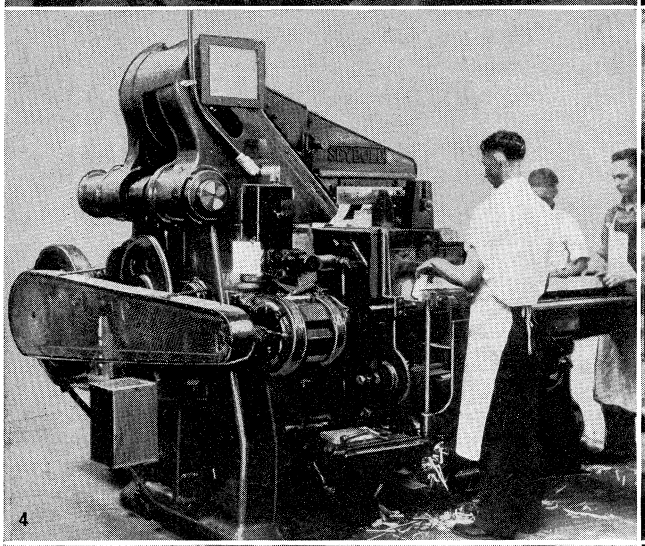
1. Large sheets off the printing press being cut by a precision flat cutter
2. High-speed machine which folds the flat sheets automatically into signatures (folded sections)
3. Tipping machine for pasting end papers onto the first and last signatures of each book. The machine feeds the signatures into position, applies paste to the edge, tips on the end papers and presses the whole together
4. Stripping machine which automatically attaches muslin reinforcements to the first and last signatures
5. Gathering machine which collects the loose signatures of a volume in their proper sequence ready for the sewing machine
6. After gathering, the assembled signatures are fed onto a sewing machine which sews them into individual volumes
7. Another type of sewing machine—the side sewer. Holes are drilled through the book and the thread is sewn through the holes in one operation

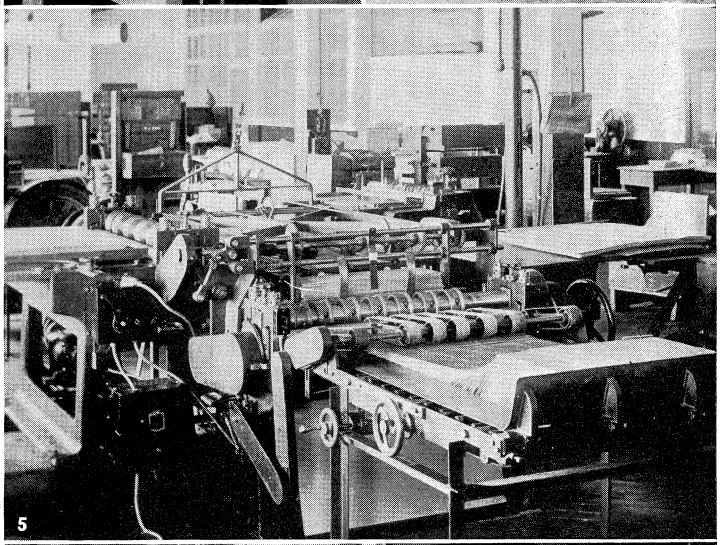
BOOKBINDING

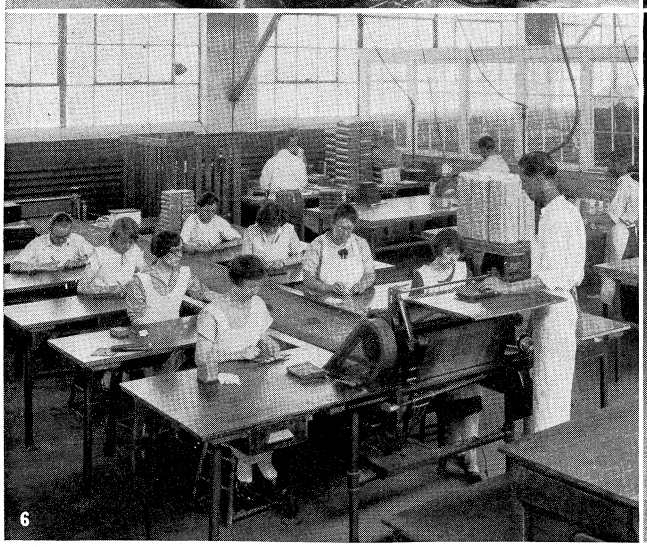


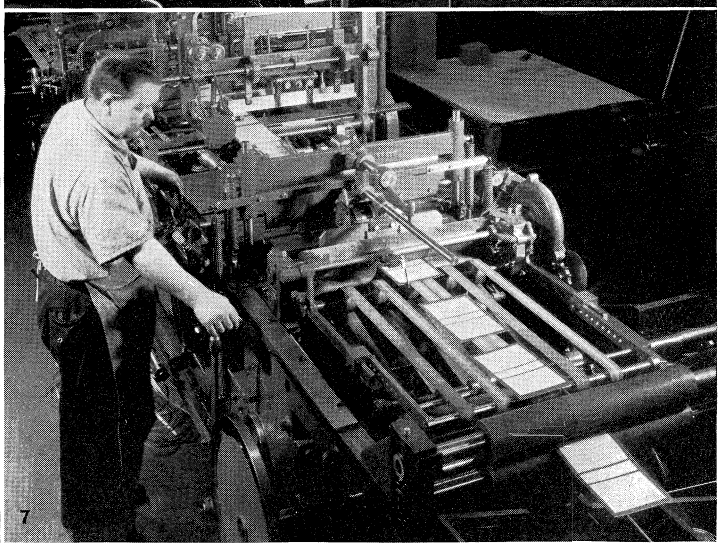








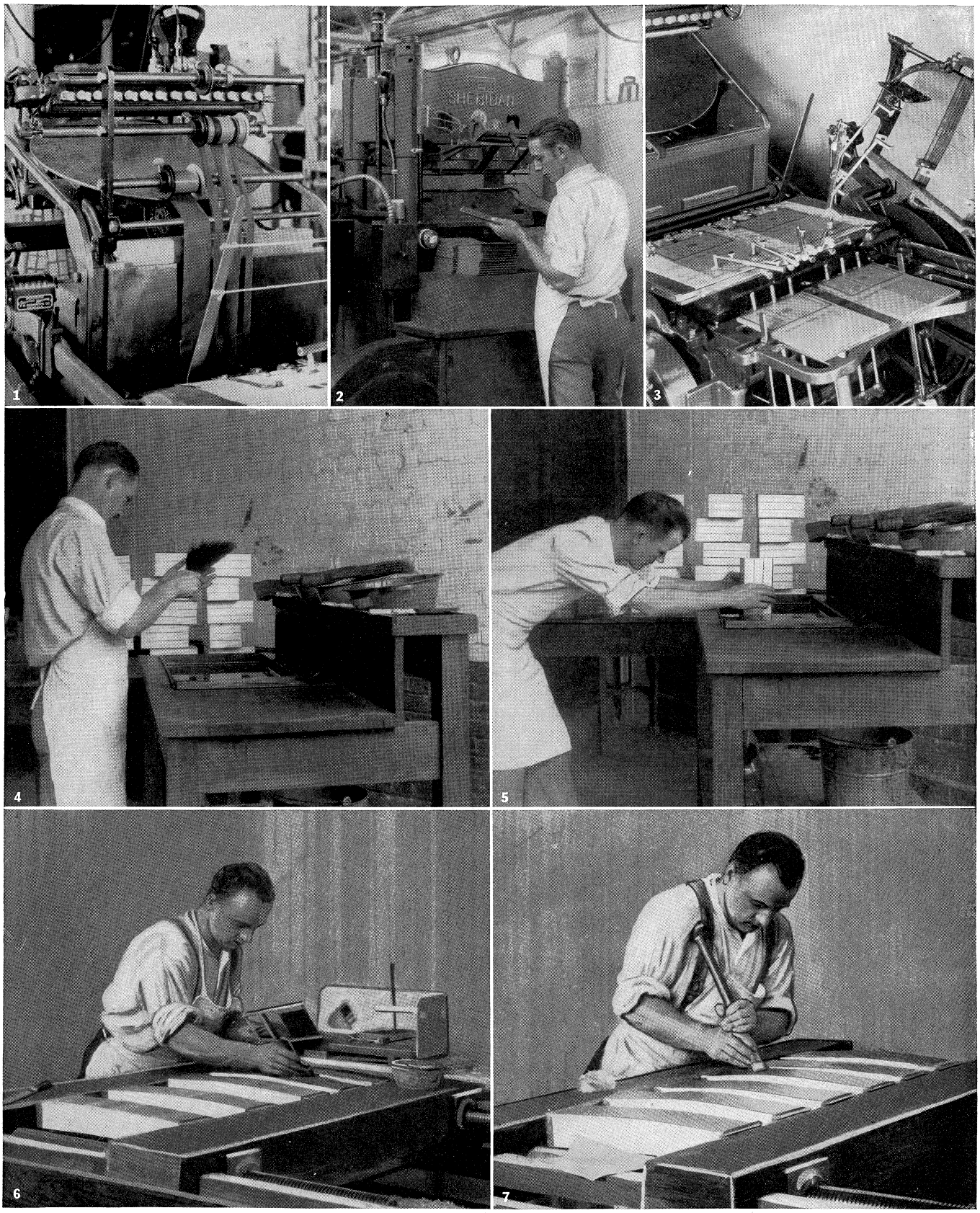




BY COURTESY OF (1, 3, 4, 6) THE KINGSPORT PRESS, (2) THE JOHN J. PLEGER COMPANY, (5) THE STANDARD MACHINERY COMPANY, (7) R. R. DONNELLEY & SONS COMPANY

PROGRESSIVE STEPS IN THE PROCESS OF BINDING A BOOK

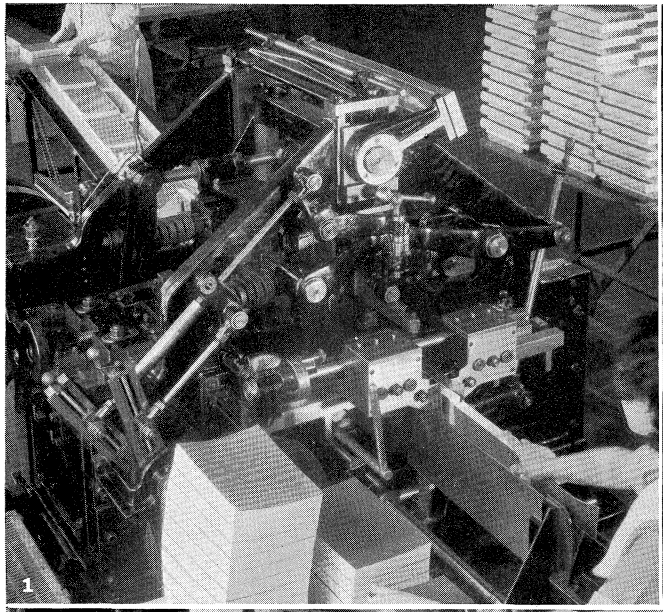
1. After sewing (see preceding plate), the books are compressed by a smashing machine, driving the air from between the leaves
2. Book back gluing machine which reinforces the sewing
3. An operation sometimes done is the rounding of the corners of books or pamphlets
4. Three-knife, drum-type continuous trimmer used for trimming the edges of unbound books
5. The unbound volumes are now ready, except for rounding and back-lining, to be cased in, or bound; they are stacked for drying and "seasoning." Meanwhile, manufacture of the cases (covers) proceeds; the first operation is cutting the boards, performed by the rotary board cutter illustrated
6. Making covers by hand
7. Making covers by machine. The outside cloth of the binding is cut from a roll into proper lengths, upon which the boards and lining paper are automatically glued. The machine then folds the edges of the cloth over the boards. Except for stamping and other operations such as lacquering, the cover of the book is then complete

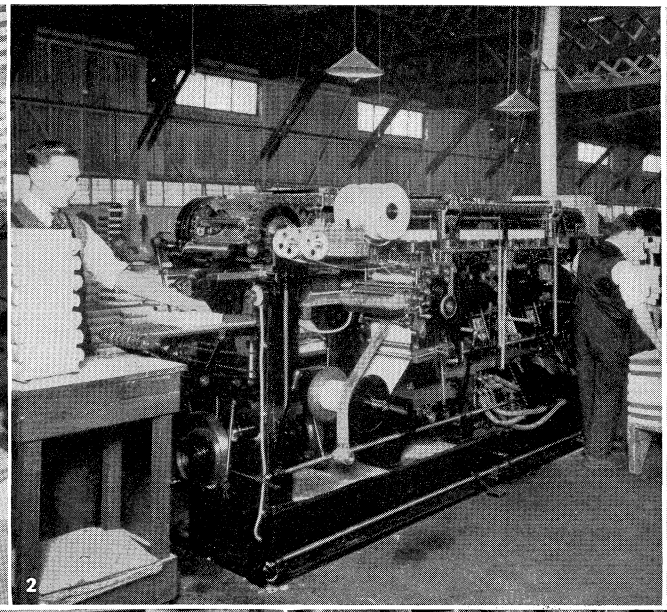


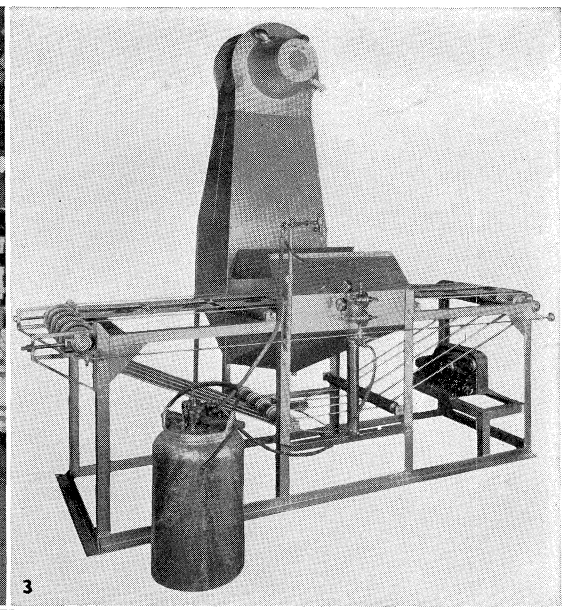
BY COURTESY OF (1) THE PEERLESS ROLL LEAF COMPANY, INC., (2, 4-7) THE KINGSPORT PRESS, (3) CHANDLER AND PRICE COMPANY

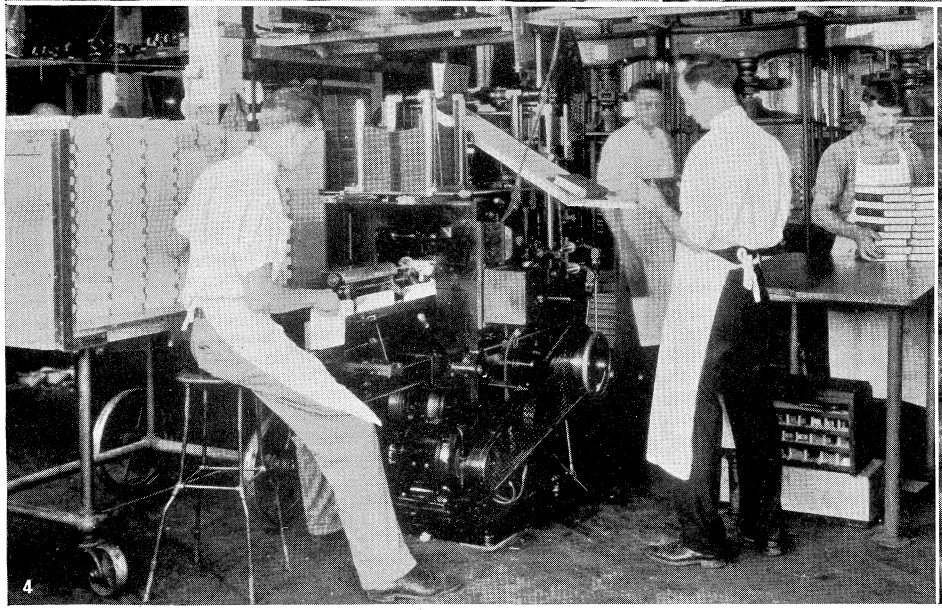
STAMPING THE COVERS AND COLOURING OR GILDING THE EDGES OF BOOKS

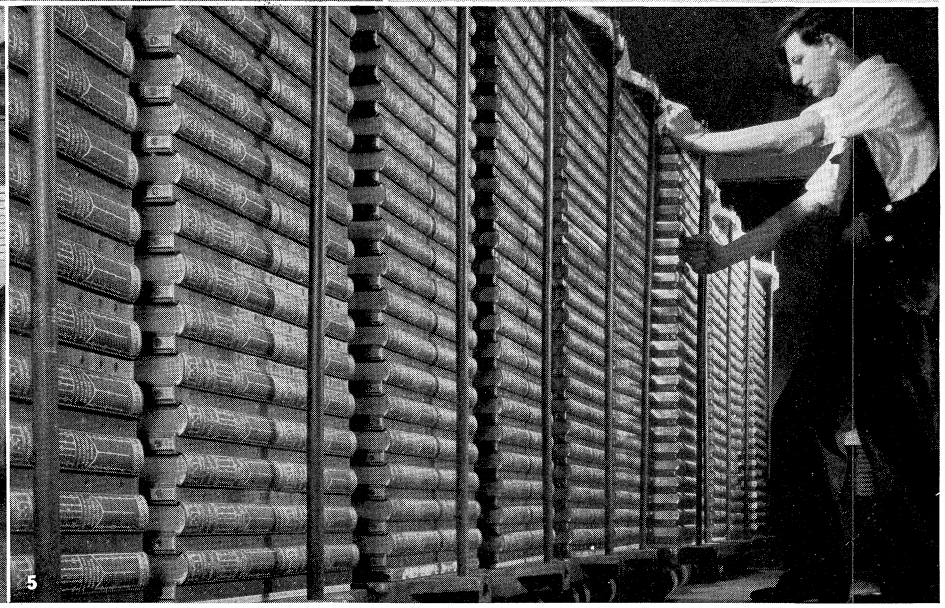
1. Roll leaf attachment for stamping gold or coloured foil on book covers
2. Stamping press with roll attachment which transfers leaf or foil onto the covers of books
3. Press which stamps ink on covers
4. Spattering colours on a marbling vat preparatory to transferring colours by dipping process onto the edges of unbound books
5. Dipping books in the marbling vat
6. Laying gold on book edges—a process requiring considerable skill
7. Burnishing gold on book edges with a flat burnisher











BY COURTESY OF (1, 5) R. R. DONNELLEY & SONS COMPANY, (2, 4) THE SMYTH MANUFACTURING COMPANY, (3) PAASCHE AIRBRUSH COMPANY

FINAL SUCCESSIVE STEPS IN BOOKBINDING

1. Before fitting into the cover, the back of the unbound volume is rounded to provide a keystone effect for rigidity
2. Lining-up machine which fastens muslin and paper linings onto the backbone of the unbound book; this machine also attaches headbands, the small decorative pieces of cloth on the top of the backbone
3. Unit for spraying lacquer on book covers
4. Casing-in machine which fastens the books into covers
5. Completed books are kept under pressure between flanged boards until all adhesives are thoroughly dry

a pattern engraved on the edge, enables endless bands of ornament to be impressed easily and rapidly.

Leather bindings may be decorated by the impressions of the heated tools directly on the leather, leaving a "blind" impression, or after the leather has been prepared the tools may be struck through gold leaf, leaving the impression in gold. Gold tooling is the commonest and most characteristic method of ornamenting bindings and may be used by itself or in conjunction with blind tooling or with inlays of various-coloured leathers.

Gold-tooled patterns are designed by arranging the impressions of the tools in some orderly manner. The tools may consist of

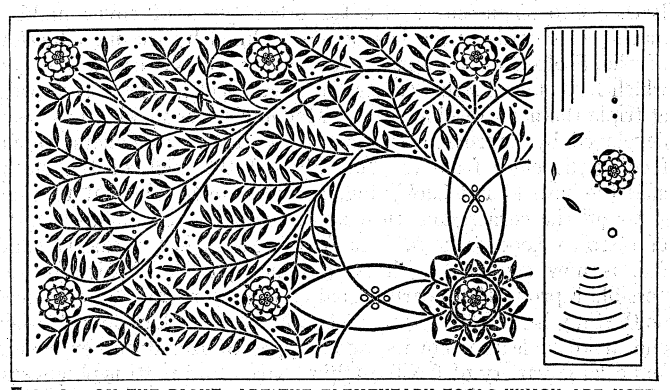


FIG. 4.—ON THE RIGHT, ARE THE ELEMENTARY TOOLS WHICH ARE USED TO FORM THE DESIGN ON THE LEFT

more or less complete designs in themselves (*see* fig. 3) or may consist of single leaves, flowers, dots, etc. Generally speaking, the more elementary the actual tools, the greater the freedom of the designer. Fig. 4 shows how a design may be formed by the use of elementary tools.

Construction.—The "spine" of a well-bound book should "throw up" when the book is opened, that is to say, the spine convex when the book is closed should become concave when it is open. The leather, if its full qualities are to be utilized, should be attached directly to the back of the sections. This results in a certain creasing of the leather when the book is opened, and this is sometimes objected to as it may injure the gold tooling. This difficulty is got over by lining up the spine so that it cannot alter its shape, but the result is that the book cannot open freely. An alternative is to make what is known as a hollow back, which allows the actual back to throw up independently of the leather. This method throws a great strain on the leather at the joints and in every large library many leather-bound books will be found with the "hollow" breaking away. In cloth-bound books a hollow back is necessary because the cloth cannot be moulded to the shape of the back.

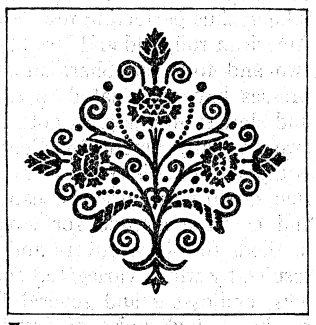


FIG. 3.—A GOLD-TOOLED DESIGN, COMPLETE IN ITSELF, USED TO IMPRESS ORNAMENTAL PATTERNS ON BOOKBINDINGS

The raised bands on the back of a book are caused by the cords on which the book is sewn. If raised bands are shown on a hollow-backed binding they are false and have nothing to do with the construction.

Materials for Bindings.—Where a whole leather binding is too costly, a saving can be made by binding in half-leather. In a half-binding the back and corners only are covered by the leather and the sides are covered by cloth or paper. Library binders make very strong bindings by sewing books on tapes and securing the ends of these between "split" boards. The spines may be covered with leather that can be left fairly thick if a small interval is left between the boards and the joint so that the bend of the leather is not confined to a single line. Where leather is too expensive, books may be bound in a woven material. The best book cloths are known as buckrams, but any cloth with a strong woven basis will serve. The cheaper cloths used largely by publishers' binders consist of little but a weak muslin filled in with dressing and these have little strength.

Bookbinding leather is not now always a reliable material. The Royal Society of Arts appointed a committee to investigate the causes of the premature decay of bookbinding leather and a valuable report was issued. The chief cause of decay was found to be the use of sulphuric acid in the dye bath, and certain leather manufacturers now supply leather that they guarantee to be free from injurious acid. Some, but not all, of these guaranteed leathers have proved to be satisfactory for as long as they have been tested. On the whole, sumach tanned goat-skin (known as morocco) has been found to be the most generally satisfactory leather for binding books, although the skins of many other animals if properly prepared may be employed for this purpose. (D. Coc.)

MACHINE BOOKBINDING

Bookbinding by machine methods has been greatly improved in the past decade. Automatic machines have made possible mass production and eliminated much of the hand work heretofore necessary. Machine production is divided into two classes, edition or hard bound products and pamphlet or paper bound publications.

Pamphlet Binding.—In the field of pamphlet production the introduction of web and rotary type printing presses, with folding equipment as part of the press, have eliminated the separate operation of folding such printed sheets. Automatic inserting machines introduce separate leaves or sections and the automatic assembling, wire-stitching and covering machine units complete the operation of pamphlet binding to the point of trimming the edges and packaging for shipment. Several types of machines, combining these operations, are in use and a method known as "perfect binding" is sometimes employed where the side or saddle-stitch type of wiring does not please. Perfect binding is effected in a machine which accepts the complete book in sections, clamps and cuts off the back or folded edge of the sections, glues, affixes crash and in turn glues on a paper cover, completing the book for trimming.

Trimming, or cutting the edges, has been improved by the introduction of rapid three-knife machines which cut the top, front and foot edges of a large pile of books or magazines at one operation. Packaging or wrapping for mailing is accomplished by automatic machines, often in conjunction with addressing equipment synchronized with the wrapping device.

Edition Binding.—Edition binding still included, in 1928, folding printed sheets in machines automatically fed from a pile, one sheet at a time, and delivering one or more sections, or signatures, of 16, 32 or 64 pages each, up to as many as eight 16's or four 32's, at each revolution. Bundling of signatures after folding has been improved by the introduction of compressed air bundlers, in place of the former hand and electrically driven types. The pasting in of illustration leaves and affixing to the first and last sections of each book of the fly-leaves and cover-lining sheets is accomplished by Marresford tipping machines. No machine has yet been developed to paste satisfactorily insert-leaves inside a folded section. End papers may also be affixed to books by attachments built on assembling machines, but as yet few of these equipments have been introduced into binderies. Reinforcing maps, folded sections and the end sections of books is accomplished by Brackett stripping machines, which work equally as well with muslin, twill or paper. Other machines performing similar operations are the Marsh end paper, the Marsh twill school book end paper and the Eldredge end paper machines. Gathering or assembling of the separate signatures into book sequence is almost entirely performed by machines, among which are the Sheridan, Jeungst and Plimpton. These machines consist of ten or more pockets or metal bins in which quantities of each signature are placed in consecutive order, and by the operation of the machine one drawn from the bottom of each pocket, dropped on a travelling conveyor and with one circuit of the machine a gathered book emerges. These machines are often synchronized with perfect binders, stitchers, pamphlet coverers and have end paper affixing

and smashing units. Smashing and nipping operations have been improved by the introduction of the Sheridan belt conveyor smashers and the Seybold compressor. These machines reduce the books to uniform bulk, eliminate printing impression, and the compressor reduces the swell caused by thread used in sewing.

Sewing machines have been improved in speed and uniformity. It is possible to sew not only on tapes but, by affixing the cotton or twill tapes, to the book proper by stitches passing through the tape. The Smyth curved needle and the National straight needle machines are frequently used in American production. The Staubli Swiss machine, with straight needles, automatic gauging and pasting devices, with straight arm feeding and tape sewing attachments, is a noticeable improvement in machine method. The oversewing machine, for extra strong and library bindings, and the Leonard wire sewing machine, for particular problems, are new developments. A new type of thread binding machine has just been offered which cuts diagonal slots traversely across the back of the gathered book and in the slots automatically places, cuts off and glues in strong threads, tipping the thread ends down on the front and back leaves of the book. This is designed as an improvement over ordinary perfect binding, which has been attempted on edition book work with some success on low cost production. School-books are often side stitched with thread through and through, the book and end papers having twill reinforcements. The Morrison stitcher, which first drills holes half way through the book, and with synchronized stitching attachment forces the needles through the prepared holes, has made possible stitching of books up to one inch in thickness, where five-eighths of an inch was considered the maximum before. Book trimming machines, as in magazine trimming, have been improved in speed, accuracy and capacity. The Smyth continuous trimmer, three-knife type, in which the knives cut against the next book instead of against a base-board, and the Seybold three-knife drum type continuous trimmer have to a large extent superseded the former duplex two-knife and the single knife trimmers for book work.

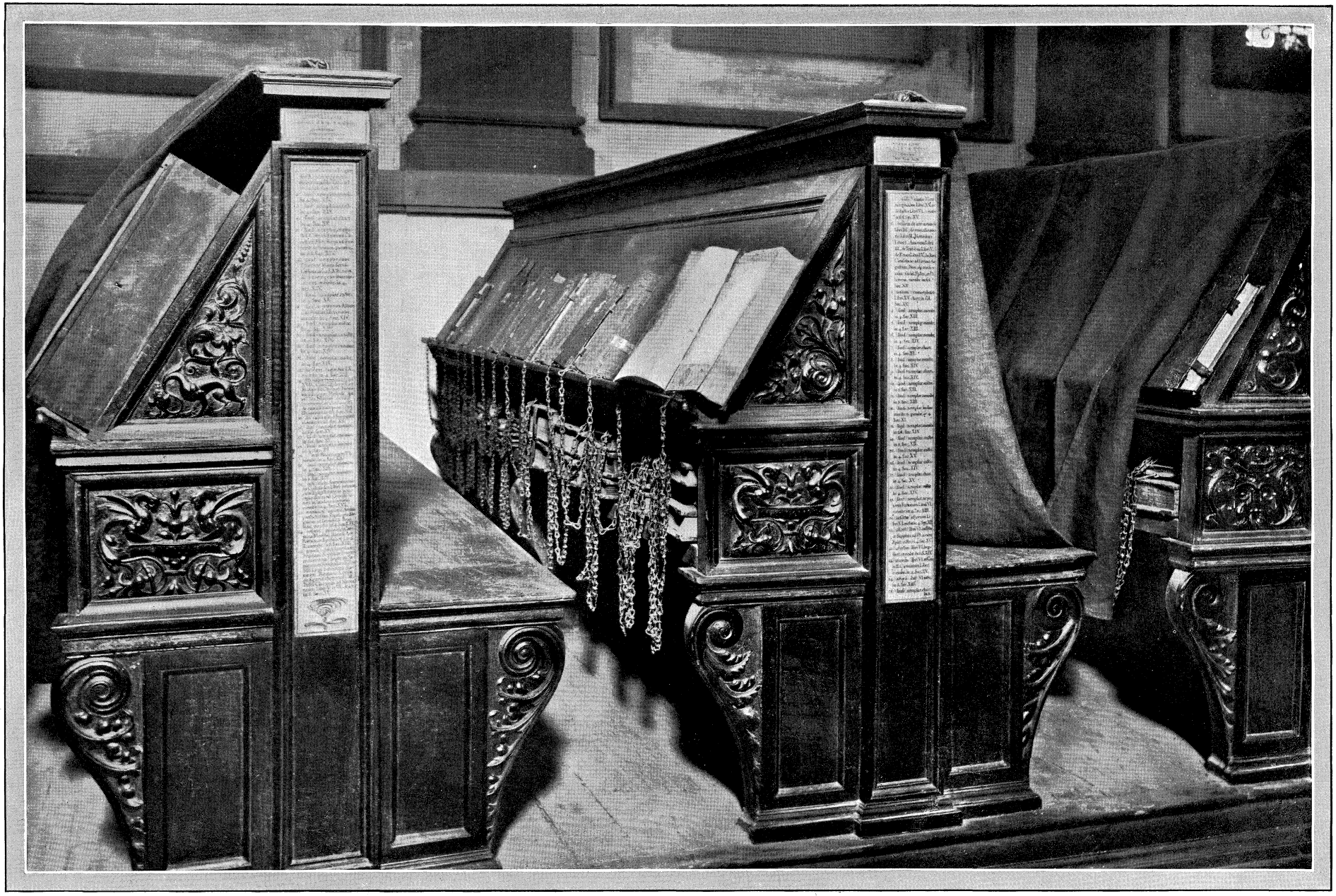
In edging, the application of gold is still made by the old process of scraping, filling, sizing, laying on leaf in sheets and burnishing. Edge colouring, formerly done by sponge or brush, is now largely accomplished by air gun; sprinkling likewise. Marbling materials have been improved, but the method of spattering colours on a vat and dipping books while held under pressure is still followed. Simulating deckle edges has been improved by the introduction of a steel studded disc, revolving at high speed, against which the front and foot edges of books are held by pressure until the edge is roughened in an even manner. Shaping the back, whereby the concave front and the rounded back edge is obtained, and the joint set, against which the cover will hinge, is accomplished by the Crawley machine. The Pleger gluing-off machine is accepted in many plants as a substitute for hand gluing-off the backs of books before backing. Murray, of London, has developed a new roller type machine backer and an automatic feed for sewing machines, which are not yet introduced in America nor on a large scale abroad. Thumb cut indexing is largely a hand operation, with the improvement in the aperture cutting tools using air pressure to operate instead of hands. In backlining and headbanding, which includes the application of glue, crash, glue and paper to the back and the small ornamental woven headbands, machines are now in vogue which eliminate practically all hand work. These machines include the Blauvelt, Sheridan, Beutler and Brock types; the latter two being exclusively used in plants where they were developed by individuals. The Blauvelt, Brock and Sheridan are the only ones which affix headbands as well as linings. Casing-in, or affixing the book in the cover, is entirely accomplished, where the book must be glued tightly into the cover at the back, by hand, and on much of the flexible and limp type of leather and artificial leather bindings. All ordinary productions and many unusual types are affixed in cover by Smyth or Sheridan automatic casing-in machines which, accepting the book placed on a revolving arm by the operator, paste off the end papers well into the joints and affix the cover, fed simultaneously from a magazine, delivering the book on the arm of the machine to the inspector ready for building into presses between wooden boards having brass, aluminium or other metal edging, which set the cover and form the valley along the back of the book, which gives a hinge to the cover. Screw type compression presses are being replaced with types of compressed air power pressers.

Stock cutting methods have been improved by the Cameron slitting machine, which slits to any desired width and re-rolls paper, cloth, artificial leather or crash in rolls of suitable size for cover making, backlining and wrapping machines. The Smyth cloth cutter slits and cuts off full width rolls of book cloth or artificial leather into single cover size for other types of cover making machines. Board cutting has been simplified by the introduction of the Stolp-Gore automatic feeder for rotary board cutters, which feeds board strips (after the large sheet has been stripped) at triple the hand feeding speed. Machine cover making has been developed by improvements on the Sheridan casemakers which, feeding the cloth from the roll, glue-off the back of the cloth, affix the boards and backlining, cut the cover material to size, shear off the corners and turn in the complete cover at the rate of 1,800 to 2,000 an hour. The Smyth casemaker, formerly hand fed, is now equipped with an automatic feeder, which makes possible a production nearly equal to the Sheridan. New devices on the Smyth machine also make possible the production of leather and artificial leather covers, some types of round corner covers and a large variety of flexible (thin board) and parti type covers. Hand casemaking is more rapid by the use of the Booth, U.S. Shoe Machinery Company and Anthony type machines. The use of gluing machines either with or without belt conveyors to carry the glued materials to operators has superseded hand gluing methods and also for gluing or pasting off labels, inlays and other mountings. Cover stamping or blocking has had more attention than the majority of machine binding operations. Automatic feeders have been developed by Miller and Kluge for feeding book covers from magazines into Chandler and Price and other presses. The use of electrically heated plates as a base for affixing dies in presses has simplified the blinding or blanking out of pattern cloths before inking, thus perfecting register. The introduction of the Peerless, American roll gold and Brighten roll leaf attachments for upright two and four rod Sheridan and Standard Machinery Company presses have eliminated to a very large extent the hand laying and slow stamping with gold leaf, metal leafs and ink foils. The two-way attachment by Peerless is the latest development in equipment of this type. Hand laid gold is still employed on many fine quality productions, especially where deep grain goat-skin and cowhide is used for cover material. The use of airbrush methods for sizing covers and particularly in effecting superfinish results, by which variegated colour combinations, grainings, panelings, embossing and several tone treatments are produced, has reached a high point of development. Superfinishing, originated by Utley and developed on book cover work by Molloy, has now become an accepted form of cover decoration in all large binderies. Automatic feeding devices have been installed on Standard machinery upright presses to cope with automatic fed inkers. Book inspection and jacketing continues to be done by hand, but individual wrapping and packaging is now accomplished by machine.

BIBLIOGRAPHY.—Pleger, *Bookbinding* (1924); Philip, *The Business of Bookbinding* (1912); Hasluck, *Bookbinding* (1920); Hitchcock, *The Building of a Book* (1927); B. L. Goodwin, *Pamphlet Binding* (1925); E. W. Palmer, *A Course in Bookbinding* (1927). (E. W. P.)

BOOKCASE, a piece of furniture, forming a shelved receptacle for the storage of books.

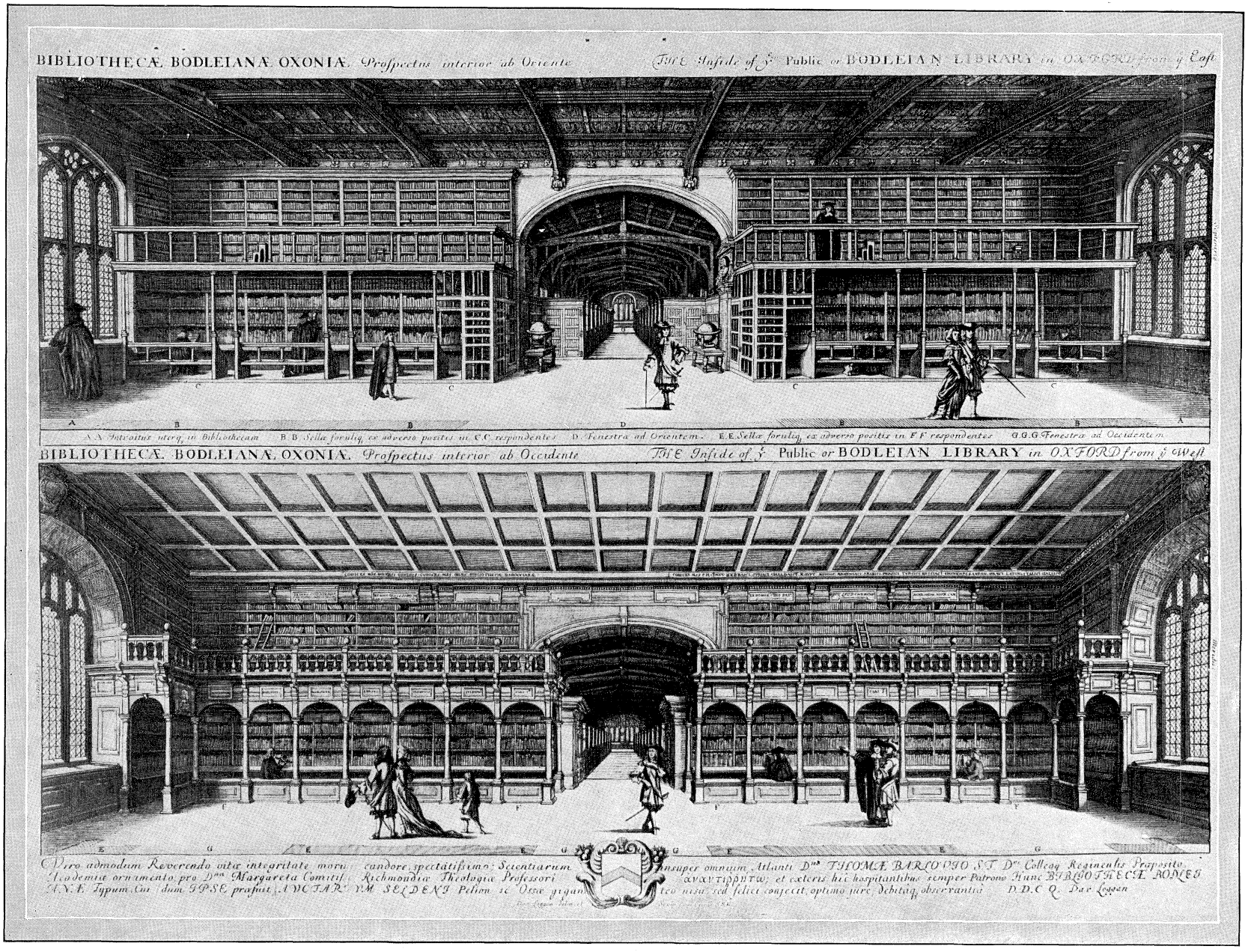
Books written by hand were kept in small coffers which the great carried about with them on their journeys. As manuscript volumes accumulated in the religious houses or in regal palaces they were stored upon shelves or in cupboards, and it is from these cupboards that the bookcase of to-day directly descends. At a somewhat later date the doors were discarded, and the evolution of the bookcase made one step forward. Even then, however, the volumes were not arranged in the modern fashion. They were either stacked in piles upon their sides or placed upright with their



PHOTOGRAPH, ALINARI

16TH CENTURY BOOKSTANDS IN THE BIBLIOTECA MEDICEO-LAURENZIANA, FLORENCE

These stands of carved walnut are characteristic of the book receptacles in use before the introduction of bookcases. They allowed for the storage of very few volumes, and the rapid and cheap output of printed books which followed shortly in the 17th century made them impracticable



VIEWS OF THE EAST AND WEST WINGS OF THE BODLEIAN LIBRARY, AT OXFORD, IN 1675

Upper view. The Bodley end of the library, erected 1610–12, containing the earliest examples of shelved galleries extant. The centre door leads into the Duke Humphrey library, founded 1444 and refurnished in 1599 with the oldest known bookcases in England

Lower view. The Selden end or west wing, 1634–40. Books under the galleries were placed with backs to the wall and until 1759 were guarded against theft by iron chains that were long enough to permit the books to be lifted from the shelves and placed on counters

backs to the wall and their edges outwards. The band of leather, vellum or parchment which closed the book was often used for the inscription of the title, which was thus on the fore-edge instead of on the back. It was not until the invention of printing had greatly cheapened books that it became the practice to write the title on the back and place the edges inwards. (*See* Books.) Early bookcases were usually of oak. The oldest bookcases in England are those in the Bodleian library at Oxford, which were placed in position in the last year or two of the 16th century; in that library are the earliest extant examples of shelved galleries over the flat wall-cases. Long ranges of book-shelves are necessarily somewhat severe in appearance, and many attempts have been made by means of carved cornices and pilasters to give them a more graceful appearance—attempts which were never so successful as in the hands of the great English cabinet-makers of the second half of the 18th century.

Both Chippendale and Sheraton made or designed great numbers of bookcases, mostly glazed with little lozenges encased in fret-work frames often of great charm and elegance. The French cabinet-makers of the same period were also highly successful with small ornamental cases. Mahogany, rose-wood, satin-wood and even choicer exotic timbers were used; they were often inlaid with marqueterie and mounted with chased and gilded bronze. Dwarf bookcases were frequently finished with a slab of choice marble at the top. In the great public libraries of the 20th century the bookcases are often of iron, as in the British Museum where the shelves are covered with cowhide, of steel, as in the library of Congress at Washington, or of slate, as in the Fitzwilliam library at Cambridge.

BOOK-COLLECTING, the bringing together of books which in their contents, their form or the history of the individual copy possess some element of permanent interest, and either actually or prospectively are rare, in the sense of being difficult to procure. This qualification of rarity, which figures much too largely in the popular view of book-collecting, is entirely subordinate to that of interest, for the rarity of a book devoid of interest is a matter of no concern. On the other hand so long as a book (or anything else) is and appears likely to continue to be easily procurable at any moment, no one has any reason for collecting it. The anticipation that it will always be easily procurable is often unfounded; but so long as the anticipation exists it restrains collecting, with the result that Horn books are much rarer than First Folio Shakespeares. Of the books which any one generation of readers acquires the great majority are dead before their own owners. But from out of this seemingly dead stock, preserved at haphazard, critics and antiquaries and librarians gradually pick out at auctions or from dealers' stocks books which they find to be still alive and possessing an interest which cannot be reproduced in its entirety by any mere reprint. At first this salvage is rescued at haphazard, but in the modern private collection, as in the modern museum, the first requisite is the steady pursuit of a central idea. Neither the collector nor the curator can be content to keep a mere curiosity shop. It is the collector's business to illustrate his central idea by his choice of examples and by the care with which he examines and describes them. It is mainly by the zeal of private collectors that books which otherwise would have perished from neglect are discovered, preserved and made to yield up their secrets, with the result that almost every great library owes more, on its historical side, to their generosity than to the purchases made from its own resources.

Although adumbrations of it existed under the Roman empire and towards the end of the middle ages, book-collecting, as it is now understood, is essentially of modern growth. Even when the invention of printing had reduced the cost of books by some 80%, book-collectors did not immediately appear. There is a natural temptation to imagine that the early book-owners, whose libraries have enriched modern collectors with some of their best-known treasures, must necessarily have been collectors themselves. This is far from being the case. In England Archbishop Cranmer, Lords Arundel and Lumley, and Henry, prince of Wales (1594–1612); in France Jean Grolier (1479–1565), who bought largely in Italy, and the famous historian Jacques Auguste de Thou (1553–1617), brought together the best books of their day in all departments of learned literature, put them into handsome leather jackets, and enriched them with their coats of arms, heraldic badges or other marks of possession. But they brought their books together for use and study, to be read by themselves and by the scholars who frequented their houses, and no evidence has been produced that they appreciated what a collector might now call the points of a book other than its fine condition and literary or informational merits. Collecting, as distinct from the formation of working libraries, may perhaps be said to have begun in England at the time of the antiquarian reaction produced by the book massacres when the monasteries were dissolved by Henry VIII., and the university and college libraries and the parish service books were plundered and stript by the commissioners of Edward VI. To rescue good books from perishing is one of the main objects of book-collecting, and when Archbishop Parker and Sir Robert Cotton set to work to gather what they could of the scattered records of English statecraft and literature, and of the decorative art bestowed so lavishly on the books of public and private devotion, they were book-collectors in a sense and on a scale to which few of their modern imitators can pretend. Men of more slender purses, and armed with none of Archbishop Parker's special powers, worked according to their ability on similar lines. Humphrey Dyson, an Elizabethan notary, who collected contemporary proclamations and books from the early English presses, and George Thomason (d. 1666), the bookseller who bought, stored and catalogued all the pamphlet literature of the Civil War, were mindful of the future historians of the days in which they lived. By the end of the 17th century book-collecting was in full swing all over Europe, and much of its apparatus had come into existence. In 1676 book auctions were introduced into England from Holland, and soon we can trace in priced catalogues the beginning of a taste for Caxtons, and the books prized by collectors slowly fought their way up from amid the heavy volumes of theology by which they were at first overwhelmed.

Early Book-buyers.—Almost all the large book-buyers of the 16th, 17th and 18th centuries bought with a public object, or were rewarded for their zeal by their treasures being thought worthy of a public resting-place. Sir Thomas Smith (1513–1577) bequeathed his books to Queen's college, Cambridge; Archbishop Parker's were left under severe restrictions to Corpus Christi college in the same university; Sir Thomas Bodley refounded during his lifetime the university library at Oxford, to which also Laud gave liberally and Selden bequeathed his books. The library of Archbishop Williams went to St. John's college, Cambridge; that of Archbishop Usher was bought for Trinity college, Dublin. The mathematical and scientific books of Thomas Howard, earl of Norfolk (1585–1646), were given by his grandson to the Royal Society; the heraldic collections of Ralph Sheldon (d. 1684) to Heralds' college; the library in which Pepys took so much pleasure to Magdalen college, Cambridge. Bishop Moore's books, including a little volume of Caxton quartos, almost all unique, were bought by George I. and presented to the university library at Cambridge. Archbishop Marsh, who had previously bought Stillingfleet's printed books (his manuscripts went to Oxford), founded a library at Dublin. The immense accumulations of Thomas Rawlinson (1681–1725) provided materials for a series of auctions, and Harley's printed books were sold to Osbourne the bookseller. But the trend was all towards public ownership. While Richard Rawlinson (1690–1755) allowed his brother's books to be sold, the best of his own were bequeathed to Oxford, and the Harleian mss. were offered to the nation at a sum far below their value. A similar offer of the great collections formed by Sir Hans Sloane, including some 50,000 printed books, together with the need for taking better care of what remained of the Cotton manuscripts, vested in trustees for public use in 1702 and partially destroyed by fire in 1731, led to the foundation of the British Museum in 1753, and this on its opening in 1757 was almost immediately enriched by George II.'s gift of the old royal library, formed by the kings and queens of England from Henry VII. to Charles II., and by Henry, prince of Wales, son of James I., who had bought the

books belonging to Archbishop Cranmer and Lords Arundel and Lumley.

When George III. came to the throne he found himself bookless, and the magnificent library of over 80,000 books and pamphlets and 440 manuscripts which he accumulated shows on a large scale the catholic and literary spirit of the book-lovers of his day. As befitted the library of an English king it was rich in English classics as well as in those of Greece and Rome, and the typographical first-fruits of Mainz, Rome and Venice were balanced by numerous works from the first presses of Westminster, London and Oxford. This noble library passed in 1823 to the British Museum, which had already received the much smaller but carefully chosen collection of the Rev. C. M. Cracherode (d. 1799), and in 1846 was further enriched by the wonderful library formed by Thomas Grenville, who died in that year, aged 91. A few less wealthy men had kept up the old public-spirited tradition during George III.'s reign, Garrick bequeathing his fine collection of English plays to the British Museum, and the natural history books of Sir Joseph Banks also passing to it. Capell's Shakespearian treasures enriched Trinity college, Cambridge, and those of Malone went to the Bodleian library at Oxford, the formation of these special collections, in place of the large general library with a sprinkling of rarities, being in itself worth noting. But the noble book-buyers celebrated by the Rev. Thomas Frognall Dibdin in his numerous bibliographical works kept mainly on the old lines, though with aims less patriotic than their predecessors. The duke of Roxburghe's books were sold in 1812, and the excitement produced by the auction, more especially by the competition between Lord Spencer and the duke of Marlborough (at that time marquess of Blandford) for an edition of Boccaccio printed by Valdarfer at Venice in 1471, led to the formation of the Roxburghe club at a commemorative dinner. In 1819 the duke of Marlborough's books were sold, and the Boccaccio for which he had paid £2,260 went to Earl Spencer (d. 1834) for £750, to pass with the rest of his rare books to Mrs. Rylands in 1892, and by her gift to the John Rylands library at Manchester in 1899. The books of Sir M. M. Sykes were sold in 1824, those of J. B. Inglis in 1826 (after which he collected again) and those of George Hibbert in 1829. The 150,000 volumes brought together by Richard Heber at an expense of about £100,000 were disposed of by successive sales during the years 1834–37 and realized not much more than half their cost.

Great Collections.—The wonderful library of William Beckford (d. 1844), especially rich in fine bindings, bequeathed to his daughter, the duchess of Hamilton, was sold in 1882, with the Hamilton manuscripts, for the most part to the German Government. Their dispersal was preceded in 1881 by that of the Sunderland collection, already mentioned. The library of Brian Fairfax (d. 1749), which had passed to the earls of Jersey, was sold in 1885, that of Sir John Thorold (d. 1815) in 1884, his "Gutenberg" Bible fetching £3,900 and his Mainz Psalter £4,950. The great collection of manuscripts formed by Sir Thomas Phillipps (d. 1872) has furnished materials for numerous sales. The printed books of the earl of Ashburnham (d. 1878) kept the auctioneers busy in 1897 and 1898; his manuscripts were sold in sections to the British Government (the Stowe collection shared between the British Museum and Dublin), the German Government (part of the Libri and Barrois collection, all, save one ms. of 13th century German ballads, resold to France), the Italian Government (the rest of the Libri collection), Mr. Yates Thompson (the mss. known as the Appendix) and Mr. J. Pierpont Morgan (the Lindau Gospels). In the present century the Huth library formed by Henry Huth (1815–78) on very broad lines, and augmented by his son Alfred, was dispersed on the latter's death; after 50 books and manuscripts had been selected by the British Museum in accordance with his bequest, and a fine set of Shakespeare quartos sold privately, the collection realized £250,566. Large as was this total it was far surpassed by that fetched by the Britwell library, originally formed by William Henry Miller (1789–1848), of which the main strength lay in the number and rarity of its editions of early English and Scottish literature. After passing, with Britwell Court, to Samuel Christie-Miller (d. 1889) this great collection was dispersed in the years 1916–27 in 13,707 lots for £612,145. In contrast with these vast collections the modern cabinet theory of book-collecting was first carried out with conspicuous skill by Henry Perkins (d. 1855), whose 865 fine manuscripts and specimens of early printing, when sold in 1870, realized nearly £26,000. Henri Béraldi, in his catalogue of his own collection (printed 1892), has described how in France a little band of book-loving amateurs grew up who in place of the miscellaneous library in which every class of book claimed to be represented, and which needed a special room or gallery to house it, aimed at small collections, more especially of the French illustrated books of the 18th century, which should epitomize the owner's tastes and require nothing bulkier than a neat bookcase or cabinet to hold them. On similar lines Frederick Locker (Locker-Lampson, 1821–95) formed in two small book cases a gathering of first editions of English imaginative literature (catalogue published in 1886) which by its compactness and unity won much admiration, more especially in the United States, where book-collecting was just becoming a popular pastime with wealthy men. The one great private collection of English imaginative writers of the last 300 years held by an English collector, that of the late Thomas J. Wise, is now owned by the British Museum. The catalogue of this in nine volumes was completed in 1928. (A. W. P.)

UNITED STATES

The United States entered into the field of book-collecting more than two centuries after Sir Robert Bruce Cotton began to gather together his famous library in England, yet it is in America that, during the last 60 years, the most important collections of the world, apart from those already possessed by the great public institutions of England and the Continent, have become established.

Pioneer Collectors.—James Lenox (d. 1880) was a pioneer American book-collector when, in 1847, he brought to America for the first time an example of the Gutenberg Bible, for which he paid the then extravagant price of £500. Prior to 1860, Lenox and John Carter Brown (d. 1874) of Providence, R.I., greatly assisted in their quest by Henry Stevens, an American living in London and engaged in the rare book business, competed against each other in collecting in England volumes relating to the early history of the United States, incidentally picking up other treasures as well. Lenox, for instance, brought home one of the earliest first folios of Shakespeare which came to America; now there are considerably more Shakespearian first folios in America than in England.

Of the second edition of *Hamlet* (the first to contain the true text) the three examples extant are today respectively in the Huntington library at San Marino, Calif., the library of the Elizabethan club of Yale university, New Haven, Conn., and the Henry C. Folger collection in Washington, D.C. Thomas Barton (1803–1866), whose volumes were bequeathed to the Boston public library, was an early collector of Shakespeariana.

The John Carter Brown library, at Providence, R.I., represents the only American bibliographical dynasty. The nucleus of this magnificent collection was begun by Nicholas Brown in the 18th century, added to by his son Nicholas (d. 1841), brought to its great importance in the next generation by John Carter Brown (d. 1874), increased and presented to Brown university in 1904 by his son, John Nicholas Brown (d. 1900), and is still receiving additions through the continuing interest of the present John Nicholas Brown. The Lenox books, including the Gutenberg Bible, are now a part of the New York public library.

Important Collections.—The great impetus to book-collecting in general and to American collecting in particular came when John Pierpont Morgan (d. 1913), the American financier, began to gather together the marvellous library which was later dedicated by his son to the use of the people of the city of New York. Henry E. Huntington (d. 1927), a railroad magnate, acquired, in addition to his Americana, incunabula, and general rarities, Shakespeariana which rival those of the British Museum, and as many English volumes printed prior to 1640 as are in the Bodleian library. At its founder's death, the Huntington col-

lection passed into the hands of the people, and it is now permanently housed in a magnificent library at San Marino, Calif.

The Folger library, housed in a $2,000,000 building in Washington, D.C., was established by Henry C. Folger (d. 1930). It is designed as a national memorial to Shakespeare, but is far more than a Shakespeare library. Its collection of English Mss. and books printed between 1475 and 1640 is surpassed only in the British Museum and the Bodleian. Its original and early editions of Shakespeare are matchless (including 79 first folios), and its collection of books relating to Shakespeare and his age is the largest in the world.

Other noteworthy American collections are those made by Robert Hoe (1838–1909) of New York, which was sold in 1911–12 for nearly $2,000,000; by Edward E. Ayer (1841–1927) of Chicago, who specialized in books relating to the American Indian, presented before his death to the Newberry library, Chicago; by William A. White (1843–1927), whose Elizabethans, the envy of book-lovers on both sides of the water, Harvard acquired by purchase, increasing its collection to 62% of the 994 plays or editions of English plays written before 1643 and printed before 1700. General Rush C. Hawkins (1831–1920) collected examples of the earliest presses of the 15th century, now preserved in the Annmary Brown library at Providence, R.I.

Improved Outlook.—Only the names of the most noteworthy American collectors have been mentioned. Book-collecting as an art is in its infancy in America. New foundations with ample funds for the purchase of volumes demonstrate the fact that the American people fully realize that libraries are created by books rather than by buildings. Most significant is the army of more modest collectors who undertake the adventure without the financial ability to compete against wealthy enthusiasts, yet succeed in bringing together important libraries. The fact that the great American collections have been made by industrial leaders rather than by scholars is also worthy of attention. The history of book-collecting shows a surprising number of those who have amassed fortunes in industrial pursuits turning with no less zeal to the acquisition of literary treasures; and when these are once acquired, the final wish of their collectors is to place them in the hands of the people. The "despoiling" of the private libraries of England by American financiers, so much decried in England, has resulted in making the "spoils" far more available to the world than if the precious examples had remained in private English collections. It is significant that Morgan always declined to bid against the British Museum for any book which obviously should become a part of that great and wonderfully stocked library, and the princely gesture of the present Morgan in 1929 in assisting the British Museum to acquire the Luttrell Psalter and the English Bedford Book of Hours has become romantic bibliographical history.

Apart from the famous collections and collectors, American university libraries have reason to feel grateful for the generous additions they have received from private sources. This is especially true as regards those collectors who have devoted their attention to special subjects; *e.g.*, Willard Fiske (1831–1904), who presented his extraordinary collections of Dante, Petrarch and Icelandic literature to the Cornell university library; William A. White whose 88 Shakespeare quartos, and Harry Elkins Widener (1885–1912), whose collection included the most complete Stevensoniana in the world, were given to Harvard.

The purchase of the Vollbehr collection by Congress in 1930 for $1,500,000 transformed the library of Congress from a second or third rate depository of books into one of the great libraries of the world. Included in this collection is the finest copy of the Gutenberg Bible in the world.

The entry of American financiers into the book-market caused the continuous increase in the prices of books ever since collecting began to progress by leaps and bounds instead of at its earlier quiet though steady pace, so that within the last 40 years prices of first editions of famous English plays, poems and novels have in many cases increased 40-fold, and some amazing records have been created, for example, that of £15,400, which was paid at Sotheby's in 1928 for the manuscript of "Lewis Carroll's" *Alice in Wonderland.*

Fields of Collecting.—Among American collectors Elizabethan and pre-Elizabethan authors are always in demand and prices paid are in keeping. Among the 19th century English authors collected Charles Dickens stands supreme, with Thomas Hardy seemingly on his way to a similar niche. Thackeray, Stevenson and Kipling never lack for admirers. Collectors specializing in American literature can, however, have their share of excitement, with Edgar Allan Poe, Mark Twain, Bret Harte and Walt Whitman standing well out in front. A new game, that of collecting first and limited editions of contemporary authors has acquired startling momentum in the United States. It appeals to the average book-lover who cannot afford the older rarities; and for those who intelligently pursue the hobby there is the added fascination of staking one's own judgment against that of posterity.

Americana (the term includes books, pamphlets and broadsides relating to America) offers a field of special interest for American collectors. It is so large that collectors usually specialize, limiting their field chronologically, geographically or by subject matter. Thus we have collections on certain colonies, on the French and Indian Wars, on the Revolution and Civil Wars, on Indians, on certain states or sections, etc. There are many collections on the World War, especially the Hoover collection at Leland Stanford university. A notable increase in the demand for books on the Far West has brought this field into prominence in recent years, and the increase in interest in Latin America is also being felt in auction room prices. The Huntington library at San Marino, Calif., stands among the great Americana collections. The Bancroft library, now one of the special libraries of the University of California at Berkeley, Calif.; the Munk library, now a part of the library of the Southwest in the Southwestern Museum in Los Angeles; the Coe collection in New York city; the Clements library at Ann Arbor, Mich.; the Philip Ashton Rollins collection, recently given Princeton university; the William A. Clark collection, presented to the University of Southern California; and the Burton library at Detroit are other important private collections of Western Americana open to scholars.

There are collectors of items of the early American presses, items of Benjamin Franklin usually standing preeminent, and of later presses noted for the typographical excellence of their work. The outstanding American book designer of modern times has been Bruce Rogers (*see* F. Warde, *Bruce Rogers; Designer of Books,* 1926) whose books already command a high premium. There are other collectors with more eccentric hobbies which are however no less fascinating. Old books on cooking, navigation, bee-keeping, smoking, hunting, early textbooks, almanacs, guide-books, time-tables—these and books in a hundred categories are in demand by someone and are easily disposed of. (W. D. O.)

BIBLIOGRAPHY.—The details can be studied in *Bookprices Current,* started by J. H. Slater in 1887, and *Book-Auction Records,* started by Frank Karslake in 1903, both since published annually with decennial indexes, and for the United States in *American Book Prices Current,* started by Luther Livingston in 1913 and also continued annually. The exploits of earlier gatherers are recorded in C. and M. Elton, *The Great Book-Collectors* (1893), and W. Y. Fletcher, *English Book-Collectors* (1902), while the *List of Catalogues of English Book-Sales, 1676–1900,* now in the British Museum, printed by order of the trustees in 1915, facilitates research. A notable feature in the museum collection is the auctioneer's copies annotated with prices and purchasers' names from 1744 to the present century. Stories of the later American collections will be found in A. S. W. Rosenbach, *Books and Bidders* (1928), who succeeded G. D. Smith as the chief agent for American collectors at English book auctions. Many guides for would-be collectors have been written, among the best of which are John Hill Burton, *The Book Hunter* (1862); C. J. Davenport, *The History of the Book* (1908); A. E. Newton, *Amenities of Book-Collecting* (1918), and *This Book Collecting Game* (1928); I. A. Williams, *The Elements of Book Collecting* (1927); J. T. Winterich, *Collector's Choice* (1928); and *A Primer of Book Collecting* (1927); C. Davenport, *Byways Among English Books* (1927); C. J. Sawyer and F. J. Harvey Darton, *English Books 1475–1900; a Signpost for Collectors* (1927); *The American Collector* (edited by C. F. Heartman, 1925); *A Record of British and American Private Collectors* (1927); *Private Book Collectors in the United States and Canada* (1928); William Dana Orcutt, *The Magic of the Book* (1930); Ruth Grannis, *The Book in America* (1939). *See* also D. Cockerell, *Book-binding and the Care of Books* (ed. 4, 1920) and *Some Notes on Bookbinding* (1929);

H. Williams, *History of Book Clubs and Printing Societies in Great Britain and Ireland* (1929); W. Ransom, *Private Presses and the Books They Have Given Us* (1929).

BOOKKEEPING. A systematic record of business transactions, in a form conveniently available for reference, made by individuals or corporations engaged in commercial or financial operations with a view to enabling them with the minimum amount of trouble and of dislocation to the business itself to ascertain at any time (1) the detailed particulars of the transactions undertaken, and (2) their cumulative effect upon the business and its financial relations to others. The ideal of any system of bookkeeping is the maximum of record and of speed in arriving at results, combined with the minimum of labour; but as dishonesty has to be guarded against, no system of bookkeeping can be regarded as adequate which does not enable the record to be readily verified as a true and complete statement of the transactions involved. Such a verification is called an audit, and in public and other large concerns is ordinarily undertaken by professional accountants (*see* ACCOUNTANCY AND ACCOUNTANTS). Where the bookkeeping staff is large it is usually organized so that its members check each other's work, and to that extent an audit, known as a "staff audit" or "internal check" is frequently performed.

Formerly, when credit was a considerably less important factor in commercial transactions than now, bookkeeping was frequently limited to an account of receipts and payments of money; and in early times, before money was in use, to an account of the receipt and issue of goods of different kinds. Even now what may be called the "cash system" of accounts is almost exclusively used by governments, local authorities, and charitable and other institutions; but in business it is equally necessary to record movements of credit, as a mere statement of receipts and payments of money would show only a part of the total transactions.

History.—The origin of bookkeeping is lost in obscurity, but recent researches would appear to show that some method of keeping accounts has existed from the remotest times. Babylonian records have been found dating back as far as 2600 B.C., written with a stylus on small slabs of clay, and it is of interest to note (*Records of the Past,* xi. 89) that these slabs or tablets "usually contain impressions from cylinder seals, and nail marks, which were considered to be a man's natural seal," thus showing that the modern method of identifying criminals by finger-prints had its counterpart in Babylonia some 4,500 years ago. Ancient Egyptian records were commonly written on papyrus, and contemporary pictures show a scribe keeping account of the quantities of grain brought into and removed from the Government storehouses. It will thus be seen that some form of bookkeeping existed long before bound books were known, and therefore the more general term *accounting* would seem to be preferable—the more so as the most modern developments are in the direction of again abandoning the bound book in favour of loose or easily detached sheets of paper or cards, capable of being rearranged as circumstances or convenience may dictate. At the present time all bookkeeping records are kept in three distinct columns, dealing respectively with the date of the transaction, its nature, and its money value. The earliest extant example of accounts so kept is probably a ledger in the Advocates' Library (now the National Library of Scotland) at Edinburgh, dated 1697, which, it is of interest to note, is ruled by hand. Before that double-entry bookkeeping had been in general use. The exact date of its introduction is unknown; but it was certainly not, as often stated, the invention of Lucas de Bergo, in or about 1494. This, however, is the date of the first issue (at Venice) of a printed book entitled *Everything about Arithmetic, Geometry, and Proportion,* by Luca Pacioli, which contains *inter alia* an explanation of bookkeeping by double-entry as then understood; but in all probability the system had then been in use for something like 200 years.

General Principles.—The centre of all bookkeeping systems is the *ledger,* and it may be said that all other books are only kept as a matter of practical convenience—hence the name "subsidiary books" that is frequently applied to them. Inasmuch, however, as the transactions are first recorded in these subsidiary books, and afterwards classified therefrom into the ledger, the names *books of entry* or *books of first entry* are often employed. Subsidiary books which do not form the basis of subsequent entries into the ledger, but are merely used for statistical purposes, are known as *statistical* or *auxiliary books.* In the early days of bookkeeping the ledger comprised merely those accounts which it was thought desirable to keep, and was not a complete record of all transactions. Thus in many instances records were only kept of transactions with other business houses, known as *personal accounts.* In the earliest examples transactions tending to reduce indebtedness were recorded in order of date, as they occurred, underneath transactions recording the creation of the indebtedness; and the amount of the reduction was subtracted from the sum of the indebtedness up to that date. This method was found to be inconvenient, and the next step was to keep one account of the transactions recording the creation of indebtedness and another account (called the *contra account*) of those transactions reducing or extinguishing it. For convenience these two accounts were kept on opposite sides of the ledger, and thus was evolved the *Dr.* and *Cr.* account as at present in general use. In this form of account all transactions creating indebtedness due from the person named therein to the business—that is to say, all benefits received by that person from the business—are recorded upon the left-hand or *Dr.* side, and *per contra* all transactions representing benefits imparted by him, giving rise to a liability on the part of the business, are recorded upon the *Cr.* side. The account may run on indefinitely but for convenience it is usually ruled off each time all indebtedness is extinguished.

It is also ruled off at certain periodical intervals, so that the state of the account may then be evident.

Single Entry Accounts.—A mere collection of *personal accounts* is, however, obviously a very incomplete record of the transactions of any business, and does not suffice to enable a statement of its financial position to be prepared. So at an early date other accounts were added to the ledger, recording the acquisition of and disposal of different classes of property, such accounts being generally known as *real accounts.* These accounts are kept upon the same principle as personal accounts, in that all expenditure upon the part of the business is recorded upon the *Dr.* side, and all receipts upon the *Cr.* side; the excess of the debit entries over the credit entries thus showing the value placed upon those assets that still remain the property of the business. With the aid of personal and real accounts properly written up to date, it is possible at any time to prepare a statement of assets and liabilities showing the financial position of a business, and the following is an example of such a statement, which shows also how the profit made by the business may be thus ascertained.

STATEMENT OF AFFAIRS AS AT DECEMBER 31, 1926

Liabilities.

Trade creditors	£ 4,961	10	0
Bills payable	2,620	18	4
Balance, being excess of assets over liabilities (or "capital") at this date, carried down	14,918	7	2
	£22,500	15	6
Amount of capital on Jan. 1, 1926	£15,010	1	7
Balance, being net profit for the year ended this date	1,408	5	7
	£16,418	7	2

Assets.

Fixtures, furniture, etc.	£1,269	4	3
Stock on hand	5,751	3	10
Trade debtors	3,842	7	9
Bills receivable	7,468	14	3
Cash at bank	4,169	5	5
	£22,500	15	6
Balance brought down	£14,918	7	2
Amount drawn out of business during year ended this date	1,500	0	0
	£16,418	7	2

Note. Outside of Great Britain it is customary to place the assets above, instead of under, the liabilities and capital.

The method of accounting hitherto described represents *single entry,* which—albeit manifestly incomplete—is still very often used by small business houses, and particularly by retail traders. Its essential weakness is that it provides no automatic check upon the clerical accuracy of the record, and, should any mistake be made in the keeping of the books, or in the extraction therefrom of the lists of assets and liabilities, the statement of assets and liabilities and the profit or loss of the current financial period will be incorrect to an equal extent. It was to avoid this obvious weakness of single entry that the system of double entry was evolved.

Double Entry.—The essential principle of double entry is that it constitutes a complete record of *every* business transaction it handles, and as these transactions are invariably cross-dealings, involving simultaneously the receipt of a benefit by someone and the imparting of a benefit by someone else, a complete record of transactions from both points of view necessitates an entry of equal amount upon both debit and credit sides of the ledger. Hence it follows that, if the clerical work be correctly performed, the aggregate amount entered up on the debit side of the ledger must at all times equal the aggregate amount entered up on the credit side; and thus a complete list of all ledger balances should show an agreement of the total debit balances with the total credit balances. Such a list is called a *trial balance,* an example of which is given below. It should be observed, however, that the test supplied by the *trial balance* is a purely mechanical one, and does not prove the absolute accuracy of the ledger as a record of transactions. Thus, transactions which have actually taken place may have been omitted from the books altogether, or they may have been recorded to the wrong accounts, or the money values attached to them may be incorrect; or, yet again, fictitious records may be entered of transactions which have never taken place.

TRIAL BALANCE, DECEMBER 31, 1926

Page	Name of Account	*Dr.*	*Cr.*
1	Capital account	..	£15,010 1 7
5	Drawings	£ 1,500 0 0	..
20	Trade creditors	..	4,961 10 0
24	Fixtures, furniture, etc.	1,269 4 3	..
27	Bills payable	..	2,620 18 4
40	Bad debts	71 4 2	..
44	Stock, Jan. 1, 1926	4,078 16 4	..
50	Discounts allowed	975 3 3	..
53	Trade debtors	3,842 7 9	..
60	Discounts received	..	1,117 17 8
65	Wages and salaries	1,865 12 0	..
75	Depreciation	141 0 5	..
78	Rent, rates, and taxes	1,242 13 8	..
82	General expenses	1,087 8 0	..
90	Bills receivable	7,468 14 3	..
97	Purchases	44,731 2 10	.
100	Sales	..	48,732 4 9
c56	Cash at bank	4,169 5 5	..
		£72,442 12 4	£72,442 12 4

A *trial balance* is thus no very adequate safeguard against fraud, nor does it bring to light mistakes in the monetary value attaching to the various transactions recorded. This last point is of especial importance, in that the monetary value of transactions may have been correctly recorded in the first instance, but owing to altered circumstances may have become inaccurate at a later date. This of course means that the altered circumstances constitute an additional "transaction" which has been omitted.

It will be observed that, in order to complete the record of the transactions by double entry, it has become necessary to introduce into the ledger a third class of accounts, known as *impersonal* or *nominal accounts.* These accounts record the transferences of money, or of money's worth, which, so far from representing a mere reshuffling of assets and liabilities, involve an increase in or a reduction of the amount invested in the business, *i.e.,* a profit or a loss. Transactions representing profits are recorded upon the *Cr.* side of nominal accounts, and those representing losses (including expenses) upon the *Dr.* side. This is consistent with the rule already laid down in connection with real and nominal accounts, inasmuch as expenditure which does not result in the acquisition of an asset is a loss, whereas receipts which do not involve the creation of liabilities represent profits. All debit balances therefore that are not assets are losses, and *per contra* all credit balances that are not liabilities are profits. Thus, inasmuch as double entry provides *inter alia* a complete statement under suitable headings of all profits and all losses, it is possible by aggregating these results to deduce therefrom the net profit or loss of carrying on the business—and that by a method entirely distinct from that previously described in connection with single entry, thus constituting a valuable additional check. Taking the trial balance previously shown, the following represent the *trading account, profit and loss account,* and *balance sheet* compiled therefrom. The trading account may be variously regarded as the account recording the movements of goods which represent the stock-in-trade, and as a preliminary to (or a subdivision of) the profit and loss account.

In American practice the *trading account, profit and loss account* is superseded to a large extent by the *statement of income, profit and loss.* The purpose of this type of statement is to display in running form the various accounts which have influenced the final profit figure for the period and also to tie up this final profit figure with the capital changes during the period so that the final account will agree with the capital account as set forth in the balance sheet of the enterprise. The following statement of *income, profit and loss* is based upon the preceding *trial balance* with the English money converted into American money at the rate of $4.86 a pound.

Statement of Income, Profit and Loss for the period ended December 31, 1926

Income from sales		$236,838.67
Deduct:		
Purchases	$217,393.35	
Less: Increase in inventory	8,127.74	
Cost of sales		209,265.61
Gross profit on sales		27,573.06
Administrative expense:		
Salaries and wages	9,066.82	
General expenses	5,284.76	
Total		14,351.58
Net operating profit		13,221.48
Other income:		
Discount received		5,432.91
Total		18,654.39
Deductions from income:		
Depreciation	685.36	
Rent, rates, and taxes	6,039.44	
Discounts allowed	4,739.29	
Bad debts	346.07	
Total		11,810.16
Net profit for period		6,844.23
Add:		
Capital at beginning of period	72,948.98	
Less: Withdrawals	7,290.00	65,658.98
Capital, December 31, 1926, as per Balance Sheet		$72,503.21

Balance Sheet.—The balance sheet is a statement of the assets and liabilities; but (inasmuch as, by transferring the balance of the profit and loss account to the capital account, it is possible

BALANCE SHEET as at December 31, 1926

To A. B., capital account	£14,918 7 2	By fixtures, furniture, etc.	£ 1,269 4 3
To trade creditors	4,961 10 0	By stock on hand	5,751 3 10
,, bills payable	2,620 18 4	,, trade debtors	3,842 7 9
		,, bills receivable	7,468 14 3
		,, cash at bank	4,169 5 5
	£22,500 15 6		£22,500 15 6

Dr. TRADING ACCOUNT for the Year ended December 31, 1926 *Cr.*

To Stock on hand, Jan. 1, 1926	£ 4,078 16 4	By Sales	£48,732 4 9
„ Purchases	44,731 2 10	„ Stock on hand, Dec. 31, 1926	5,751 3 10
„ Gross profit, transferred to profit and loss account	5,673 9 5		
	£54,483 8 7		£54,483 8 7

Dr. PROFIT AND LOSS ACCOUNT for the Year ended December 31, 1926 *Cr.*

To Rent, rates, and taxes	£1,242 13 8		By Gross profit as per trading account		£5,673 9 5
„ Salaries and wages	1,865 12 0		By Discount received		1,117 17 8
„ General expenses	1,087 8 0				
		£4,195 13 8			
„ Discounts allowed		975 3 3			
„ Bad debts		71 4 2			
„ Depreciation		141 0 5			
„ Net profit for the year transferred to capital account		1,408 5 7			
		£6,791 7 1			£6,791 7 1

to bring the latter account up to date and show the credit balance representing the surplus of assets over liabilities to date) the balance sheet, instead of showing a difference, or a "balance" representing what is *assumed to be* the amount of the capital to date, shows an absolute agreement of assets upon the one hand and of liabilities *plus* capital upon the other.

In the foregoing example the customary method has been followed of deducting withdrawals of capital from the capital account and of adding profits thereto. Sometimes, however, the balance of the capital account remains constant, and the drawings and net profits are transferred to a separate account called *current account.* This plan is not very often observed in the case of undertakings owned by individuals, or private firms, but is invariably adopted in connection with joint-stock companies, although in such cases the name *appropriation of profits account* is generally employed.

Reference No.	Name of debtor	Amount due on Oct. 1, 1926	Charges for current quarter	Total debit	Date received	Amount received	Discounts	Allowances	Bad debts	Amount due on Dec. 31, 1926	Remarks
		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	

Outside of Great Britain it is customary to place the assets on the left hand side of the balance sheet and the liabilities and capital on the right hand side. The following *balance sheet* accords with the American practice and is based upon the *trial balance* which precedes with conversions computed on the basis of $4.86 to the pound.

General Balance Sheet as of December 31, 1926

Cash in bank	$20,262.66	Accounts payable	$24,112.89
Accounts receivable	18,674.00	Notes payable	12,737.66
Notes receivable	36,297.94	A.B., capital	72,503.21
Merchandise inventory	27,950.79		
Furniture, fixtures, etc.	6,168.37		
	$119,353.76		$119,353.76

It will be observed in the above balance sheet that the terminology is somewhat different from that used in the trial balance, e.g., *accounts receivable* (*q.v.*) replaces the account *trade debtors, notes receivable* replaces the account *bills receivable, merchandise inventory* replaces the account *stock,* etc.

Books of First Entry.—Although it is now usual to employ several books of first entry, in the case of small businesses one such book is sufficient for all purposes, in that it is practicable for one person to record all the transactions that take place as and when they occur. A book of this description is called the *journal,* and for many years represented the only book of first entry employed in bookkeeping. In modern times, however, with the growth of business it was soon found impracticable to keep one book of first entry for all transactions, and accordingly it became necessary either to treat the journal as an intermediate book, in which the transactions might be brought together and focused as a preliminary to being recorded in the ledger, or to split up the journal into numerous books of first entry, each of which might in that case be employed for the record of a particular class of transaction. The first method has been generally adopted in the Continental countries of Europe, whereas in Great Britain and in North America the latter method is more general.

Sub-division of Ledgers.—With a view still further to split up the work, thus enabling a large staff to be simultaneously engaged, the ledger itself is now generally kept in sections. Thus the cash account and the bank account are frequently bound together in one separate book called the *cash book,* showing in parallel money columns the movements of office cash and of cash at the bank, and by the addition of a third column for discounts the necessity of keeping an additional book of first entry as a *discount journal* may also be avoided. Of late years, however, most businesses pay all moneys received into their banks without deduction, and pay all accounts by cheque; the necessity of an account for office cash thus no longer exists, save in connection with petty payments, which are recorded in a separate book called the *petty cash book.* With regard to the remaining ledger accounts, personal accounts (which are the most numerous) are frequently separated from the real and nominal accounts, and are further subdivided so that customers' accounts are kept separate from the accounts of trade creditors. The customers' accounts are kept in a ledger (or, if need be, in several ledgers) called *sales ledgers, sold ledgers* or *accounts receivable ledgers* (*q.v.*); while the accounts of trade creditors are similarly kept in *purchases ledgers, bought ledgers* or *accounts payable ledgers* (*q.v.*). The nominal and real accounts, if together, are kept in what is called the *general ledger;* but this may be further subdivided into a *nominal ledger* and a *private ledger.* By the employment of *adjustment* or *balancing accounts,* which complete the double entry record in each separate ledger, these various ledgers may readily be made self-balancing, thus enabling clerical errors to be localized.

Tabular Bookkeeping.—Of recent years considerable attention has been devoted to further modifications of bookkeeping methods with a view to reducing clerical work, increasing the speed with which results are available, and enabling them to be

handled more quickly and with greater certainty. *Tabular bookkeeping* is a device to achieve one or more of these ends by the substitution of books ruled with numerous columns for the more usual form. The system may be applied either to books of first entry or to ledgers. As applied to books of first entry, it enables the same book to deal conveniently with more than one class of transaction; thus, if the trading of a business is divided into several departments, by providing a separate column for the sales of each department, it is possible readily to arrive at separate totals for the aggregate sales of each, thus simplifying the preparation of *departmental trading accounts*. As applied to ledgers, the application of the system may be best described by the aid of the following example (the headings of the columns only being given), which shows how a very large number of personal accounts may be recorded upon a single opening of a ledger, provided the number of entries to be made against each individual be few.

Slip System.—Another important application of modern methods consists of what may be described as the *slip system*, which is in many respects a reversion to the method of keeping records upon movable slabs or tablets, as in the Babylonian accounts referred to at the beginning of this article. This system may be applied to books of first entry, or to ledgers, or to both. As applied to books of first entry it aims at so modifying the original record of the transaction (whether it represents an invoice for goods sold or an acknowledgment given for money received) that a facsimile copy may be taken of the original entry by the aid of a carbon sheet, which instead of being immovably bound up in a book is capable of being handled separately and placed in any desired order or position, and thus more readily recorded in the ledger. Additional carbon copies prepared at the same time may serve any other desired purpose, *e.g.*, as delivery notes, stock control sheets, etc. Postings are thus made direct from the original slips, which have been first sorted out into an order convenient for that purpose and afterwards re-sorted so that the total sales of each department may be readily computed; after which they are filed away in a form convenient for reference. Sometimes the process is carried a step farther, and the original slips, filed away with suitable guide-cards indicating the nature of the account, themselves constitute the ledger record—which in such cases is to be found scattered over a number of sheets, one for each transaction, instead of, as in the case of the ordinary book ledger, a considerable number of transactions being recorded upon a single page. This adaptation of the slip system is impracticable except in cases where the transactions with each individual are few in number, and is not worth adoption unless the exceedingly large number of personal accounts makes it important as far as possible to avoid all duplication of clerical work. The more usual adaptation of the slip system to ledgers is to be found in the employment of *card ledgers* or *loose-leaf ledgers*. With card ledgers each ledger account is upon an independent sheet of cardboard suitably arranged in drawers or cabinets. The loose-leaf ledger may be described as midway between card and bound ledgers. It consists of a number of sheets in book form, so bound as to be capable of being readily separated when desired. These modern types of ledgers lend themselves to the employment of bookkeeping machines (*see* OFFICE APPLIANCES).

Education.—Apart from the organizations of professional accountants, there is none of note devoted to the scientific study of bookkeeping other than purely educational institutions. Among the universities, those in the United States were the first to include accounting as part of their curriculum; while in Great Britain all the universities except Oxford and Cambridge have recognized its importance. More recently Japan has been making a movement in the same direction, and other countries will doubtless follow suit. In England there have for a number of years past been various bodies (such for instance as the Royal Society of Arts, the London Chamber of Commerce, and Owens college, Manchester) which hold examinations in bookkeeping and grant diplomas to successful candidates, while most of the polytechnic and technical schools give instruction in bookkeeping; these latter, however, for the most part regard it as a "craft" merely. The Accountant Lecturers' Association provides a means of communication between lecturers in accountancy subjects.

BIBLIOGRAPHY.—Those interested in the bibliography of bookkeeping are referred to the catalogue of the library of the Institute of Chartered Accountants in England and Wales, which probably contains the most complete collection in existence of ancient and modern works on accounting, both British and foreign. The following short list comprises those most likely to be found of general interest: *The Accountant's Library* (1901); G. Lisle, *Encyclopaedia of Accounting* (1903); L. R. Dicksee, *A.B.C. of Bookkeeping* (1908); *Bookkeeping* (8th ed., 1921); *Advanced Accounting* (6th ed., 1921); P. Crivelli, *Translation of Pacioli's Treatise on Double Entry Bookkeeping* (1924); Hatfield, *Accounting;* Kester, *Accounting Theory and Practice,* vol. i.; Koopman & Kester, *Fundamentals of Accounting;* Paton & Stevenson, *Principles of Accounting.* (*See* ACCOUNTANCY AND ACCOUNTANTS.) (L. R. D.)

BOOKKEEPING MACHINES: *see* OFFICE APPLIANCES.

BOOK OF THE DEAD: *see* EGYPT: *Religion.*

BOOK-PLATES. The book-plate, or *ex-libris,* a printed label intended to indicate ownership in books, is nearly as old as the printed book. According to Friedrich Warnecke, of Berlin (one of the best authorities on the subject), the oldest movable *ex-libris* are certain woodcuts representing a shield of arms supported by an angel (fig. 1), which were pasted in books presented to the Carthusian monastery of Buxheim by Brother Hildebrand Brandenburg of Biberach, about the year 1480—the date being fixed by that of the recorded gift. The woodcut, in imitation of similar devices in old mss., is hand-painted. Many other authorities claim that there is another which antedates the Brandenburg. It is that of Johannes Knabensberg (called Hans Igler), chaplain of the family of Schönstett. It is a woodcut found in an old Latin vocabulary. Some authorities date it *c.* 1450, others *c.* 1470–80. In France the most ancient *ex-libris* as yet discovered is that of one Jean Bertaud de la Tour-Blanche, dated 1529; and in England that of Cardinal Wolsey, 1515–34. Holland comes next with the plate of a certain Anna van der Aa, in 1597; then Italy with one attributed to the year 1622. The earliest known American example is the plain printed label of John Cotton, 1674.

A sketch of the history of the book-plate must obviously begin in Germany, not only because the earliest examples known are German, but also because they are found in great numbers—often of the highest artistic interest—long before the fashion spread to other countries. Albrecht Dürer is known to have actually engraved at least six plates (some of very important size) between 1503 and 1516 (fig. 2), and to have supplied designs for many others. Several notable plates are ascribed to Lucas Cranach and to Hans Holbein, and to that bevy of so-called Little Masters, the Behams, Virgil Solis, Matthias, Zundt, Jost Amman, Saldörfer, Georg Hüpschmann and others. The influence of these draughtsmen over the decorative styles of Germany has been felt through subsequent centuries down to the present day, notwithstanding the invasion of successive Italian and French fashions during the 17th and 18th centuries, and the marked effort at originality of

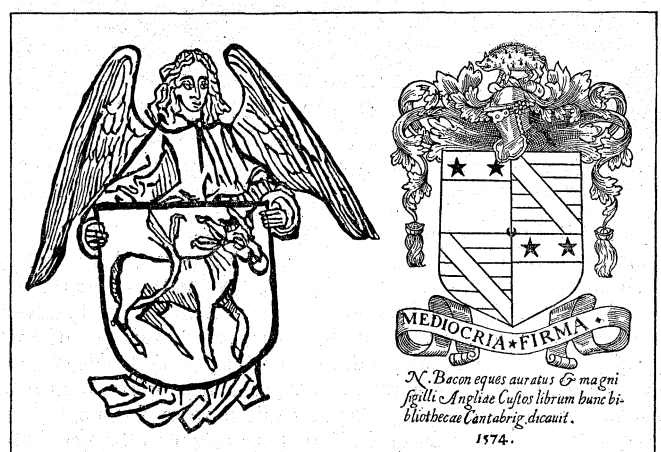


FIG. 1.—15TH AND 16TH CENTURY BOOK-PLATES
The plate on the left, believed to be the earliest movable book-plate, was pasted in books presented to the monastery of Buxheim, Germany, by Brother Hildebrand Brandenburg c. 1480. That on the right was made for Sir Nicholas Bacon in 1574 for the books presented by him to the University of Cambridge

composition observable among modern designers. The heavy, over-elaborated German style never seems to have affected neighbouring countries; but since it was undoubtedly from Germany that was spread the fashion of ornamental book-plates as marks of possession, the history of German *ex-libris* remains on that account one of high interest to all those who are curious in the matter.

It was not before the 17th century that the *movable ex-libris* became tolerably common in France. Up to that time the more



FIG. 2.—BOOK-PLATE OF LAZARUS SPENGLER, ENGRAVED IN 1515 BY THE GERMAN PAINTER AND ENGRAVER, ALBRECHT DÜRER

luxurious habit of stamping the cover with a personal device had been in such general favour with book-owners as to render the use of labels superfluous. From the middle of the century, however, the *ex-libris* proper became quite naturalized; examples of that period are very numerous, and, as a rule, are very handsome. It may be here pointed out that the expression *ex-libris,* used as a substantive, which is now the recognized term for book-plate everywhere on the Continent, found its origin in France. The words only occur in the personal tokens of other nationalities long after they had become a recognized inscription on French labels.

English Styles.—In many ways the consideration of the English book-plate, in its numerous styles, from the late Elizabethan to the late Victorian period, is peculiarly interesting. In all its varieties it reflects with great fidelity the prevailing taste in decorative art at different epochs. Until the last quarter of the 17th century the number of authentic English plates is very limited. Their composition is always remarkably simple, and displays nothing of the German elaborateness. They are as a rule very plainly armorial, and the decoration is usually limited to a symmetrical arrangement of mantling, with an occasional display of palms or wreaths. Soon after the Restoration, however, a book-plate seems to have suddenly become an established accessory to most well-ordered libraries. Book-plates of that period offer very distinctive characteristics. In the simplicity of their heraldic arrangements they recall those of the previous age; but their physiognomy is totally different. In the first place, they invariably display the tincture lines and dots, after the method originally devised in the middle of the century by Petra Sancta, the author of *Tesserae Gentilitiae,* which by this time had become adopted throughout Europe. In the second, the mantling assumes a much more elaborate appearance—one that irresistibly recalls that of the periwig of the period—surrounding the face of the shield. This style was undoubtedly imported from France, but it assumed a character of its own in England. As a matter of fact, thenceforth until the dawn of the French Revolution, English modes of decoration in book-plates, as in most other chattels, follow at some years' distance the ruling French taste. The main characteristics of the style which prevailed during the Queen Anne and early Georgian periods are:—ornamental frames suggestive of carved oak, a frequent use of fish-scales, trellis or diapered patterns, for the decoration of plain surfaces; and, in the armorial display, a marked reduction in the importance of the mantling. The introduction of the scallop-shell as an almost constant element of ornamentation gives already a foretaste of the *Rocaille-Coquille,* the so-called Chippendale fashions of the next reign. As a matter of fact, during the middle third of the century this rococo style (of which the Convers plate [fig. 3] gives a typical sample) affects the book-plate as universally as all other decorative objects. During the early part of George III.'s reign there is a return to greater sobriety of ornamentation, and a style more truly national, which may be called *the urn style,* makes its appearance. Book-plates of this period have invariably a physiognomy which at once recalls the decorative manner made popular by architects and designers such as Chambers, the Adams, Josiah Wedgwood, Hepplewhite and Sheraton. The shield shows a plain spade-like outline, manifestly based upon that of the pseudo-classic urn then so much to the fore. The ornamental accessories are symmetrical palms and sprays, wreaths and ribands. The architectural boss is also an important factor. In many plates, indeed, the shield of arms takes quite a subsidiary position by the side of the predominantly architectural urn. From the beginning of the 19th century, until comparatively recent days, no special style of decoration seems to have established itself. The immense majority of examples

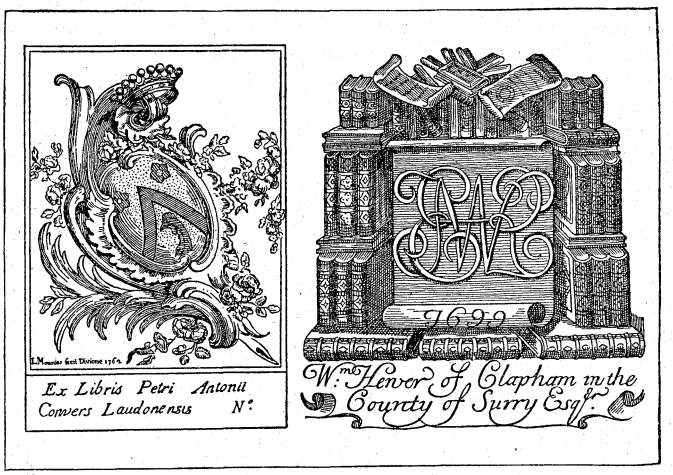


FIG. 3.—ENGLISH BOOK-PLATES OF THE 17TH AND 18TH CENTURIES

The plate on the left is that of P. A. Convers, 1762, and is representative of the rococo style that affected decorative art during this period. That on the right, the book-pile model, was made for W. Hewer, Samuel Pepys's secretary, in 1699

display a plain shield of arms with motto on a scroll below, and crest on a fillet above. Of late years, however, a rapid impetus appears to have been given to the designing of *ex-libris;* a new era, in fact, has begun for the book-plate, one of great interest.

The main styles of decoration (and these, other data being absent, must always in the case of old examples remain the criteria of date) have already been noticed. It is, however, necessary to point out that certain styles of composition were also prevalent at certain periods. Many of the older plates (like the majority of the most modern ones) were essentially pictorial. Of this kind the



BY COURTESY OF (1, 2, 5, 9) THE TRUSTEES OF THE BRITISH MUSEUM, (3, 8) THE METROPOLITAN MUSEUM OF ART, (4) BERTARELLI AND PRIOR FROM "GLI EX LIBRIS ITALIANI" (ULRICO HOEPLI), (6, 7) THE AMERICAN ANTIQUARIAN SOCIETY

EXAMPLES OF EARLY BOOK-PLATES

1. Earliest known English book-plate, 1515–30, that of Cardinal Wolsey. Not printed, but drawn and coloured by hand
2. Heraldic. Fifteenth century woodcut. One of the three earliest German book-plates known to-day. It was found fastened to the cover of an old Latin vocabulary and is thought to antedate the Brandenburg book-plate
3. German. Earliest portrait book-plate. A copper plate engraving by Albrecht Dürer, 1524, of Bilibald Pirckheimer, a Nuremberg jurist and councillor to the Emperors Maximilian and Charles V.
4. Earliest known Italian dated book-plate, 1622. Anonymous
5. Eighteenth century English book-plate in Chippendale armorial style. This Nicholas Bacon is not to be confused with the Sir Nicholas Bacon of the 1574 book-plate (Fig. 1. Page 867)
6. Early American book-plate, that of Paul Revere, unsigned but undoubtedly engraved by Revere about 1775
7. Earliest known American book-plate, bearing the date 1674 and belonging to John Cotton
8. George Washington's book-plate. Armorial engraving in the Chippendale style, probably between 1765 and 1775
9. Earliest known Dutch book-plate, that of Anna Vander Aa. It bears the date 1597

BOOK-PLATES



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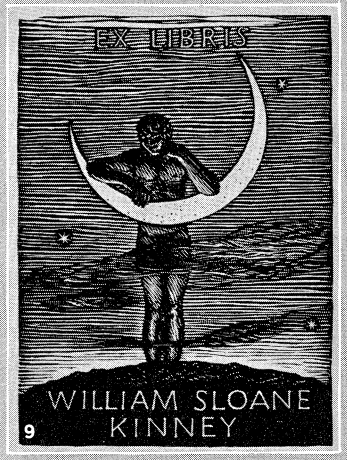

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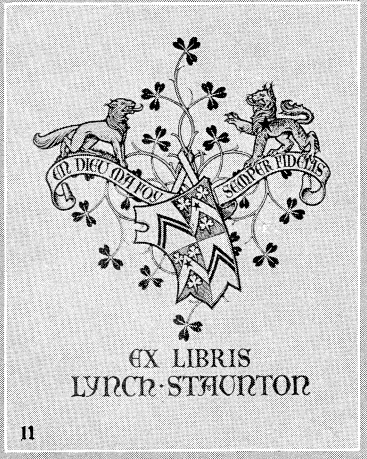

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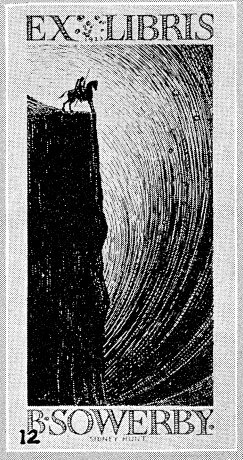

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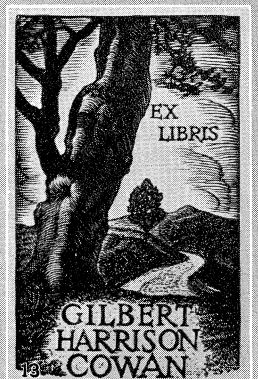

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BOOK-PLATES BY COURTESY OF (1, 2, 3, 4, 5, 14) THE AMERICAN ANTIQUARIAN SOCIETY, (6, 7, 8, 10, 11, 12, 16) THE TRUSTEES OF THE BRITISH MUSEUM, (9, 13) JULIUS J. LANKES, (15) FOWLER, FROM "BOOK PLATES FOR BEGINNERS"

BOOK-PLATES BY MODERN DESIGNERS

1. By J. W. Spenceley
2. By F. Charles Blank
3. By Sidney L. Smith
4. By Arthur N. Macdonald
5. By Dugald S. Walker
6. By Albert Daniel Rutherston for H. C. Coleman
7. By C. F. A. Voysey
8. Book-plate by Sherborn
9. By J. J. Lankes
10. By Sidney James Hunt
11. Design by Paul Woodroffe
12. By Sidney James Hunt
13. By J. J. Lankes
14. By E. D. French
15. By Franz von Bayros
16. By George W. Eve

best-defined English genus may be recalled: *the library interior*—a term which explains itself—and *book-piles,* exemplified by the *ex-libris* (fig. 3) of W. Hewer, Samuel Pepys's secretary. We have also many *portrait-plates,* of which, perhaps, the most notable are those of Samuel Pepys himself and of John Gibbs, the architect; *allegories,* such as were engraved by Hogarth, Bartolozzi, John Pine and George Vertue; *landscape-plates,* by wood engravers of the Bewick school, etc. In most of these the armorial element plays but a secondary part.

The value attached to book-plates, otherwise than as an object of purely personal interest, is comparatively modern. The study of and the taste for collecting these private tokens of book-ownership hardly date farther back than the year 1875. The first real impetus was given by the appearance of the *Guide to the Study of Book-Plates,* by Lord de Tabley (then the Hon. Leicester Warren) in 1880. This work, highly interesting from many points of view, established what is now accepted as the general classification of styles: *early armorial* (*i.e.,* previous to Restoration, exemplified by the Nicholas Bacon plate); *Jacobean,* a somewhat misleading term, but distinctly understood to include the heavy decorative manner of the Restoration, Queen Anne and early Georgian days (the Lansanor plate, fig. 3, is typically Jacobean); *Chippendale* (the style above described as *rococo,* represented by the French plate of Convers); *wreath and ribbon,* belonging to the period described as that of the urn, etc. Since then the literature on the subject has grown considerably. Societies of collectors have been founded, first in England, then in Germany and France, and in the United States, most of them issuing a journal or archives: *The Journal of the Ex-libris Society* (London), the *Archives de la société française de collectionneurs d'ex-libris* (Paris), both of these monthlies; the *Ex-libris Zeitschrift* (Berlin), a quarterly.

Until the advent of the new taste the devising of book-plates was almost invariably left to the routine skill of the heraldic stationer. Of late years the composition of personal book-tokens has become recognized as a minor branch of a higher art, and there has come into fashion an entirely new class of designs which, for all their wonderful variety, bear as unmistakable a character as that of the most definite styles of bygone days. Broadly speaking, it may be said that the purely heraldic element tends to become subsidiary and the allegorical or symbolic to assert itself more strongly. Among modern English artists who have more specially paid attention to the devising of book-plates, and have produced admirable designs, may be mentioned C. W. Sherborn, G. W. Eve, Robert Anning Bell, J. D. Batten, Erat Harrison, J. Forbes Nixon, Charles Ricketts, John Vinycomb, John Leighton and Warrington Hogg. The development in various directions of process work, by facilitating and cheapening the reproduction of beautiful and elaborate designs, has no doubt helped much to popularize the book-plate—a thing which in older days was almost invariably restricted to ancestral libraries or to collections otherwise important. Thus the great majority of modern plates are reproduced by process. There are, however, a few artists left who devote to book-plates their skill with the graver. Some of the work they produce challenges comparison with the finest productions of bygone engravers. Of these the best-known are C. W. Sherborn and G. W. Eve in England, and in America, J. W. Spenceley of Boston, Mass., K. W. F. Hopson of New Haven, Conn., and E. D. French of New York city.

BIBLIOGRAPHY.—The curious in the matter of book-plate composition will find it treated in the various volumes of the Ex-libris Series. *See* also A. Poulet-Malassis, *Les Ex-libris français* (1875); Hon. J. Leicester Warren (Lord de Tabley), *A Guide to the Study of Book-plates* (1880); Sir. A. W. Franks, *Notes on Book-plates, 1574–1800* (1887); Friedrich Warnecke, *Die deutschen Bücherzeichen* (1890); Henri Bouchot, *Les Ex-libris et les marques de possession du livre* (1891); Egerton Castle, *English Book-plates* (1892); Walter Hamilton, *French Book-plates* (1892), *Dated Book-plates* (1895); H. W. Fincham, *Artists and Engravers of British and American Book-plates* (1897); Count K. E. zu Leiningen-Westerburg, *German Book-plates,* Eng. trans. by G. R. Denis (1901); Clifford N. Carver, *Book-plates of Well-Known Americans* (Princeton, N.J., 1911); George W. Fuller (ed.), *A Bibliography of Bookplate Literature* (Spokane, Wash., 1926).

(E. CAS.)

BOOKS. Book is the name for any literary production of some bulk, now applied particularly to a printed composition forming a volume, or, if in more than one volume, a single organic literary work.

The clay tablets of Babylonia and Assyria (*q.v.*) which were literary as well as documentary in their contents and were collected into libraries, are perhaps entitled to be called books, but the direct ancestry of the modern printed book begins rather with a papyrus roll of 18 columns in Egyptian hieratic writing of about the 25th century B.C., in the Musée de Louvre at Paris, preserving the maxims of Ptahhetep. Papyrus continued to be the usual vehicle of writing until the early centuries of the Christian era, and it was from the name by which they called it, *βύβλος* or *βίβλος,* that the Greeks formed *βίβλιον,* their word for a book, the plural of which (mistaken for a feminine singular) has given us our own word Bible. In the 2nd century B.C. Eumenes II., king of Pergamus, finding papyrus hard to procure, introduced improvements into the preparations of the skins of sheep and calves for writing purposes, and was rewarded by the name of his kingdom being preserved in the word *pergamentum,* whence our "parchment," by which the dressed material is known. In the 10th century there was introduced from the East a new writing material made from a pulp of linen rags, and the name of the vanquished papyrus was transferred to this new rival. Paper-mills were set up in Europe in the 12th century and the use of paper gained ground, though not very rapidly, until the invention of printing created an unprecedented demand for it which has since continually increased, and is now largely met by substitutes passing under the same name, mainly composed of wood-pulp, esparto grass and clay (*see* PAPER).

So long as the use of papyrus was predominant the usual form of a book was that of the *volumen* or roll, wound round a stick, or sticks. The modern form of book, called by the Latins *codex* (a word originally used for the stump of a tree, or block of wood, and thence for the three-leaved tablets into which the block was sawn) was coming into fashion in Martial's time at Rome, and gained ground in proportion as parchment superseded papyrus. The *volumen* as it was unrolled revealed a series of narrow columns of writing, and the influence of this arrangement is seen in the number of columns in the earliest codices. Thus in the Codex Sinaiticus and Codex Vaticanus of the Bible, both of the 4th century, there are respectively four and three columns to a page; in the Codex Alexandrinus (5th century) only two; in the Codex Bezae (6th century) only one, and from this date to the invention of printing, while there were great changes in handwriting, the arrangement of books changed very little, single or double columns being used as was found convenient.

15th Century.—Between a manuscript written in a formal book-hand and an early printed copy of the same work, printed in the same district, the difference in general appearance was very slight. The printer's type (*see* TYPOGRAPHY) would as a rule be based on a handwriting considered by the scribes appropriate to works of the same class; the chapter headings, headlines, initial-letters, paragraph marks, and in some cases illustrations, would be added by hand in a style which might closely resemble the like decorations in the manuscript from which the text was being printed; there would be no title-page and very probably no statement of any kind that the book was printed, or as to where, when or by whom it was produced. Information as to these points, if given at all, was reserved for a paragraph at the end of the book, called by bibliographers a colophon (*q.v.*), to which the printer often attached a device consisting of his arms, or those of the town in which he worked, or a fanciful design. The earliest title-page is prefixed to a bull of Pope Pius II., printed by Fust and Schoeffer, at Mainz, probably in 1463, and bears the words, "Dis ist die bul zu dutsch die unser allerheiligster vatter der bapst Pius herusgesant hait widder die snoden ungleubigen turcken." In 1470 Arnold ther Hoernen at Cologne printed a nine-line paragraph on an otherwise blank page giving the title of the book, *Sermo ad populum predicabilis in festo presentacionis Beatissime Marie Semper Virginis,* with some words in its praise, the date in Roman numerals, and a reference to

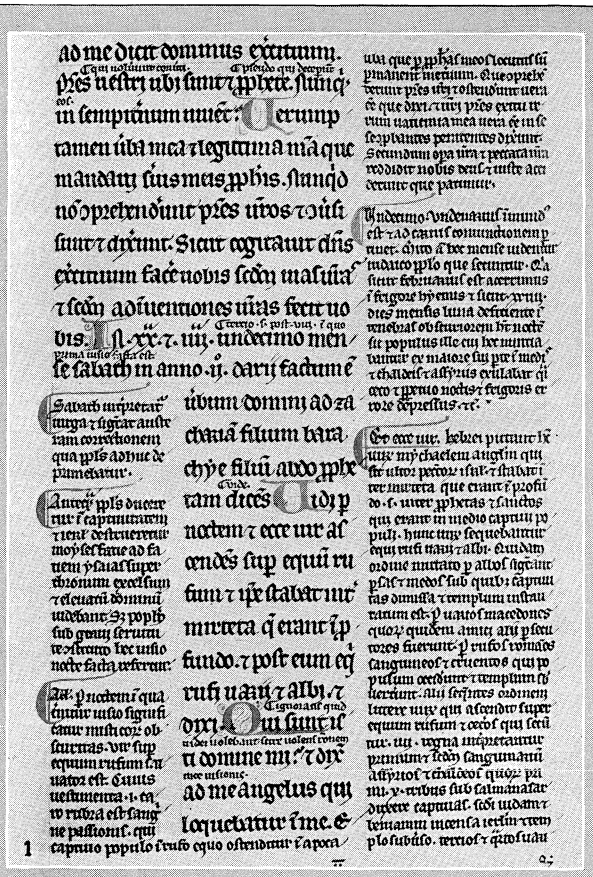
further information on the next page. In 1475 in a Venice edition of Augustine's *De Civitate Dei* the name of the printer, Gabriel Petri, is found in the headline of the first page of text. In 1476 Erhard Ratdolt and his partners at Venice printed their names and the date, together with verses describing the book, on the title-page of a Latin calendar, and surrounded the whole with a border in four pieces. For another 20 years, however, when title-pages were used at all, they usually consisted merely of the short title of the book, with sometimes a woodcut or the printer's (subsequently the publisher's) device beneath it, decoration being more often bestowed on the first page of text. Title-pages completed by the addition of the name and address of printer or publisher, and also by the date, did not become common till about 1520. In other respects the completion of the book, independently of handwork, was fairly rapid. Printed illustrations appear first as rude woodcuts in some small books produced at Bamberg by Albrecht Pfister about 1461. Pagination and headlines were first used by Arnold ther Hoernen at Cologne in 1470 and 1471; printed signatures to guide binders in arranging the quires correctly (*see* BIBLIOGRAPHY) by Johann Koelhoff, also at Cologne in 1472. Illustrations abound in the books printed at Augsburg from the year 1470, and from about 1480 are common in Germany, France and the Low Countries, while in Italy their full development dated from about 1490. Experiments were made in both Italy and France with illustrations engraved on copper, but in the 15th century these met with no success. Bound with wooden boards covered with stamped leather, or with half of the boards left uncovered, many of the earliest printed books are immensely large and heavy, especially the great choir-books, the Bibles and the biblical and legal commentaries, in which a great mass of notes surrounds the text. The paper on which these large books were printed was also extraordinarily thick and strong. For more popular books small folio was at first a favourite size, but towards the end of the century small thin quartos were much in vogue. Psalters, books of hours, and other prayer-books were practically the only very small books in use. As early as 1467 the bishop of Aleria writing to Pope Paul II. speaks of the introduction of printing having reduced prices to one-fifth of what they had previously been, and they steadily diminished.

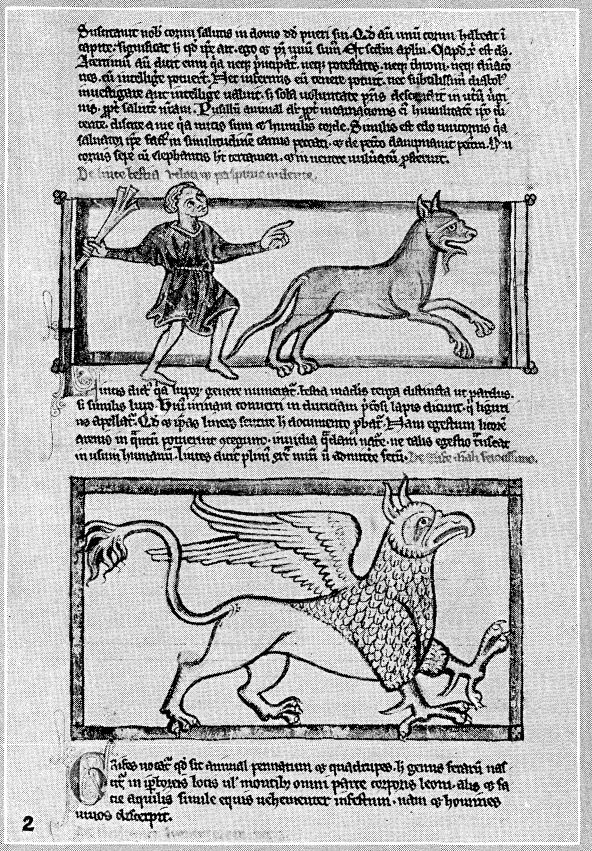
16th Century.—The popularization of the small octavo by Aldus at Venice in 1501 and the introduction in these handy books of a new type, the italic, had far-reaching consequences. Italics grew steadily in favour during the greater part of the century, and about 1570 had almost become the standard vernacular type of Italy. In France also they were very popular, the attempt to introduce a rival French cursive type (*lettres de civilité*) attaining no success. In England they gained only slight popularity, but roman type, which had not been used at all in the 15th century, made steady progress in its contest with black letter, which by the end of the century was little used save for Bibles and proclamations. The modern practice in the use of i and j, u and v dates from about 1580, though not firmly established till the reign of Charles I. In the second quarter of the 16th century the French printers at Paris and Lyons halved the size of the Aldine octavos in their small sexto-decimos, which found a ready market, though not a lasting one, the printers of Antwerp and Leyden ousting them with still smaller books in 24mo or small twelves. These little books were printed on paper much thinner than had previously been used. The size and weight of books was also reduced by the substitution of pasteboards for wooden sides. Gold tooling came into use on bindings, and in the second half of the century very elaborate decoration was in vogue in France until checked by a sumptuary law. On the other hand a steady decline in the quality of paper, combined with the abandonment of the old simple outline woodcuts for much more ambitious designs, made it increasingly difficult for printers to do justice to the artists' work, and woodcuts, at first in the Low Countries and afterwards in England and elsewhere, were gradually superseded by copper-plates printed separately from the text. At the beginning of this century in England a ballad or Christmas carol sold for a halfpenny and thin quarto chapbooks for 4d. (a price which lasted through the century); the Great Bible of 1541 was priced at 10s. in sheets and 12s. bound, Edward VI.'s prayer-book (1549) at 2s. 2d. unbound, and 3s, 8d. in paste or boards; Sidney's *Arcadia* and other works in 1598 sold for 9s.

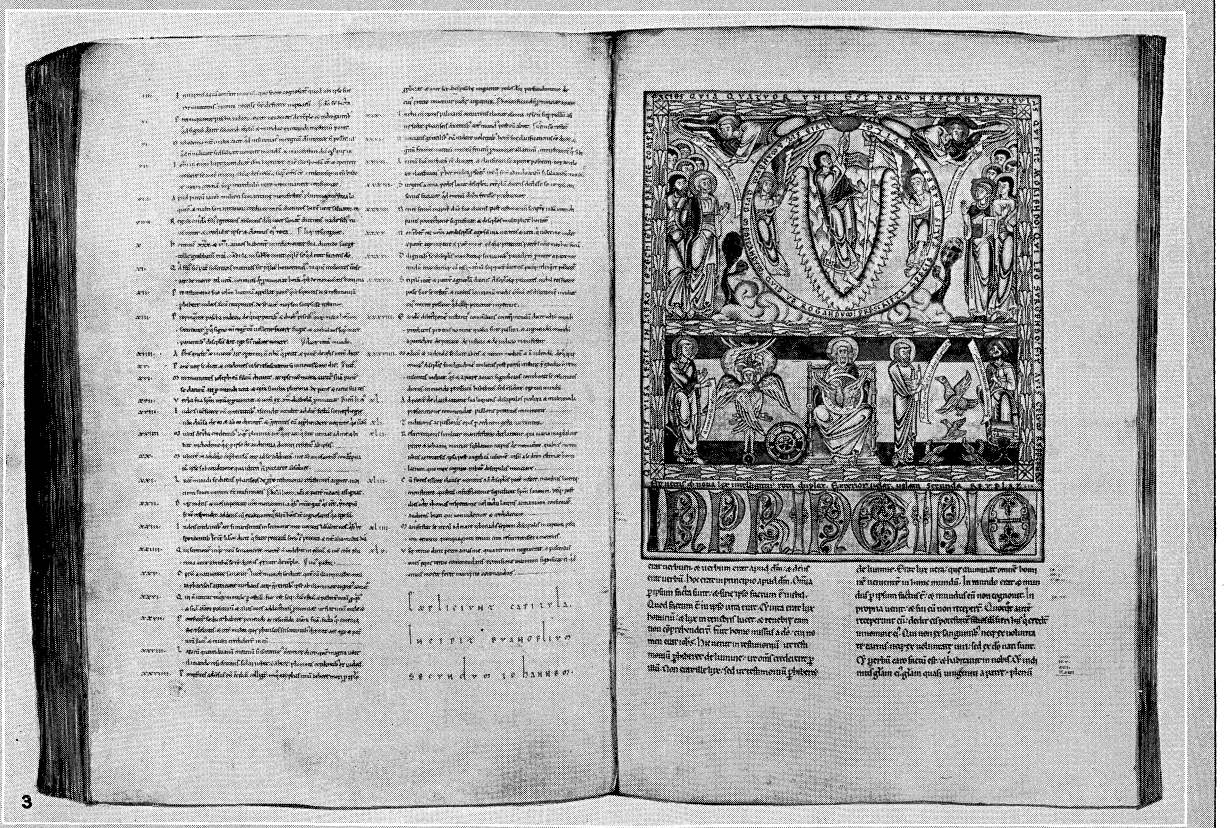
17th Century.—Although the miniature editions issued by the Elzevirs at Leyden, especially those published about 1635, have attracted collectors, printing in the 17th century was at its worst, reaching its lowest depths in England in the second quarter. After this there was a steady improvement, partly due to slight modifications of the old printing presses, adopted first in Holland and copied by the English printers. In the first half of the century many English books, although poorly printed, were ornamented with attractive frontispieces, or portraits, engraved on copper. During the same period, English prayer-books and small Bibles and New Testaments were frequently covered with gay embroideries in coloured silks and gold or silver thread. In the second half of the century the decorated leather bindings in vogue were the daintiest England had yet produced. For trade bindings rough calf and sheepskin were most used, and the practice of lettering books on the back, instead of on the sides or fore-edges or not at all, came gradually into favour. Owing to the increase of money, and in some cases to the action of monopolists, in others to the increased payments made to authors, book-prices rather rose than fell. Thus church Bibles, which had been sold at 10s. in 1541, rose successively to 25s., 30s. and (in 1641) to 40s. Single plays in quarto cost 6d. each in Shakespeare's time, 1s. after the Restoration. The Shakespeare folio of 1623 is said to have been published at £1. Izaak Walton's *Compleat Angler* was priced at 1s. 6d. in sheepskin, *Paradise Lost* at 3s., *The Pilgrim's Progress* at 1s. 6d. Dryden's *Virgil,* published by subscription at £5 5s., stands by itself.

18th Century.—During this century there was a notable improvement alike in paper, type and presswork in both France and England, and towards the end of the century in Germany and Italy also. Books became generally neat and sometimes elegant. Book-illustration revived with the French *livres-à-vignettes,* and English books were illustrated by Gravelot and other French artists. In the last quarter of the century the work of Bewick heralded a great revival in woodcut illustrations, or as the use of the graver now entitled them to be called, wood engravings. The best 18th century binders, until the advent of Roger Payne, were inferior to those of the 17th century, but the technique of the average work was better. In trade bindings books were mostly cased in paper boards. Prior and Pope made large sums by subscription editions at high prices. Single poems by Pope, however, were sold at 1s. and 1s. 6d. Novels were mostly in several volumes. The price at the beginning of the century was mostly 1s. 6d. each. It then remained fairly steady for many years, and at the close of the century rose again. Thus Miss Burney's *Evelina* (3 vols., 1778) sold for 7s. 6d., her *Cecilia* (5 vols., 1782) for 12s. 6d. and her *Camilla* (5 vols., 1796) for £1 1s. Johnson's *Dictionary* (2 vols., folio, 1755) cost £4 4s. in sheets, £4 15s. in boards.

19th Century.—A great change in the appearance of books was caused by the use first of glazed calico (about 1820), afterwards (about 1830) of cloth for the cases of books as issued by their publishers. At first the lettering was printed on paper labels, but soon it was stamped in gilt on the cloth, and in the last quarter of the century many very beautiful covers were designed for English and American books. Book illustrations passed through many phases. As subsidiary methods colour-prints, line engravings, lithographs and etchings were all used during the first half of the century, but the main reliance was on wood-engraving, in which very great technical skill was developed. In the '60s and the years which immediately preceded and followed them many of the chief English artists supplied the engravers with drawings. In the last decade of the century wood-engraving was killed for a time by the perfection attained by photographic methods of reproduction (*see* PHOTO-ENGRAVING), the most popular of these methods entailing the use of paper heavily coated with china clay. During the century trade-printing, in England and America, steadily improved, and the work done by William Morris at his Kelmscott Press (1891–96), and by other amateur



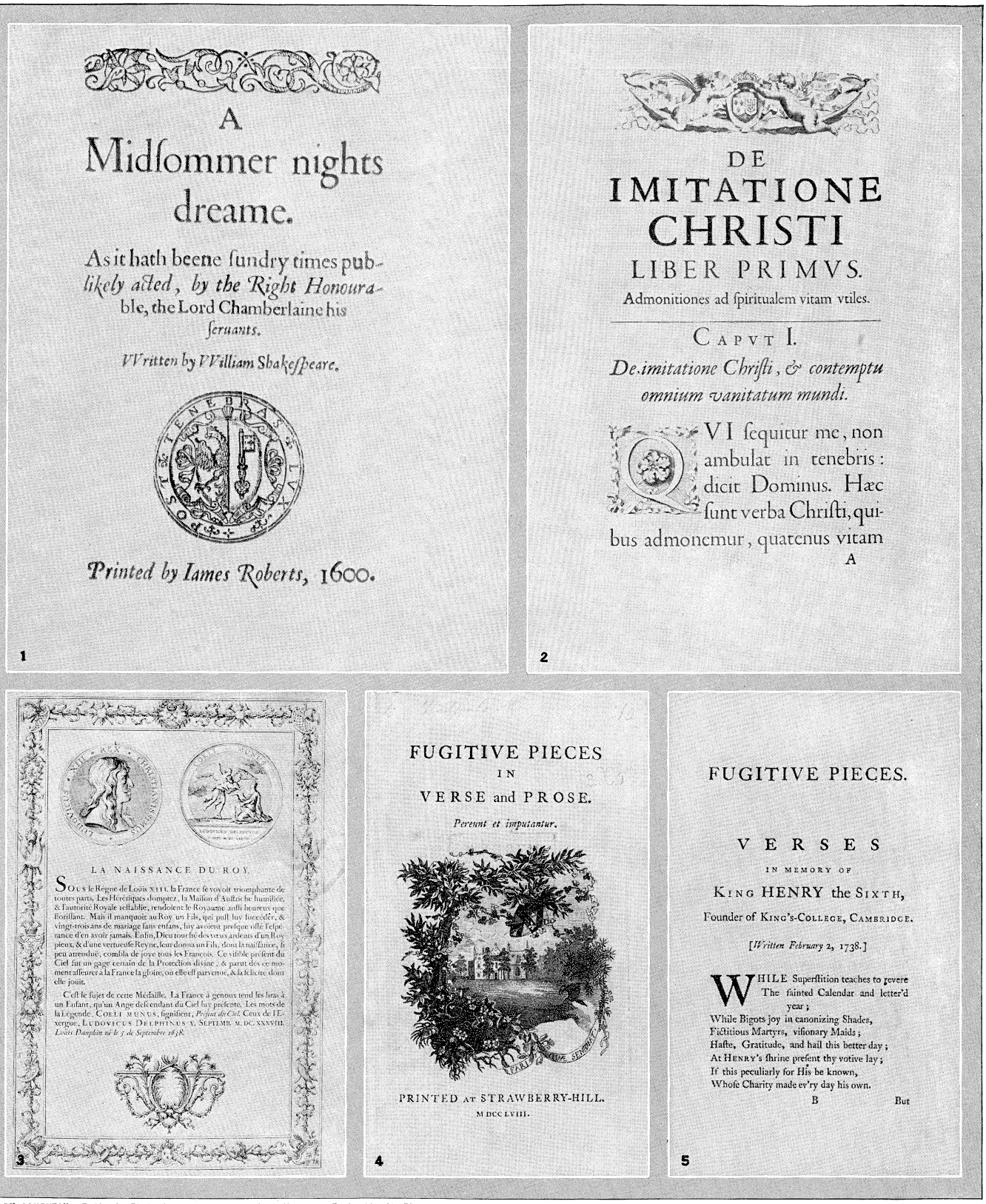




BY COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM

SPECIMEN PAGES FROM TWELFTH AND THIRTEENTH CENTURY MANUSCRIPTS

1. Page with vulgate text and Latin gloss from Bible ms. containing the minor prophets and the Book of Job, probably written at Christ Church, Canterbury, towards the end of 13th century
2. Page from an illuminated bestiary, written in Latin. England, early 13th century
3. Two facing pages from the Gospel of St. John, the capitula on the left, and the first page on the right, with miniatures and illuminated initials. This is from a vulgate version of the Bible, written for the Abbey of Floreffe, near Namur, in Belgium, about 1160



A
Midſommer nights
dreame.

As it hath beene ſundry times publikely acted, by the Right Honourable, the Lord Chamberlaine his ſeruants.

VVritten by VVilliam Shakeſpeare.

Printed by Iames Roberts, 1600.

1

DE
IMITATIONE
CHRISTI
LIBER PRIMVS.

Admonitiones ad ſpiritualem vitam vtiles.

CAPVT I.

De imitatione Chriſti, & contemptu omnium vanitatum mundi.

QVI ſequitur me, non ambulat in tenebris: dicit Dominus. Hæc ſunt verba Chriſti, quibus admonemur, quatenus vitam

A

2

LA NAISSANCE DU ROY.

SOVS le Regne de Loüis XIII. la France ſe voyoit triomphante de toutes parts. Les Heretiques domptez, la Maiſon d'Auſtriche humiliée, & l'autorité Royale reſtablie, rendoient le Royaume auſſi heureux que floriſſant. Mais il manquoit au Roy un Fils, qui puſt luy ſuccéder, & vingt-trois ans de mariage ſans enfans, luy auoient preſque oſté l'eſperance d'en auoir jamais. Enfin, Dieu touché des vœux ardens d'un Roy pieux, & d'une vertueuſe Reyne, leur donna un Fils, dont la naiſſance, ſi peu attendüe, combla de joye tous les François. Ce viſible preſent du Ciel fut un gage certain de la Protection divine, & parut dés ce moment aſſeurer à la France la gloire, où elle eſt parvenuë, & la felicite dont elle jouït.

C'eſt le ſujet de cette Médaille. La France à genoux tend les bras à un Enfant, qu'un Ange deſcendant du Ciel luy preſente. Les mots de la Legende. COELI MUNUS, ſignifient, *Preſent du Ciel*. Ceux de l'Exergue, LUDOVICUS DELPHINUS V. SEPTEMB. M. DC. XXXVIII. *Loüis Dauphin né le 5 de Septembre 1638.*

3

FUGITIVE PIECES
IN
VERSE and PROSE.

Pereunt et imputantur.

PRINTED AT STRAWBERRY-HILL.
M DCC LVIII.

4

FUGITIVE PIECES.

VERSES
IN MEMORY OF
KING HENRY the SIXTH,
Founder of KING'S-COLLEGE, CAMBRIDGE.

[*Written February* 2, 1738.]

WHILE Superſtition teaches to revere
The ſainted Calendar and letter'd year;
While Bigots joy in canonizing Shades,
Fictitious Martyrs, viſionary Maids;
Haſte, Gratitude, and hail this better day;
At HENRY's ſhrine preſent thy votive lay;
If this peculiarly for His be known,
Whoſe Charity made ev'ry day his own.

B But

5

BY COURTESY OF (1, 4, 5) THE TRUSTEES OF THE BRITISH MUSEUM; (2, 3) FROM STANLEY MORISON, "FOUR CENTURIES OF FINE PRINTING" (BENN)

TYPES OF 17TH AND 18TH CENTURY PAGE DESIGNS

1. *A Midsommer nights dreame,* by William Shakespeare. The edition was printed by James Roberts and published by Thomas Pavier, who is alleged to have annotated it falsely. The date on the book is 1600 but the real date is supposed to have been 1619

2. *De Imitatione Christi,* by Thomas à Kempis, 1642, The first publication was a folio text of the *Imitation* which was printed in Garamond's *Caractères de l'Université*

3. The *Médailles sur les Événements du Règne de Louis le Grand,* 1702. The book has an engraved frontispiece by the elder Simonneau after Coypel fils. Its borders and fleurons are by Berain; the head of the king on the medals is from the burin of Gerard Edelinck

4. Title page from *Fugitive Pieces in Verse and Prose,* by Horace Walpole, published by the Strawberry-Hill Press in 1758

5. First page of *Fugitive Pieces in Verse and Prose*

printers who imitated him, set a new standard of beauty of type and ornament, and of richness of general effect. On the other hand the demand for cheap reprints of famous works induced by the immense extension of the reading public was supplied by scores of pretty editions at 1s. 6d. and 1s. and even less. About 1894 the number of such medium-priced books was greatly increased in England by the substitution of single-volume novels at 6s. each (subject to discount) for the three-volume editions at 31s. 6d. The preposterous price of 10s. 6d. a volume had been adopted during the first popularity of the *Waverley Novels,* and despite the example of France, where the standard price was 3fr. 50, had continued in force for the greater part of the century.

20th Century.—This opened well with the books printed by Emery Walker and Cobden Sanderson at the Doves Press in a fine roman type, based on that used by Nicolas Jenson at Venice (1470–80), and apart from the badness of paper and shortage of skilled pressmen and binders from 1915 to 1920, there was a steady improvement in printing, due largely to the introduction of monotype machines, which ensured that every new book should be printed with new type. In connection with the monotypes many excellent new founts were introduced, the general tendency being to a lighter style of printing and decoration and a greater use of italics as a text type. The use of attractive paper jackets for new books, especially novels, somewhat lessened the decoration of bindings, but on the whole the standard of book production was higher than ever before, and though for some years after the World War books nearly doubled in price, with better machinery a gradual return to cheapness was found possible. (*See* PUBLISHING and BOOKSELLING.) (A. W. P.)

ART OF THE BOOK

Though the book throughout its history has tended to become more and more a personal possession, until it is now a necessary adjunct to the ordinary man's life instead of being the semi-magical weapon of the few who could read, it depends, as a thing of beauty, on the fact that it is an inscription, a thought written down. From the Babylonian clay amulet with its charm in writing, as old as civilization, to the modern "book oath" of the law-courts, we find this reverence for "frozen thought" persisting in men's minds. From the impulse of reverence sprang religion, and from religion art, which grew at first in order to make sacred objects more potent. The craftsman of older days took his inspiration directly from the fundamental human emotions of awe and curiosity instead of from the theories of professors, and by directing his reason upon an emotional state of mind was able to explore the technique of his craft, and, quite incidentally, to achieve beauty independent of the whims of aesthetic fashion-mongers. No art is the worse for being criticized with an eye to the purpose and state of mind in which it was produced; but in considering the book we are forced into such an attitude, because we are dealing first and foremost with an instrument of thought, and only secondarily with an object of art. We must keep in mind not only the fact that every rule for the beautiful book arises from some practical need for lucid exposition, but, more important still, we must remember the almost superstitious reverence with which the craftsman regarded man's unique gift of ciphering and deciphering thought. The modern "fine book" is the direct descendant of the sacred book of the past, but any inscription at all has a peculiar relation to the intellect. The gramophone record is not an inscription, because it is deciphered not by the intellect but by merely mechanical devices; hence no embellishment will ever be lavished upon it. But when a message directly enters the mind through the eye, it must be clothed in relation to its importance.

Ancient Books.—The hieratic books of ancient Egypt furnish an early example. The famous surviving ms. of the "Book of the Dead" has called on the utmost resources of calligrapher and illuminator. It is a long roll of papyrus, the early equivalent of paper (*q.v.*). Although this was made of the inner bark of Nile reeds, beaten flat, it seems to have been produced in qualities of extreme fineness and flexibility. Pliny mentions a roll containing the entire Iliad, which could be enclosed in a nut-shell. This may be a myth, but at least it was not considered beyond belief. Parchment was introduced as an expensive substitute in the 2nd century B.C.; but despite its more enduring qualities not a single complete parchment book from the golden age of Roman or Greek literature has survived to our day. Our earliest Latin ms. is possibly of 4th-century origin. The roll form of book, whether of parchment or papyrus, measured often 16 ft. and sometimes far more in length, and was well adapted to the needs of important texts, sacred or profane. In its original form, reading down (or up) from one scroll rod to the other, it keeps nearest to its parent, the inscribed stone tablet, and may have been hung banner-wise in Egyptian temples. An interesting survival of this use of books for exhibition is found in the "Exsultet" rolls of the mediaeval church. The deacon read or sang the tract *Exsultet iam angelica turba* at the Easter vigil, unrolling as he did so a long scroll which hung down from over his lectern. This was painted with illustrative miniatures, upside down from the text he read, so that they were revealed to the congregation as he proceeded.

When, however, the writing was arranged long-wise on tne roll it had to be broken up into blocks or sections, the length of the line being governed by ease in reading. These blocks of text then took the familiar rectangular form of our own book page. Merely folding the roll back on itself would convert it into a modern book of leaves as long as the edges were not cut. But the roll was regarded, because of its solemn uses, as a single object rather than as a collection of pages for easy reference; hence it was generally wound, not folded, from one end-rod to another—whence our word volume (from *volvere,* to roll). The end-rods were furnished with bosses and the rolls were enclosed in *scrinia,* cases. Both of these were elaborately worked by craftsmen when the value of the book demanded it, so that Seneca could accuse certain wealthy bibliophiles of paying more attention to their elaborate titlings and cases than to the literary worth of the contents of their libraries. This satire still has point.

As the book grew away from its original function in the temple and became the property of private owners, the needs of convenience altered its appearance. The book of leaves or pages existed as an informal contemporary of the roll, not only in the primitive *diptychs,* or wax-coated folding tablets, which formed the ancient note-book, but by the first century, in genuine published works. Possibly the difficulty of binding papyrus by piercing it through with threads hindered the development of such books. Certainly parchment, better for this purpose, was more costly; but already in the 1st century Martial was unconsciously sounding the knell of the roll in his line (Epigr. I., ii.) "Let the great folk have their *scrinia;* my book can be held in one hand." Martial also mentions (I., lxvi.) "virgin sheet" (*charta*) being soiled by rough chins; which gives us a picture of the difficulty with which a long roll was held open while the reader searched for a particular passage. He also tells of a friend who returned one of his books unrolled to the end rod (*explicitum . . . ad sua cornua librum*) as a proof that it had been read. These *cornua* would seem to have been fashioned of bone or ivory, perhaps for greater flexibility. The roll was held in the left hand and unrolled with the right; many grave-monuments show sculptures of readers holding rolls so that the final page hangs down: "the book is ended." Parchment, which was less brittle at the edges than papyrus, seems to have been specially destined for the *codex* or leaf book, which has three free edges instead of two, and these three multiplied by the number of pages in the book. It also withstood corrections and expunging better than papyrus, and gave a freer surface to the illuminator. Magnificent Greek mss. from mediaeval times were sometimes written in gold upon purple-stained skins. What illumination there was in ancient books would seem to have been more like the modern, straightforward illustration of our own books than like the work of the mediaeval artists, who made decoration spring naturally from the writing of the text. Surviving mss. of Terence, for example, which seem to have been copied from late classic books, show that the pictures were really needed to illustrate the positions of the actors on the stage. Massive initial letters were known, and a rudimentary title-page appears in the inscription of the first leaf of some early Greek manuscripts.

Although the *codex* was dependent on parchment for its development, the latter material was used for writing in Greece from the earliest times. The *codex* originated, it would seem, in Greece or Asia Minor as a form specially suited to books of law (whence our word "code"), in that pages could be excised or added after statutory changes without destroying the continuity of the volume. It may also have perpetuated (for law is conservative) the primitive tables of stone or wood on which decrees were first inscribed. The single pages could, like these tables, be first exhibited and then piled together. But works of literature were soon issued in *codices,* although the fine book as we are considering it was not affected at once by the innovation. As late as the 3rd century of our era the jurist Ulpian defined "books" as rolls to the seeming exclusion of *codices,* although this definition was soon extended to the humbler form.

Though Christianity did not noticeably stay the destruction of ancient books inevitable after the barbarian invasions of Rome, the church of the 3rd to 5th centuries rendered a distinct service to the physical arts of the book by sharply reviving the idea that only sacred writings are worthy of preservation in a beautiful form. A secular author, however great, is at the mercy of the mere literary tastes of subsequent generations; but revealed or pious writings depend on no such whims. Hence a tradition of copied texts was possible. Had there been no church, the fine book might have disappeared entirely in the West; as it was, the *codex,* which gradually superseded the roll, became a far more reasoned and workable thing in daily use in the churches than it could have become on the shelves of rich amateurs in imperial Rome, who—like ourselves—had lost sight of the motives that inspire true craftsmanship. The Gospels were often bound in jewelled cases *because* they were used in public rituals.

The Early Mediaeval Book.—When Charlemagne sent to Rome for a copy of the Gregorian sacramentary, with an idea of establishing a standard of worship as well as of language, the fine book profited by the new script invented for this purpose no less than by the added vigour and realism of decorations inspired by the tastes of the imperial court. Under CALLIGRAPHY there is noted the discrepancy between national styles of writing which made this standardization so necessary; but whereas the hands of early mediaeval France, Italy and Spain were degenerate growths from the writing in capital letters of the classic period, there existed a very important school of fine book-making in Ireland from the 6th century which continued the finest style of Roman 4th-century writing and added to it an original and powerful system of decoration. One of the most pretentious and successful books of all time is the "Book of Kells," a book of the Gospels produced in Ireland in the 7th century. On seeing the curiously sophisticated and intricate embellishments of this ms. one realizes that the "spark of civilization," almost extinguished in Western Europe at this time, was well guarded in the Irish monasteries. The Irish sacred book, with its somehow rigid perfection, influenced English work from 664 on, but became more fluid and casual in Saxon hands. Alcuin of York, who was one of the greatest figures of Hiberno-Saxon book work, was called in by Charlemagne to direct the deliberate revival of book production at the end of the 8th century. The so-called *Carolingian minuscule* thus evolved allowed a page of great lightness and crispness, due to the simplicity of the letters used; this in turn produced a freer style of illumination. The bold, outstanding initial letter (which, brightly painted, served as a useful "pointer" in finding passages) comes into a closer relation to the text; vines descend from it until they cover the margin, and finally a whole illustrative scene is incorporated within a large initial. From the middle of the 13th century we are able to see what magnificent unity was achieved by the mediaeval book, not through any self-conscious canons of "taste," but because the craftsmen concerned were all imbued with the same set of ideas, indeed the same pictorial traditions. The binding of the kind of book we are considering, *i.e.,* the "fine" book, was often of gold or silver set with the unfaceted precious stones of the day, each one of which had a spiritual and medicinal value to the mediaeval mind. There are crucifixion scenes in *repoussé* metal or ivory. Occasionally an older ivory *diptych* would be mounted to serve as a binding; but in general the pages themselves (in such copies as remain unaltered) show the same grouping of figures and stylish treatment as do the covers. Respect for older texts made the miniaturists conservative, and many illustrative scenes can be traced back, by their grouping and costumes, through a chain of earlier mss. to a presumptive original, now lost, such as the copy of the Vulgate written for St. Jerome, which would itself have been an object of reverence.

The Late Mediaeval Book.—The increased sprightliness of decoration, approaching sheer naturalism, was counterbalanced as time went on by the formalizing of script. The final formalization was the angular letter which, at the dawn of the renaissance, was contemptuously nicknamed "gothic" (much as we said "hunnish" in World War I). The "gothic" page is as near as we have come to an abstract form of beauty in writing, because it is rigidly consistent and links each letter into a rich, massive text-page. But "abstract" beauty will not do for the book, however little it be meant for reading and however much for a display of magnificence: and the scholars who revived the Carolingian letter in the 15th century rightly forsook optical consistency for practical legibility, which is a very different thing. Still, whatever its demerits as a readable text, the formal letter attributed to Gutenberg (the supposed perfector if not the inventor of printing, *c.* 1454) is aesthetically as much a monument to the age that was passing as it was historically a presage of the future. Before dealing with the changes brought about by the printing press it would be well to note how books were affected, during the middle ages, by the purpose for which they were made. Liturgical, legal and other books differed widely and imposed definite rules on the craftsman. Just as portability distinguishes the book itself from the inscription, so the small book became roughly differentiated from the large one. The latter, comprising the volumes regularly used in churches as well as most of the secular romances which delighted the nobility, were kept on shelves and transferred for reading purposes to a lectern; in some libraries books were even chained down to baffle thieves. Of the many liturgical books of this character the most important is the *missale* or mass-book. Such reverence was felt for this rite that craftsmen soon evolved special rules for its written text. The Canon, for example, was in larger letters than the rest of the text, and was placed in the middle of the book, a necessary thing in days when end-leaves were often in danger. The music-books of the liturgy had to be large in order that a choir might read from one page; books of lections could be propped up and read to a community. But with the practice of reciting the hours arose the *breviarium,* a book definitely intended to be carried about. Indeed, in England it was known as a *portiforium.* The book of hours plays a long and important part in the history of the book arts. It was the intimate companion of lay folk as well as of the clergy, and its comparatively small size admitted of its being lavishly decorated by wealthy owners. The *Little Hours of the Virgin,* in particular, offered the scribe a relatively short text and the illuminator a charming series of subjects. Books of hours made for important personages show more and more response to the layman's desire for show and splendour; and it is difficult to think how this desire could be better gratified than by the glowing blue of powdered lapis that shone on the Virgin's cloak in painted miniatures; by the glint of gold-leaf in the marginal vines, raised by sizing, the better to catch the light; by the rubrications of pure vermillion (now become so rare) interspersed among the lines of text, or the binding, often worked in embroidery by pious hands or intricately tooled. A book like this might well be treasured by queens: it was a unique and intensely personal work of art.

The Printed Book.—After contemplating such a masterpiece one is tempted to wonder whether the printed book should strictly be considered as a work of art at all. However beautiful a piece of typography is (and it has unique and subtle beauties of its own), it is in its very nature a replica, a thing produced by a machine. The earliest printed books, by imitating closely every artistic rule of the calligrapher, profited by 14 centuries of previous experiment; type-founders, while they could not equal the nervous fineness of the best writing, certainly attained a new

consistency and clarity of letter design; and yet the lover of written books, fine hand-tooled bindings and original painted illustrations may quite rightly maintain that such original pieces alone deserve the title of works of art, not of reproduction. Collectors and rich patrons, however, could still add a hand-tooled or inlaid binding and make it an individual work of art to that extent; binding, until the introduction of machine stamping and mass production, remained the most personal handicraft connected with typography. Illuminators, too, continued for a while to work on the printed page.

But as soon as printing was generally introduced (after 1456) it became obvious that no mere imitation of ms. style would serve the printed book. The artist's hand, the hand of the creative craftsman, had been transferred from direct writing to the work of designing and engraving the steel punch from which type-matrices were made, and to cutting the wood or metal used for illustrations. The printed page is quite literally, the "proof" of the unseen labours of the punch-cutter and engraver. This gives us, inevitably, a new set of artistic rules. An example is found in the "block books" which were sheets of paper "rubbed off" like proofs from engraved planks of wood inked with liquid, not greasy, ink. Whether these "block books" antedated printing or not, they were closely allied to the single xylographic print which certainly did so; and like the latter, they show how the mechanical problems of the cutter on wood forced him to "buttress" one set of lines with another, executing the lettering with the same rugged freedom as the cut and acquiring perfect homogeneity. When the colourist had added the faint glaze of his pigments, the result was of naïve and almost touching beauty—although the *Biblia pauperum* and the rest were the very opposite of "luxurious" books. The Chinese and Japanese block-book could not, on account of the intricacies of the alphabet, be swept away almost at once by type printing, so that we are able to see, in oriental books of this character, what the block book can attain in technical sophistication, when the lettering is done by experts and the colour woodcuts by masters.

The popularization of mechanically produced books was aided, and their appearance greatly affected, by the use of paper. While this substance was being made in France as early as 1189 it was never popular with calligraphers; the slightly acid ink from the scribe's pen was made so as to "bite" into the smooth surface of vellum without any pressure. But printers, with their oil-and-varnish ink, found that the absorbent surface of paper was the perfect medium for receiving pressure, by which ink was actually driven into the substance of the sheet.

Effect of Illustration.—Illustration was seldom used "for art's sake" in the 15th century; but there were many kinds of books that demanded the use of explanatory pictures. The new interest in natural science and the outer world produced herbals, geographies and books of travel like Breydenbach's celebrated *Pilgrimage* (Mainz, 1486). The 16th century added the modern text-book, and with the *Hypnerotomachia* printed by Aldus in 1499 began a long line of "emblem books," collections of symbolic pictures dear to the Renaissance mind, which had an influence upon decorative printing. Each of these kinds of books affected the type-page in some way. The "pocket edition" invented by Aldus for the convenience of scholars, offered little opportunity for lavish decoration; but the book of hours continued, until the 1540's, to call on the resources of the book artist. Music part-books appeared at the beginning of the 16th century, in a distinctive oblong shape.

Engraved illustration was attempted in books as early as 1477 but it was not until the printer-publisher had tired of the many possibilities of wood-cutting that the copper plate came into general use (*post* 1550). By that time types of almost fragile delicacy were being cut; with proper inking and press-work they would have rendered discreet typographic support to the engraved title-pages and frontispieces which added a magnificent and not too alien touch to the book. Christophe Plantin of Antwerp, in the mid-16th century, was one of the last of his period to attempt unity in fine books. But he naturally gave much attention to engravings, and these had the effect of making patrons think of "fine books" as "fine picture-books" so that the punch-cutter, the ultimate typographic craftsman, lost prestige, save in such exotic efforts as polyglots. The first entirely successful attempt to restore all-round beauty to the book was made at the behest of Louis XIV., when the French national printing office produced its famous folio *Médailles* (*see* TYPOGRAPHY) with the newly-cut "King's types" of Grandjean. By this time the printer had learned how to deal with engraved and etched illustration, and the French 18th century produced the brilliant phenomenon of those octavos and duodecimos illustrated by Gravelot, Cochin and other masters, which were made for the eternal joy of collectors. Wood engravers began to imitate the delicate strokes of the *burin*. There was a general effort toward refinement of the printed page.

But it was John Baskerville of Birmingham who, by experimenting in 1757 not only with type design but with paper, ink and the press, revived the idea of the book as a technical whole, something more important than the sum of fine parts. A Baskerville book in a contemporary English black binding is a thing of the happiest consistency from beginning to end, and shows how little need the intelligent printer has for decoration or plates. Baskerville's followers could hardly improve on this serene style without evolving (as they eventually did) a hard and icy perfection of page, which is not so much tiring to the eye as to the mind. The post-Baskerville style in England was open, serene and friendly; the late 19th century Didot style in France was crisp and magnificently logical; but the books influenced by Bodoni of Italy (d. 1812) had an arbitrary perfection which was ill interpreted by his followers. The reaction, when it came in the 19th century, was two-fold. Decoration followed the whimsicalities of the romantic-gothic style with the new technical freedom of lithography and white-line wood engraving; typefounders and printers began to "revive" ancient type faces, so that the more pretentiously designed books took on the self-conscious archaisms of museum replicas. But this piracy of the past had at least an educative value, and prepared the way for the labours of William Morris and the "private presses" at the end of the century. The so-called "crafts" movement was once more to bring instructed reverence to the task of revising the outworn rules for the making of beautiful books. Our own modern typographic achievements are good inasmuch as we realize that all standards of craftsmanship depend on knowing, not only how things should be done, but why they are worth doing.

See PALAEOGRAPHY; CALLIGRAPHY; BOOKBINDING; ILLUMINATED MANUSCRIPTS; TYPOGRAPHY; PRINTING TYPE; PRINTING; ENGRAVING. (P. BE.)

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MODERN ENGLISH AND CONTINENTAL BOOKS

The Private Presses.—William Morris brought back dignity to the printed book in a time of its abject abasement. Indeed, he brought it too much dignity. His books were designed not for the common usage of his day, but, as it were, for the private pomps of mediaeval princes. They were beautiful, but they were not true. Yet they have served a noble purpose, conceived and executed as they were with the passionate faith of a protestant against the ugliness and tawdriness of the industrial 19th century. Morris sought to overthrow the machine. Hand-made paper, hand-cut punches for his types, hand composition, hand press-work: these were the articles of faith in the war against the machine. The result was that there were from 1892 to 1910 a few books printed superbly, almost arrogantly, and a multitude of books monstrous in their ignorance and ugliness. There was nothing between. There was no contact between the two classes.

The second and third decades of the 20th century have seen this contact made. That is their contribution to the art of book printing. The machine has not been tamed—it was never wild; the machine has been *saved.* It has been saved from the corrupt use of its nature. Its nature is to make—to make beautifully. It may make ugly things beautifully, or beautiful things beautifully. But the hand of man cutting letters and printing them painfully on a primitive press upon hand-made paper may make ugliness beautifully just as the machine may. If it is forcing the issue to say that the hand is part of the human machine, it is strictly and relevantly the truth that every type, be it never so hand-designed, hand-cut, hand-cast and hand-set, is a mechanical unit, and that every tool used by Morris in the making of his type, and in his use of it, was essentially a simple form of machine. The whole purpose of printing is to make cheap mechanical reproductions of certain symbols conveying sound and sense. The process of writing and illuminating a ms. in the 12th century is as far removed from the process of hand composition of type as it is from mechanical composition. The wheel, the lever, the wedge, the screw, the pulley—these and these only in less or greater complication make the handpress of Gutenberg and the greatest and latest rotary machine.

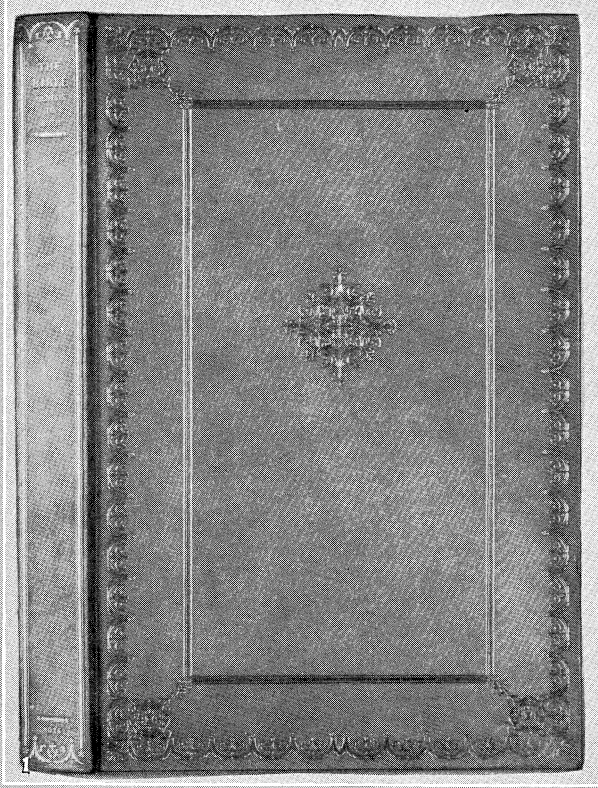
The significance of Morris's Kelmscott Press and the other private presses which it inspired (the Doves Press of Cobden-Sanderson and Emery Walker, Hornby's Ashendene Press and Rickett's Vale Press are the most notable) was, therefore, essentially not that they were "hand" presses, but that they were controlled by artists and designers of high competence and honourable enthusiasm. These artists and designers were expert amateurs. Their output was so small and expensive and "precious" as to justify the slightly derogatory sense which the word "amateur" carries; and though it was also conceived lovingly enough to justify the literal sense of the word "precious," it is the fact that the first importance of the private presses lies not in their own productions, but in the effect of their work upon fully mechanical book production. The effect was not first or directly upon the large printing houses. They were very slow to learn. Between them and the lesson were the prejudice of the professional against the amateur, and, even more, many acres and thousands of tons of preposterous type equipment. The first was overcome when it was realized that it was "good business" to be in the typographic movement; the second was disposed of even more completely when type-setting machines replaced the hand compositor in book work—for vast quantities of type became useless, and fetched during the World War a high price as scrap metal.

Modern Methods.—The principal type-setting machines for book work are the monotype and the linotype, of which the former has at present by far the greater variety of good type-faces. The monotype machine produces single types—separate "characters," whereas the linotype machine casts the type in lines, or "slugs." The common virtues of the type-setting machines are that they reduce the cost of composition; that they provide new type for each book; that, as they cast their own letters from matrices, the printer never runs short of a particular type, as he was apt to do in the days of hand composition; and that type after use is not laboriously "distributed," but put into the melting-pot. The particular merit of the monotype machine is that it possesses at least a score of admirable type faces, as compared with no more than perhaps a dozen really good book types available at great expense to the hand compositor; and that these can be set with a nicety and flexibility of spacing (half the secret of good composition) actually beyond the power of the hand compositor. In short, compared with the old hand processes, the type-setting machine gives a wider range of type-faces with always new types; *can* set these types with greater subtlety; and *does* set them more cheaply. The type-setting machines used with as much skill as hand-set type will give a better result, and, in alliance with fast but very perfect cylinder printing presses, will give this result not to a few but to a multitude. It has taken us from the day of "the book beautiful" and given us the day of the beautiful book. The machine has fulfilled the democratic purpose of printing.

Function of the Typographer.—A new character in the printing industry has appeared to make use of this opportunity. He is the *typographer.* As is the architect to the builder, so is he to the printing house. He may be independent of both publisher and printer, and be called in by one or other as need demands. He may be in the permanent employ of the publisher. He is seldom in the permanent employ of the printer. His is a new profession, a new industrial function. The printer has become the executant. He receives his instructions and obeys them with all his technical skill. He is part of the machine, and his function is that proper to the machine. The machine, let it be repeated, has its own standard of beauty, which we call efficiency. A good printer is an efficient printer. A good typographer is a designer capable of using the mechanical equipment of the printer, the paper-maker and the binder, as tools in the production of a beautiful book. If the printer protests against this delimitation of his power, it must be said that he has in general only himself to blame. The few printers who add typographers to their staff maintain a reputation as something besides executants. The Cambridge University Press, the Curwen Press and the Westminster Press in England are of this class.

Several important English publishing houses—William Heinemann, Jonathan Cape and Chatto and Windus, for example—pay very careful attention to the production of their books. They give to their printer precise instructions as to the size of the page, the "face" or character of type to be used, the closeness or openness of setting, the proportions of type to margin, and their relative positions on the page, the lay-out of the title-page and so on. The results of this initial care and thoroughness are apt of course, to become quickly established as formulae; but they are good formulae, and have assisted materially in the education of public taste in the matter of good book production. It is now a common thing to see the good (or bad) style and printing of a book with no "artistic" pretensions commented on in reviews. This is a distinctly new and encouraging departure for the average commercial book.

The most definite move in the direction of the full and considered use of modern printing equipment has, however, come from certain "semi-private" presses which specialize in the production of "limited editions." The limited edition appeals to three publics: the book collector, who does not read a book so much as fondle it; the speculator, who sees in it an article of commercial profit if the demand much exceeds the supply; and the people who "use books for reading" but still like to have them in a dress appropriate to their subject, and made of pleasant and enduring materials. These three classes in combination make a considerable public. The pre-machine limited edition was very narrowly limited; perhaps 2 or 3 or, rarely, 500 copies might be struck off the hand-press. In 1923 the writer began the publication of fine editions in the making of which the machine was exploited for economy at every point where machine processes were as good as hand processes. The "limit" of the editions was raised to about 1,500 copies, and prices much lower than had before been asked for "fine books" were thus made possible. It was quickly found that a very large public existed in England



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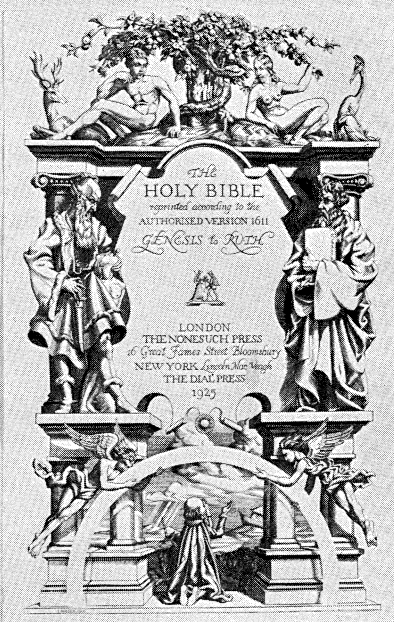

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THE SECOND BOOK OF MOSES, CALLED

EXODUS

NOW THESE ARE THE NAMES OF THE CHILDREN OF ISRAEL, WHICH CAME INTO EGYPT; EVERY MAN AND HIS HOUSEHOLD CAME WITH JACOB. REUBEN, SIMEON, LEVI, AND JUDAH, ISSACHAR, ZEBULUN, AND BENJAMIN, DAN, AND NAPHTALI, Gad, and Asher. And all the souls that came out of the loins of Jacob were seventy souls: for Joseph was in Egypt *already*. And Joseph died, and all his brethren, and all that generation.

And the children of Israel were fruitful, and increased abundantly, and multiplied, and waxed exceeding mighty; and the land was filled with them. Now there arose up a new king over Egypt, which knew not Joseph. And he said unto his people, Behold, the people of the children of Israel *are* more and mightier than we: come on, let us deal wisely with them; lest they multiply, and it come to pass, that, when there falleth out any war, they join also unto our enemies, and fight against us, and *so* get them up out of the land. Therefore they did set over them taskmasters to afflict them with their burdens. And they built for Pharaoh treasure cities, Pithom and Raamses. But the more they afflicted them, the more they multiplied and grew. And they were grieved because of the children of Israel. And the Egyptians made the children of Israel to serve with rigour: and they made their lives bitter with hard bondage, in morter, and in brick, and in all manner of service in the field: all their service, wherein they made them serve, *was* with rigour.

And the king of Egypt spake to the Hebrew midwives, of which the name of the one *was* Shiphrah, and the name of the other Puah: and he said, When ye do the office of a midwife to the Hebrew women, and see *them* upon the stools; if it *be* a son, then ye shall kill him: but if it *be* a daughter, then she shall live. But the midwives feared God, and did not as the king of Egypt commanded them, but saved the men children alive. And the king of Egypt called for the midwives, and said unto them, Why have ye done this thing, and have saved the men children alive? And the midwives said unto Pharaoh, Because the Hebrew women *are* not as the Egyptian women; for they *are* lively, and are delivered ere the midwives come in unto them. Therefore God dealt well with the midwives: and the people multiplied, and waxed very mighty. And it came to pass, because the midwives feared God, that he made them houses. And Pharaoh charged all his people, saying, Every son that is born ye shall cast into the river, and every daughter ye shall save alive.

¶And there went a man of the house of Levi, and took *to wife* a daughter of Levi. And the woman conceived, and bare a son: and when she saw him that he *was a* goodly *child*, she hid him three months. And when she could not longer hide him, she took for him an ark of bulrushes, and daubed it with slime and with pitch, and put the child therein; and she laid *it* in the

64

3

RUTH CHAPTER IV

thee a restorer of *thy* life, and a nourisher of thine old age: for thy daughter in law, which loveth thee, which is better to thee than seven sons, hath born him. And Naomi took the child, and laid it in her bosom, and became nurse unto it. And the women her neighbours gave it a name, saying, There is a son born to Naomi; and they called his name Obed: he *is* the father of Jesse, the father of David.

Now these *are* the generations of Pharez: Pharez begat Hezron, and Hezron begat Ram, and Ram begat Amminadab, and Amminadab begat Nahshon, and Nahshon begat Salmon, and Salmon begat Boaz, and Boaz begat Obed, and Obed begat Jesse, and Jesse begat David.



THE END OF THE FIRST VOLUME

4

A REPRINT OF THE BIBLE ACCORDING TO THE AUTHORISED VERSION OF 1611

1. Binding of the Bible. This volume, comprising the books Genesis to Ruth, is bound in orange decorated with gold
2. Illustrated title page of the same edition of the Bible
3. A page from the Book of Exodus
4. The final page of the first volume of the Bible. The page design illustrates the Book of Ruth

BOOKS



Jean François de GALAUP
comte de LA PEROUSE
1741 - 1788



est dans les appartements du Roi, au château de Versailles. Une pièce sobre. Au mur, des cartes. Sur les tables, des livres, des manuscrits. Sur une des mappemondes, le Roi trace du doigt l'itinéraire d'un long voyage. L'épée au côté, encore jeune dans son uniforme de capitaine de la marine, un homme se tient près de lui et regarde. Le doigt royal va toujours plus loin. Il contourne l'Amérique, remonte vers l'Asie, redescend vers la Chine, erre dans un grand espace bleu : l'Océan. Là sont des terres inconnues. Le doigt s'arrête, comme pour dire : " Vous irez là ". Le capitaine fait signe qu'il a compris.

■ Le roi, c'est Louis XVI; le capitaine: La Pérouse. Jean-François de Galaup comte de La Pérouse, était né au Gua, près d'Albi, en 1741. Entré à quinze ans dans la marine, La Pérouse conquiert ses grades, à la pointe de l'épée. La France vient de déclarer la guerre à l'Angleterre. Elle veut soutenir les Américains qui ont proclamé leur indépendance. Avec ses soldats, Lafayette se bat sur le sol même des Etats-Unis. Pendant ce temps, nos marins sous les ordres d'Orvilliers, d'Estaing, de Suffren, de Lamotte-Piquet, affrontent résolument les flottes anglaises sur toutes les mers. Le jeune La Pérouse prend une part active à ces batailles. A 18 ans, il est blessé et fait prisonnier dans le combat de Belle-Isle. Remis en liberté, ses actions d'éclat lui

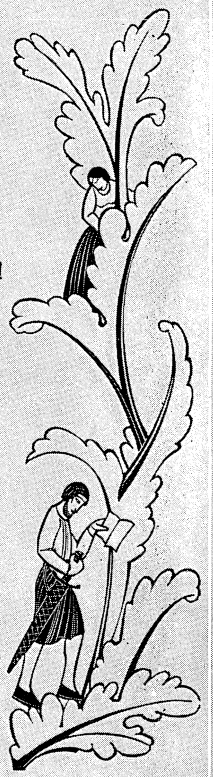
1

And ek I knowe, of longe tyme agon,
His thewes goode, and that he is nat nyce.
Nauauntour, seith men, certein, he is noon;
To wis is he to doon so gret a vice;
Ne als I nyl hym neuere so cherice
That he may make a vaunt by iuste cause;
He shal me neuere bynde in swich a clause.

Now sette a cas, the hardest is, ywis:
Men myghten demen that he loueth me.
What dishonour to myn estat is this?
May ich hym lette of that? Why nay, parde!
I knowe also, and alday here and se,
Men louen wommen al biside hire leue;
And whan hem list no more, lat hem leue!

Ek wot I wel he worthy is to haue
Of wommen in this world the thriftyeste,
As ferforth as she may hire honour saue;
For out and out he is the worthieste,
Saue only Ector, which that is the beste;
And yit his lif lith al now in my cure;
But swich is loue, and ek myn auenture!

Ne me to loue, a wonder is it nought;
For wel wot I my self, so god me spede,
Al wolde I that no man wiste of my thought,
I am oon of the faireste out of drede
And goodlieste, who so taketh hede;
And so men seyn in al the town of Troie.
What wonder is, though he of me, haue Ioye.



2



men när hon ej blev tvingad att ge, fast hon ville så gärna,
låtsar hon väl med sin blick glädje, men ledsen hon är.
Våld led Phoebe en gång, och med våld togs ock Hilaira;
bägge de rövade strax fingo sin rövare kär.

Känd är sägnen ju väl, men förtjänt av att åter förtäljas,
huru den scyriska mön brud åt haemoniern blev.
Ren var skönhetens olyckspris av gudinnan betålat,
vilken på Ida de två andra besegrat med fog;
ren sonhustrun till Priamus förts från landet i fjärran,
och uti Ilions borg satt hon där nu som gemål;
samtliga svuro en ed den förnärmade maken att hämna;
skymfen, som drabbade en, gällde för alla som skäl;

3

Auf ein ächtes Wort der Weisheit muß alles (ſcheinbar) beim Alten bleiben; iſt aber alles (ſcheinbar) ſogleich geändert oder änderungswert, ſo war das Wort nicht vom rechten Geiſt.

◇◇◇

Wer nicht weiß, wie tief vergeblich ein großer Mann iſt, der weiß nicht, was ein großer Mann iſt; für den war er — vergeblich.

◇◇◇

Der freie Menſch iſt einem Volke wenig nütze, wohl aber der ſich befreiende, — der ſich nicht ganz befreiende.

◇◇◇

Wer an der Welt mitzutun wahrhaft berufen iſt; der gerät nicht in ein Übermaß von Leiden, wenn es

4

ZEITSCHRIFT
FÜR
BÜCHERFREUNDE
HERAUSGEGEBEN
VON
GEORG WITKOWSKI



1918/19 HEFT 3
NEUE FOLGE 10. JAHRGANG
VERLAG E. A. SEEMANN. LEIPZIG.

5

BY COURTESY OF (1) TOLMER, EDITEUR, (2) THE GOLDEN COCKEREL PRESS, (3) ALBERT BONNIER, "BOKFÖRLAG," (4) BAUERSCHE GIESSEREI, (5) VERLAG E. A. SEEMANN AND FELIX KRAIS

USE OF ILLUSTRATION AND DECORATION IN MODERN EUROPEAN BOOK PRODUCTION

1. French. Page, with colour illustration, from *Voyages et Glorieuses Découvertes des grands Navigateurs et Explorateurs Français*
2. English. Page from *Troilus and Criseyde*. Illustration by Eric Gill, wood engraving
3. Scandinavian. Page from a translation of Ovid's *Ars Amatoria*. Illustration by Yugve Berg
4. German. Page from *Aphorismen* by Moritz Heimann
5. German. Facsimile of a title-page reproduced in "Die neue deutsche Buchkunst," by Hans Loubier

and America for books made on this plan, and many other undertakings of somewhat similar style have contributed admirably-made and moderately-priced books to the shelves of the book lover. Traditional style, in this the most significant development of current book production in England, has not been ignored, nor has it been slavishly imitated. There has been a sort of honourable understanding, for instance, that old illustrations and decorations should wherever possible give way to new. Inventiveness in the variations on old typographical themes is recognized and rewarded by a public becoming more and more familiar (chiefly by means of the writings of Stanley Morison and D. B. Updike) with the history of printing and with examples of its most illustrious styles. Thus, things work at present in a virtuous circle. The semi-private presses, which combine the functions of typographer and publisher but not necessarily that of actual printer, have learned from the hand-press a true style which is adaptable to the more fully mechanical processes of an up-to-date printing house, paper mill and bindery. Their support makes economically possible the inventiveness (on the printing side) of the type-setting machine companies, who in their turn are able to offer to the commercial printer excellent characters of types which otherwise he could not possess. Thus contact is made with a great and "untypeconscious" public, which begins to take notice of the physical appearance of its books. From this uninstructed sense of comfort and propriety develops an interest in these books which are made expressly with an eye to beauty, either by well-controlled hand or by well-controlled machine methods.

Modern Typographic Style.—The books of the typographer-publisher presses, most of them reprints, are in general dressed in a format and printed in a type and style created, developed or mitigated for the special requirements of each particular work. If one word can summarize the whole art of the book, it is *suitability*. The modern typographer, unlike the designer of the private press books, has all the equipment of all the printing houses at his disposal in his search after this highly elaborated quality of suitability. Many considerations—the "atmosphere" or the actual date of the text, the nature of the illustrations, with such factors as the desired size of page, or the extent of the contents—will in conjunction suggest the typographer's choice. Of all the lessons which the private or precious presses taught, perhaps the most significant was this: a well-made book is a unity. Subject, paper, type, pictures, binding—all these are to be judged not independently for a self-possessed merit, but each item in relation to the next, and all to the whole. True, Morris and Cobden-Sanderson, in building up a book as a unity, put too much stress upon physical processes. No illustration seemed to them appropriate, for instance, which was not itself printed as a letter-press—a typographical surface of which the raised parts take ink from the roller and impress the paper. But flat surfaces, like the lithographic stone, or intaglio surfaces, such as copper-plates, which require a different printing process, may very well afford entirely suitable results to the eye which is not blinded by pedantry. The great *Daphnis et Chloé* of the Imprimerie Nationale used Garamond's types and lithographic illustrations. And its success or failure is not to be judged by the consideration that in the 16th century lithography had not been invented. There is no limit, except his own inventiveness, to the range of the modern typographer's designs. Such a press as the Doves, on the other hand, maintained a general uniformity of design throughout its publications, because it possessed only its one strongly characteristic type-face, which virtually imposed its own will on the typographer, being capable of but little variety in its disposition on the page.

Book Printing on the Continent.—On the Continent, Germany shows the most interesting recent developments in printing. Just before and after the World War, a number of private presses stimulated the demand for good printing, and provided a training ground for typographic artists. The collapse of the mark spelt ruin to many of these private undertakings; but the typographers, thus released, have turned their attention (with greater benefit to the general reader) to the designing of books for the commercial publishers. The Morris revival in England had a great though over-appreciated effect upon German typography at the end of the 19th century. The German derivatives of Morris's types and Burne-Jones's illustrations are definitely unpleasant—a kind of mediaeval "art nouveau." The true inspiration of the notable book work done by both private, semi-private and commercial presses in Germany is none the less English. Edward Johnston, the English calligrapher, sent German typographers and type-designers back to the written letter. Upon penforms the new German typography is surely founded. Moreover, Rudolph Koch and others experimented with the making of "block books," and learned thereby a pictorial style of letter-making.

The Insel Verlag of Leipzig, one of the many German firms familiar to English collectors of limited editions, has, like other similar firms, turned its attention to the production of unlimited editions at low prices, with marked success. The Propyläen Verlag of Berlin, which has also made many fine limited editions, is issuing a pleasantly printed series of excellent modern editions and reprints at only 2s. each. Both of these concerns have maintained the function of typographer with those of printer and publisher.

The printing of novels by some of the leading German firms has been improved out of all recognition. In spite of the fact that the paper used has to be of inferior quality in order that the books can be produced at the prices current in Germany, the efforts made to secure a good impression by means of suitable inking have been so successful that the appearance of the novels published by such firms as Fischer, Ernst Rowholt of Berlin and Kiepenheuer of Potsdam, is highly agreeable. A striking thing about present-day book production in Germany is the use made of patterned papers to give distinction to the covers of cheap books. German typographers also make very excellent use of printers' "flowers" in the decoration of their book covers. Their expert handling of the collotype process of pictorial reproduction means that German books on the fine arts are incomparably better produced than similar books in England. They are also very much cheaper. Germany owes a great deal of her technical expertness in printing, as in other applied arts, to the excellence of her technical schools and institutes, which are supported by the State and served by the best artists and technicians of the day. Switzerland shared in this excellence of instruction, and her standard of book production is also high, following in the main the trend of German development.

In France, the general level of printing is not nearly so high, though certain rather expensive volumes well printed on fine paper have recently appeared, and the standard of the ordinary paper-bound book has risen considerably in the case of the publications of certain houses, among which the *Nouvelle Revue Française* ranks high. The standard of illustration in France is much higher than that of printing; indeed, the value of the expensive French book has hitherto lain almost exclusively in the excellence of its illustrations, with the printing a secondary and unimportant affair. In particular, illustrations coloured by the *pochoir* or stencil process have been brought to a high state of perfection. The pre-War *Gazette du Bon Ton* deserves much credit for this development. The Couluma Press of Argenteuil is responsible for much of the good printing to be found among French books of the day. It is now making a significant addition to its plant of a monotype composing machine. Its handling of monotype material is certain to prove most interesting. What should be a help to the wide dissemination of well-printed books is the custom of certain French publishers of re-publishing their limited editions subsequently in un-numbered editions on cheaper paper. In some instances, there are as many as six editions, ranging downwards according to the paper used and the number of the impression to a final edition costing but a few francs. Unfortunately it often happens that the "imposition," *i.e.*, the setting of the page of type in relation to the margin of the page, goes awry in these reprints, and that the press-work is very poorly done.

Belgian printing is strongly under the influence of France. Belgian books, like French ones, are bound only in paper, and consequently the finest examples of book production in both

France and Belgium are, compared with English books of similar standard, very inexpensive. In Holland there are a number of private presses which have produced good work, but the general level of book production is low. The only strong influence in the direction of improved printing comes from the Enschedé foundry, which is not only producing good types, but also printing them very effectively.

Sweden, which formerly followed the lead of Germany in printing matters, has of recent years broken away from this influence, and is developing along her own lines in this as in other branches of applied art. She now favours a much lighter style of printing than that common to Germany, and makes considerable use of "old-face" types rather than of the newer, heavier type faces popular in Germany. But her books maintain a simple sturdiness in their general style as well as in the details of ornamentation, and the "peasant art" motif is clearly discernible.

The contribution of Spain to fine contemporary printing is not large. The monastery of Montserrat is responsible for some strikingly good books. Apart from that, there is a school of competent book printers, whose interest seems to be chiefly in the Didot style in France since the late 18th century.

Italy is not happy in her printers. The average commercial book is very poor, although the Scuola del Libro at Milan is exerting a good influence on the printing trade, and the printing house of Bertieri and Vanzetti has done some good work. But the book as a work of art owes more to, and has more to expect from, the Milan publisher Mondadori, who has recently established his own press at Verona, and has associated with him there Herr Hans Madersteig, whose small editions set in the Bodoni types were unexcelled for their technical skill in all printing history. The State-sponsored editions of d'Annunzio's works have been entrusted to him.

Soviet Russia has contributed some very interesting examples of an aggressive and telling style in printing. The illustrations, in the form of strong and vigorous wood-cuts, are often striking, and the type and style of printing in conjunction with these wood-cuts is provocative and stimulating. The best of these Russian publications have been in the cheaper ranges of book production. No doubt the fact that so many adults in Russia are only now learning to read has had a considerable influence on the very direct and blunt and almost poster-like style of Russian printing.

Czechoslovakia shows a well-informed but definitely conservative taste in printing. Method Kalab of Prague and the national printing office may be mentioned as sources of satisfactory books, employing mainly English monotype faces in their production.

(F. M.)

MODERN AMERICAN

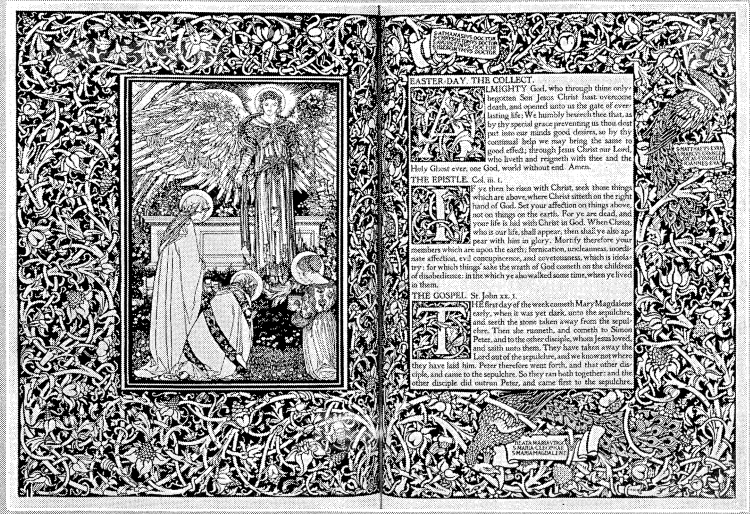
The renaissance of fine book-making, due in England to the unbounded enthusiasm and ability of William Morris and continued in a more restrained style by his disciples, Cobden-Sanderson of the Doves press and others, has had a marked influence on book design and printing in America. The leaders in this revival of the art of the book in the United States were D. B. Updike and Bruce Rogers. But an excellent foundation was laid for them in the closing years of the 19th century and the early part of the 20th by two outstanding printers of a preceding generation: Theodore L. De Vinne and Walter Gilliss.

De Vinne and Gilliss.—The work of De Vinne (1828–1914) fell mostly within the 19th century but continued into the 20th and set a fine example of high standards in the art of printing for the emulation of the younger generation. De Vinne was one of the founders of the Grolier club, the most distinguished among American book clubs, and he planned and printed the majority of its early publications. The De Vinne press not only printed limited editions of fine books for wealthy amateurs, but also established high standards on work which involved, for that period, large scale production; such for instance as the *Century Dictionary*, the *Century Magazine*, and *St. Nicholas*. De Vinne strove constantly to benefit the printing craft, artistically, socially and economically. He was an ardent student of the history of typography and was the author of a number of books on this subject and on the practice of printing. In book printing his composition was well planned and carefully executed, and the quality of his press-work was unexceptionable. He produced many fine books, the simplest of which are the best, at a time when the printing art in the United States had fallen to deplorable levels. Though not a great artist when compared with some who were to follow him in the next generation, he must be credited with a great accomplishment in the period in which he worked.

Walter Gilliss (1855–1925) was the other distinguished book printer of De Vinne's generation who did much fine work during the first quarter of the 20th century. During most of this period he did not himself manufacture his printing but he planned it in every detail of typography, paper, printing and binding, and supervised its production with meticulous care. His judgment in visualizing the typography of a book before it was set in type was unerring, a rare faculty among book designers. His original lay-outs, marked with the most minute instructions, were seldom departed from. Most of his work was classical in its simplicity; when he indulged in ornament he appeared to be under 18th century French influence. He was secretary of the Grolier club from its earliest days, and through this and other like connections enjoyed the warm friendship of the leading amateurs of fine books, for many of whom he produced privately printed volumes of great charm—notably the series of dainty volumes for the discriminating bibliophile, William Loring Andrews. He planned much of the printing of the Metropolitan Museum of Art, which has set new standards in institutional printing. His most important book was undoubtedly the *Iconography of Manhattan Island* executed for I. N. Phelps Stokes. At one time in his career, he was concerned also with printing of larger volume, producing the old *Life* and *Vogue* during the infancy of those periodicals. In the field of type faces, Gilliss was very partial to Elzevir and Caslon and he played a not inconsequential rôle in the revival of the latter face.

The Merrymount Press.—Daniel Berkeley Updike (1860–1941) entered the printing business in 1893 with a very definite ideal: the practice of printing as an art. Yet he aimed to make the enterprise a success financially as well, and he proved that these two ends are not, in every case, mutually exclusive. The first equipment consisted of a composing room only, but later presses were added so that the standards of press-work—too often faulty in well-designed books—might be worthy of the typography. He named his plant the Merrymount press. The first book of importance to be executed was the *Altar Book*, printed in 1896 in the "Merrymount" type, a new face designed for Updike by Bertram Grosvenor Goodhue (1869–1924), the distinguished U.S. architect. The illustrations were by Robert Anning Bell and the borders were designed by Goodhue. A glance at the pages from this book will show to what extent Updike was at this time under the influence of William Morris. The type was black, the borders heavy and the tone of the illustrations in keeping. A pioneer in introducing the Morris style—then a novelty in book-making—in the United States, Updike did not practise it long. Following—and also to a large extent leading—the taste in book design, his printing soon became much lighter in tone. Herbert Horne designed for him a lighter type face, the Montallegro, the punches for which were cut by the celebrated English punch-cutter, Edward P. Prince. It was used first in 1905 in Condivi's *Life of Michelangelo Buonarroti* and later in the various volumes of the *Humanists' Library*. Types, in addition to Caslon, which Updike used most extensively, and with great success, were Montjoye and Oxford, a typefoundry face of earlier years which he had cast for his own use; also in later years he made a limited use of several of the newer types of European origin: Poliphilus, Naudin and Champlevé. All his composition was done in foundry-cast type, set by hand, often by women compositors.

The field of printing in which Updike stood alone was the making of beautiful books by the capable and tasteful use of type alone, without embellishment of any sort, gaining all desired effects of display or emphasis by the use of italic, small capitals, letter spacing, a well-chosen initial here and there, a right relation of sizes, sound spacing between elements on the page and correctly proportioned margins. All this was done in any one book with the



EASTER-DAY. THE COLLECT.

ALMIGHTY God, who through thine only-begotten Son Jesus Christ hast overcome death, and opened unto us the gate of everlasting life: We humbly beseech thee, that, as by thy special grace preventing us thou dost put into our minds good desires, so by thy continual help we may bring the same to good effect; through Jesus Christ our Lord, who liveth and reigneth with thee and the Holy Ghost ever, one God, world without end. Amen.

THE EPISTLE. Col. iii. 1.

IF ye then be risen with Christ, seek those things which are above, where Christ sitteth on the right hand of God. Set your affection on things above, not on things on the earth. For ye are dead, and your life is hid with Christ in God. When Christ, who is our life, shall appear, then shall ye also appear with him in glory. Mortify therefore your members which are upon the earth; fornication, uncleanness, inordinate affection, evil concupiscence, and covetousness, which is idolatry: for which things' sake the wrath of God cometh on the children of disobedience: in the which ye also walked some time, when ye lived in them.

THE GOSPEL. St. John xx. 1.

THE first day of the week cometh Mary Magdalene early, when it was yet dark, unto the sepulchre, and seeth the stone taken away from the sepulchre. Then she runneth, and cometh to Simon Peter, and to the other disciple, whom Jesus loved, and saith unto them, They have taken away the Lord out of the sepulchre, and we know not where they have laid him. Peter therefore went forth, and that other disciple, and came to the sepulchre. So they ran both together: and the other disciple did outrun Peter, and came first to the sepulchre.

2

ISAIAH THOMAS

Printer, Writer & Collector

A Paper read April 12, 1911, before

THE CLUB OF ODD VOLUMES

BY

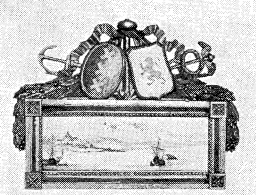
CHARLES LEMUEL NICHOLS

With a Bibliography of the Books printed by Isaiah Thomas

Printed for

THE CLUB OF ODD VOLUMES

BOSTON : 1912



CHAPTER I

THE PERIOD OF DISCOVERY

1524-1609

THE DUTCH PERIOD

1609-1664

THE explorer who was so closely associated with the discovery of the Hudson River that his name began to be applied to it almost immediately after his death, was not in reality the first European to discover and describe the confines of the bays and harbour of New York.[1] It is now an established fact that another had entered these waters eighty-five years before Henry Hudson's failure to find a northeast passage to the riches of the Orient had turned him towards the west and brought his ship along our shores.[2] In 1524, Giovanni da Verrazzano, an Italian explorer sailing in the interest of the King of France, coasted along the eastern shore of North America from North Carolina to Newfoundland and on the way "found a very agreeable situation located within two small prominent hills [the Narrows], in the midst of which flowed to the sea a very great river [the Hudson], which was deep within the mouth." His ship, the "Dauphine," a caravel of a hundred tons, was "anchored off the coast in good shelter. Not wishing to enter

3

1652] John Carter Brown Library

NOORT, OLIVER VAN.

Wonderlijcke Voyagie / [...] : (*title the same as in* 1649 *edition, except* "Oliver van Noort" *is in roman, instead of in Italic*). (Utrecht.) By Lucas de Vries. Boeck-verkooper in de Snippe-vlucht / 1652.

1 unnumbered leaf and 92 (5-63) pages. 18⅝ × 15⅞ mm. The work has been reset, and the engraving on p. 32 of the 1649 edition and *Title Own Leave*, pp. 63-67, omitted. John Carter Brown, II, 142. Purchased, August, 1863.

PALAFOX Y MENDOZA, JUAN DE.

Al Rey nuestro Señor. | Satisfacion | al Memorial de los | Religiosos de la Compañia | del Nombre de Iesvs de la | Nueva-España. | Por | La Dignidad Episcopal de la Puebla de los Angeles. | Salire | la Execvcion, y Obediencia | del Breue Apostolico de N. Santissimo Padre | Inocencio X. | Expedido en su Favor a XIIII. | de Mayo de M. DC. XLVIII. | Y | Passado repetidamente, y mandado executar por el | Supremo Consejo de las Indias. | En el qual determinò su Santidad veinte y seis Decretos | Surrepticiamente, y Iurisdiccionales, importunos | al bien de las almas. | Año de M. DC. LII.

4 unnumbered leaves and 131 (3-133) pages. 18⅛ × 13⅝ mm. Medina, *Biblioteca Hispano-Americana*, iii, 117:1. John Carter Brown, II, 237. From the collection of Henri Terrien-Compans. Purchased in 1846.

Al Rey nuestro Señor. | Satisfacion | al Memorial de los | Religiosos de la Compañia | de Jesus de la Nueva-España. | . . . [Wood-cut.] Año 1652. | En Madrid. Por Gregorio de Matta. | A costa de Antonio Hero, y Texada, Familiar del Santo | Oficio, y Mercader de Libros en las | quatro Calles.

1 unnumbered leaf and 131 (3-133) pages. 18⅛ × 13⅝ mm. Text as in previous item. Ex libris Mouth. Medina, *Biblioteca Hispano-Americana*, iii, 117:6. Purchased, May, 1909.

PYNCHON, WILLIAM.

The | meritorious Price | of | Our Redemption, Iustification, &c. | Cleerly | in it from some common Errors. | . . . | By William Pinchin Gentleman, in New-England. | . . . | London, | Printed for William Ley at Pauls Chain neer Doctors Commons. 1652.

4 unnumbered leaves and 113 pages. 18⅞ × 14⅛ mm. Issue 2, 1650. Thomason, with imprint "Printed by J. M. for George Whittington and James Moxon." Book-plate of "R H" Purchased, February, 1917.

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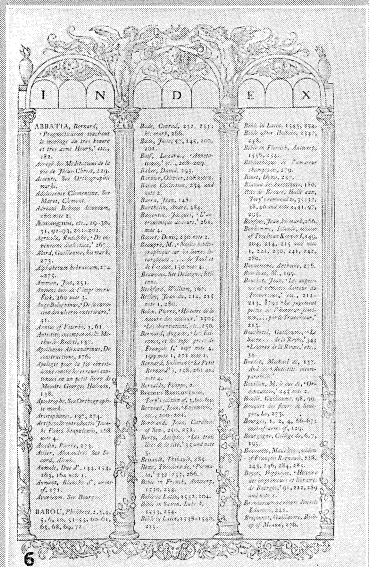
4

THE CENTAUR. WRITTEN BY MAURICE DE GUERIN AND NOW TRANSLATED FROM THE FRENCH BY GEORGE B. IVES.

I WAS born in a cavern of these mountains. Like the river in yonder valley, whose first drops flow from some cliff that weeps in a deep grotto, the first moments of my life sped amidst the shadows of a secluded retreat, not vexed its silence. As our mothers draw near their term, they retire to the caverns and in the innermost recesses of the wildest of them all, where the darkness is most dense, they bring forth, uncomplaining, offspring as alien to themselves. Their strength-giving milk enables us to endure with our weakness or dubious struggles the first difficulties of life, yet we leave our caverns later than you your cradles. The reason is that there is a tradition amongst us that the early days of life must be secluded and guarded, as days engrossed by the gods.

My growth ran almost its entire course in the darkness where I was born. The innermost depths of my home were so far within the bowels of the mountain, that I should not have known in which direction the opening lay, had it not been that the winds at times blew in and caused a sudden coolness and confusion. Sometimes, too, my mother returned, bringing with her the perfume of the valleys, or dripping wet from the streams to which she resorted. Now, these her home comings, although they told me naught of the valleys or the streams, yet, being attended by emanations therefrom, disturbed my thoughts, and I wandered about, all agitated, amidst my darkness. What, I would ask myself, are these places which my mother goes and what power reigns there which summons her so frequently? To what influences is one there exposed.

5



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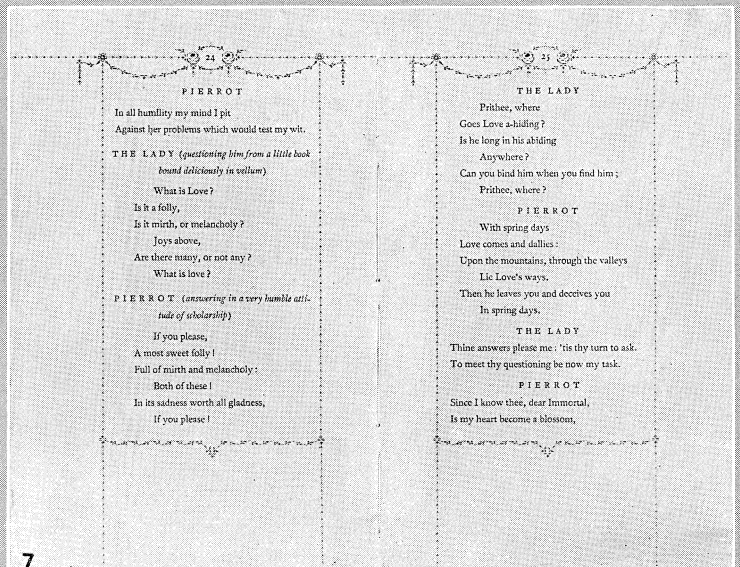


24

PIERROT

In all humility my mind I pit
Against her problems which would test my wit.

THE LADY (*questioning him from a little book bound deliciously in vellum*)

What is Love?
Is it a folly,
Is it mirth, or melancholy?
Joys above,
Are there many, or not any?
What is love?

PIERROT (*answering in a very humble attitude of scholarship*)

If you please,
A most sweet folly!
Full of mirth and melancholy:
Both of these!
In its sadness worth all gladness,
If you please!

25

THE LADY

Prithee, where
Goes Love a-hiding?
Is he long in his abiding
Anywhere?
Can you bind him when you find him;
Prithee, where?

PIERROT

With spring days
Love comes and dallies:
Upon the mountains, through the valleys
Lie Love's ways,
Then he leaves you and deceives you
In spring days.

THE LADY

Thine answers please me: 'tis thy turn to ask.
To meet thy questioning be now my task.

PIERROT

Since I know thee, dear Immortal,
Is my heart become a blossom,

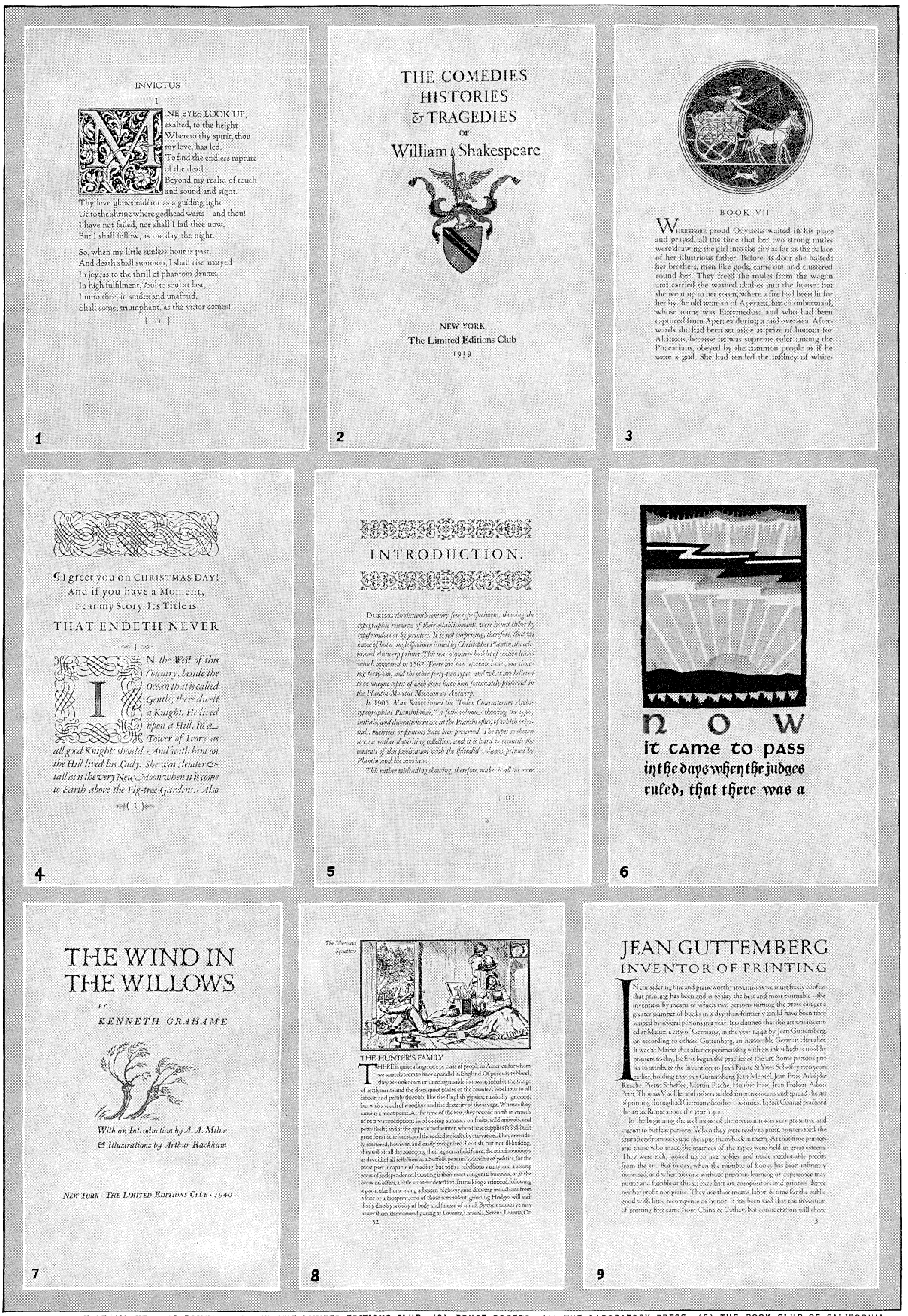
7

BY COURTESY OF (1) THE MERRYMOUNT PRESS, (2) THE CLUB OF ODD VOLUMES, (3) R. H. DODD, (4) THE BROWN UNIVERSITY, JOHN CARTER BROWN LIBRARY, (5) BRUCE ROGERS, (6) HOUGHTON MIFFLIN COMPANY, (7) THE GROLIER CLUB, NEW YORK

PAGE DESIGNS OF MODERN AMERICAN BOOKS FROM 1896 TO 1923

1. *The Altar Book*, designed by D. B. Updike. 1896. 2. *Isaiah Thomas, Printer, Writer and Collector*, by C. L. Nichols, designed by D. B. Updike. 1912. 3. *Iconography of Manhattan Island* by I. N. P. Stokes, designed by Walter Gillis. 1915. 4. *Catalogue* of the John Carter Brown Library, designed by D. B. Updike. 1919. 5. *The Centaur*, by Maurice de Guérin, designed by Bruce Rogers. 1916. 6. *Geoffroy Tory, Painter and Engraver*, by Auguste Bernard, translated by G. B. Ives and designed by Bruce Rogers. 1909. 7. *The Pierrot of the Minute*, by Ernest Dowson, designed by Bruce Rogers. 1923

BOOKS


INVICTUS
I
MINE EYES LOOK UP,
exalted, to the height
Whereto thy spirit, thou
my love, has led,
To find the endless rapture
of the dead
Beyond my realm of touch
and sound and sight.
Thy love glows radiant as a guiding light
Unto the shrine where godhead waits—and thou!
I have not failed, nor shall I fail thee now,
But I shall fellow, as the day the night.
So, when my little sunless hour is past,
And death shall summon, I shall rise arrayed
In joy, as to the thrill of phantom drums.
In high fulfilment, soul to soul at last,
I unto thee, in smiles and unafraid,
Shall come, triumphant, as the victor comes!
[10]
1
THE COMEDIES
HISTORIES
& TRAGEDIES
OF
William Shakespeare
NEW YORK
The Limited Editions Club
1939
2
BOOK VII
WHEREFORE proud Odysseus waited in his place
and prayed, all the time that her two strong mules
were drawing the girl into the city as far as the palace
of her illustrious father. Before its door she halted:
her brothers, men like gods, came out and clustered
round her. They freed the mules from the wagon
and carried the washed clothes into the house: but
she went up to her room, where a fire had been lit for
her by the old woman of Apeiraea, her chambermaid,
whose name was Eurymedusa and who had been
captured from Apeiraea during a raid over-sea. After-
wards she had been set aside as prize of honour for
Alcinous, because he was supreme ruler among the
Phaeacians, obeyed by the common people as if he
were a god. She had tended the infancy of white-
3
I greet you on CHRISTMAS DAY!
And if you have a Moment,
hear my Story. Its Title is
THAT ENDETH NEVER
I
IN the Weſt of this
Country, beside the
Ocean that is called
Gentle, there dwelt
a Knight. He lived
upon a Hill, in a
Tower of Ivory as
all good Knights should. And with him on
the Hill lived his Lady. She was slender &
tall as is the very New Moon when it is come
to Earth above the Fig-tree Gardens. Alſo
(1)
4
INTRODUCTION.
DURING the sixteenth century five type specimens, showing the typographic resources of their establishments, were issued either by typefounders or by printers. It is not surprising, therefore, that we know of but a single specimen issued by Christopher Plantin, the celebrated Antwerp printer. This was a quarto booklet of sixteen leaves which appeared in 1567. There are two separate issues, one showing forty-one, and the other forty-two types, and what are believed to be unique copies of each issue have been fortunately preserved in the Plantin-Moretus Museum at Antwerp.
In 1905, Max Rooses issued the "Index Characterum Archi-typographiae Plantinianae," in folio volume, showing the types, initials, and decoration in use at the Plantin office, of which originals, matrices, or punches have been preserved. The types so shown are a rather dispiriting collection, and it is hard to reconcile the contents of this publication with the splendid volumes printed by Plantin and his associates.
This rather misleading showing, therefore, makes it all the more
(10)
5
NOW
it came to pass
in the days when the judges
ruled, that there was a
6
THE WIND IN
THE WILLOWS
BY
KENNETH GRAHAME
With an Introduction by A. A. Milne
& Illustrations by Arthur Rackham
NEW YORK · THE LIMITED EDITIONS CLUB · 1940
7
The Silverado Squatters
THE HUNTER'S FAMILY
THERE is quite a large race or class of people in America, for whom we scarcely seem to have a parallel in England. Of pure white blood, they are unknown or unrecognisable in towns; inhabit the fringes of settlements and the direct quiet places of the country; rebellious to all labour, and portly thievish, like the English gipsies; rustically ignorant, but with a touch of woodcraft and the dexterity of the savages. Whence they came is a moot point. At the time of the war, they poured north in crowds to escape conscription; lived during summer on fruits, wild animals, and petty theft; and at the approach of winter, when these supplies failed, built great fires in the forest, and there died basically by starvation. They are wide-ly scattered, however, and easily recognised. Loutish, but not ill-looking, they will sit all day, swinging their legs on a field fence, the mind seemingly as devoid of all reflection as a Suffolk peasant's, careless of politics, for the most part incapable of reading, but with a rebellious vanity and a strong sense of independence. Hunting is their most congenial business, or, if the occasion offers, a little amateur detection. In tracking a criminal, following a particular horse along a beaten highway, and drawing inductions from a hair or a footprint, one of these somnolent, grunting Hodges will sud-denly display activity of body and finesse of mind. By their names ye may know them, the women bigairing as Lovena, Larsenia, Serena, Loanna, Or-
52
8
JEAN GUTTEMBERG
INVENTOR OF PRINTING
IN considering fine and praiseworthy inventions we must freely confess that printing has been and is to-day the best and most estimable—the invention by means of which two persons turning the press can get a greater number of books in a day than formerly could have been tran-scribed by several persons in a year. It is claimed that this art was invent-ed at Mainz, a city of Germany, in the year 1442 by Jean Guttemberg, or, according to others, Guttenberg, an honorable German elsewhere. It was at Mainz that after experimenting with an ink which is used by printers to-day, he first began the practice of the art. Some persons pre-fer to attribute the invention to Jean Faiste & Yues Schoffer, two years earlier, holding that our Guttemberg, Jean Mentel, Jean Pruss, Adolphe Rusche, Pierre Scheffer, Martin Flache, Hulfstic Haz, Jean Fioben, Adam Petri, Thomas Vualthe, and others added improvements and spread the art of printing through all Germany & other countries. In fact Conrad proclaimed the art at Rome about the year 1460.
In the beginning the technique of the invention was very primitive and known to but few persons. When they were ready to print, printers took the characters from sacks and then put them back in them. At that time printers and those who made the matrices of the types were held in great esteem. They were rich, looked up to like nobles, and made incalculable profits from the art. But to-day, when the number of books has been infinitely increased, and when anyone without previous learning or experience may putter and fumble at this so excellent art, compositors and printers derive neither profit nor praise. They use their means, labor, & time for the public good with little recompense or honor. It has been said that the invention of printing first came from China & Cathay, but consideration will show
3
9

BY COURTESY OF (1) KENDALL BANNING, (2, 7) THE LIMITED EDITIONS CLUB, (3) BRUCE ROGERS, (4) THE LABORATORY PRESS, (6) THE BOOK CLUB OF CALIFORNIA, (8) CHARLES SCRIBNER'S SONS AND CHATTO AND WINDUS

PAGE DESIGNS FROM MODERN AMERICAN BOOKS

1. *Songs of the Love Unending*, by Kendall Banning, designed by Frederic and Bertha Goudy. 2. *The Comedies, Histories & Tragedies of William Shakespeare*, designed by Bruce Rogers. 3. *The Odyssey*, translated by T. E. Shaw, designed by Bruce Rogers. 4. *That Endeth Never*, by Hildegarde Flanner, designed by Porter Garnett. 5. Plantin's *Index Characterum*, edited by Douglas C. McMurtrie, designed by Elmer Adler. 6. *The Book of Ruth*, designed by Edwin and Robert Grabhorn. 7. *The Wind in the Willows*, by Kenneth Grahame, illustrated by Arthur Rackham and designed by Bruce Rogers. 8. *The Silverado Squatters*, by R. L. Stevenson, designed by John Henry Nash. 9. *Jean Guttemberg*, translated and designed by Douglas C. McMurtrie

use of one simple face of type in a full range of sizes. The fine artistry he attained by the simplest of means was represented, for example, in a number of college catalogues and reports of institutions, notably in the catalogue of the John Carter Brown library. Updike, however, did not disdain the use of type ornament or other embellishment in proper places, but it was always an incident in the plan of a book rather than the dominating feature of the design. The standards of workmanship at the Merrymount press were exigent, so that well-designed books should not suffer from blemishes of execution. Updike indulged no fetish regarding handwork where the results he wished to achieve could be obtained by more effective means. Thus his presswork was done on power-driven cylinder presses of modern type.

In the judgment of many discerning critics, Updike was the best American printer of his generation. His primacy was due, according to these critics, to the fact that he did not exaggerate in the effort to make beautiful books; he was not restlessly seeking some new device to make a book different from other books for no reason better than a desire for difference. He worked on a positive rather than a negative principle, that each book should be perfectly fit in design to its purpose and subject. If this rule led him into new fields, he did not hesitate to enter them; when it led along the paths of tradition he followed obediently. According to the Merrymount press's own statement, "an economy of means and a sort of disciplined sobriety mark its product; and this comes about, probably, through aiming at suitability—a quality which involves discarding whatever does not organically belong to the particular work in hand." Updike rendered a great service to typography in his two-volume work, *Printing Types* (1922), which was awarded the gold medal of the American Institute of Graphic Arts. This book gives a review of the historical development of type design, with a running critique of the aesthetic merits or demerits of the better faces of each period. He was also the author of a series of essays on the work of the printer, *In the Day's Work* (1924), which state many of the principles on which he worked. He likewise edited for the Grolier club a reprint of Mores' *A Dissertation Upon English Typographical Founders and Founderies* (1924). Updike died Dec. 28, 1941.

Bruce Rogers.—Bruce Rogers is the most celebrated of the fine printers in America, and his books are now the vogue among collectors, a situation which has led to a sharp appreciation in the market value of the best which he has designed. He has the advantage of being himself an artist of ability and has thus been able to design some of the type faces and almost all the decorations which have gone into the making of his books. Rogers is a traditionalist at heart but he is also endowed with a sprightly inventiveness which has leavened the style of all his work. His first interest in book production was concerned with illustration. He drew for undergraduate publications at Purdue university and after his graduation in 1890 he worked on the art staff of the Indianapolis *News*. Soon after he became acquainted with Joseph M. Bowles who had established an American organ of the "Arts and Crafts" movement called *Modern Art*. Bowles showed Rogers some of the Kelmscott press books which had just begun to appear. They were a revelation to the young artist, and his interest began to widen from illustration alone to embrace the art of the book as an integral whole. In 1895 he designed a few decorations for Thomas B. Mosher, the idealistic publisher of Portland, Me., these being used in an edition of A. E.'s *Homeward Songs by the Way,* in the colophon of which the name Bruce Rogers appears for the first time. In search of financial support Bowles moved *Modern Art* to Boston, and Rogers soon followed to that city—an excellent field for the budding talent of a young book designer. In 1900 Rogers cemented closer a relation already established with the Riverside press of Cambridge, Mass., a special department for the production of fine books in limited editions being set up at that plant under his supervision. From this department issued a succession of charming volumes which promptly won favour with bibliophiles and collectors, many of whom entered subscriptions for all books which might be issued. Time has justified their confidence.

The most attractive feature of the Riverside books was their variety. With the celebrated English presses, to have seen three of their books was to have seen all. With Rogers's work each volume was different, in typography, in decoration (where decoration was used), in format, in binding. And the style of each volume was related, as only a master of book-making could relate it, to the subject of the text it embodied in printed form. Among the more important books produced at Cambridge were the folio Montaigne (1902–04), *Franklin and his Press at Passy* (1914), executed for the Grolier club, and a translation of Auguste Bernard's *Geofroy Tory* (1909), for which latter volume Rogers redrew with an exquisite touch the crudely printed but exceedingly beautiful borders engraved on wood by Tory, with the result that they were printed as the great French master would have wished them to appear.

The relation between Bruce Rogers and the Riverside press terminated in 1912 and the designer went abroad for a year. On his return he fell in with Carl Purington Rollins who was operating a small printing office in an old mill, the Dyke mill, at Montague, Mass. Here Rogers printed his perhaps most celebrated book, a slim volume—little more than a leaflet—bound in boards, *The Centaur* by Maurice de Guérin, translated by George B. Ives. This volume was set in the Centaur type, a very skilful recreation of the great Roman type of Nicolas Jenson, the design and decoration of the book being modelled after the style of Robert Estienne, the French printer of the early 16th century. Only 135 copies were printed, most of these being presented by the designer to his friends. The auction price of this leaflet has gone above $300.

After a period of work as adviser to the university press in Cambridge, England, Rogers returned to America and became consulting designer of books for William Edwin Rudge who moved to Mt. Vernon, N.Y., a printing plant which had already, in New York City, earned a reputation for printing far above the average. He also became adviser to the Harvard university press. Since his association with Rudge, Rogers' work has shown a new verve. He became enamoured of type ornament—*i.e.,* decorative units cast like single types—and he has used this material in many whimsical and astounding ways. The finest example of its use may be seen in the borders, printed in rose, framing the pages of *Pierrot of the Minute,* by Ernest Dowson, produced in 1923 as one item in the printers' series of the Grolier club.

This volume must always be considered among Rogers' finest achievements in creative design. He has also carried the use of type ornament to even more fanciful extremes in several notable pieces of advertisement.

Other Eastern Typographers.—Carl Purington Rollins, who operated at Montague, Mass., the press at the Dyke mill already referred to, has been for a number of years typographic adviser to the Yale University press. In this capacity he has put the impress of beauty upon many trade publications issued at moderate prices. He also operates in his home a private press, performing all the processes of manufacture with his own hands. As a book designer Rollins ranks with the best. His period typography is authentic and ably conceived, and all his work gives evidence of a sure and discriminating taste.

The Village press, located successively at Park Ridge, Ill., Hingham, Mass., New York city, Forest Hills Gardens, L. I., and Marlboro, N.Y., is an enterprise of Frederic W. Goudy and his wife. Village, Kennerley, Forum, Italian old style, and many other fine type faces have been designed by Goudy. The issues of his press, always extremely limited in number, are set in the types he designs, and the decoration used is also a product of Goudy's brush or pen. The pieces are usually small, no large book having issued from the Village press, but they all give evidence of the unquestioned artistry in matters typographic of the master of the press. Being published through no regular channel, their fugitive character makes them the despair of amateurs seeking to acquire a reasonably complete collection.

Elmer Adler is one of the latest entrants into the guild of fine book-making, working in New York under the name of the Pynson Printers. His press is operated as a business enterprise which

makes no concessions to commercialism in the quality of its work. Well grounded in the classic traditions of typography, Adler has been willing to use new types and follow new modes, if they are sound ones, with the result that much of his work is refreshingly original in style without being freakish. As to type faces he has relied principally on Garamond and Bodoni Book, but has also used effectively some of the more modern types, particularly those designed by the German artist, Lucian Bernhard.

He has rendered another service to good book-making in having designed, for Alfred A. Knopf, numerous books of general circulation which have exceeded his own manufacturing facilities, and laid out, also for Knopf, the typography of the *American Mercury*.

Frederic Warde (1894–1939), who was doing interesting work as typographic adviser to the Princeton university press, left that institution for extensive travel in Europe, in order to become familiar with Continental book arts and to do work of an experimental character on his own account. While abroad he revived, in collaboration with Stanley Morison, one of the most interesting of the 16th century Italian cursive types, Arrighi, the punches for which were cut by hand.

San Francisco Printers.—From New York and New England it is a long jump to the next centre of fine book printing, San Francisco. The initiative here must be credited to John Henry Nash, a typographer of distinction with personal attributes which have enabled him to make a business success of fine printing, which must often be a hobby, subsidized in one way or another. His way was made the easier by the patronage of a distinguished American collector and he has received other important commissions for the execution of fine books. Nash is an enthusiast for close spacing and his typography is well planned and set. His press-work, which is done outside under his close supervision, is excellent. In style Nash's printing is more flamboyant than that of the other fine printers; he makes generous use of colour, rules and decoration. The possible criticism is that he sometimes strains a little after effect. But he has, on the other hand, the very distinct merit of having established an individual style. He has printed numerous books for the California book club in addition to those commissioned by private collectors, and has also published several handsome volumes on his own account.

Edwin Grabhorn, in association with his brother Robert, has established an enviable reputation within a very few years for doing as fine printing as is done anywhere to-day. He plans his work with exquisite taste in a truly original style. The Grabhorns do all branches of their work in their own small office; hand composition, presswork, illumination and binding. They print their hand-made paper wet, which is becoming a lost art, and attain a uniformity of colour and perfection of impression almost beyond criticism. Both are still young men and much brilliant work may confidently be expected of them.

Taylor and Taylor, also in San Francisco, have done much creditable book printing, and two young men, the Johnson brothers, who work under the name of the Windsor press, show signs of real virtuosity as book typographers.

Recent Contributors.—At the Laboratory press at Pittsburgh, Porter Garnett has not only done some fine printing himself—notably his privately printed volume *That Endeth Never*—but has also made a substantial contribution to the cause of fine printing in America, by training talented students in its principles and artistry. Among the other men who have done or are doing fine work in the book printing field during the 20th century are Spencer Kellogg, Jr., at the Aries press, Eden, N.Y.; Clark Conwell at the Elston press, New Rochelle, N.Y.; William A. Kittredge at the Lakeside press, Chicago; Will Ransom at Chicago; A. B. McCallister at Los Angeles; and Douglas C. McMurtrie at Greenwich, Conn.

Two commercial publishing enterprises deserve consideration in any review of fine book printing in America. The first of these, the Roycroft press at East Aurora, N.Y., founded by Elbert Hubbard, was directly inspired by the work of the Kelmscott press. Its earliest work, done in the spirit of idealism, was good, but as commercial success became the paramount consideration its standards were lowered. In Portland, Me., Thomas B. Mosher, a publisher with a love for less known items of good literature and excellent taste as to format, produced many lovely volumes which became widely known.

Modern Facilities.—The modern fine printer interested in doing work of the highest quality is fairly well provided with facilities. Modern press equipment, either of the platen or cylinder variety, when properly operated, will deliver impression as perfect as can be obtained on a hand press and with a much greater uniformity in ink distribution. Almost all the finely printed books being produced to-day are printed on power presses. As to type supply, the foundry offerings have improved greatly during the 20th century; the companies making type composing and casting machinery have shown an interest in fine types which they lacked in earlier years, European sources have been tapped for supplies of good types, and a number of the designers have had special faces cut for their own use. As regards paper, a few American mills have been making better and better grades of stock for book printing, though it has been necessary to import the large amounts of hand-made paper which have been required. The quality of ink is reasonably satisfactory though there is still room, in this field, for much improvement. Fine binding is to be had in several centres, the good work being done for the most part by English artisans who have settled in America, but there are also a number of women binders who have taken up this craft in the amateur spirit and have produced highly creditable work.

The cause of fine book-making has received great impetus from the "fifty books" exhibition held annually under the auspices of the American Institute of Graphic Arts. It was difficult to find 50 good books, produced during the current year, worthy of inclusion in the first exhibition in 1923, but with the growth in prestige of this annual show, publishers have displayed a keen rivalry to have their books included among the 50 honoured by the choice of the jury. The exhibition has thus undoubtedly exercised a beneficial influence on the artistry of American book-making. (*See* TYPOGRAPHY; BOOKBINDING; BOOK-PLATES; PRINTING.)

BIBLIOGRAPHY.—W. A. Dwiggins, *D. B. Updike and the Merrymount Press* (1924); F. Warde, *Bruce Rogers, Designer of Books* (1925); D. C. McMurtrie, Ruth Grannis, and others, *Walter Gilliss, 1855–1925* (1925); W. Gilliss, *Recollections of the Gilliss Press* (1926); *The Merrymount Press, Its Aims, Work and Equipment* (1927); G. P. Winship, *The Merrymount Press* (1928); W. Ransom, *Private Presses and the Books they have given us* (1928). (D. C. McM.)

BOOKS CLOSE, a term indicating the day on which the transfer books of a corporation are closed to permit the making of an accurate list of stockholders to whom to send dividends. Regardless of who may actually own a share of stock, the issuing corporation has no further liability than to send the dividend to the holder whose name is recorded in the transfer books on the day of closing. The term is used in Great Britain, but commonly not in the U.S.

BOOKSELLING. The trade in books is of a very ancient date, the oldest reference to it occurring in Egyptian literature. The early poets and orators recited their effusions in public to induce their hearers to possess written copies of their poems or orations. Frequently they were taken down *viva voce,* and transcripts sold to such as were wealthy enough to purchase. A reference in the Talmud seems to show that not only the buying and selling, but also the lending of books was known to the Hebrews in their early history. In the book of Jeremiah the prophet is represented as dictating to Baruch the scribe, who, when questioned, described the mode in which his book was written. These scribes were, in fact, the earliest booksellers, and supplied copies as they were demanded. Aristotle, we are told, possessed a somewhat extensive library; and Plato is recorded to have paid the large sum of 100 minae for three small treatises of Philolaus the Pythagorean. When the Alexandrian library was founded about 300 B.C., various expedients were resorted to for the purpose of procuring books, and this appears to have stimulated the energies of the Athenian booksellers, who were termed *βιβλίων κάπηλοι.* In Rome, towards the end of the republic, it became the fashion to have a library as part of the household furniture; and the booksellers, *librarii* (Cic. *D. Leg.* iii. 20) or *bibliopolae* (Martial iv. 71,

xiii. 3), carried on a flourishing trade. Their shops (*taberna librarii,* Cic. *Phil.* ii. 9) were chiefly in the Argiletum, and in the Vicus Sandalarius. On the door, or on the side posts, was a list of the books on sale; and Martial (i. 118), who mentions this also, says that a copy of his First Book of Epigrams might be purchased for five denarii. In the time of Augustus the great booksellers were the Sosii. According to Justinian (ii. 1. 33), a law was passed securing to the scribes the property in the materials used; and in this may, perhaps, be traced the first germ of the modern law of copyright.

The spread of Christianity naturally created a great demand for copies of the Gospels and other sacred books, and later on for missals and other devotional volumes for church and private use. Benedict Biscop, the founder of the abbey at Wearmouth in England, brought home with him from France (671) a whole cargo of books, part of which he had "bought," but from whom is not mentioned. Among the Jews bookselling was well recognized in the middle ages. We read of one bookseller, Aaron, who carried Hebrew mss. into Italy from Toledo, and sold one considerable batch at Perugia. The travelling bookseller was a typical mediaeval figure. Previous to the Reformation, the text writers or stationers (*stacyoneres*), who sold copies of the books then in use—the A B C, the Paternoster, Creed, Ave Maria and other ms. copies of prayers, in the neighbourhood of St. Paul's, London—were, in 1403, formed into a gild. Some of these "stacyoneres" had stalls or stations built against the very walls of the cathedral itself, in the same manner as they are still to be found in some of the older Continental cities. In Henry Anstey's *Munimenta Academica* we catch a glimpse of the "sworn" university bookseller or stationer, John More of Oxford, who apparently first supplied pupils with their books, and then acted the part of a pawnbroker. Besides the sworn stationers there were many booksellers in Oxford who were not sworn; for one of the statutes, passed in the year 1373, expressly recites that, in consequence of their presence, "books of great value are sold and carried away from Oxford, the owners of them are cheated, and the sworn stationers are deprived of their lawful business." It was, therefore, enacted that no bookseller except two sworn stationers or their deputies, should sell any book exceeding half a mark in value, under pain of imprisonment, or, if the offence was repeated, of abjuring his trade within the university.

"The trade in bookselling seems," says Hallam, "to have been established at Paris and Bologna in the 12th century; the lawyers and universities called it into life. It is very improbable that it existed in what we properly call the dark ages. Peter of Blois mentions a book which he had bought of a public dealer, but we do not find many distinct accounts of them till the next age. These dealers were denominated *stationarii,* perhaps from the open stalls at which they carried on their business, though *statio* is a general word for a shop in low Latin. They appear, by the old statutes of the University of Paris, and by those of Bologna, to have sold books upon commission, and are sometimes, though not uniformly, distinguished from the *librarii,* a word which, having originally been confined to the copyists of books, was afterwards applied to those who traded in them.

THE INVENTION OF PRINTING

The modern system of bookselling dates from soon after the introduction of printing. The earliest printers were their own editors and booksellers; but being unable to sell every copy of the works they printed, they had agents at most of the seats of learning. Antony Koburger, who introduced the art of printing into Nuremberg in 1470, although a printer, was more of a bookseller; for, besides his own 16 shops, we are informed by his biographers that he had agents for the sale of his books in every city of Christendom. Wynkyn de Worde, who succeeded to Caxton's press in Westminster, had a shop in Fleet street.

The religious dissensions of the Continent, and the Reformation in England under Henry VIII. and Edward VI., created a great demand for books; but in England neither Tudor nor Stuart could tolerate a free press, and various efforts were made to curb it. The first patent for the office of king's printer was granted to Thomas Berthelet by Henry VIII. in 1529, but only such books as were first licensed were to be printed. At that time even the purchase or possession of an unlicensed book was a punishable offence. In 1556 the Company of Stationers was incorporated and very extensive powers were granted in order that obnoxious books might be repressed. In the following reigns the Star Chamber exercised a pretty effectual censorship; but, in spite of all precaution, such was the demand for books of a polemical nature, that many were printed abroad and surreptitiously introduced into England. Queen Elizabeth interfered but little with books except when they emanated from Roman Catholics, or touched upon her royal prerogatives; and towards the end of her reign, and during that of her successor, bookselling flourished. Archbishop Laud, who was no friend to booksellers, introduced many arbitrary restrictions, but they were all, or nearly all, removed during the time of the Commonwealth. An order of parliament in 1643 provided that no book should be printed or "put on sale," "unless the same be first approved of and licensed" by the persons appointed by the Government. Booksellers' shops were even liable to be raided in the search for contraband books. It was against this order that Milton wrote his *Areopagitica* (1644). So much had bookselling increased during the Protectorate that, in 1658, was published *A Catalogue of the most Vendible Books in England, digested under the heads of Divinity, History, Physic, etc., with School Books, Hebrew, Greek, and Latin, and an Introduction, for the use of Schools,* by W. London. A bad time immediately followed. The Restoration also restored the office of Licenser of the Press, which continued till 1694.

In the first English Copyright Act (1709), which specially relates to booksellers, it is enacted that, if any person shall think the published price of a book unreasonably high, he may thereupon make complaint to the archbishop of Canterbury, and to certain other persons named, who shall thereupon examine into his complaint, and if well founded reduce the price, and any bookseller charging more than the price so fixed shall be fined £5 for every copy sold. Apparently this enactment remained a dead letter.

In the course of the 16th and 17th centuries the Low Countries for a time became the chief centre of the bookselling world, and many of the finest folios and quartos in our libraries bear the names of Jansen, Blauw or Plantin, with the imprint of Amsterdam, Utrecht, Leiden or Antwerp, while the Elzevirs besides other works produced their charming little pocket classics. The southern towns of Douai and St. Omer at the same time furnished polemical works in English.

For later times it is necessary to make a gradual distinction between *booksellers,* whose trade consists in selling books, either by retail or wholesale, and *publishers,* whose business involves the production of the books from the author's mss. and who are the intermediaries between author and bookseller. The article on PUBLISHING (*q.v.*) deals more particularly with this second class, who, though originally booksellers, gradually took a higher rank in the book-trade, and whose influence upon the history of literature has often been very great. The convenience of this distinction is not impaired by the fact either that a publisher is also a wholesale bookseller, or that a still more recent development in publishing (as in the instance of the direct sale in 1902, by the London *Times,* of the supplementary volumes to the 9th edition of the *Encyclopædia Britannica,* which were also "published" by *The Times*) started a reaction to some extent in the way of amalgamating the two functions. The scheme of *The Times* Book Club (started in 1905) was, again, a combination of a subscription library with the business of bookselling (*see* NEWSPAPERS); and it brought the organization of a newspaper, with all its means of achieving publicity, into the work of pushing the sale of books, in a way which practically introduced a new factor into the bookselling business.

During the 19th century it remains the fact that the distinction between publisher and bookseller—literary promoter and shopkeeper—became fundamental. The booksellers, as such, were engaged either in wholesale bookselling, or in the retail, the old or second-hand, and the periodical trades.

Coming between the publisher and the retail bookseller is the important distributing agency of the *wholesale bookseller*. It is to him that the retailer looks for his miscellaneous supplies, as it is simply impossible for him to stock one-half of the books published. In Paternoster Row, London, which has for over 100 years been the centre of this industry, may be seen the collectors from the shops of the retail booksellers busily engaged in obtaining the books ordered by the book-buying public. It is also through these agencies that the country bookseller obtains his miscellaneous supplies. At the leading house in this department of bookselling almost any book can be found, or information obtained concerning it. At one of these establishments over 1,000,000 books are constantly kept in stock. It is here that the publisher calls first on showing or "subscribing" a new book, a critical process, for by the number thus subscribed the fate of a book is sometimes determined.

What may be termed the third partner in publishing and its ramification is the *retail bookseller;* and to protect his interests there was established in 1890 a London booksellers' society, which had for its object the restriction of discounts to 25%, and also to arrange prices generally and control all details connected with the trade. The society a few years afterwards widened its field of operations, and its designation then became "The Associated Booksellers of Great Britain and Ireland."

The trade in old or (as they are sometimes called) second-hand books is in a sense a more specialized class of business, requiring a knowledge of bibliography, while the transactions are with individual books rather than with numbers of copies. Occasionally dealers in this class of books replenish their stocks by purchasing remainders of books, which, having ceased from one cause or another to sell with the publisher, they offer to the public as bargains. The most recent enactment that affects the second-hand bookseller is that directed against the underhand so-called "knock-out" system, by which at great book-sales, a ring of buyers conspired to bid low and buy in the books at knock-out prices. The periodical trade grew up during the 19th century, and was in its infancy when the *Penny Magazine, Chambers' Journal* and similar publications first appeared. The growth of this important part of the business was greatly promoted by the abolition of the newspaper stamp and of the duty upon paper, the introduction of attractive illustrations, and the facilities offered for purchasing books by instalments.

EARLY BOOKS IN MEXICO

The history of bookselling in America has a special interest. The Spanish settlements drew away from the old country much of its enterprise and best talent, and the presses of Mexico and other cities teemed with publications, mostly of a religious character.

The prologue of printing and bookselling in the New World was, in fact, written in Mexico City. Cortez landed at the harbour which he called Vera Cruz on Good Friday, 1519; within eighteen years a book press was in operation in the former capital of the Aztecs. At the instance of the first Viceroy, Don Antonio de Mendoza, and the first bishop, Don Fray Juan de Zumarraga, the famous printer of Seville, Juan Cromberger, sent to Mexico a printing press with all needed supplies, in charge of Juan Pablos, a Lombard from Brescia, originally known as Giovanni Paoli. It is probable that this was in the year 1536, and that in 1537 was printed the first book: *Escala Espiritual* of St. John Climacus, translated from Latin into Spanish by Fray Juan de Estrada. What is known with certainty is that in May 1538 a printing press had been established, and that in April 1540, "it was situated on the southwest corner of Cerrada de Santa Teresa la Antigua and Moneda streets, facing the wall of the Archbishop's palace" (*Bibliografia mexicana del siglo xvi.,* por Joaquin Garcia Icarbalceta). A *Manual de Adultos,* with the imprint of Juan Pablos, was issued in 1540.

Among early books printed in Mexico, one of the most interesting is the *Three Dialogues,* by Francisco Cervantes Salazar, which has the imprint, "Mexici, apud Joannem Paulum Brisensem, 1554." A traveller from old Spain visits the capital city of New Spain, and is entertained by two worthy inhabitants. They propose to show him the beauties of the town, and set forth together on horseback along Tacuba street, the charms of which are related in their conversation:

"How the view of this street delights the mind and refreshes the eyes! How wide and ample it is, how straight, how level, all paved with stones, lest in winter the feet be mired. Along its centre, for ornament and use, flows water in its channel, open to the sky, that it may give the greater pleasure. All the houses on both sides are splendid and costly, such as befit the richest and most noble citizens; they are so built that they might be called, not houses, but citadels."

The hosts of the visitor explain that these mansions are solidly built because it was impossible in the beginning to gird the city with walls and towers as a protection against the multitude of enemies surrounding it. All the residences along the great street were, we are told, nearly of the same height, so as not to rob each other of the sun and also as a precaution against earthquakes. Further, it was thought that the free course of the winds through the city would ensure the health of its inhabitants. Nor were these dwellings built of wood or other common material, but rather of great stones artistically set, with the insignia of their lords carved above the doors. The roofs were flat. The visitor admires the palace of the Viceroy, greater and loftier than the rest, adorned with many columns and surmounted by a tower: "It is not a palace," he exclaims, "but another city!" On the tower of the palace was a clock with chimes.

They visit the great square, where were held the markets, the merchants of the whole province bringing their wares thither. There, perhaps, were also exhibited the first books printed and sold in the New World. One of the most valuable of these books was the *Spanish-Aztec Dictionary* of Alonso de Molina, printed in 1571. Several copies of this finely printed work are extant. (X.; E. RH.)

See Luis Gonzalez Obregon, *Mexico Viejo* (Paris-Mexico, 1900).

THE UNITED STATES

Early History.—The first authentic reference to the trade of bookselling in America appears among the early manuscript records of Harvard college. In 1638, the Rev. Joseph Glover, an English dissenting clergyman, decided that the American Colonies stood in need of aids to the faith such as he might be able to supply. He therefore solicited funds in England and Holland, purchased a printing press, a font of type and other necessary materials, engaged one Stephen Day as printer and three men servants as helpers, and thus equipped, set sail for Boston with his wife and children in the summer of the same year. He died en route; his widow soon after married the Rev. Henry Dunster of Harvard college in whose house the press was set up in the late autumn and commenced operations at once with various pamphlets and books in the service of church and State.

In 1647 appeared "An Almanack. . . . By Samuel Danforth, of Harvard College. . . . Cambridge. Printed by Matthew Day. Are to be sold by Hez. Usher at Boston. 1647." Pioneer Boston was followed by Philadelphia and New York 38 years later with another almanac whose imprint read: "Printed and sold by William Bradford, sold also by the author and H. Murrey in Philadelphia and Philip Richards in New York. 1685." Again Boston led when the first private library, that of "The Late Reverend and Learned Mr. Samuel Lee" is "Exposed . . . to sale by Duncan Campbell" in 1693, and scored once more when "the curious and valuable books belonging to the late Reverend and Learned Ebenezer Pemberton" were catalogued and offered for sale by auction on July 2, 1717. Book catalogues of general interest were few and far between in the 18th century and it was not until 1795 that one appeared in Philadelphia: that of the Moreau de St. Mery & Company's store which listed books in Spanish, Italian, German, Dutch and Latin, with over 900 items in French.

The 19th Century.—Booksellers of English Colonial America appear to have found little favour with the historian; title-pages and colophons note many names that are difficult or impossible to trace elsewhere, and the sale of books at retail was usually an adjunct to printing and publishing. But the year 1801 marks

a striking departure through the organization of The American Company of Booksellers for the purpose of promoting the sale of books by means of fairs similar to those held annually at Leipzig. Matthew Carey of Philadelphia was the first president; a majority of the members were citizens of New York, Boston and Philadelphia. Sales at auction would appear to have fallen into disrepute at this period as one of the rules of the company forbade any member to dispose of books by this method.

In 1802 24 New York booksellers agreed to sponsor the "Literary Fair" to be held in that city in June and invited other booksellers in towns "accessible to water" to attend and to bring samples of such books as they desired to sell or exchange. The long room of the old Coffee House in Beaver street was the site chosen, and a substantial success may be inferred from the fact that at the close of the proceedings the New York members entertained their visitors at a banquet. The Philadelphia members were hosts at the second fair which began on June 20, 1803 during the course of which one Jacob Johnson of Philadelphia was awarded the company's prize of $50, "or a gold medal of equal value," for having submitted the best specimen of printing ink of American manufacture, one that the members found superior to the London ink which they had hitherto used. The company continued to prosper; membership increased; new by-laws and articles of association were adopted at a meeting in New York in 1804, and another fair was held in Newark the following year; whereupon the company mysteriously dissolved "owing to a general dissatisfaction."

In 1802, ten New York individuals and firms formed The New York Association of Booksellers to publish and sell school and text-books, and began with a Cicero in Latin and English. Philadelphia followed with a small organization of similar purpose during the next year, but both enterprises were short-lived. 1804 saw the publication of "A Catalogue of all the Books printed in the United States. . . . Published by the Booksellers in Boston." This was a pamphlet of 79 pages listing 1,338 books divided among the categories of "Law, Physics, Divinity, Bibles, Miscellanies, School-Books and Singing-Books." Book trade cataloguing then languished until 1820 when Orville A. Roorbach began to compile a comprehensive record of American books which remained in the press until 1849 when it was finally concluded and published. Addenda were supplied by the author and other publishers during the following year. *Norton's Literary Adviser,* in the nature of a trade journal, appeared in May 1851 and suffered various changes in style, title and ownership until Jan. 1872 when it appeared as *The Weekly Trade Circular,* and in 1873 became *The Publisher's Weekly,* continuing to-day its valuable career as official trade paper of the booksellers of the United States.

During a large part of the 19th century books, largely for scholars and libraries, were imported from Europe. After the War of 1812 printing-presses multiplied rapidly, and with the spread of newspapers and education there also arose a demand for books, and publishers set to work to secure the advantages offered by the wide field of English literature, the whole of which they had the liberty of reaping free of all cost beyond that of production. The works of Scott, Byron, Moore, Southey, Wordsworth, and indeed of every author of note, were reprinted generally without the smallest payment to author or proprietor. Half the names of the authors in the so-called "American" catalogue of books printed between 1820 and 1852 were British. By this means the works of the best authors were brought to the doors of all classes at low prices and in a great variety of forms. After the Civil War, as a consequence of the high price of labour and the restrictive duties imposed in order to protect native industry, coupled with the frequent intercourse with England, a great change took place, and American publishers and booksellers, even while there was still no international copyright, made liberal offers for early sheets of new publications. During this period Boston, New York and Philadelphia retained their old supremacy as bookselling centres.

Modern Conditions.—Bookselling, as a retail enterprise apart from publishing and printing, developed slowly during the 19th century. A majority of the important publishers maintained departments for the sale at retail of their own publications and those of their brothers-in-trade; but such departments were usually subsidiary and were adulterated by stationery, playing cards and other foreign matter. Clergymen, pedagogues and members of other professions were allowed discounts ruinous to profit; it was not until the turn of the century that a concerted and determined effort was made to place the trade independently upon a proper basis. In May 1900, there was organized and incorporated in New York city The American Booksellers Association for the principal purpose of enabling its members to establish and maintain the net price system. The retail price for all books intended for general sale was fixed by the publisher, discounts to the trade were arranged upon a sliding scale according to quantity, and bookselling at retail entered upon its first period of comparative stability and security. Under able and energetic management and with the hearty co-operation of the publishers, the association maintains to-day a thriving and exceptionally stimulating trade organization. Its only serious reverse occurred early in its career, when the principle of price maintenance was assailed by a department store in the metropolitan district which filed suit for damages under the Federal law known as the Sherman Act, claiming that the price arrangement between bookseller and publisher constituted "a combination in restraint of trade." After long and costly litigation, the case was decided in favour of the plaintiff who, with other stores of the kind, continues to sell books at less than the price fixed by the publisher.

Current Bookselling.—Consideration of current conditions must begin with *The American Book Trade Directory,* New York, 1928, which lists 5,600 booksellers in the United States, divided among the following categories: circulating library; department store; drug store; educational; college texts; school texts; foreign; general bookstore; gift shop; books at holidays only; juveniles; law; medical; periodicals; old and rare; religious; second-hand; subscription books; wholesale; and fine editions and modern firsts. This is the first authoritative publication of such a list; earlier figures are contradictory and unreliable, but the categories alone indicate the growth in public interest and the increased distribution of the trade.

Periodicals relating directly or indirectly to the bookseller, and newspapers and magazines devoting more or less space to the reviewing of books also showed a striking growth during the same year. Publishers' records of chain stores—circulating libraries, drug and department stores—showed a greater volume of sales and a broadening of the demand for books other than fiction. One of the leading publishing houses at this time had increased the number of its branch bookshops to 26; one company operating as a circulating library, but also selling at retail, reported 53 stores in 14 cities and towns. Another marked increase is recorded in the number of new shops which concentrate on books of a special type or kind, or which emphasize a certain subject; a glance at the New York City *Telephone Directory* reveals firms devoted exclusively to art, philosophy, drama, Irish books, Orientalia and books in many foreign languages. A number of the larger cities support at least one shop which sells children's books only and which is specially decorated and equipped to appeal to the juvenile reader.

The largest and most inclusive stocks for the general book-buyer are still to be found in the older stores, most of which bear the names of well-known publishers; but the smaller shops more recently established are usually staffed by assistants of a new type who read widely, study the leading English and American reviews, and are thoroughly prepared to supply, if requested, exceptionally efficient and intelligent advice and suggestions, in addition to the conventional filling of orders. Co-operative shops appear to thrive best in college and university towns; membership in these is secured by the purchase of one or more shares of stock at a nominal price; dividends are paid at the prevailing rate of interest, and members are entitled to a discount on their purchases.

In recent years, modern first editions have become an important factor and are responsible for a number of newcomers to the trade, especially in the larger cities; early "firsts" of the more esteemed contemporary authors have registered sensational ad-

vances in price: a fine copy of Rudyard Kipling's "Schoolboy Lyrics," published at a few shillings in 1881, sold in 1924 for $1,500 and in 1928 for $3,500. The interest in and demand for old and rare books has resulted in an unprecedented rise in values during the last few years and corresponding prosperity to this ancient and honourable branch of the trade. The following comparative table of approximate prices is revealing:—

Boswell's *Life of Johnson* (boards)	1903—$ 37.50	1928—$2500
Defoe's *Robinson Crusoe*	1900—$ 7.50	1926—$3525
Swift's *Gulliver's Travels*	1900—$ 56.00	1927—$4200
Omar-Fitzgerald's *Rubaiyat*	1901—$260.00	1927—$3250

An interesting phenomenon in present-day bookselling is the rise and growth of the Book Club organized upon a national scale. Two, operating at the present time, 1928, may be taken as fair examples. Their general features are similar: a board of editors, authors and critics who choose one new book per month, or offer a choice of several, for distribution among the members. In the case of the first club, the editorial board reports one month in advance to the members who then make their selection and agree to purchase not less than four books per year at the published price, postage extra; payments monthly within ten days of receipt of bill. The second club allows no appeal from the rulings of its board as to the most desirable book for its members each month, but offers its selection postage prepaid, at a reduction from the retail price to the public. Payment for a year's service may be made in advance, in full or in instalments. The first club, beginning in April 1926, with 4,500 subscribers recorded a membership of 85,000 in Sept. 1928; the second increased from 5,732 in March 1927 to 55,000 in Sept. 1928.

Second-hand booksellers are now widely distributed throughout the country. These dealers buy private libraries and the overstock of publishers and retailers which they dispose of at less than list prices by direct sale and catalogues by mail. Many agencies assist in the marketing of books at retail. The R. R. Bowker Company supplies *The Trade List Annual* which consists of the catalogues of all publishers of importance to the general trade bound in one volume. The H. W. Wilson Company, New York, issues *The United States Catalogue* with frequent supplements, which contains a list of all books, pamphlets and documents published in the United States, arranged in one alphabet under author, title and subject. A similar index of current books appears in each issue of the *Publisher's Weekly*. These three publications are indispensable to the general bookseller. Another aid of great value is the National Association of Book Publishers which supplies the retail trade with various means for the development of new outlets, in addition to the usual medium of advertising in newspapers and magazines. This association publishes and mails gratis the bi-monthly *Year-Round Bookselling News,* a pamphlet of practical advice and suggestion for all branches of the trade. It also provides original and striking posters for display; descriptive circulars of sets, series and single volumes with the booksellers' imprint and return-order blanks; ably written and attractively printed pamphlets concerned with such details as the increasing of mail orders, improvement in shop arrangement, equipment and display; bookkeeping and accounting; and rental libraries.

Women Booksellers.—In conclusion, mention must be made of the extraordinary increase during recent years in the number of women booksellers. Those with college training, and especially those who have specialized in English and in languages, are most acceptable as assistants and usually most competent as managers. Successful bookselling of to-day must combine exceptional taste in literature with shrewd judgment in buying; and it is significant to record that the number of bookshops in the United States owned and operated exclusively by women has grown from the negligible minority of only a few years ago to over 390 in 1928. (T. B. H.)

BOOKS OF ACCOUNT, a complete system of accounting records used by a person, business or organization for the purpose of providing a permanent entry of financial transactions. The financial status of an individual or an organization can be accurately determined only through the operation of an adequate set of books of account. A small business may require only a journal (*q.v.*) and a ledger (*q.v.*) whereas a larger business might need several types of journals (general, private, purchase, sales, cash, etc.) and several types of ledgers (general, private, accounts receivable, accounts payable, stock, etc.). Except in those organizations which come within the jurisdiction of government bureaux or commissions, business concerns are permitted complete freedom in selecting their books of account (*see* ACCOUNTANCY AND ACCOUNTANTS; BOOKKEEPING).

BOOK SCORPION or **FALSE SCORPION,** a small arachnid (order Pseudoscorpiones), somewhat resembling tailless scorpions. Book scorpions occur widely throughout the world, living under stones, beneath bark, or in vegetable detritus. Some are found in books and old chests, while others, mostly blind, live in caves. They feed upon minute insects and mites.

BOOK VALUE, the monetary value of an asset as shown in the books of account (*q.v.*). The book value is calculated by deducting from the cost price as shown on the books the depreciation which has been set up against it. Thus the book value of a machine which cost $1,500 and which has been depreciated $300 would be $1,200. An *appraised value* might be higher or lower than the *book value.* The book value of a share of common stock in a company having no preferred issues is determined by dividing the excess of assets over liabilities by the number of shares outstanding. The *market value* of the share as indicated by quotations on a securities exchange might be higher or lower than the *book value* of the share. Generally speaking, there need not be any close coincidence between the book value and the appraised value or the market value. (*See* VALUE.)

BOOKWORM, the name given to various insects, moths, beetles, etc., whose larval (or adult) forms injure books by gnawing the binding and piercing the leaves with small holes. There is, however, no single species which may properly be called the bookworm, for many of the numerous insects that feed upon dry, starchy material or paper may cause damage to books. Among the most widely known of these are the silverfishes (order Thysanura) and the booklice (order Psocoptera). (R. L. WL.)

BOOLE, GEORGE (1815–1864), English logician and mathematician, was born in Lincoln on Nov. 2, 1815, the son of a tradesman of limited means. When about 16 years of age, Boole became assistant-master in a private school at Doncaster. Later he established a successful school at Lincoln, and in 1849 was made professor of mathematics in Queen's college, Cork. Boole's earliest published paper, on the "Theory of Analytical Transformations," printed in the *Cambridge Mathematical Journal* for 1839, led to a friendship with D. F. Gregory, the editor. Only two systematic treatises on mathematical subjects were completed by him during his lifetime. The well-known *Treatise on Differential Equations* appeared in 1859 (supplementary posthumous volume, 1865), and was followed, the next year, by a *Treatise on the Calculus of Finite Differences,* designed to serve as a sequel to the former work. In the 16th and 17th chapters of the *Differential Equations* there is a lucid account of the general symbolic method, the bold and skilful employment of which led to Boole's chief discoveries, and of a general method in analysis, originally described in his famous memoir printed in the *Philosophical Transactions* for 1844. Boole was one of the most eminent of those who perceived that the symbols of operation could be separated from those of quantity and treated as distinct objects of calculation.

With the exception of Augustus de Morgan, Boole was probably the first English mathematician since John Wallis who had also written upon logic. Speculations concerning a calculus of reasoning had occupied Boole's thoughts, but it was not till the spring of 1847 that he put his ideas into the pamphlet called *Mathematical Analysis of Logic.* Boole afterwards regarded this as a hasty and imperfect exposition of his logical system, and he desired that his much larger work, *An Investigation of the Laws of Thought, on which are founded the Mathematical Theories of Logic and Probabilities* (1854), should alone be considered as containing a mature statement of his views. He did not regard logic as a branch of mathematics, as the title of his earlier pamphlet might be taken to imply, but he pointed out such a deep analogy between the symbols

of algebra and those which can be made, in his opinion, to represent logical forms and syllogisms that we can hardly help saying that logic is mathematics restricted to the two quantities, 0 and 1. By unity Boole denoted the universe of thinkable objects; literal symbols, such as *x, y, z, v, u,* etc., were used with the elective meaning attaching to common adjectives and substantives. Thus, if x=horned and y=sheep, then the successive acts of election represented by x and y, if performed on unity, give the whole of the class *horned sheep*. Boole showed that elective symbols of this kind obey the same primary laws of combination as algebraical symbols, whence it followed that they could be added, subtracted, multiplied and even divided, almost exactly in the same manner as numbers. Thus, $1-x$ would represent the operation of selecting all things in the world except *horned things,* that is, *all not horned things,* and $(1-x)(1-y)$ would give us *all things neither horned nor sheep.* By the use of such symbols propositions could be reduced to the form of equations, and the syllogistic conclusion from two premises was obtained by eliminating the middle term according to ordinary algebraic rules.

Still more original and remarkable, however, was that part of his system, fully stated in his *Laws of Thought,* which formed a general symbolic method of logical inference. Given any propositions involving any number of terms, Boole showed how, by the purely symbolic treatment of the premises, to draw any conclusion logically contained in those premises. The second part of the *Laws of Thought* contained a corresponding attempt to discover a general method in probabilities, which should enable us from the given probabilities of any system of events to determine the consequent probability of any other event logically connected with the given events. Boole died on Dec. 8, 1864.

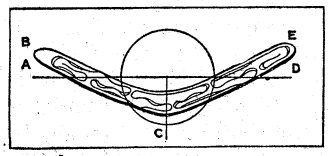
For Boole's memoirs and detached papers see *Catalogue of Scientific Memoirs,* published by the Royal Society, and the supplementary volume on *Differential Equations,* edited by Isaac Todhunter. In the *Cambridge Mathematical Journal* and its successor, the *Cambridge and Dublin Mathematical Journal,* and in the *Philosophical Magazine* there are other papers. The Royal Society printed six important memoirs in the *Philosophical Transactions,* and a few other memoirs are to be found in the *Transactions of the Royal Society of Edinburgh* and of the *Royal Irish Academy,* in the *Bulletin de l'Académie de St. Pétersbourg* for 1862 (under the name G. Boldt, vol. iv. pp. 198–215), and in *Crelle's Journal. See* R. Harley's article in the *British Quarterly Review,* July, 1866, No. 87. (W. S. J.)

BOOM, a pole, bar or barrier (*cf.* Ger. *Baum,* tree, Eng. beam); applied as a nautical term to a long spar used to extend a sail at the foot (main-boom, jib-boom, etc.). In the sense of a barrier, a boom is generally formed of timber lashed together, or of chains, built across the mouth of a river or harbour as a means of defence. The "boom" of a cannon, the cry of the bittern, etc., is a different and onomatopoeic word.

In trade, the word boom has two applications. First, it is used colloquially as the equivalent of to push or to advertise energetically; to carry through with a rush and a roar. Hence, no doubt, the derivation from boom, a loud roar or rumble, as in the boom of a gun, boom being a word imitative of the sound it describes. In this sense of booming a thing by sounding its merits, the origin was American. In 1878 Mr. J. B. McCullagh, according to his own statement to *The Century Dictionary* used the term in the Grant presidential campaign through his familiarity with its use by Mississippi pilots to describe the rapid swelling and rising of the river. So he came to speak of the Grant campaign as "booming," and the term passed into general English-speaking use.

In a second sense, the word "boom" is commonly applied to the peak of a trade cycle as opposed to its lowest point which is often called the slump: the two words are now in common use as an expressive pair of antithetical terms.

BOOMERANG, a weapon of the Australian aborigines and other peoples, chiefly used as a missile. The word is taken from the native name used by a single tribe in New South Wales. It is not connected with the *womera* or spear-thrower. Two main types may be distinguished: (a) the return boomerang; (b) the non-return or war boomerang. Both types are found in most parts of Australia; the return form was, according to General Pitt-Rivers, used in ancient Egypt; and a weapon closely resembling the boomerang survives to the present day in north-east Africa, with allied forms made of metal (throwing knives). In south India is found a boomerang-shaped instrument which can be made to return. The Hopis (Moquis) of Arizona use a non-return form. The general form of both weapons is the same. They are sickle-shaped, and made of wood (in India of ivory or steel). The thickness is about $\frac{1}{6}$th of the breadth, which again is $\frac{1}{12}$th of the length, the last varying from 6in. to 3 or 4ft.



AUSTRALIAN BOOMERANG
Illustration shows the centre of gravity, and the movement of the weapon around this centre, when in flight

The return boomerang, which may have two straight arms at an angle of from 70° to 120°, but in Australia is always curved at an angle of 90° or more, is usually $1\frac{1}{2}$ to 2ft. in span, and weighs some 8oz.; the arms have a skew, being twisted 2° or 3° from the plane running through the centre of the weapon, so that B and D (*see* fig.) are above it, A and E below it; the ends AB and DE are also to some extent raised above the plane of the weapon at C; the cross section is asymmetrical, the upper side in the figure being convex, the lower flat or nearly so; this must be thrown with the right hand. The non-return boomerang has a skew in the opposite direction, but is otherwise similar.

The peculiarity of the boomerang's flight depends mainly on its skew. The return boomerang is held vertically, the concave side forward, and thrown in a plane parallel to the surface of the ground, as much rotation as possible being imparted to it. It travels straight for 30 yds. or more, with nearly vertical rotation; then it inclines to the left, lying over on the flat side and rising in the air; after describing a circle of 50 or more yards in diameter it returns to the thrower. Some observers state that it returns after striking the object; it is certainly possible to strike the ground without affecting the return. Throws of 100yds. or more, before the leftward curve begins, can be accomplished by Australian natives, the weapon rising as much as 150 ft. in the air and circling five times before returning. The non-return type may also be made to return in a nearly straight line by throwing it at an angle of 45°; normally it is thrown like the return type and will then travel an immense distance. No accurate measurements of Australian throws are available, but an English throw of 180 yds. has been recorded, compared with the same thrower's 70 yds. with the cricket ball.

The war boomerang in an expert's hand is a deadly weapon, and the lighter hunting boomerang is also effective. The return boomerang is chiefly used as a plaything or for killing birds, and is often as dangerous to the thrower as to the object at which it is aimed.

See Pitt-Rivers (Lane Fox) in *Anthropological and Archaeological Fragments,* "Primitive Warfare"; also in *Journ. Royal United Service Inst.* xii. No. 51; *British Ass. Report* (1872); *Catalogue of Bethnal Green Collection,* p. 28; Buchner in *Globus,* lxxxviii., 39. 63; G. T. Walker in *Phil. Trans.* cxc. 23; *Wide World Mag.* ii. 626; *Nature,* xiv. 248, lxiv. 338, Brough Smyth, *Aborigines of Victoria,* i. 310–29; Roth, *Ethnological Studies.*

BOONE, DANIEL (1734–1820), most famous of American pioneers and backwoodsmen, was born probably on Nov. 2, 1734, near the present city of Reading (Pa.), but moved to the Yadkin valley with his family in his youth. A wagoner and blacksmith in Braddock's disastrous expedition, a wandering hunter and trapper who in 1765 visited Florida and bought a lot intending to settle there, by a strange trick of tradition he has been extolled as the discoverer and founder of Kentucky and has more than any other individual moulded the frontier legend. Many white men had traversed the "dark and bloody ground" before Boone, including John Finley, Boone's guide, Dr. Thomas Walker and Christopher Gist; many land speculators had coveted the fertile forests and plains of Kentucky before Judge Richard Henderson, one of the most enterprising of them, engaged Boone in 1769 to explore the country thoroughly, to assist in negotiating the purchase of the immense tract from the Cherokees, and finally to open up the Wilderness road and escort settlers to the new colony of Transylvania. There is no doubt that Boone displayed immense resource-

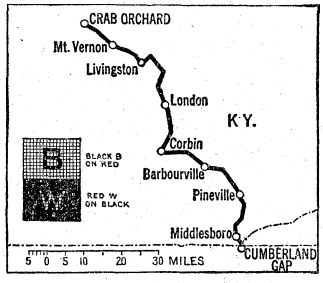
fulness, daring and perseverance in his explorations, in the establishment of the border posts, and in the struggles with the Indians. Henderson himself wrote, "It was owing to Boone's confidence in us and the people's in him that a stand was ever attempted in order to wait for our coming." Nevertheless, the inability of Henderson to have his purchase declared valid and Boone's own carelessness about titles and taxes caused him to lose all the choice tracts which he had marked out for himself and in his old age to seek the open prairies in the Spanish territory west of the Mississippi (at La Charette in the present State of Missouri). Even there, after the Louisiana purchase, his title was found to be defective, although Congress, as a result of his pathetic petition and the intervention of the Kentucky legislature, confirmed the grant with praise for the pioneer who had "opened the way to millions of his fellow men." From it he made occasional long trapping expeditions into Kansas and once (1814) to the Yellowstone. He died in the latter part of September (probably Sept. 26) 1820, even then the object of veneration and pilgrimage. In 1845 his and his wife Rebecca's remains were removed to Frankfort (Ky.), where a monument was erected to his memory. Doubtless the germ of the Boone legend was the so-called autobiography, the production of John Filson; but to it have contributed scores of poets, travellers, novelists, and historians including writers as diverse as Lord Byron in *Don Juan* and the obscure Kentucky versifier, Daniel Bryan, in *The Mountain Muse* (1813).

BIBLIOGRAPHY.—The best biography is that by R. G. Thwaites (1902). S. E. White's *Daniel Boone, Wilderness Scout* (1922) is designed for juvenile readers. *See* also W. H. Miner, *Bibliography of Writings Concerning Daniel Boone* (1901); A. B. Hulbert, *Boone's Wilderness Road* (1903), "Historic Highways of America," vol. vi.; Archibald Henderson, *The Conquest of the old Southwest* (1920); Constance L. Skinner, *Pioneers of the Old Southwest* (1919), "The Chronicles of America," vol. xviii.; and the article by C. W. Alvord in the *American Mercury* (July 1926).

BOONE, a city of Iowa, U.S.A., near the Des Moines river, in the centre of the State, at an altitude of 1,100 ft.; the county seat of Boone county. It is on the Lincoln Highway, is a division point of the Chicago and North Western, and is served also by the Chicago, Milwaukee, St. Paul and Pacific railway. Pop. (largely native white) was 11,886 in 1930 federal census; 1940, 12,373. The surrounding country is one of the richest sections of the corn belt, and is noted for its cattle and hogs and Belgian horses. It has also large deposits of bituminous coal, clay and gravel. There are two producing coal mines on the edges of the city. The leading manufactures are building and paving brick, reinforced concrete pipe, machinery, hosiery, iron implements, refrigerators, meats and vegetables, coolers and ventilators. In 1940 the output of the 22 factories within the city was valued at $4,000,000. Near by on the river is the Ledges state park of 644 ac. The national Swedish old people's home and the state home of the Order of the Eastern Star are situated there.

Boone was laid out in 1865; incorporated as a town in 1866; and chartered as a city in 1868. It was named after Col. Nathan Boone, son of the pioneer and backwoodsman Daniel Boone.

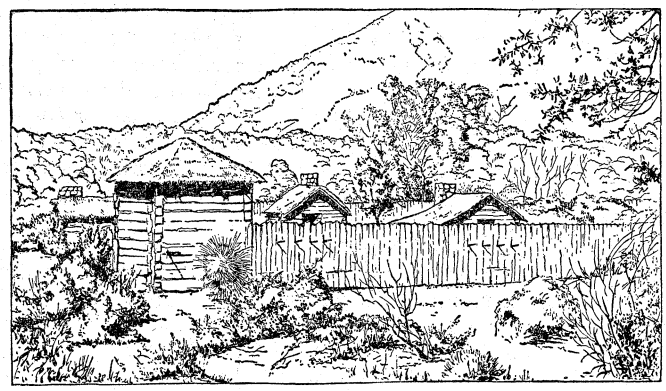
BOONE WAY, a thoroughfare extending originally from Crab Orchard, Ky., to Cumberland Gap, where the States of Kentucky, Tennessee and Virginia meet. Named after Daniel Boone, it is also known as the "Boone Route" or "Daniel Boone Trail," and is about 95m. long, all paved. Later it was planned to extend this interesting highway to Lake Superior and the South Atlantic coast.



BOONTON, a town of Morris county, New Jersey, U.S.A., 32 mi. N.W. of New York city, on the Lackawanna railroad. The population in 1940 was 6,739. It is a trading centre and has paper mills, large silk factories and other industries. The New Jersey firemen's home, established 1900, is maintained there by the state firemen's association.

BOONVILLE, a city in the coal-mining and agricultural region of southwestern Indiana, U.S.A., 17 mi. northeast of Evansville; the county seat of Warrick county. It is served by the Evansville Suburban and Newburgh and the Southern railways. The population in 1930 was 4,208; in 1940 it was 4,526 by federal census. Boonville was founded about 1818 and incorporated in 1858.

BOONVILLE, a city in the central part of Missouri, U.S.A., on the right bank of the Missouri river 150 mi. W. by N. of St. Louis; the county seat of Cooper county. It lies on high



BY COURTESY OF THE UNIVERSAL PICTURES CORPORATION

RECONSTRUCTION OF THE WOOD STOCKADE BUILT IN 1810, THE FIRST STAGE IN THE DEVELOPMENT OF THE CITY OF BOONVILLE

land above the river, and includes a small area in Howard county, across the river, around the northern approach to the fine highway bridge. It is on federal highway 40, and is served by the Missouri Pacific and the Missouri-Kansas-Texas railways. The population in 1930 was 6,435, and in 1940 by the federal census it was 6,089. The natural resources of the region include loess soil on the bluffs, a variety of clays and shales, stone, coal, and other minerals. Among the industries are a chick hatchery, two creameries, a flour mill, a brick plant, sand works, marble works, and the largest corncob-pipe factory in the world. The state training school for boys (1889) and Kemper Military school (1844) are here. There are several Indian mounds in Harley park.

Boonville was settled in 1810, incorporated as a village in 1839, and chartered as a city in 1896. It was named after Daniel Boone. In the pioneer days it was one of the most important trading posts of the region, as traffic to the south-west ascended the Missouri to this point, and then went on by wagon-train over the Santa Fe trail. During the Civil War it was in hotly contested territory, and an engagement took place here June 17, 1861.

BOORDE (or BORDE), **ANDREW** (1490?–1549), English physician and author, was born at Boord's hill, Holms Dale, Sussex. He was educated at Oxford, and was admitted a member of the Carthusian order while under age. In 1521 he was "dispensed from religion" in order that he might act as suffragan bishop of Chichester, though he never actually filled the office, and in 1529 he was freed from his monastic vows, not being able to endure, as he said, the "rugorosite off your relygyon." He visited the universities of Orleans, Poitiers, Toulouse, Montpellier, and Wittenberg, saw the practice of surgery at Rome, and went on pilgrimage with others of his nation to Compostella in Navarre. In 1534 Boorde was again in London at the Charterhouse, and Thomas Cromwell seems to have entrusted him with a mission to find out the state of public feeling abroad with regard to the English king. In 1536 he was studying medicine at Glasgow. About 1538 Boorde travelled extensively, visiting nearly all the countries of Europe except Russia and Turkey, and later making his way to Jerusalem. Of these travels he wrote a full itinerary, lost, unfortunately, by Cromwell, to whom it was sent. He finally settled at Montpellier and before 1542 had completed his *Fyrst Boke of the Introduction of Knowledge,* which ranks as the earliest continental guide book, his *Dietary of Healthe* (printed 1562) and his *Brevyary* (printed 1562). He probably returned to England in 1542. He made his will in the Fleet prison in April 1549.

See Dr. F. J. Furnivall's reprint of the *Introduction* and some other selections for the Early English Text Society (new series, 1870).

BOOS, MARTIN (1762–1825), German pietist, was a Bavarian Catholic priest, who started a movement among Catholics, closely allied to the pietist movement in the Lutheran churches. He pursued his propaganda from about 1799 to 1812 in Austria, but repeated accusations in the consistorial courts compelled him to return to Bavaria, where his enemies followed him. The Prussian Government gave him a professorship at Düsseldorf in 1817, and in 1819 a pastorate at Sayn, near Neuwied. He died on Aug. 29, 1825.

See *Life* by J. Gossner (1831).

BOOT. (1) Profit or advantage (*cf.* Mod. Ger. *Busse,* "penance, fine," and "better," the comparative of "good"). The word survives in "bootless," *i.e.* useless or unavailing, and in such expressions, chiefly archaistic, as "what boots it?" "Bote," an old form, survives in some old compound legal words, such as "house-bote," "fire-bote," "hedge-bote," etc. (*see* ESTOVERS and COMMONS).

(2) A covering for the foot (O. Fr. *bote,* modern *botte;* Med. Lat. *botta* or *bota*). Properly a boot covers the whole lower part of the leg, sometimes reaching to or above the knee, but in common usage it is applied to one which reaches only above the ankle, and is thus distinguished from "shoe" (*see* DRESS and SHOE).

The "boot" of a coach has the same derivation. It was originally applied to the fixed outside step, the French *botte,* then to the uncovered spaces on or beside the step on which the attendants sat facing sideways. Both senses are now obsolete, the term being applied to the covered receptacles under the seats of the guard and coachman. For boot as an instrument of torture, *see* TORTURE.

BOOT AND SHOE INDUSTRY. In the boot and shoe industry the modern tendency is for large firms to expand, and for it to become increasingly difficult for those with small capitals to build up successful businesses. The limit to the growth of large manufacturing concerns does not appear to have been reached in any country, although the daily output has, in some cases, already attained extraordinarily high figures. In America, where the market created by a large population favours the development of big businesses, an output of 130,000 pairs per day of all classes of boots and shoes has been achieved. This total has not been equalled in Europe by any individual firm, although one of the largest has reached a daily output of between 50,000 and 60,000 pairs.

With the machinery available for the production of boots and shoes, the number of operations which need be performed by hand has become so small as to be almost negligible. There is still a limited demand for footwear made principally by hand, but the section of the industry known as the "bespoke trade" which, in the latter half of the 19th century, was flourishing, has been reduced to small proportions and may eventually cease to exist through lack of skilled handicraftsmen. Few are being trained to take the place of those now earning their living at the bespoke trade, and the apprenticeship system, which was formerly a recognized feature of the industry, has been practically discontinued. In the majority of shoe factories apprentices, when taken, are engaged to learn one or more of the important or "key" operations, but the manufacturer does not undertake to teach them how to make a boot from start to finish. Modern factory methods require the use of a different machine for each operation, and the sub-division of production makes it almost impossible to teach individual workers to handle all the machines, even if this were necessary. To ensure that the younger operatives shall have an opportunity to study all sections of the trade, technical schools have been established in all the larger centres of the trade in Britain, and in other important shoe centres in Europe.

Shoe Styles.—Since 1900 there has been a large increase in the demand for light footwear. Although heavy boots are still produced in considerable quantities for artisan wearers, the tendency among all classes is to select the lightest boots and shoes consistent with reasonable wear. This change is attributed partly to a demand for smart and comfortable shoes, but it has been encouraged by the development of passenger transport services which have reduced the amount of walking indulged in by the public, particularly in wet weather and over rough surfaces. The increased use of mechanically propelled vehicles has not, however, caused any loss of trade to the shoe industry because the lighter goods are required in larger quantities per head of the population than the stronger footwear formerly worn. Women's shoe styles first showed a tendency to become lighter and more elaborate in design, and in 1911 footwear was being produced of a type which caused the trade to adopt the phrase "shoe millinery" to describe it. But the vogue of the women's light shoe did not develop fully until 1920 and was influenced chiefly by alterations in dress fashions. At first the continued changes in styles caused much inconvenience to the trade generally, retailers in particular suffering financial losses through stock becoming out-of-date before it could be sold. By the end of 1925, however, the fashion trade was working more smoothly as regards both production and distribution, and the industry as a whole benefited considerably by the extra business it brought. Most of the established methods of making shoes proved adaptable for the production of women's light footwear, but at first the turnshoe system, formerly used principally for the manufacture of dancing pumps, slippers and similar indoor shoes, was most favoured. A method of construction, which provided for the attaching of the sole with a strong adhesive, instead of a sewn seam, was also successfully adopted by many manufacturers.

For the production of light footwear chrome tanned upper leathers, including box calf, willow calf and glacé kid, proved most suitable. These leathers can be produced in a wide range of qualities, substances and colours and have a bright finish, besides being soft and pliable. They are used for both men's and women's footwear and have replaced oil-dressed leathers except for the heaviest boots. Patent leather which had long been used for the uppers of shoes became even more popular when the fashion trade increased, and new types of washable leathers in calf and kid were also introduced. These had a bright waterproof finish somewhat similar to patent leather, but the finish, being transparent, allowed the grain and colour of the leather to appear. Many fancy leathers, not formerly considered suitable for footwear, were also used for the higher-grade shoes, but owing to the limited supplies and consequent high cost they could not be employed freely for cheap goods. Leathers with unusual grains and colours were produced from a variety of reptile skins, including Indian and Java lizards, pythons and other snakes with sufficiently large and well-marked skins. Ostrich skins, shark and various fish skins were also dressed for the shoe trade. The leathers with the most attractive grains were closely imitated by printing and embossing calf and other skins, and these imitations were found useful for the manufacture of the cheaper fancy shoes. For boot soles leather similar to that used for this purpose for many centuries is still the most popular, but a few innovations have been made, notably the waterproof sole leathers which are produced by various processes, the chief among which is a special method of chrome tanning. The use of rubber in various forms for soles has increased, and for sports shoes natural crepe rubber and vulcanized rubber soles are commonly used. A number of compounds made of rubber mixed with fibrous material such as cotton, or a suitable mineral filler, have been produced for use as boot soles and have met with a moderate sale. Most of the compounds are waterproof and wear as well as, if not better than, medium quality leather. They have been used chiefly for the soles of medium to heavy-weight boots and can be sold at prices which enable the producers to compete with tanners of sole leather suitable for this class of footwear.

Production.—The census of production taken in Great Britain in 1924 showed that the output of the British shoe industry in that year was 117,456,000 pairs, valued at £47,427,000. In 1907 when the preceding official census was taken the output was 97,440,000 pairs, valued at £19,874,000. These figures included boots and shoes made wholly or mainly of leather, footwear with canvas uppers, slippers of all kinds and boots and shoes made of

all other materials except rubber. The number of workers engaged in the industry was 147,300 in 1924 and 124,800 in 1907. A large proportion of the output was sold in the home market, the exports to all countries being only 17·7% of the men's footwear and 12·1% of the women's and children's goods made chiefly of leather. In the case of boots and shoes made of materials other than leather (principally slippers of felt and similar fabrics) the exports were less than 4% of the number made.

The shoe industry of the United States has the largest output of any country in the world. Statistics compiled in 1927 from reports supplied by manufacturers to the Government's Department of Commerce showed that the total production of all classes of boots and shoes, except those of rubber, was 343,605,905 pairs. The number of workers engaged to make this quantity was more than 210,000, and they were employed in 1,460 factories. The value of the goods they produced was more than $930,000,000 and they received as wages $225,788,000. Of the total produced 8,000,000 pairs were exported. A little over 3,000,000 pairs were imported.

A segregation of the 343,605,905 pairs of shoes produced in the United States in 1927 from January to December inclusive, shows the proportion (in pairs) of various types as follows: Men's 95,328,098; women's 116,258,866; boys' and youths' 24,229,296; girls' and children's 39,649,961; infants' 24,541,551; total of leather shoes, 300,007,772; athletic and sporting, 2,477,519; canvas, satin and fabric, 3,301,433; slippers, 29,158,122; all others, 8,661,060.

The comparatively small export trade transacted by the larger shoe producing countries is due in some degree to the perfection of modern machinery. Where there is a market for shoes, factories are usually to be found which can supply a good proportion of the demand. In the British dominions, including Canada, Australia and South Africa, shoe manufacturing has been introduced and under the protection of import tariffs has been carried on successfully during the period required to get the industry firmly established. The machinery available allows rapid training of unskilled labour to perform many operations, and competent workers can be obtained from other countries to carry out the processes for which trained operatives are essential. Under expert management these factories have been able from their commencement to produce marketable goods in sufficient quantities to obviate the necessity of importing all the boots and shoes required, and the output has improved in quality in proportion to the length of time that the industry has been carried on. (*See* also BOOT AND SHOE MACHINERY.)

See E. J. C. Swaysland, *American Methods of Boot and Shoe Manufacture* (Northampton, 1906); F. Plucknett, *Boot and Shoe Manufacture* (1916); T. Wright, *The Romance of the Shoe* (1922).

(F. T. B.)

BOOT AND SHOE MACHINERY. During the last 30 years shoemaking has undergone a complete change, due to the marked progress of mechanical equipment. Keen competition and close co-operation between Britain and America have greatly stimulated development, which to-day must closely follow the dictates of fashion as well as produce bulk with certain and absolute uniformity.

The complex characteristics of shoemaking, the different types of footwear, alternative methods of making, and innumerable completely distinct operations resulting from great subdivision of labour, have made necessary a range of machines differing fundamentally in design and performance and varying greatly in type to an extent equalled in no other industry; very many different machines are used in the making of a single welted shoe; other types of footwear need equally distinctive machines. Machines are grouped into separate departments for distinctive work. Those which deal with the cutting, preparing and assembling of the upper are the clicking and closing departments. The bottom stock department cuts and prepares soles, insoles, etc., and includes the making of heels, stiffeners and welts. The section where the uppers and bottoms are assembled on the last and permanently joined is the making room, and the finishing department produces results that are not only attractive but necessary.

Upper Machinery.—While the greater proportion of upper components is cut by hand in Britain, many standard shapes and a greater number of fittings, *i.e.*, tongue, backstraps, etc., are cut on a clicking press, a machine of the single revolution type, which presses a shallow knife through the leather on to a fibre or wood block. Machines for producing decorative features are numerous. Perforating is done on a machine which makes a distinctive design at one blow, or, alternately, on a machine with one punch holder, for giving a running design as the work is fed through. Involving these same general principles, folding machines are used for turning in and folding back the edges of vamps, caps, etc., after these have received a preliminary skiving and cementing. This produces a very attractively finished edge. Closing machines for sewing the upper components together attain speeds up to 4,000 revolutions per minute and vary in type. There are "flat," "cylinder" and "post" machines, indicating the style of table over which the work is fed. There are chain-stitch and lock-stitch machines to sew one, two or four rows, with adjustments to vary the length of stitch, and some are fitted with under-trimming mechanism, so that the margin from edge to stitching is maintained uniform throughout.

Button-holing is done on a machine capable of cutting and working 22 holes per minute, and a button sewing machine will automatically feed and attach with 16 stitches to each, approximately 60 buttons per minute. Eyeletting and hooking machines are similar in operation. Eyelets, fed from a rotating hopper, gravitate along a chute into holes punched and spaced automatically, and are then clinched. To hold eyeletted uppers in position for lasting, these are temporarily laced by a machine which will tie over from one to four pairs of holes, and at the same time securely knot the thread.

Bottom Stock.—Soles, middlesoles and insoles are pressed out. A most widely used machine is the revolution press, a quick action machine with a heavy beam. The cutting block is of wood or compressed fibre, and shaped knives 4 in. deep are used. The beam descends on to a 4 in. deep knife upon the operator tripping the machine, the knife being moved along after each cut. Soles, etc., are frequently cut to a standard pattern and later trimmed to a particular shape on the rounding machine. A clamp holds sole and wood pattern in position while a knife, with its cutting edge level with the sole, and held to the former by a spring, traverses the complete periphery, giving the desired shape and a square edge. A stamping machine used for recording size, fitting shape, tannage and other information will give 10,000 different markings and maintain a uniform depth of impression irrespective of substance. Channelling machines play an important part in the preparation of soles and also welted insoles. Outsoles are prepared by having an oblique incision or a groove cut parallel to the edge of the sole in which the stitches are buried when the sole is attached, a channelling knife being used to suit the type of seam to be made. In preparing the welt insole an entirely different machine of more intricate design is needed to cut an inside channel and an outside lip at the same time, and with such accuracy that the substance between these two channels is maintained uniform. Subsidiary machines open these channels and perform other minor operations. Sole and insole moulding machines are commonly used with various types of shoes, and particularly women's, where more extreme shapes are met. A preliminary shape is given by this machine, which, using vertical pressure, actuated by toggle motion, moulds the sole to the shape of the last between upper and lower moulds. The machine is alternating, one mould being fed while the other is under pressure.

Heel Building Machines.—Heel lifts and top pieces are generally blanked out on a small press similar to the clicking press. A rand, or bevelled strip of leather, is sometimes attached to the seat lift by a tacking machine, which also employs a slashing knife to facilitate the conformation of the flat strip to the curved outline of the heel. The heel building machine itself carries a mould into which the lifts are fed and held in position while nails are driven at one blow. Heels are compressed on a powerful machine, and acting automatically, as one heel is fed the previous one is ejected. The top piece is generally attached with a slugging

machine, which takes its name from the kind of nail used. This is a length of wire cut from a coil and with no head or point. The "breasting" of the front of the heel is done with a gouge of the required curve fixed to a machine with an adjustable table which enables the correct angle of cut to be obtained.

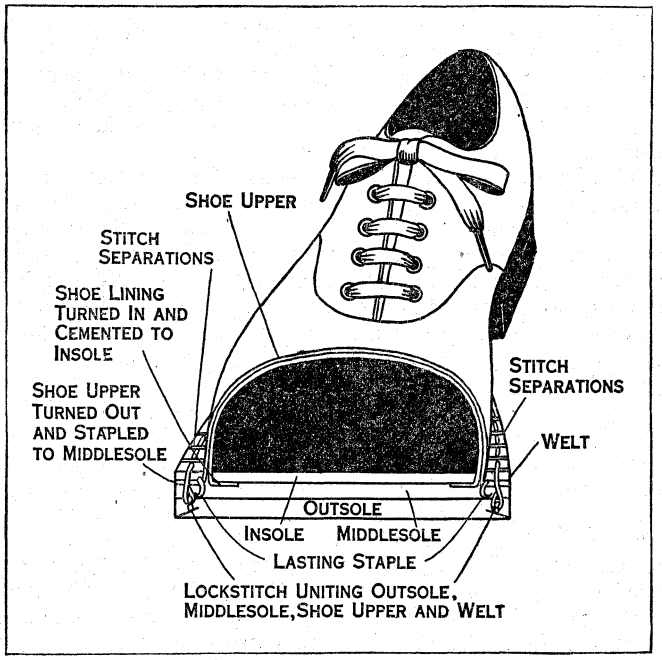
Assembling and Making Machinery.—The operation of pulling over is performed on a machine of ingenious design and great precision. It is to this machine that the insoles and uppers are brought, assembled on the last, with stiffener and toe puff in position. The upper is gripped by three or five pincers, one or two on each side of forepart and one in centre at toe, and tension is applied to draw it tightly over the last after it has been straightened to the satisfaction of the operator by the manipulation of various convenient adjustments. The pull on the pincers is adjustable to suit the lightest fabric or toughest leather, is applied steadily, and is sensitively controlled by an oil buffer. In the second cycle five or seven tacks are driven through upper and insole, retaining the whole in position. The tacks are delivered to the required position by an air blast, which blows them point foremost through conducting tubes, the timing being in perfect unison with the whole sequence of movements. The machine is wonderfully adaptable, admitting all sizes from children's to men's. The lasting machine used in conjunction with the above completes the work as it was formerly performed by hand. The machine uses a single twisting pincer which pleats the surplus upper drawn over the last, and drives tacks delivered from a rotating tack pot. The pounding up machine hammers the tacks home and grinds to a level the bunched upper at the toe. Operations now vary according to the type of shoes and consequently the machines also. Important methods of making shoes include welt, machine sewn, turnshoe, veldt, littleway, etc. Dealing with the two first mentioned, the foregoing operations are all performed mechanically, but only the chief machines are described. After lasting, the surplus upper is removed, staples of fine wire substituted for the lasting tacks, which are withdrawn in order to offer no impediment to the needle of the welt sewing machine. This machine makes a horizontal seam, in which respect it imitates the work of the hand welt sewer. Making a chain stitch of three or four to the inch it uses a curved needle and produces a tight horizontal seam, through welt, upper and the insole lip. A channel guide indicates the point where the needle will pierce through, and helps to steady the work. A hot waxed thread is used and the machine is heated by steam or electricity. Each stitch is pulled tight, regardless of the substance of the material or variation in speed of machine. Surplus material is closely trimmed on a machine specially designed to obviate damage to the seam. The welt is beaten out flat. The machine used for this purpose carries a reciprocating hammer and incorporates a slashing knife for assisting round the toe. The ends of the welt are both skived off simultaneously to any desired angle, and two tacks driven to hold permanently in position on a welt butting and tacking machine. The bottom is filled, shank inserted and sole attached. The shoe, with the last in, is placed under pressure in the sole-laying machine to cause the sole to follow closely the contour of the last. The rounding and channelling machine performs an important work. It roughly trims the edge of the sole, and at the same time cuts a channel parallel to the edge to receive the stitches. An arrangement of adjustable guides mechanically determine the finished shape or contour, which is cut by a chisel-shaped knife. A high speed lockstitch sewing machine, with totally-enclosed mechanism and a needle automatically lubricated, is generally used for fastening the sole to the welt, in which uniformity and tightness of stitches is of paramount importance. The needle and shuttle threads are gummed or waxed and the machine is heated by steam or electricity. After lasting and pounding up as previously mentioned the shank is inserted, and the sole temporarily attached by a wire grip tacking machine, which cuts, points, and drives any desired length of headless tack from a coil of wire. The permanent attachment in this type of shoe is then made direct through sole and insole, taking in the lasted upper at the same time. The shoe with last removed is placed on the horn of the improved Blake sewing machine, and the needle or hook which combines the duties of awl and needle, pierces the sole so that the barb of the hook projects through the insole, where it takes up the thread passed through the horn. A waxed or gummed thread is used and the machine is generally heated by gas. A chain or crochet stitch is made, each tightened by its successor, the length being variable from three to seven to the inch. Metallic fastenings of various kinds are used for permanent attachment on some classes of shoes. One of these is made by the rapid screwing machine, which, using a coil of steel or brass wire, threaded with a regular pitch, automatically cuts off and clinches at the correct length the screws with which it secures at the rate of 250 per minute at a regular and adjustable spacing. Levelling the bottom is an operation common to most types of footwear. Two distinct types of machines are employed. The roller type uses a rapidly-vibrating roller which sleeks the bottom of the shoe while on the last, pressure being applied successively over the whole surface. The direct pressure type operates with a crank motion, an iron foot on which the shoe is placed swinging under a mould of particular shape. Later developments of this pattern have produced a machine equally effective with work on or off the last which, by a peculiar rocking motion, embodies the advantages of both types. In each case the alternating design admits of one shoe being under pressure while the other is removed and replaced. Machines for attaching heels are stoutly built to withstand the great pressure that is necessary to drive up to 16 nails either from inside or outside the shoe. Automatic nail loaders are attached which replace the required number of nails into the attaching stand ready for the next heel. Any desired pressure can be uniformly applied, the nails being driven by two distinct blows which eliminate the possibility of springing back. Machines have been specially designed for the fitting of Louis and other wood heels. One automatically gauges shoes for correct position from the actual heel.

Finishing Machinery.—High speed ball bearing machines for trimming, scouring and polishing, constitute the major group for this section. When necessary they are provided with means for exhausting dust. The rough heel is trimmed to shape on the heel trimming machine which carries two cutters, moulded to the reverse shape of the heel, in the rotating head, which automatically adjusts itself to variations in height of heel. Edge trimming machines produce the shape of the finished edge of foreparts and waists with specially formed cutters which are readily interchangeable. The latest machines include reciprocating planing knives which blend the juncture of the heel and waist trimming. Marked features of these trimming machines are their solidarity, eliminating vibration, and their convenience of operation. Scouring and buffing machines for smoothing the surface of heels and bottoms are similar in general principles, differently shaped rolls of various types, covered with sandpaper, or other abrasive material that can be quickly replaced, being mounted on shafts speeded to give a uniform velocity. Edge setting is a process that requires pressure and friction, and the automatic edge setting machine has been designed to perform this heavy duty entirely mechanically. The shoe is clamped in a travelling jack, the movement of which is controlled through hydraulic action, while a rapidly vibrating heated tool is forced against the edge with uniform pressure which can be varied to suit the lightest or heaviest work. The machine adapts itself to all sizes and represents the furthest step yet made toward automatic shoemaking machinery. Heated machines employing metal or other rolls, burnish heels and bottoms, distributing a film of wax over the surface, and others emboss the sole with trade mark or price, scour and repair the surface of patent leather, and withdraw the last.

With the more universal employment of electric power, many machines have been designed to embody their own individual motors, and this policy is being continued, so that the arrangement of a complete plant may shortly be unaffected by limitations prevalent to-day because of the restricted means for driving. Machines which require heat are also being adapted to the use of electricity, and the extensive use of ball bearings is making a marked reduction in running costs. Close attention is being paid to the incorporation of safety devices and progress will probably lean toward the introduction of more completely automatic machinery.

(C. Be.)

Machinery in the United States.—In the making of some types of shoes there are required as many as 210 handlings after the order is received in the factory, embracing as many as 174 machine operations, 154 of which are performed on different machines, there being a duplication in only 20 instances. There are, in America, six manufacturing methods, standard screw, McKay sewed, Goodyear welt, Goodyear turned, littleway and stitchdown, utilizing various types of machines. The standard screw method is used almost entirely for reinforcing certain portions in the heavier and more rugged types of soled shoes. The McKay sewed shoe method was still in wide use in 1928 having an extended field through the advent of the types of close edged soles in imitation of the appearance of the turned shoes. The turned shoe is made as its name implies, wrong side out, and as it has no insole, it is very flexible. It is a type which was very popular in the light-soled dainty slippers of the period beginning back at least in the 14th century and which has continued up through 1928. The most distinctive American methods are the stitchdown and the Goodyear welt. The stitchdown differs in principle from others in using an insole tacked to the bottom of the last, the shoe upper being drawn over it. The lining is cemented to the surface of the insole. A second middle sole is laid, larger in size and cemented to the insole. The outsole is cemented to this middle sole and the stitching machine unites outsole, middle sole, shoe upper and a small welt is fed through the machine to make a complete union of these different members, the welt being used to give greater security to the stitch and also to bring the thickness of the sole up to the level of the surface of the insole. The Goodyear welt shoe is probably more widely worn than any other, it being adapted to the greatest range of uses. Most men's shoes at the present time, in America particularly, are made by this process and up to 1928 it was still very widely used in producing women's shoes, as well as those even for children and infants. When an order is received at a factory

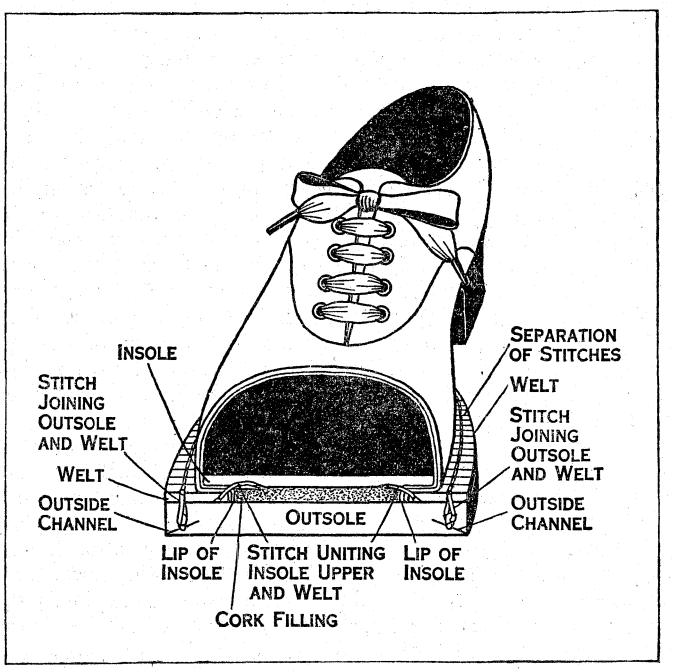


FROM "THE BOOT AND SHOE RECORDER"

CROSS SECTION OF A STITCH DOWN SHOE

using the Goodyear welt method, the details regarding all of the material are carefully written out on tags, one of which usually goes to the division of the factory known as the cutting room and contains those details regarding the kind of leather, colour, the design to be employed, the number and sizes to be made. After the parts have been cut out by means of thin steel dies they are then sent to the stitching room and are there fashioned into the complete shoe upper with all of the various linings, stays, buttons, facings, eyelets and other parts which are required. On the completion of this work the shoe uppers are sent to the bottoming room and soled. The insole is first channeled by a machine which cuts a little slit along the edge and on the one which extends toward it. These lips are afterwards turned up so that they stand out at a right angle to the surface of the insole in order that the greatest strength and flexibility may be achieved.

Fabrication.—The insoles which are then the exact size and shape of the bottom of the last are tacked in place. The shoe

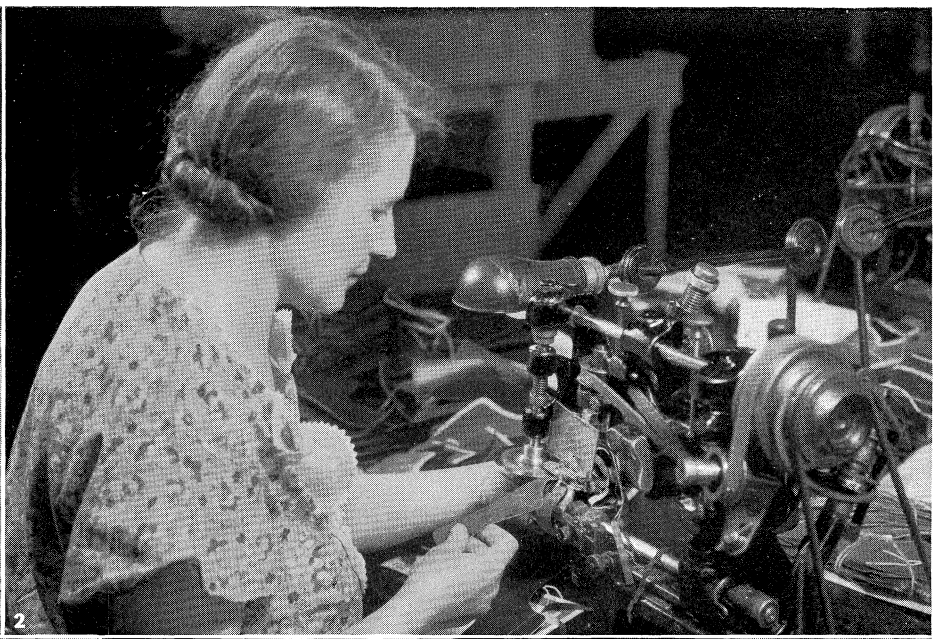


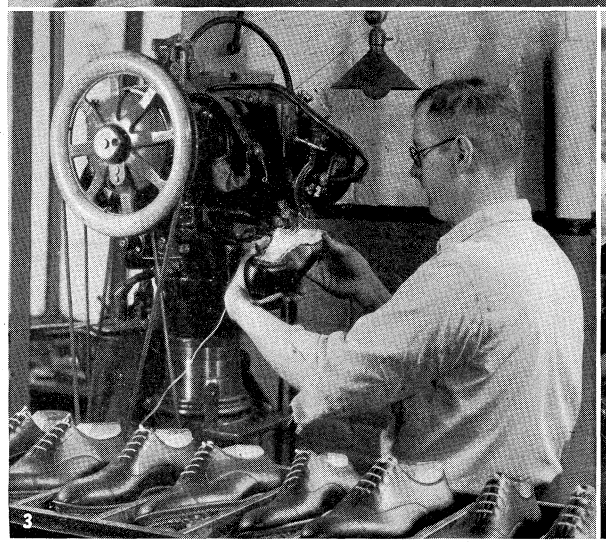
FROM "THE BOOT AND SHOE RECORDER"

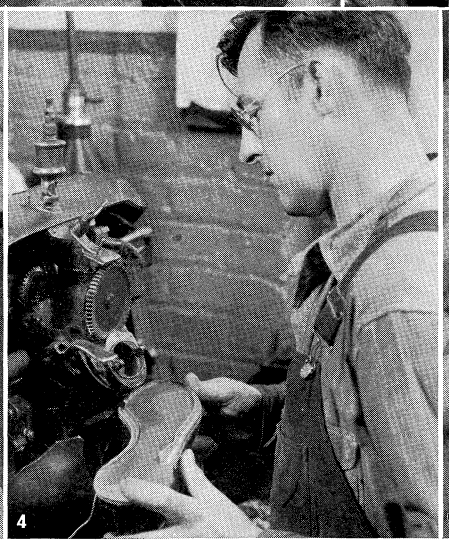
CROSS SECTION OF A GOODYEAR WELT

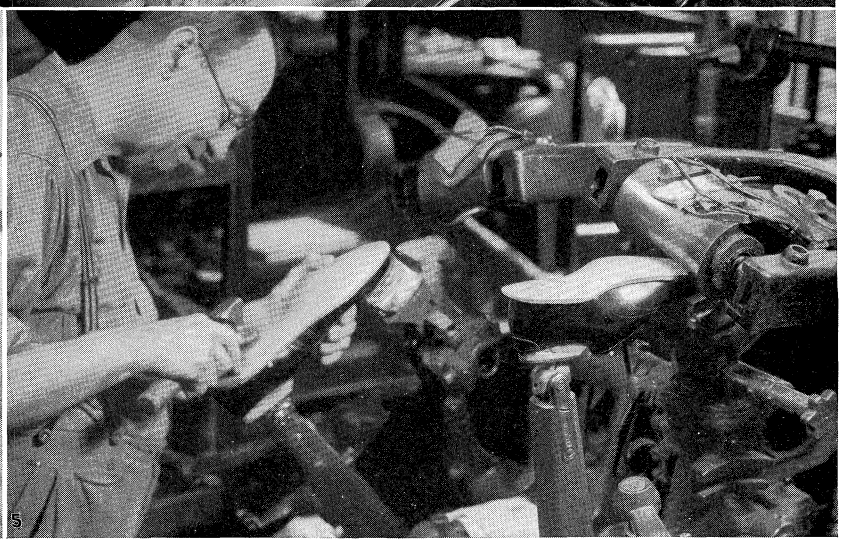
upper is assembled, the operator in this case placing the counter in its proper position between the lining and the foxing in the heel portion of the shoe, as well as the toe box which gives permanent form to the toe of the shoe, putting the back seam of the shoe upper in correct position on the heel of the last. In the stitching room the shoe uppers are laced in order that they may be held in proper position on the last. A machine laces them and automatically ties a bow knot. The assembled shoe is then presented to an assembling machine and two tacks are driven, one just beside the back seam and one just over the edge of the insole at the heel, holding the shoe upper securely in place at these points. The shoe is then pulled over by a machine which permits the operator to adjust quickly the position of the shoe upper on the last so that the shoes have toe caps which are square across and of the proper length in each instance. Prior to the use of this machine this was one of the most difficult operations in shoe production. The operator corrects the position of the shoe upper and the sides of the shoe are then lasted. The toe and heel are next lasted, tacks being driven at the heel and toe, held in place temporarily by wire which lies in the crimp of the leather. There then follows another stapling machine which staples the toe portion to the lip of the insole so that the wire may be removed. These staples have made negligible the large loss which formerly accrued through the breaking of needles and cutting of thread. The surplus portion of the shoe upper and lining are now trimmed away and the welt is sewn. It is a narrow strip of leather sewn from a point beginning at the breast of the heel on one side to a like position on the opposite side of the shoe, going around the forepart. The curved needle in the machine enters the welt and then pierces the shoe upper, the lining and the lip with its canvas reinforcement on the surface of the insole. It does not go inside the shoe. There is then spread over the surface of the insole a material generally made of ground cork and rubber cement to make up the difference in height occasioned by the addition of the welt. This serves as a cushion under the foot and with it there is generally placed the shank piece which is intended to give permanent form to the shank of the shoe. Tacks are withdrawn









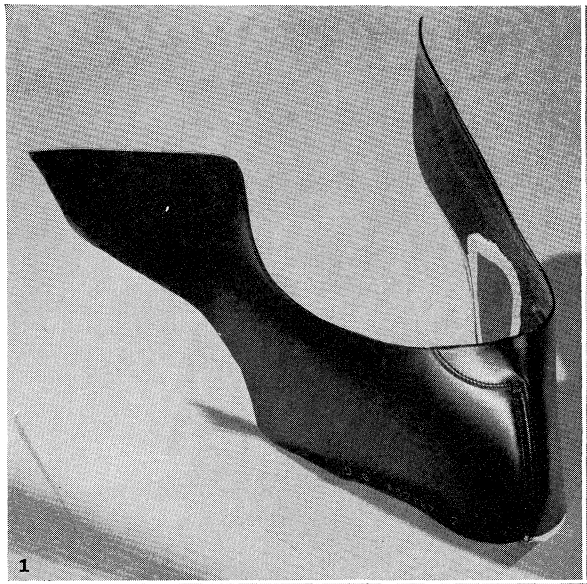


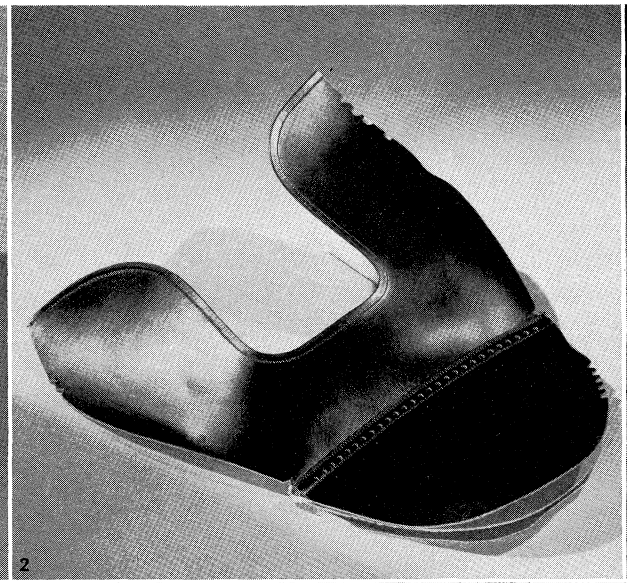
BY COURTESY OF THE FLORSHEIM SHOE COMPANY

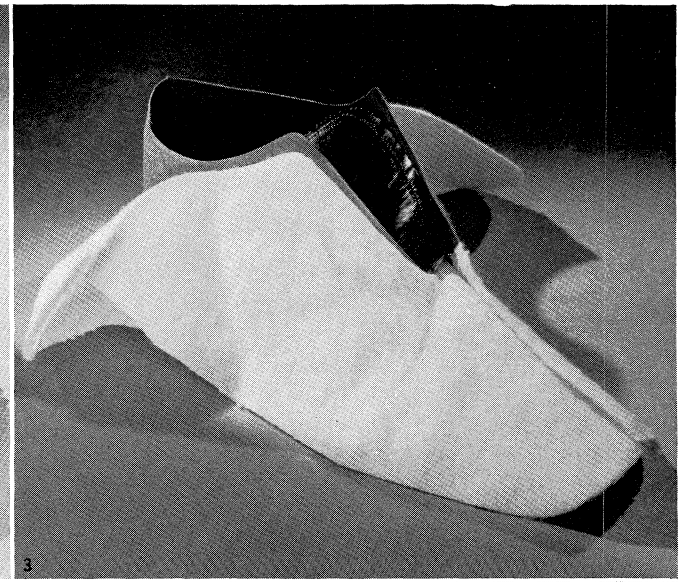
PROCESSES AND MACHINERY USED IN THE MANUFACTURE OF SHOES

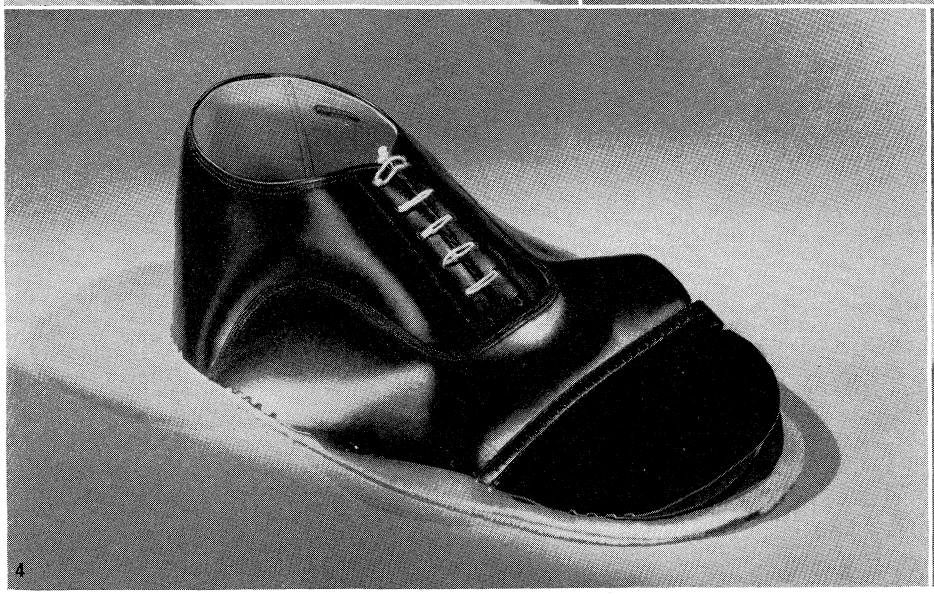
1. Cutting the leather for the upper part of the shoe, a highly skilled manual operation done with a knife around metal-bound patterns
2. Skiving machine, which bevels down the various edges of the upper leather so that they may be stitched together neatly
3. After the upper leather is stitched together, the lining and tongue attached and the completed upper pulled over the last to be joined to its insole, the shoe passes to the welt sewing machine (illustrated). Here the welt is joined to the upper and the insole in a single operation
4. Stitching machine which lockstitches the sole to the welt
5. Heavy-pressure rollers "level" and shape the sole. The shoe is now ready for heeling and finishing

BOOT AND SHOE MACHINERY









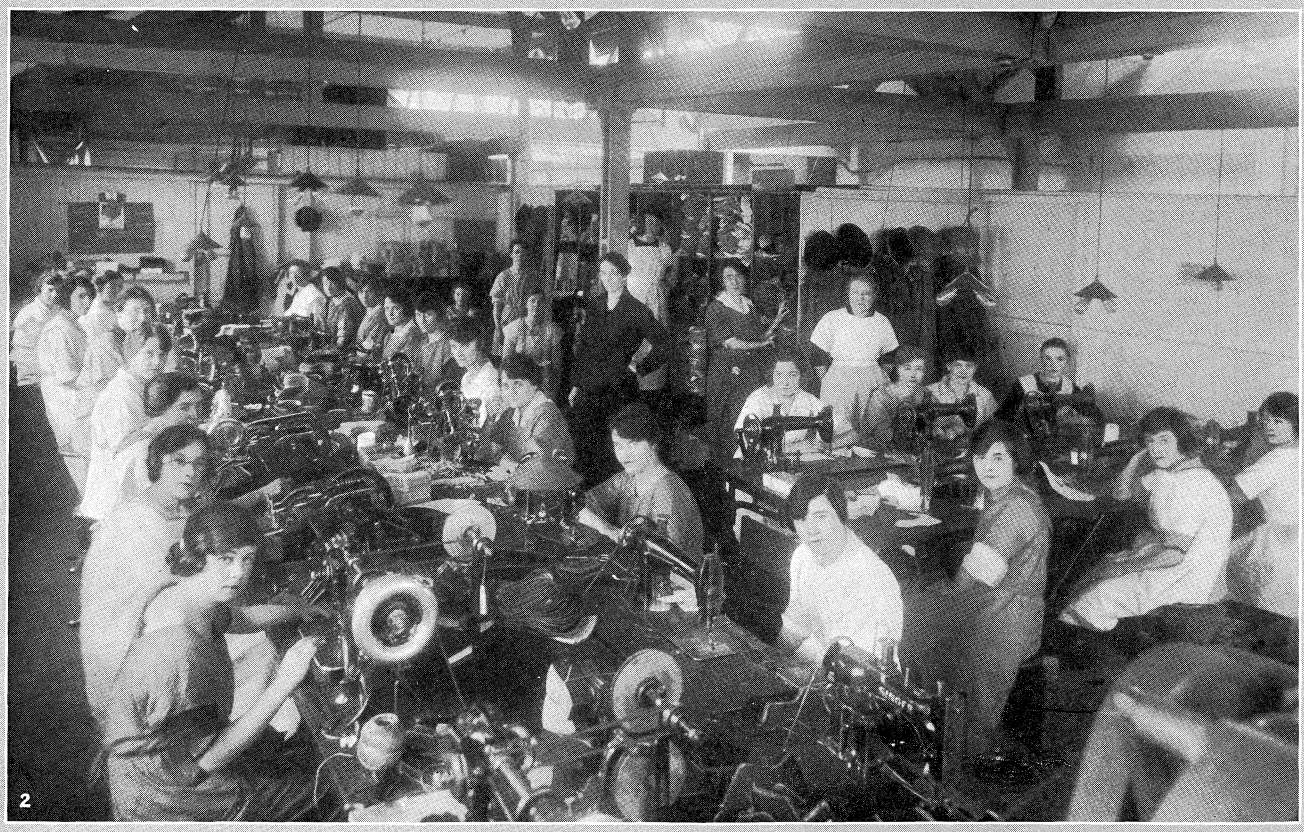


BY COURTESY OF THE FLORSHEIM SHOE COMPANY

A SHOE IN VARIOUS STAGES OF MANUFACTURE

1. The completed top
2. Vamp and tip ready for assembling to the top
3. A finished lining, with tongue attached
4. Completed upper ready for joining to insole (lasting)
5. Shoe immediately after bed lasting, before welt, sole and heel are attached





BY COURTESY OF (1) THE FLORSHEIM SHOE COMPANY, (2) FREEMAN, HARDY AND WILLIS, LTD.

FITTING ROOMS IN THE SHOE INDUSTRY

1. Fitting room in an American factory, where the upper parts of the shoe are stitched together

2. A British factory's fitting (or closing) room, with its batteries of sewing machines and other apparatus

at this time from the forepart of the shoe, and the surface of the welt and the filling are given a coat of rubber cement and the heavier insole which is cut to the required shape is also coated with rubber cement. The sole is laid or pressed into place in proper position by a machine which has one shoe under pressure while the other is being prepared. The shoe is then rounded, the edges being cut to the required shape and the shoe is given its style. The shape of the sole and its relation to the lasted shoe is of great importance. Incidental to this operation the machine cuts a little channel in the edge of the sole which is afterwards turned back by a machine in order that there may be a clear path for the needle of the stitching machine which unites the outsole to the welt. The thread used is very strong and is coated with hot wax, beng maintained in that condition until it is actually set in the leather. The channel is coated with rubber cement and a machine rubs the lip down smoothly to conceal the stitches. The shoe is then levelled by rolls under heavy pressure, rolling out any unevenness which may be in the forepart of the shoe. The heel portion of the outsole is then nailed in place, the nails going through the outsole and clenched against the steel heel piece on the last. Many have rubber top lifts attached to them. The nails in most men's shoes with leather heels are all driven at one time and are clenched against the steel bottom of the last. The rough lifts of the heel are then trimmed to the required shape by means of the rapidly revolving knives of a trimming machine and the breast of the heel is cut to the required shape by a downward thrust of a knife, the movement of which is very accurately gauged. By various scouring operations the breast of the heel is brought to a smooth surface. Then follows a machine which blacks the heel, followed by another machine which coats the surface with hot wax and burnishes it to a lasting finish. The forepart of the shoe is also treated and trimmed very smoothly to the required bevel and shape by rapidly revolving knives on the trimming machine, two cutters being used, one for the forepart and one in the shank where the bevel is changed. These edges are also coated with wax and are burnished by means of hot irons electrically heated, vibrating very rapidly. The bottom of the shoe is then buffed, all the stains gathered in the manufacturing process being removed by rapidly revolving wheels covered with abrasive. The shank of the shoe receives special treatment on a machine on which there are two pads revolving as rapidly as 7,500 times per minute, cooled by a pressure of air from a pump which is a part of the machine. There follow a variety of waxings and finishing operations varying with the type of the shoe. The treeing machine is then employed for ironing out wrinkles and removing any stains on the shoe, and after a final brushing and careful inspection the shoes are ready for packing and shipment. (A. D. An.)

BOÖTES, a constellation of the northern hemisphere (Gr. *βοώτης*, a ploughman, from *βοῦς*, an ox). The ancient Greeks symbolized it as a man walking, with his right hand grasping a club, and his left extending upwards and holding the leash of two dogs, which are apparently barking at the Great Bear. The brightest star is Arcturus (*q.v.*). Another interesting star is *ε Boötis*, a beautiful double star composed of a yellow star of magnitude 3, and a blue star of magnitude $6\frac{1}{2}$.

BOOTH, BARTON (1681–1733), English actor, who came of a good Lancashire family, was educated at Westminster school, where his success in the Latin play *Andria* gave him an inclination for the stage. He was intended for the church; but in 1698 he ran away from Trinity college, Cambridge, and obtained employment in a theatrical company in Dublin, where he made his first appearance as Oroonoko. After two seasons in Ireland he returned to London, where Betterton gave him all the assistance in his power. At Lincoln's Inn Fields (1700–04) he first appeared as Maximus in *Valentinian,* and his success was immediate. He was at the Haymarket with Betterton from 1705 to 1708, and for the next 20 years at Drury Lane. Booth died on May 10, 1733, and was buried in Westminster Abbey. His greatest parts, after the title-part of Addison's *Cato,* which established his reputation as a tragedian, were probably Hotspur and Brutus. His Lear was deemed worthy of comparison with Garrick's.

See Victor, *Memoirs of the Life of Barton Booth* (1733); Cibber, *Lives and Characters of the most eminent Actors and Actresses* (1753).

BOOTH, CHARLES (1840–1916), English shipowner and sociologist, was born at Liverpool. In 1862 he became a partner in Alfred Booth and Co., a Liverpool firm engaged in the Brazil trade, and subsequently chairman of the Booth Steamship Co. He devoted much time and money to enquiries into the statistical aspects of social questions. The results of these are chiefly embodied in a work entitled *Life and Labour of the People in London* (1891–1903), of which the earlier portion appeared under the title of *Life and Labour* in 1889. The book is designed to show "the numerical relation which poverty, misery and depravity bear to regular earnings and comparative comfort, and to describe the general conditions under which each class lives." It contains a striking series of maps, in which the varying degrees of poverty are represented street by street, by shades of colour.

Booth also paid much attention to the lot of the aged poor. In 1894 he published a volume of statistics on the subject, and, in 1891 and 1899, works on old-age pensions, his scheme for the latter depending on a general provision of pensions of 5s. a week to all aged persons, irrespective of the cost to the State. He was a member of the Royal Commission on the Poor Law, from which he had, however, to retire for reasons of health, but he made important recommendations, which he published separately as *Poor Law Reform* (1910). He was made a privy councillor in 1904. Booth married, in 1871, Mary Macaulay, a granddaughter of Zachary Macaulay. She was the author of *Charles Booth, a Memoir,* published anonymously in 1918.

BOOTH, EDWIN THOMAS (1833–1893), American actor, second son of the Anglo-American actor Junius Brutus Booth, was born Nov. 13, 1833 at Belair, Maryland. His father (born London 1796) removed to America in 1821. There he became a great favourite upon the stage, renewing the successes he had achieved in London, where he was regarded as a serious rival to Edmund Kean.

Edwin Booth's first appearance was made at the Boston Museum on Sept. 10, 1849, as Tressel to his father's Richard III., in Colley Cibber's version. But it was not until after his parent's death in 1852 that Edwin won renown for himself. His first New York appearance was as Wilford in *The Iron Chest* at the National Theatre in Chatham Street, Sept. 27, 1850, and a year later, on the illness of his father, Edwin took his place in the character of Richard III. Between 1852 and 1856 he played in California, Australia and the Sandwich Islands, and from this time his dramatic triumphs were warmly acknowledged.



AFTER THE STATUE BY QUINN IN GRAMERCY PARK, NEW YORK

EDWIN BOOTH AS HAMLET, ONE OF HIS MOST SUCCESSFUL STAGE RÔLES

Thus early successful, in 1862 he became manager of the Winter Garden Theatre, New York. There he presented a series of Shakespearean productions of then unexampled magnificence. There the three Booth brothers, Junius Brutus (1821–1883), Edwin and John Wilkes (1839–1865), played together in a memorable performance of Julius Caesar, and later, from Nov. 26, 1864, to March 22, 1865, Edwin played Hamlet consecutively for one hundred times. The splendour of this period in his career was dashed for many months when in 1865 his younger brother, John Wilkes Booth, assassinated President Lincoln. This caused his retirement until January 3, 1866, when he reappeared with success at the Winter Garden as Hamlet.

In 1868 Booth built a theatre of his own, Booth's Theatre, at the corner of 23rd Street and Sixth Avenue, New York, and organized an excellent company of actors. Here he produced practically his own entire repertory, Shakespearean and otherwise. At

this time he used the true text of Shakespeare, and thus antedated by many years a similar reform in England. Almost invariably his ventures were successful, but injudicious direction of financial affairs took away from him the structure he had raised (1874), and with it went his entire personal fortune. By arduous toil, however, he again accumulated wealth.

In later life Booth formed partnerships, which brought artistic distinction to the theatre and success to him and to his associates, with Lawrence Barrett and Helena Modjeska. He played with Madame Ristori in 1885, and during April and May 1886 he and Tommaso Salvini appeared together in *Othello* and *Hamlet*. In 1861 he had played in London, which he revisited in 1880 and in 1882, playing there and in the English provinces with much success. At the invitation of Henry Irving he alternated Iago and Othello with him at the Lyceum Theatre, London. He also visited Germany in 1882, where his acting was received with the highest enthusiasm. This success he regarded as the summit of his artistic achievement. He was supported by a German troupe. His last appearance was as Hamlet, in 1891 at the old Academy of Music, Brooklyn, N.Y. He died on June 7, 1893.

The record of Booth's achievements and the testimony of his time bear witness to his undeniable genius as an actor, especially in tragic rôles, for which his personality, voice and appearance were eminently fitted. His place is secure with the greatest in the long line of Shakespearean tradition. Booth, for the most part, confined himself to playing Hamlet, Macbeth, Lear, Othello, Iago, Brutus, Shylock, Wolsey and Richard III., of Shakespeare; and to "Richelieu" by Bulwer Lytton, Bertuccio in Tom Taylor's "The Fool's Revenge," and John Howard Payne's "Brutus."

Despite its professional high-lights the course of Booth's life was sad and tragic, shadowed as it was with exceptional sorrows and reverses. Their effect upon his sensitive nature was to make him more aloof and retiring. He converted his residence at 16 Gramercy Park, New York, into a club, The Players, and presented to it in perpetuity the house, with all his books and works of art.

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Portraits.—In civilian dress by John Singer Sargent, at The Players; as *Richelieu* by Hon. John Collier, at The Players; as *Hamlet* by Oliver I. Lay, at The Players; as *Iago,* by Thomas Hicks, at The Players.

Bust.—As *Hamlet,* by Launt Thompson, at The Players; *Edwin Booth,* by Edmond T. Quinn, placed in the Hall of Fame.

Statue.—As *Hamlet,* by Edmond T. Quinn, erected in Gramercy Park by The Players, November 13, 1918. (W. HAM.)

BOOTH, JOHN WILKES (1839–65), American actor, assassin of President Lincoln, was born in Harford Co., Md., in 1839. He was the son of Junius Brutus, and brother of Edwin Thomas Booth (*q.v.*) and an actor of prominence. He sympathized with the South in the American Civil War, and in 1865 organized a conspiracy to assassinate the President, the Vice-President and members of the cabinet. On the night of April 14, 1865, while Lincoln was watching a play from a box at Ford's Theatre in Washington, Booth stealthily entered the box and discharged a pistol at the head of the president from behind, the ball penetrating the brain. Brandishing a huge knife, the assassin rushed through the stage-box, leaped down upon the stage and escaped from the building. He was pursued, and twelve days later was shot in a barn where he had concealed himself.

BOOTH, WILLIAM (1829–1912), founder and "general" of the Salvation army, was born at Nottingham on April 10 1829, the son of a speculative builder. He was apprenticed to a pawnbroker. At 15 he underwent the experience of religious conversion, and he became a revivalist preacher. In 1849 he went to London, where he worked in a pawnbroker's shop at Walworth, hating the business, but bound to it by the necessity of sending money home. At this period he met Catherine Mumford, his future wife and lifelong helpmate. In 1852 he had become a regular preacher of the Methodist New Connection, and in 1855 they were married. After nine years of the ministry Booth broke loose from the Connection and began his career as an independent revivalist. Booth held the simple belief that eternal punishment was the fate of the unconverted. Coupled with this was a profound pity for the outcast, and a hatred of dirt, squalor and suffering. In 1864 Booth went to London and continued his services in tents and in the open air, and founded at Whitechapel the Christian Mission, which became (in 1878) the Salvation army and which made every convert a daily witness for Christ, both in public and private. Booth modelled its "Orders and Regulations" on those of the British army. Its early "campaigns" excited violent opposition, a "Skeleton army" being organized to break up the meetings, and for many years Booth's followers were subjected to fine and imprisonment as breakers of the peace. After 1889 these disorders were little heard of. The operations of the army were extended in 1880 to the United States, in 1881 to Australia, and spread to the European Continent, to India, Ceylon and elsewhere, General Booth himself being an indefatigable traveller, organizer and speaker. His wife died in 1890. By her preaching at Gateshead, where her husband was circuit minister, in 1860, she began the women's ministry which is so prominent a feature of the army's work.

In 1890 General Booth published *In Darkest England, and the Way Out,* in which he had the assistance of W. T. Stead. He proposed to remedy pauperism and vice by ten expedients: (1) the city colony; (2) the farm colony; (3) the over-sea colony; (4) the household salvage brigade; (5) the rescue homes for fallen women; (6) deliverance for the drunkard; (7) the prison-gate brigade; (8) the poor man's bank; (9) the poor man's lawyer; (10) Whitechapel-by-the-Sea. Money was liberally subscribed and a large part of the scheme was carried out. The opposition and ridicule with which Booth's work was for many years received gave way, towards the end of the 19th century, to very widespread sympathy as his genius and its results were more fully realized. The active encouragement of King Edward VII., at whose instance in 1902 he was invited officially to be present at the coronation ceremony, marked the completeness of the change; and when, in 1905, General Booth went through England, he was received in state by the mayors and corporations of many towns. In the United States also and elsewhere, his work was cordially encouraged by the authorities. The fiery old man had become a great figure in English life. He found it hard to witness his wife's sufferings, and he was saddened by the different views of theology taken by some of his children, and by the loss of his eyesight. His fame lives as the man who believed that the outcast may be restored to society if he can be made to feel that a decent member of that society cares whether he rises or not. The real strength of the man lay in his intense religious conviction and his wide humanity.

BIBLIOGRAPHY.—*See* T. F. Coates, *The Life Story of General Booth* (2nd ed. 1906); W. H. Nelson, *General William Booth* (1929), Harold Begbie, *Life of William Booth* (1920).

BOOTH, WILLIAM BRAMWELL (1856–1929), general of the Salvation Army, and eldest son of General William Booth, its founder, was born at Halifax, Yorkshire, in 1856. He became an officer in the Salvation Army in 1874, and was from 1880 its chief organizer. He organized the first social relief operations of the army. Mr. Booth was prominent in the campaign against the "white slave" traffic. In 1885, as a result of his part in a social purity agitation, he was indicted with the late W. T. Stead and others on a technical charge, but was subsequently acquitted. The action proved to a sceptical public that young girls could be bought and sold under the most degrading circumstances, and it was largely due to this agitation that the Criminal Law Amendment act, 1885, was passed. He was ably assisted in his work by his wife, Florence, herself a Salvation Army officer, whom he married in 1882. On his father's death in 1912 he became general of the Army. He died June 16, 1929.

BOOTH, a temporary dwelling of boughs or other slight materials. The word gained the special meaning of a market-stall

or any non-permanent structure, such as a tent at a fair, where goods were on sale. Later it was applied to the temporary structure where votes were registered, viz., polling-booth. As *bothy* or *bothie,* in Scotland, meaning generally a hut or cottage, the word was specially applied to a barrack-like room on large farms where the unmarried labourers were lodged.

BOOTHIA, a peninsula of northern Canada, belonging to Franklin district, and lying between 69° 30′ and 72° N. and 92° and 97° W. Area, 13,000 sq.mi. Pop. (1941) 190. It forms the western side of the Gulf of Boothia, which separates it from Baffin Land, and takes its name from Sir Felix Booth, who fitted out the expedition of 1829–33, led by Captain (afterwards Sir James) Ross, which discovered the peninsula. Cape Murchison is the most northerly point of the American mainland. The north magnetic pole was first distinctly localized in the peninsula (70°5′ N., 96°47′ W.), by Ross. (*See* also ARCTIC REGIONS.)

BOOTLE, municipal, county (1888) and parliamentary (1918) borough, a suburb of Liverpool, Lancashire, England. Pop. (1938) 74,080. Area 3.8 sq.mi. It contains a continuation of the main Liverpool (*q.v.*) docks on the east bank of the Mersey and has large numbers of transport workers, also ship repairers and engineers, while there are foundries, wire-rope works, tin works and tin-box factories, electrical works, dye works, flour mills and very large timber yards. Bootle also has large storage arrangements for cotton, grain, etc. A proposal to merge Bootle in the city of Liverpool was rejected by parliament in 1903. In 1921 the corporation introduced an instalment plan for the payment of rates by small rate payers. Since 1918 Bootle has returned one member to parliament.

BOOTLEGGING. National prohibition (*q.v.*) in the United States brought about a revival of the lost art of "bootlegging," and of the once rather popular profession of smuggling. The pioneers of early colonial days found it expedient to outlaw the sale of liquor to the Indians who, unaccustomed to its use, drank to excess and often became dangerous. But unscrupulous citizens, caring more for financial profit than for community welfare, engaged in the forbidden traffic and often concealed in the legs of their boots the liquor they carried for sale. This gave the name "bootlegger" to the illicit liquor trafficker. The name was revived and applied to the various phases of the intricate outlaw business of supplying liquor to the market while national prohibition was in effect.

Smuggling was a lucrative and more or less accepted occupation in colonial times, there being no centralised Government interested in customs revenues. After the central Government was formed, it established a Federal control of customs revenue and, through the Federal agencies of the customs internal revenue service and coast guard, it soon made smuggling unprofitable, and the practice almost disappeared. The boundary line between the United States and Mexico has been the one exception. This frontier is for each nation the farthest removed from its seat of Government and constitutes for each its least populous region. These conditions are ideal for smuggling, and both nations have suffered financially from its continued practice. In May 1925 the representatives of both nations met in El Paso, Tex., and formulated a treaty that was designed to stop smuggling along the boundary line.

Introduction of Prohibition.—While the early settlers found it expedient to forbid the sale of liquor to a certain class, it was only by slow stages that society in the United States became willing to forbid the sale of liquor to all its members. Laws to this end first appeared in small communities; and here always someone was ready to import liquor for profit in violation of the law. The need was thus always felt for wider and wider control, until ultimately the Constitution of the United States was amended to forbid the manufacture, transportation or sale of intoxicating beverages anywhere within the nation. In its laws making this amendment effective, Congress defined intoxicating beverages as those containing one-half of 1% or more of alcohol by volume.

Individuals who continued to drink created a demand for intoxicating beverages in violation of the law, and, as always, there were unscrupulous individuals willing to supply this illicit market. There was thus rapidly built up the outlaw business of obtaining supplies of liquor and of distributing them to the market—a business involving the bribery of Government and other agents and the corruption of traffic in alcohol and liquors for legitimate purposes. The Government easily controlled all the known supplies of liquor, and ultimately concentrated them in Government-controlled warehouses from which they were withdrawn for legitimate purposes by Government permit. Those people still determined to drink turned at first to home manufacture. But bootleg liquor soon became available at such prices as made home manufacture unnecessary, as it always had been inconvenient and unsatisfactory.

Revival of Smuggling.—The first bootleg supply was liquor withdrawn from Government warehouses through the use of fraudulent permits, etc. This was soon prevented by the Government and the bootlegger then turned to importation from abroad. Smuggling, on an increasingly large scale, sprang into existence. Ships under the protection of foreign flags, laden with contraband liquor, hovered just without the territorial waters, within easy communication of the shore, and there established an unfailing source of supply to the bootlegger.

The U.S. coast guard, long since relieved of its duty to prevent smuggling, and for generations engaged in the happier duty of bringing relief to those in distress at sea, was ill prepared to break up this traffic. By 1924 as many as 336 rum ships were known to be engaged in bootlegging. All along the coasts, specially equipped high-power motor-boats, often armed and armoured, and innumerable fishing and other coastwise craft, were engaged in running liquor from these ships to countless inlets and landing places. Congress increased the personnel and equipment of the coast guard to meet this situation; and the Government made treaties with foreign powers which, for this purpose, extended the U.S. territorial waters from 3 m. to 12 miles. By June 1, 1925, the coast guard was sufficiently augmented to make a serious effort to eliminate this smuggling business off the Atlantic coast between Boston and Atlantic City. The method employed was to picket each rum ship with small patrol boats which rendered contact with the shore impracticable. This resulted in reducing the rum fleet along this front to negligible proportions and in keeping at much greater distances the few ships which did appear.

Home Manufacture.—As bootlegging found increasing difficulty in importing its supplies from abroad, it turned to home manufacture and rapidly acquired facility in imitating every foreign and domestic brand that the market demanded. Labels and containers were imitated with sufficient perfection to defy detection on the part of the purchaser. The alcohol for this manufacture was obtained by the diversion of alcohol, and particularly of denatured alcohol, from its legitimate avenues in industry. This rapidly became the chief, practically the only, source of supply. The percentage of unadulterated genuine whisky found among the total of the whisky confiscated ran between 1 and 2%.

Alcohol (*q.v.*) is one of the articles essential to industry. Its uses are so numerous in manufacture, and the quantities used legitimately by industry are so large, that its control introduced the most serious problems for the Government in the enforcement of the prohibition laws. This involved issuing annually over 40,000 permits and supervising the operations of the permittees.

The bootleg industry invaded practically every field of alcohol using business and secured permits for its use, transacting just enough legitimate business to secure the permits, while diverting to the liquor traffic the rest of the alcohol secured. To do this successfully they sold to legitimate customers at greatly reduced prices in order to get enough business to justify their existence. They thus menaced the stability of many legitimate business enterprises and almost forced them to participate in the illegitimate profits derived from the bootleg industry. The Government undertook to control this situation in its earlier developments by denaturing alcohol for industrial use, to make it unfit for beverage use. But the bootlegger, indifferent to considerations of public health, soon established the practice of "boiling," or

redistilling—but indifferently well. A later expedient was the introduction of chemicals to counteract the denaturant, liquors containing a double dose of chemicals thus reaching the market.

Narcotics.—While the conspicuous revival of smuggling involved liquors primarily, it soon came to include narcotics and the illegal entry of foreigners, conspicuously Chinese. Smuggling was in 1928 practically the only source of supply for the illicit trade in narcotics. Because this trade offers tremendous profits, and because narcotics are moved in such small packages, the Government finds it difficult to control this smuggling. All manner of expedients are resorted to by the smugglers, and their detection requires constant vigilance on the part of highly trained agents. Real progress is, however, being made.

In this connection, Government took a most interesting step. The United States, recognizing that the success of Governmental efforts to control the illicit narcotic trade was dependent upon quick, decisive action on the part of police, initiated an effort which resulted in an international agreement by which the Secret Service agencies of these nations deal directly with each other in the detection and apprehension of criminals engaged in this nefarious traffic. This is a unique agreement, perhaps the first time in history that any nation has undertaken to have its Governmental agencies give information to those of another nation which might lead to the arrest and punishment of one of its own criminal citizens.

The repeal of the 18th Amendment took the tremendous profits out of the business of bootlegging and smuggling, and normal prohibition conditions were gradually restored in the liquor traffic. There remained however the baleful aftermath of organized crime accustomed to live extravagantly through illegal operations, with more or less political, legal, and expert highly paid assistance. Society has that problem yet to solve. (L. C. A.)

BOOTY, plunder or gain (cognate with Ger. *Beute* and Fr. *butin*). The phrase "to play booty," dating from the 16th Century, means to play into a confederate's hands, or to play badly at first in order to deceive an opponent.

BOPP, FRANZ (1791–1867), German philologist, born at Mainz on Sept. 14, 1791, educated at Aschaffenburg, in Bavaria. In 1812 he went to Paris to study Sanskrit. In 1816 he published, at Frankfort-on-Main, *Über das Conjugationssystem der Sanskritsprache in Vergleichung mit jenem der griechischen, lateinischen, persischen und germanischen Sprache.* The object of Bopp's researches was to trace the common origin of the grammatical forms or inflections of Sanskrit, Persian, Greek, Latin and German, a task which had never before been attempted. By an historical analysis of those forms, as applied to the verb, he furnished the first trustworthy materials for a history of the languages compared.

Bopp visited London and brought out, in the *Annals of Oriental Literature* (London, 1820), an essay entitled, "Analytical Comparison of the Sanskrit, Greek, Latin and Teutonic Languages," in which he extended to all parts of the grammar what he had done in his first book for the verb alone. He had previously published a critical edition, with a Latin translation and notes, of the story of *Nala and Damayantī* (London, 1819), the most beautiful episode of the Mahābhārata. Other episodes of the Mahābhārata —*Indralokāgamanam,* and three others (Berlin, 1824); *Diluvium,* and three others (Berlin, 1829); and a new edition of *Nala* (Berlin, 1832)—followed in due course.

In 1821 Bopp was appointed to the chair of Sanskrit and comparative grammar at Berlin, and was elected member of the Royal Prussian academy in the following year. He brought out, in 1827, his *Ausführliches Lehrgebäude der Sanskrita-Sprache,* on which he had been engaged since 1821. A new edition, in Latin, was commenced in the following year, and completed in 1832; and a shorter grammar appeared in 1834. At the same time he compiled a Sanskrit and Latin glossary (1830) in which, more especially in the second and third editions (1847 and 1867), account was also taken of the cognate languages. His chief activity, however, centred on the elaboration of his *Comparative Grammar,* which appeared in six parts (1833–52) as *Vergleichende Grammatik des Sanskrit, Zend, Griechischen, Lateinischen, Litthauischen, Altslavischen, Gothischen, und Deutschen.* (Eng. trans. by E. B. Eastwick, 1845.) Two other essays (on the "Numerals," 1835) followed the publication of the first part of the *Comparative Grammar.* The Old Slavonian began to take its stand among the languages compared from the second part onwards. A second German edition, thoroughly revised (1856–61), comprised also the Old Armenian. Bopp tried in his grammar to give a description of the original grammatical structure of the languages as deduced from their intercomparison, to trace their phonetic laws, and especially to investigate the origin of their grammatical forms. He also wrote monographs on the vowel system in the Teutonic languages (1836), on the Celtic languages (1839), on the Old-Prussian (1853), and Albanian languages (1854), on the accent in Sanskrit and Greek (1854), on the relationship of the Malayo-Polynesian with the Indo-European languages (1840), and on the Caucasian languages (1846).

See M. Bréal's translation of Bopp's *Vergl. Gramm.* (1866), introduction; Th. Benfey, *Gesch. der Sprachwissenschaft* (1869); A. Kuhn in *Unsere Zeit,* Neue Folge, iv. 1 (1868); Lefmann, *Franz Bopp* (1891–97).

BOPPARD, a town in Rhenish Prussia, Germany, on the left bank of the Rhine. Pop. (1933), 6,684. An old town, still partly surrounded by mediaeval walls, its most noteworthy buildings are the parish church (12th and 13th centuries); the Carmelite church (1318); the castle, now used for administrative offices, and the former Benedictine monastery on Marienberg, founded 1123. Boppard is a favourite tourist centre of the picturesque gorge of the Rhine, and has become a residential town. Trade is in wine and fruit. The *Baudobriga* of the Romans became a royal residence under the Merovingian dynasty and in the middle ages Boppard was raised to the rank of a free imperial city with considerable trade and shipping. From 1312 to 1794, when France absorbed the town, it was in the possession of the electors of Trier. In 1815 it was assigned, by the congress of Vienna, to Prussia.

BORA (Boreas—North Wind), an Italian name for a violent cold northerly and north-easterly wind, common in the Adriatic, especially on the Istrian and Dalmatian coasts. The wind generally produces boisterous squalls sometimes with whirling snow. There is always a northern tendency in the winds on the North Mediterranean shores in winter owing to the cold air of the mountains sliding down to the sea where the pressure is less. When, therefore, cyclones are found over the Mediterranean, the currents in their north-western area draw the air from the cold northern regions, and during the passage of a cyclone the bora often prevails, but the actual violence is largely on account of the weight of the cold air on the plateau. It forms a torrent which may be independent of Buys Ballot's law (*q.v.*). It is suggested that such local winds should be called "katabatic." A similar wind is experienced at Novorossiysk on the Black sea.

BORACITE, a mineral of special interest on account of its optical anomalies. Small crystals bounded on all sides by sharply defined faces are found in considerable numbers embedded in gypsum and anhydrite in the salt deposits at Lüneburg, in Hanover, where it was first observed in 1787. In external form these crystals are cubic with inclined hemihedrism, the symmetry being the same as in blende and tetrahedrite. Their habit varies according to whether the tetrahedron, the cube or the rhombic dodecahedron predominates. The crystals vary from translucent to transparent, with a vitreous lustre, and are colourless or white, though often tinged with grey, yellow or green. The hardness is as high as 7 on Mohs's scale; specific gravity 3·0.

The characters so far enumerated are strictly in accordance with cubic symmetry, but when a crystal is examined in polarized light, it will be seen to be doubly refracting, as was first observed by Sir David Brewster in 1821. Thin sections show twin-lamellae, and a division into definite areas which are optically biaxial. By cutting sections in suitable directions, it may be proved that a rhombic-dodecahedral crystal is really built up of twelve orthorhombic pyramids, the apices of which meet in the centre and the bases coincide with the dodecahedral faces of the compound (pseudo-cubic) crystal. When the crystals are

heated these optical characters change, and at a temperature of 265°C. the crystals suddenly become optically isotropic; on cooling, however, the complexity of internal structure reappears.

Chemically, Boracite is a magnesium borate and chloride with the formula $Mg_7Cl_2B_{16}O_{30}$. A small amount of iron is sometimes present, and an iron-boracite with half the magnesium replaced by ferrous iron has been called huyssenite. The mineral is insoluble in water, but soluble in hydrochloric acid.

In addition to embedded crystals, a massive variety, known as stassfurtite, occurs as nodules in the salt deposits at Stassfurt in Prussia: that from the carnallite layer is compact, resembling fine-grained marble, and white or greenish in colour, while that from the kainite layer is soft, earthy, and yellowish. (L. J. S.)

BORAGE, a herb (*Borago officinalis*) with bright blue flowers and hairy leaves and stem, grown as a pot-herb and honey-plant and used in salads. It is a native of the eastern Mediterranean region and has become naturalized in various parts of Europe, Great Britain and North America.

BORAGINACEAE, a family of plants belonging to the sympetalous section of dicotyledons, and a member of the series Tubiflorae. They are rough-haired annual or perennial herbs, more rarely shrubby or arborescent in tropical and sub-tropical forms. The leaves, generally alternate, are usually entire and narrow. The radical leaves in some genera, as *Pulmonaria* (lungwort) *Cynoglossum,* differ from the stem-leaves, being broader and sometimes heart-shaped. A characteristic feature is the one-sided (*dorsiventral*) inflorescence, illustrated in forget-me-not (*Myosotis*); the cyme is at first closely coiled, becoming uncoiled as the flowers open. Often the flowers are red in bud, becoming blue as they expand, as in *Myosotis.* The flowers are generally regular;



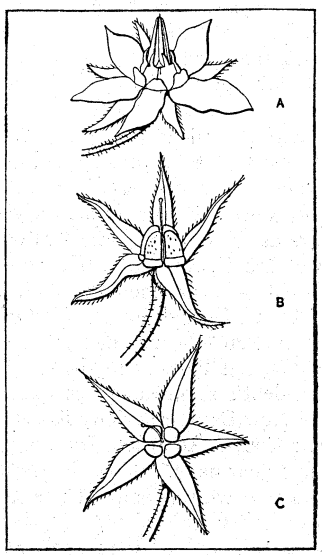
FROM THEDENIUS, "SKOLBOTANIK" BY PERMISSION OF IVAR HAEGGSTROMS BOKTRYCKERI AND BOKFORLAGS

THE FORGET-ME-NOT (MYOSOTIS PALUSTRIS) A MEMBER OF THE BORAGINACEAE FAMILY LONG REGARDED AS AN EMBLEM OF FRIENDSHIP

the form of the corolla is rotate in borage, tubular in comfrey, funnel-shaped in hounds-tongue. The throat is often closed by scale-like outgrowths from the corolla, forming the corona.

The five stamens alternate with the lobes of the corolla. The ovary, of two carpels, is seated on a ring-like disc which secretes honey. Each carpel becomes divided by a median constriction each containing one ovule; the style springs from the centre. The colour of the flowers and the presence of honey serve to attract insects. The scales around the throat of the corolla protect it from wet or undesirable visitors, and by difference in colour from the corolla-lobes, as in the yellow eye of forget-me-not, may serve to indicate the position of the honey. In most genera the fruit is a one-seeded nutlet; there are generally four, but one or more may not develop.

The family is widely spread in temperate and tropical regions, and contains 100 genera with about 1,000 species. Its chief centre is the Mediterranean region, whence it extends over central Europe and Asia, becoming less frequent northwards. A smaller centre occurs on the Pacific side of North America. The family is less developed in the south temperate zone. It is of little economic value. Several genera, such as borage, were formerly used in medicine, and the roots yield purple or brown dyes. Heliotrope or cherry-pie (*Heliotropium peruvianum*) is a well-known garden plant.



FROM STRASBURGER, "TEXTBOOK OF BOTANY" (MACMILLAN & CO.)

BORAGE (BORAGO OFFICINALIS), SHOWING CHARACTERISTIC STRUCTURE AND HAIRINESS OF FLOWER
A. Flower; B. and C. Fruit

In Great Britain the family is represented by some 12 genera and upwards of 25 species; among these are the borage (*Borago officinalis*), the gromwell (*Lithospermum officinale*), the hound's-tongue (*Cynoglossum officinale*), the viper's-bugloss (*Echium vulgare*) and several species of for-get-me-not or scorpion-grass (*Myosotis*). In North America there are about 30 genera and upwards of 250 species, most numerous in the western United States. In the northeastern States and adjacent Canada about 50 species are found, one-third of which are naturalized; in the Rocky Mountain region upwards of 150 species occur; in the Great Basin (Utah and Nevada) there are more than 100 species, and in California, more than 90. Exclusively North American genera are *Allocarya, Amsinckia, Cryptantha, Oreocarya* and *Plagiobothrys.*



VIPER'S-BUGLOSS (ECHIUM VULGARE) SOMETIMES CALLED THE BLUE THISTLE
A biennial plant common to grain-fields, it owes its name to stem spots which resemble the marks on a viper

BORAH, WILLIAM EDGAR (1865–1940), American politician, was born at Fairfield, Ill., on June 29, 1865. He studied at the Enfield academy, Ill., and entered the University of Kansas with the class of 1889, but did not finish his course. He was admitted to the bar in 1889, practised at Lyons, Kan., 1890–01, and later at Boise, Idaho. He was elected to the U.S. Senate in 1906 and re-elected in 1912, 1918 and 1924. At the time of the split in the Republican Party in 1912 he opposed the nomination of President Taft, but refused to follow Roosevelt, although in sympathy with his policy. He favoured woman suffrage and independence of the Philippines, but was opposed to the League to Enforce Peace on the ground that it tended toward internationalism. He strongly opposed many of the measures of President Wilson's Administration, and in particular the League of Nations, of which he was always an active opponent.

Always a strenuous advocate of disarmament, Borah proposed a resolution in the Senate in favour of opening negotiations with Great Britain and Japan for a mutual reduction in the naval programmes of the three Powers. Though rejected at first, it was ultimately adopted by Congress in 1921. He suggested also

a world economic conference to consider disarmament, and it was in part owing to his efforts in this direction that the Washington Conference on the limitation of armaments (Nov. 1921) was held. He endeavoured unsuccessfully to persuade the Senate to recognize the Soviet Government of Russia. At the time of the coal strike of 1922 he favoured the operation of the mines by the Federal Government. He was opposed to the World Court, on the ground that it was an adjunct of the League of Nations. Opposed as he was to the United States joining the League of Nations, he prepared an alternative plan to "outlaw" war, which he placed before the Senate in 1923.

At the Republican national convention held at Cleveland, O., in 1924, Borah was urged for the office of vice president, but refused to permit his name to go before the convention. Both on the platform and in the Senate he continued to take an active independent interest in foreign affairs as they affected the United States, freely criticizing the policy of the Government. He constantly urged that pressure be brought to bear upon the Allied nations to pay their war debts owed to the United States. He became chairman of the committee on foreign relations in 1924.

Always an independent, Borah supported Hoover in the 1928 election, but became one of the President's severest critics later. He also fought most legislation of the New Deal, especially Roosevelt's proposal to enlarge the Supreme Court. An ardent isolationist, he was author of the plan for a five-year naval holiday in 1931 and was one of the leaders in the Senate who attempted unsuccessfully to block repeal of the Neutrality act in 1939. After announcing his willingness to accept the presidency in 1936 he launched an attack upon monopolies. Borah died Jan. 19, 1940.

BORÅS, a town of Sweden, in the district (*län*) of Älfsborg, 45 mi. E. of Gothenburg by rail, on the river Viske. Pop. (1943) 49,421. It ranks among the first 12 towns in Sweden both in population and in the value of its manufacturing industries, principally textile. There are numerous cotton and woollen spinning and weaving mills, together with a weaving school. The town was founded in 1632 by King Gustavus Adolphus.

BORAX, a colourless crystalline salt found native in quantity in California, Chile, Tibet, Peru and Canada. It has an alkaline taste, and is moderately soluble in water, for which it often serves as a softening agent. When heated, borax fuses, loses the water which makes up part of its molecule, and melts finally to a clear glass-like substance.

The borax which occurs along the shores and bottoms of saline lakes, as in California especially, is usually very pure. Borax was formerly obtained by melting boric acid (*q.v.*) and soda ash together and extracting the fused mass with water from which the borax was crystallized. Since extensive deposits of Colemanite (*q.v.*), which is principally calcium borate, have been discovered, borax is now largely prepared from this material and from Rasovite found in California. Finely powdered native calcium borate is mixed and melted together with sodium carbonate. This causes sodium borate and calcium carbonate to be formed, and from this mixture the sodium borate may be extracted with water, leaving the less soluble calcium carbonate behind. By concentrating and cooling the solution of sodium borate, borax is obtained. If crystallization takes place above 60° C the pentahydrate is deposited, while below that temperature the decahydrate forms. This phenomenon takes place whenever sodium borate solutions are allowed to crystallize, regardless of which compound was used in making up the solution.

Borax hydrolyses (*see* HYDROLYSIS), giving an alkaline solution. Fused borax dissolves many metallic oxides to form characteristically coloured boron glasses. This property is made use of in metallurgy and in chemical analysis (*see* CHEMISTRY: *Analytical*). Borax finds use in soaps, in glass making, as a household and commercial water softener, as a mild antiseptic, and in glazing pottery and related substances. As a flux in welding, it dissolves the metallic oxides present on the metal surfaces, leaving clean faces to be welded. Perborates are formed when borax is electrolysed in solution or treated with hydrogen peroxide. The perborates find application in the arts as bleaching or oxidizing agents.

The United States produced, in 1925, 49,967 tons of borax, valued at $4,083,209. Next to the United States, Chile is the largest producer of borax, one source of supply there being the residual or "mother" liquors of the nitrate vats.

Borax after fusion has the formula $Na_2B_4O_7$, being sodium tetraborate, and theoretically derived from the neutralization of four molecules of sodium hydroxide with two molecules of boric or boracic acid (*q.v.*), with elimination of two extra molecules of water, then

$$2NaOH+4H_3BO_3=Na_2H_4B_4O_9+5H_2O=Na_2B_4O_7+7H_2O;$$

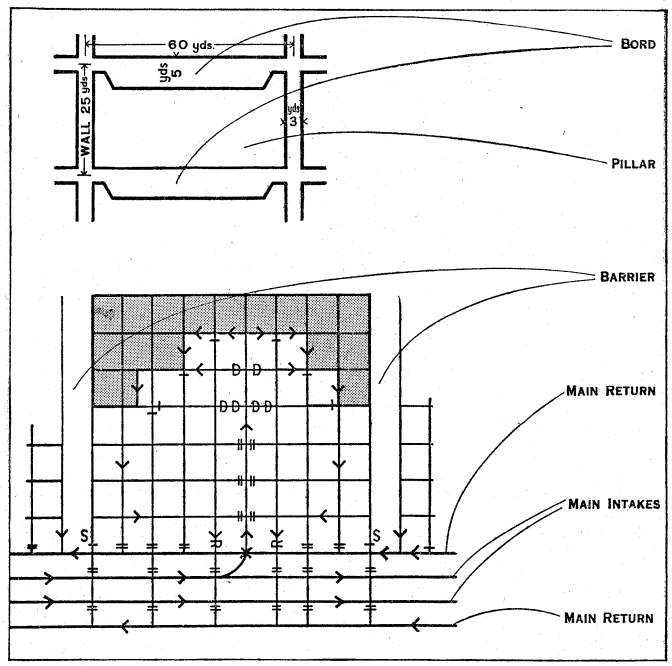
it thus is a diborate or pyroborate. In its ordinary form, as "common" or prismatic borax it has ten molecules of water of crystallization, $Na_2B_4O_7$, 10 H_2O; another form, known as "jewellers'" or octohedral borax, has the composition $Na_2B_4O_7$, 5 H_2O. There is also another crystalline form found in nature, Rasovite, which is $Na_2B_4O_7$, 4 H_2O.

BORDA, JEAN CHARLES (1733–1799), French mathematician and nautical astronomer, was born at Dax. Entering the army at an early age he transferred later to the navy, and in 1782 was taken prisoner at sea by the English, but was immediately released on parole. He contributed a long series of valuable memoirs to the Academy of Sciences. His researches in hydrodynamics were highly useful for marine engineering, while the reflecting and repeating circles, as improved by him, were of great service in nautical astronomy. He was associated with J. B. J. Delambre and P. F. A. Méchain in the attempt to determine an arc of the meridian, and the greater number of the instruments employed in the task were invented by him.

See J. B. Biot, "Notice sur Borda" in the *Mém. de l'Acad. des Sciences,* iv.

BORDAGE. (1) A nautical term for the planking on a ship's side. (2) A feudal term for the tenure by which a certain class of unfree peasants held their cottages. A "bordar" was a peasant of this type who held a cottage and a few acres of arable land in return for customary labour services. (*See* VILLEINAGE.)

BORD AND PILLAR. The bord and pillar method of working coal is perhaps the first *systematized* method practised.



PLAN OF THE BORD AND PILLAR METHOD OF SYSTEMATIZED COAL WORKING

At top, diagram showing bord, pillar and walls. Below, plan of panel, or district, in bord and pillar working. The arrows denote direction of ventilating current; stone stopping is indicated by lines = =; and the shaded area represents removed or worked-off pillars. R. Regulator; S. Scale; D. Separation door

In this method narrow roads are driven in the coal seam so as to form pillars, which are subsequently removed. The term bord and pillar is of north of England origin, the system of working

being known in other districts as "stoop and room" (Scotland), "pillar and stall" (Midlands), and sometimes merely as "narrow work."

"Bord" is an old Saxon word for road.

In most coal seams the coal is possessed of a very definite cleavage (cleat), smooth facings or partings which run through the seam in two directions at right angles to each other, one set of cleavages, termed the "bordways cleat," being more pronounced than the other. The roads (bords) driven at right angles to it are made wider than the other roads or "walls," as the coal got thereby is larger in size. The driving of the bords and walls to form the pillars is termed "working in the whole" or the "first working," the succeeding process, the removal of the pillars, being known as "working in the broken" or "broken working." At the beginning of the last century, according to John Buddle (*Mining Records 1838*), the pillars were being made 6 yd. by 22 yd., and only 45½% of the seam was got. In 1809 Buddle introduced an improvement in the working of bord and pillar by leaving barriers of solid coal round each district, and the name of "panel work" was given to the improved method.

At first the pillars were not removed, then later they were partially worked off; but for 100 years or more it has been the practice to work off the pillars entirely, for which purpose they are made much larger.

"Wide work," a system of working practised in the getting of the "thick coal" or "ten yard" seam of south Staffordshire, is a modification of bord and pillar, but is much more complicated. Under this method there may be four, five or even six separate workings. *See* COAL AND COAL MINING.

BORDEAUX, city and seaport of southwest France, capital of the department of Gironde, 359 mi. S.S.W. of Paris by the Orléans railway and 159 mi. N.W. of Toulouse on the Southern railway. Pop. (1936) 256,369. Bordeaux, the fourth largest town in France, lies on the left or west bank of the Garonne 15 mi. above its junction with the Dordogne and 60 mi. from the sea, in a plain east of the wine-growing district of Médoc. The Garonne (550–750 yd. wide) sweeping northwards in a broad curve, separates the city proper from the suburb of La Bastide on the right bank. The river is crossed by the Pont de Bordeaux (early 19th century), 1,534 ft. in length, by a railway bridge and by a merchandise *transbordeur*. From the Pont de Bordeaux, the view westward embraces a crescent of wide quays 5 mi. long with a background of tall warehouses, factories and mansions. Near the centre of the quays is the Place des Quinconces, the nodal point.

The streets and squares of the central portion are symmetrically planned in the 18th century manner. Outside this quarter, which contains most of the important buildings, the streets are narrow and quiet and bordered by the low white houses characteristic of Bordeaux. The whole city is surrounded by a semicircle of boulevards, beyond which lie the suburbs of Le Bouscat, Caudéran, Mérignac, Talence and Bègles. The dry soil of Médoc attracted settlement as early as the Bronze age and, at least since Roman times, Bordeaux has been a flourishing town and port, with connections particularly with Spain and Britain. As *Burdigala* it was the chief town of the Bituriges Vivisci. Under the Roman empire it became a commercial city, and in the 4th century it was made the capital of Aquitania Secunda. Ausonius, a contemporary native writer, describes it as a square walled-city, and celebrates it as one of the greatest educational centres of Gaul. It suffered severely after the disintegration of the empire, and did not recover till the 10th century. Along with Guienne it belonged to the English from 1154 to 1453, and was for a time the seat of the court of Edward the Black Prince, whose son Richard was born in the city. Commerce developed between Bordeaux merchants and their fellow subjects in London, Hull, Exeter, Dartmouth, Bristol and Chester. Various privileges were granted by the English as trade increased. The influence of Bordeaux was still further augmented when several neighbouring towns, *e.g.*, St. Emilion and Libourne, united in a federation under its leadership. The defeat of the English at the battle of Castillon in 1453 ended their domination in the province. The privileges of the city were at once curtailed, and only partially restored under Louis XI, who organized the *parlement* of Guienne and the university. In 1548 the inhabitants rebelled against the salt-tax.

The reformed religion found numerous adherents at Bordeaux, and after the massacre of St. Bartholomew nearly three hundred of its inhabitants lost their lives. The 17th century was a period of disturbance. The Fronde insurrection found great support among the Bordelais. In the 18th century, a period of commercial and architectural activity for Bordeaux, the marquis de Tourny, *intendant* of Guienne, spent large sums in widening the streets and laying out public squares. It was the headquarters of the Girondists at the Revolution, and during the Reign of Terror suffered severely. Its commerce was greatly reduced under Napoleon I. In 1814 it declared for the house of Bourbon; and Louis XVIII afterwards gave the title of Duc de Bordeaux to his grandnephew. In 1870 the French government was transferred to Bordeaux from Tours on the approach of the Germans to the latter city. The city was also the seat of the French government when Paris was threatened by the Germans in Aug. 1914. In June 1940, during World War II, when the German advance became again a menace to Paris, the French government moved first to Tours and later to Bordeaux. Bordeaux was severely bombed before its occupation by German troops. Crowds of refugees from all over France passed through the city. Under German occupation, Bordeaux was an important air and submarine base and as such was bombed a number of times by the Allies. The city was reoccupied, largely by French patriot forces, in Aug. 1944.

Chief Buildings.—Near the centre of the city are the allées de Tourny and the Place des Quinconces. The latter, planted with plane trees, contains two huge statues of Montaigne and Montesquieu, and terminates upon the quays with two rostral columns which serve as lighthouses. On its west side is a monument to the Girondin deputies proscribed under the convention in 1793. At its southwest corner the Place des Quinconces opens into the Place de la Comédie, the heart of the city, which contains the Grand Théâtre (18th century). The rue Sainte Catherine enters the Place de la Comédie on the south. The Pont de Bordeaux is continued by the Cour Victor Hugo, leading to a square in which stands the cathedral of St. André. The broad nave begun in the 12th century contrasts with the lofty 14th century Gothic choir. Both the north and south façades are richly decorated. Near the choir stands the Clocher Pey-Berland, named after the archbishop of Bordeaux who erected it in the 15th century. Of the numerous other churches of Bordeaux the most notable are St. Seurin (11th to 15th centuries), with a finely sculptured south door; Ste. Croix (12th and 13th centuries), remarkable for its Romanesque façade; and St. Michel (14th and 16th centuries). The bell tower of St. Michel (15th century) has the highest spire (354 ft.) in southern France, and, like that of the cathedral, stands apart from its church. The building of the Faculties of Science and of Letters (1881–1886) contains the tomb of Montaigne. The prefecture, the hôtel de ville, the bourse and the custom house belong to the 15th century. The law courts and the hospital of St. André (founded 1390) date from the early 19th century. The Palais Gallien, near the public garden, consists of remains of a Roman amphitheatre. The city lost its fortifications in the 18th century, but several old gateways remain. Bordeaux is the seat of an archbishop, the centre of an *académie* (educational division) and the seat of a court of appeal. A court of assizes is held there, and there are tribunals of first instance and of commerce, a council of trade arbitrators, and a chamber of commerce. The university (1441) includes faculties of law, of science, of letters and of medicine and pharmacy, and a faculty of Catholic theology. There are several museums, including one with a large collection of pictures and sculptures, a library with over 200,000 volumes, and numerous learned societies. The trade of Bordeaux, the fourth port in France for tonnage of goods, is chiefly carried on by sea. Its port, 5½ mi. long and on the average 550 yd. wide, is formed by the basin of the Garonne and is divided into two portions by the Pont de Bordeaux. The city trades chiefly with Great Britain, Spain, Argentina, Portugal and the United States, and has the South American service of the Messageries Maritimes. The city

is the centre of the trade in "Bordeaux" wines, and the wine-cellars of the quays are one of its principal sights. Other principal exports are brandy, resin-extract, talc, ochre, walnuts, wood-hoops, turpentine, pitwood, fruit, potatoes and other vegetables. The chief imports are pyrites, timber, grain, hardware, agricultural and other machinery and chemicals. A large fleet is annually dispatched to the codfisheries of Newfoundland and Iceland. The most important industry is ship building and refitting. Ironclads and torpedo-boats as well as merchant vessels are constructed. Railway carriages are also built. The industries subsidiary to the wine-trade, such as wine-mixing, cooperage and the making of bottles, corks, capsules, straw envelopes and wooden cases, occupy many hands.

There are also flour-mills, sugar-refineries, breweries, distilleries, oil-works, cod-drying works, manufactories of canned and preserved fruits, vegetables and meat, and of chocolate. Chemicals, leather, iron-ware, machinery and pottery are manufactured, and a tobacco factory employs 1,500 hands.

See Camille Jullian, *Hist. de Bordeaux, depuis les origines jusqu'en 1895* (Bordeaux 1895); Charles Saunier, *Bordeaux* (2nd ed. 1925); E. Delage, "Le port de Bordeaux," *Rev. Maritime* I, pp. 745–759 (1928).

BORDEAUX WINES. More and better wines have been shipped from Bordeaux to all parts of the world than from any other port. But the wine that passed through Bordeaux was not always Bordeaux wine. For the past 700 years, during the three centuries of English rule in Gascony until the early part of the 20th century, the merchants of Bordeaux spent a great deal of trouble and money—and the lawyers of Bordeaux have displayed great ingenuity—to decide which wines were and which were not entitled to the name of Bordeaux.

Since Feb. 18, 1911, the French law has laid down which wines have alone the right to be sold as Bordeaux wines; they are the wines made from grapes gathered within the Gironde Département, a département named after the River Gironde, which is the name given to the River Garonne from the Bec d'Ambès, below Bordeaux, where it receives the waters of the Dordogne, until it reaches the Bay of Biscay.

The Gironde Département produces approximately 84 million gallons of Bordeaux wine in an average year, of which some 64 million are red and 20 million white wines. This immense quantity of wine is far from uniform in quality. The best red and white wines of Bordeaux are those of four distinct districts within the Gironde Département, *i.e.*, the *Médoc, Graves, Sauternes* and *St. Emilion* districts. But there are many other vineyards in the undulating country between the rivers Dordogne and Garonne, a district known as the *Entre-deux-mers,* from which much white wine and very much more red wine is made which is of very fair quality when climatic conditions are favourable. There are also many vineyards planted in rich alluvial soil close to river banks and upon the islands of the River Gironde, which produce much wine, mostly red, of a commoner type, yet entitled to the name of Bordeaux.

A wine sold merely as *"Bordeaux"* is, or should be, a wine, or a blend of wines, made from grapes grown within the Gironde Département.

A Bordeaux wine made from the vineyards of one of the better districts of the Gironde, such as *Médoc, Graves, St. Emilion,* or *Sauternes,* is sold under the name of its native district, whether it be the produce of a single vineyard or a blend of wines from a number of different vineyards within the same district.

The Finest Bordeaux.—The best Bordeaux wines are made from the vineyards of a particularly good estate and they are always sold under the name of their native estate—a *Château,* a *Clos,* a *Cru* or a *Domaine.*

The finest of all Bordeaux wines are the following:

Red Wines.—Château Lafite—(Médoc); Château Margaux—(Médoc); Château Latour—(Médoc); Château Haut-Brion—(Graves); Château Ausone—(St. Emilion); Château Yquem—(Sauternes).

The better class wines of Bordeaux are kept in cask for about three years, before they are bottled, and they should be kept some years in bottle—the better the wine the longer should it be kept.

Bordeaux wines are bottled either "at the château," *i.e.,* in the cellars of the estate where the wine is made, or "at Bordeaux," by the Bordeaux merchants, or in any part of the world by the merchants who import their wine in casks and bottle it themselves.

A château bottled or Bordeaux bottled wine is not necessarily better than the same wine shipped in cask and bottled by the importing merchant, but it is often preferred on account of the guarantee of origin which château bottling carries. (*See* CLARET; GRAVES: WINES OF; MÉDOC WINES; SAUTERNES.)

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(A. L. S.)

BORDEN, SIR FREDERICK WILLIAM (1847–1917), Canadian statesman, was born in Cornwallis, Nova Scotia, on May 14, 1847, and died at Toronto on Jan. 6, 1917. He was educated at King's college, Windsor, and at Harvard University, and for some years practised medicine at Canning, Nova Scotia. In 1874 he was elected to the Canadian parliament as Liberal member for King's county. In 1896 he became minister of militia and defence in the Liberal ministry.

BORDEN, SIR ROBERT LAIRD (1854–1937), Canadian statesman, born at Grand Pré, Nova Scotia, on June 26, 1854. Called to the bar in 1878, he rapidly became a leading figure in the courts of his native province and in 1896 was elected Conservative member for Halifax in the Canadian House of Commons. On the resignation of Sir Charles Tupper, in Feb. 1901, he became leader of the Conservative opposition, Sir Wilfrid Laurier being at that time in office. His policy was one of ardent imperialism and antagonism to Canadian reciprocity with the United States.

At the general election of 1908 Borden was again returned for his old constituency of Halifax, after an interval during which he had represented Carlton, and in 1911 he undertook a notable campaign throughout the west in opposition to the Laurier policies. As a direct consequence Laurier's Liberal majority of 50 was turned, at the general election in the autumn, into a coalition majority of 49, and Borden was called to form a government.

He took office on Jan. 1, 1912, and soon became involved in vigorous controversy with President Taft, who had offered Canada a commercial alliance. Borden held that a reciprocity treaty on those lines would make Canada "an appanage of the United States." In regard to the navy, he declined to proceed with the Laurier programme for a Canadian navy to be built in six years, and in June, 1912, went to London to discuss with the home government the whole problem of imperial defence. As a result he proposed, at the end of the year, in the Canadian House of Commons a contribution of 35 million dollars to the imperial exchequer, earmarked for naval construction, the home government agreeing on their side to welcome a Canadian minister in London and to make him a permanent member of the Committee of Imperial Defence. The vote went through the Commons in Feb. 1913 but, after a campaign of heated criticism, was thrown out in the senate by 51 to 27. In place of the imperial contribution, an acceleration of the Laurier building programme was then arranged.

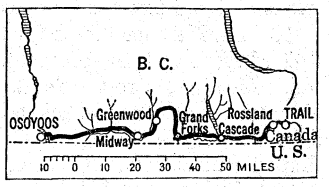
Borden was created G.C.M.G. in 1914, and remained at the head of the Canadian Government throughout the World War, in which he rendered notable service to the cause of the Allies. In Oct. 1917 he formed a National, or Coalition, Government of Liberals and Conservatives, which was confirmed in office at elections two months later. At the Peace Conference he was largely responsible for securing the separate representation of Canada. In 1920 he retired from the premiership, and in 1922 published *Canadian Constitutional Studies.* In 1927 he was Rhodes Memorial lecturer at Oxford university. He died June 10, 1937.

BORDENTOWN, a city of Burlington county, New Jersey, U.S.A., on the Delaware river and the Pennsylvania railroad, 7 mi. southeast of Trenton. The population in 1940 was 4,223. It lies on a broad plain, 65ft. above the river, and has beautifully shaded wide streets. Most of the wage-earning residents work in Phila-

delphia, Trenton, New York or at near-by industrial plants. The public schools in 1940 had 1,425 pupils. There is a private military academy, and an industrial training school for coloured youth, supported and controlled by the state.

The first settlers were several Quaker families, in the 18th century. The town was laid out by Joseph Borden, and was incorporated as a borough in 1825. It was chartered as a city in 1867, and in 1913 adopted a commission form of government. It was the home for many years of Francis Hopkinson (1737–91); of Rear-Admiral Charles Stewart (1778–1869); of Prince Napoleon Lucien Charles Murat; of Joseph Bonaparte, ex-king of Spain, who lived on a magnificent estate known as "Bonaparte's Park"; and of F. Marion Crawford, Richard Watson Gilder, Thomas Paine and Clara Barton. In 1832 the famous engine "Johnny Bull," built in England for the Camden and Amboy railway, had its first trial here, and the site was marked by a monument.

BORDER ROADS, a highway extending from Osoyoos, British Columbia, to Trail in the same province, is about 100m. in length and improved throughout. Passing over the picturesque Cascade mountains it forms part of the Trans-Canada highway and is one of the most important routes in North America.



MAP OF THE OSOYOOS TRAIL IN BRITISH COLUMBIA NEAR THE U.S. BORDER

BORDER, THE, the territory on both sides of the boundary line between England and Scotland, but especially the Scottish side. The vicissitudes of its life illustrate the relations between the two kingdoms for centuries before the union. The line begins on the coast of Berwickshire at a spot 3m. N. by W. of Berwick, and, after running a short distance west and south reaches the Tweed near the village of Paxton, whence it keeps to the river to a point just beyond Carham. There it strikes off south-south-east to the Cheviot hills, the watershed of which for 35m. constitutes the boundary, which is thereafter formed by a series of streams—Bells Burn, the Kershope, Liddel and Esk. After following the last named for 1m. it cuts across the country due west to the Sark, which it follows to the river's mouth at the head of the Solway firth. The length of this boundary is 108m., but a direct line from Solway to the North sea is only 70 miles. At the extreme eastern end a small district of 8sq.m., consisting of the tract north of the Tweed not included in Scotland, forms the "bounds" or "liberties" of Berwick, or the country of the borough and town of Berwick-on-Tweed. On the extreme west between the Sark and the Esk, as far up the latter as its junction with the Liddel, was "No man's land" (locally debatable or thriep land), for generations the haunt of outlaws and brigands, the possession of which was a constant source of contention between England and Scotland until its boundaries were finally adjusted in 1552. The English border counties are Northumberland and Cumberland, the Scottish Berwick, Roxburgh and Dumfries; though historically, and still by usage, the Scottish shires of Selkirk and Peebles have always been classed as border shires.

On the south side are lofty, bleak moorlands, affording subsistence for sheep and cattle, and rugged glens and ravines, while on the north there are many stretches of fertile soil, especially in the beautiful valleys and dales. The Roman road known in mediaeval times as Dere street crossed the Cheviots at Brownhartlaw (1,664ft.), close to the camp of *Ad Fines* by means of which the warlike Brigantes on the south and the Gadeni and Otadeni on the north were held in check, while another Roman road, the "Wheel Causeway," passed into Scotland near the headwaters of north Tyne and Liddel.

The main ways across the border in modern times include roads from the Scottish side converging on Berwick and continued southward along the coast or via Wooler, roads from Wooler on the English side crossing at Coldstream, with a secondary route via the valley of Bowmont Water reaching the Tweed at Kelso, the road from Hexham via the Reed valley to Carter Bar and Jedburgh crossing the Cheviots at over 1,250ft. above sea, the north Tyne way to Liddel Water followed by a secondary road related to the Wheel Causeway of the Romans, and the roads from Carlisle and Brampton on the English side via Longtown and via Gretna Green. (For early history *see* LOTHIAN; NORTHUMBRIA; STRATHCLYDE.)

In the 12th century were founded the abbeys of Hexham and Alnwick, the priory church of Lindisfarne and the cathedral of Carlisle on the English side, and on the Scottish side the abbeys of Jedburgh, Kelso, Melrose and Dryburgh. The deaths of the Scottish king, Alexander III. (1286) and Margaret the Maid of Norway (1290) were followed by the wars of the succession and independence between the kingdoms. Berwick and Carlisle were repeatedly assailed, and battles took place at Halidon Hill (1333), Otterburn (1388), Nisbet (1402), Homildon (1402), Piperden (1435), Hedgeley Moor (1464), Flodden (1513), Solway Moss (1542), and Ancrum Moor (1544). There were also innumerable fights arising out of family feuds and raids among the Douglases, the Percies, Scotts of Buccleuch, Kers, Humes, Haigs of Bemersyde, Armstrongs, Eliots, Grahams, Johnstones, Maxwells and other families, of which the most serious were the encounters at Arkenholme (Langholm) in 1455, the Raid of Reidswire (1575), and the bloody combat at Dryfe Sands (1593). The English expeditions of 1544 and 1545 involved the destruction of the four Scottish border abbeys, the sack of towns, and the obliteration of Roxburgh. The only other important conflict belongs to the Covenanters' time, when the marquess of Montrose was defeated at Philiphaugh in 1645. Partly for the defence of the kingdom and partly to overawe the border freebooters and moss troopers, who menaced the peace until they were suppressed in the 17th century, castles were erected at various points on both sides of the border.

The line of the border was usually divided into the East, Middle and West Marches, each under the control of an English and a Scots warden, who had to keep the peace, enforce punishment for breach of the law, and take care that neither country encroached on the boundary of the other. The wardens usually conferred once a year, as a rule in a friendly spirit, though in 1575 a display of temper led to the affair of the Raid of Reidswire. The appointment was important and lucrative, part of the fines and forfeits falling to the warden, who was also entitled to ration and forage for his retinue. On his first public progress to London, James VI. of Scotland and James I. of England attended service in Berwick church (March 27, 1603) "to return thanks for his peaceful entry into his new dominions." Anxious to blot out the bitter past, he forbade the use of the word "Borders," replacing it by "Middle Shires," which, however, soon ceased to be used. Frontier fortresses were to be dismantled and their garrisons reduced to nominal strength. This policy had the desired effect, though the expression "Borders" proved too convenient geographically to be dropped. Some English strongholds, such as Alnwick, Chillingham, Ford and Naworth, have been modernized; others, like Norham, Wark and Warkworth, are picturesque ruins; but most of the Scottish fortresses have been demolished and their sites built over, or they are now grass-grown mounds. A chain of peel towers crosses the country from coast to coast. Many were homes of marauding chiefs, and nearly all were used as beacon-stations. Early in the 18th century the Scottish gypsies found a congenial home on the Roxburghshire side of the Cheviots; and later the Scottish border became notorious for 100 years as offering hospitality to runaway couples who were clandestinely married at Gretna Green, Coldstream or Lamberton.

Border ballads occupy a distinctive place in English literature. Many were rescued from oblivion by Sir Walter Scott in *Minstrelsy of the Scottish Border* and he preserved a great deal in *Border Antiquities of England and Scotland.* Border traditions and folk-lore appealed strongly to James Hogg ("the Ettrick Shepherd"), John Wilson ("Christopher North"), and John Mackay Wilson (1804–35), whose *Tales of the Borders,* published in 1835, long enjoyed popular favour.

BORDET, JULES (1870–), Belgian physiologist, was born at Soignies, June 13, 1870. In 1892 he graduated as doctor of medicine at the University of Brussels. From 1894 to 1901 he worked at the Pasteur Institute at Paris whence he was

recalled to Brussels to found a "Pasteur Institute" for the province of Brabant of which he was made director. He was also appointed professor at the University of Brussels and in 1919 received the Nobel Prize for medicine and physiology.

His early studies showed that antimicrobic sera include two active substances, one existing there before immunization, and known as alexine; the other a specific antibody created by vaccination. He introduced the method of diagnosing microbes by sera; and his discovery of the fixation of alexine (in the first instance for cholera) inaugurated a general method of diagnosis for infectious fevers, now universally employed for the identification of typhoid fever, plague, tuberculosis, etc. He discovered haemolytic sera in 1898, and showed that they act on foreign blood by a mechanism strictly comparable with that by which an anti-microbic serum acts on microbes and, further, that the reactions of all these sera are colloidal in nature.

More recently he discovered the microbe of whooping cough, determining its action and the method of immunizing convalescents from that disease. He has thrown light on the process of the formation of coagulin, showing that it includes two elements; the first, albuminoidal and peculiar to the liquid blood, and the other, lipoidal in nature, originating in the cells of the blood or tissues. He further studied the formation of anaphylactic poisons, and, in the sphere of microbic biology, the autolysis of microbic transmissibility. Bordet's *Traité de l'Immunité dans les maladies infectieuses* was published in 1920.

BORDIGHERA, Liguria, Italy, province of Imperia, 91 mi. S.W. of Genoa by rail, and 3 mi. E.N.E. of Ventimiglia. Pop. (1936) 5,978 (town); 7,334 (commune). This famed winter resort has beautiful coast scenery and fine gardens; flowers are largely exported; palms supply palm branches for St. Peter's at Rome and other churches on Palm Sunday. The Bicknell museum contains a unique collection of the flora of the Riviera.

BORDONE, PARIS (1500–1571), Venetian painter, was born at Treviso, and entered the *bottega* of Titian at an early age. In 1538 he was invited to France by Francis I., at whose court he painted many portraits, though no trace of them is to be found in French collections, the two portraits at the Louvre being later acquisitions. He also is said to have visited Augsburg and worked for the Fuggers, probably in 1548. A true child of the Renaissance, he painted a number of religious pictures, numerous mythological scenes, allegories, nymphs, cupids and subjects from Ovid's fables, but he excelled as a portraitist. His principal historical painting, signed and dated 1540, is the "Fisherman and Doge" at the Venice academy. The National Gallery, London, has a "Daphnis and Chloe" and a portrait of a lady. Other important works are the "Madonna" in the Tadini collection at Lovere, the "Adoration of the Shepherds" in the Duomo of Treviso, two mythological pictures at the Villa Borghese and the Doria palace in Rome, the "Chess Players" in Berlin, "Christ among the doctors" in the Gardner collection at Boston and a "Baptism of Christ" in Philadelphia. Besides these, there are examples of his art in Bergamo, Milan, Genoa, Padua, Siena, Venice, Florence, Munich, Dresden, Vienna and in private collections in England. Bordone died in Venice on Jan. 19, 1571.

Beyond some references in general works on Italian paintings, very little has been written on Paris Bordone since the days of Vasari, who knew him and visited him in 1566. In 1900 the committee of the fourth centenary of Paris Bordone, Treviso, published L. Bailo and G. Biscaro's *Della Vita e delle Opere di Paris Bordone;* and the *Nuova Antologia* (Nov. 16, 1900) contains a 16-page paper on Paris Bordone by P. G. Molmenti.

BORE, a high tidal wave rushing up a narrow estuary or tidal river. A tide often rising 18ft. in 90mins. produces the Severn bore by crowding water into the narrowing funnel of the estuary. The phenomenon is also particularly well illustrated in the Bay of Fundy. The name is usually derived from a Scandinavian word (*bára*) a wave, billow. The other name by which the phenomenon is known, "eagre," is also of unknown origin. There is, of course, no connection with "bore," to make a hole by piercing or drilling, which is a common Teutonic word, *cf.* Ger. *bohren,* the Indo-European root being seen in Lat. *forāre* to pierce, Gr. *φάρος,* plough. For the making of deep holes for shafts, wells, etc. (*see* BORING). The substantival use of this word is generally confined to the circular cavity of objects of tubular shape, particularly of a gun, hence the internal diameter of a gun, its "calibre" (*see* SMALL ARMS, THE DEVELOPMENT OF). A "bore" is also a tiresome, wearying person, particularly one who persistently harps on one subject. This has generally been taken to be merely a metaphorical use of "bore," to pierce. For an early use in English in this sense *see* Earl Carlisle's letters 1768, printed in Jesse's *Life of George Selwyn.* The *New English Dictionary* suggests derivation from Fr. *bourrer,* to stuff, satiate.

BOREAS, in Greek mythology, a personification of the north wind. He was said to have carried off the beautiful Oreithyia, a daughter of Erechtheus, king of Athens, when he found her leading the dance at a festival or gathering flowers on the banks of the Ilissus. He had before wooed her in vain and now carried her off to his home in Thrace, where they lived as king and queen of the winds and had two sons, Calais and Zetes (*q.v.*).

To show his friendliness for the Athenians, Boreas wrecked the fleet of Xerxes off the promontory of Sepias in Thessaly (Herodotus, vii. 189), in return for which they built him a sanctuary or altar near the Ilissus and held a festival (*Boreasmos*) in his honour. In works of art Boreas was represented as bearded, powerful, draped against cold, and winged. On the Tower of the Winds at Athens he is figured holding a shell, such as is blown by Tritons. Boreas carrying off Oreithyia is the subject of a beautiful bronze relief in the British Museum, also of many painted Greek vases.

BORECOLE: *see* CABBAGE.

BOREL, PETRUS, full name PIERRE JOSEPH BOREL D'HAUTERIVE (1809–1859), French writer, was born at Lyons. His father had been ruined by taking part in the resistance offered by the Lyons royalists against the Convention, and Petrus Borel was educated in Paris to be an architect. He soon abandoned his profession to become one of the most violent partisans of the Romantic movement. His extravagant sentiments were illustrated in various volumes: *Rhapsodies* (1832), poems; *Champavert, contes immoraux* (1833); *Madame Putiphar* (1839), etc. His works did not rescue him from poverty, but through the kindness of Théophile Gautier and Mme. de Girardin he obtained a small place in the civil service. He died at Mostaganem in Algeria.

See Jules Clarétie, *Petrus Borel, le Lycanthrope* (1865); and Ch. Asselineau, *Bibliographie romantique* (1872).

BORELLI, GIOVANNI ALFONSO (1608–1679), Italian physiologist and physicist, was born at Naples. He was appointed professor of mathematics at Messina in 1649 and at Pisa in 1656. In 1667 he returned to Messina, but in 1674 was obliged to retire to Rome, where he lived under the protection of Christina, queen of Sweden, and died on Dec. 31, 1679. His best-known work is *De motu animalium* (1680–81), in which he sought to explain the movements of the animal body on mechanical principles; he thus ranks as the founder of the iatrophysical school. In a letter, *Del movimento della cometa apparsa il mese di decembre 1664,* published in 1665 under the pseudonym Pier Maria Mutoli, he was the first to suggest the idea of a parabolic path; and among his many astronomical works was *Theorica mediceorum planetarum ex causis physicis deducta* (Florence, 1666), in which he considered the influence of attraction on the satellites of Jupiter.

BORENIUS, TANCRED (1885–), Finnish art historian, was born July 14, 1885, at Wiborg, Finland, son of Carl Borenius. He began his studies at the University of Helsingfors and went therefrom to Italy, where he laid the foundations of his profound knowledge of Italian painting. In 1914 he was appointed lecturer on the history of art, and in 1922 professor at University college, London. When Finland became independent, he acted as secretary to the Diplomatic Mission (1918), and in 1919 was the temporary diplomatic representative of Finland in London. His works include *The Painters of Vicenza* (1909); a new edition of Crowe and Cavalcaselle, *History of Painting in North Italy* (1912); *Catalogue of the Collections of Sir Frederick Cook,* vol. i., "Italian Schools" (1913); *Catalogue of Viscount Lee of Fareham's Collection* (1923); *Four Early Italian Engravers* (1923); *English Primitives* (1924); and catalogues of the collections of the Earl of Harewood (1936) and Sir Robert Mond (1937).

BORER, a name for the hagfish (*q.v.*) and the slime-eel. The word is also used for many different animals that bore into solid substances, such as the boring sponge (*Cliona*), which bores into the shells of molluscs, the piddock (*q.v.*) of chalk cliffs and the ship-worm (*see* TEREDO).

BORGÄ: *see* PORVOO.

BORGHESE, a noble Italian family of Sienese origin, first mentioned in 1238, a member of which, Marcantonio Borghese, settled in Rome and was the father of Camillo Borghese (1550–1620), elected pope under the title of Paul V. (1605). The family took its place among the higher Roman nobility by the marriage of the prince's son Paolo with Olimpia, heiress of the Aldobrandini family, in 1614. In 1803 CAMILLO FILIPPO LUDOVICO, PRINCE BORGHESE (b. July 19, 1775), married Pauline, sister of the emperor Napoleon, and widow of General Leclerc. In 1806 he was made duke of Guastalla, and for some years acted as governor of the Piedmontese and Genoese provinces. After the fall of Napoleon he fixed his residence at Florence, where he died on May 9, 1832. He sold the Borghese Art Collection to Napoleon, part of his payment being the Piedmontese domains. On the restoration of these to Sardinia in 1815 he received part of the collection. The Borghese palace at Rome is one of the most magnificent buildings in the city, and contained a splendid gallery of pictures; most have been transferred to the Villa Borghese outside the Porta del Popolo, now Villa Umberto I, the property of the Italian government.

See A. von Reumont, *Geschichte der Stadt Rom*, iii. 605, 609, 617, etc.; *Almanach de Gotha* (Gotha, 1902); J. H. Douglas, *The Principal Noble Families of Rome* (Rome, 1905).

BORGHESI, BARTOLOMMEO (1781–1860), Italian antiquarian, was born at Savignano, near Rimini, July 11, 1781, and died at San Marino, April 16, 1860. He studied at Bologna and Rome. His monumental work, *Nuovi Frammenti dei Fasti Consolari Capitolini* (1818–20), attracted the attention of the learned world as furnishing positive bases for the chronology of Roman history, while his contributions to Italian archaeological journals established his reputation as a numismatist and antiquarian. Napoleon III. ordered the publication of a complete edition of his works. This appeared in 10 vols. (1862–97).

BORGIA, CESARE (1476–1507), duke of Valentinois and Romagna, was the son of Pope Alexander VI. by Vanozza dei Cattanei. He was born at Rome while his father was cardinal, and on his father's elevation to the papacy (1492) he was created archbishop of Valencia, and a year later cardinal. Cesare was Alexander's favourite son. In the early years of his father's pontificate he led a profligate life at the Vatican. When Charles VIII. left Rome for the conquest of Naples (Jan. 25, 1495), Cesare accompanied him as a hostage for the pope's good behaviour, but he escaped at Velletri and returned to Rome. His violence was notorious; when in 1497 his brother Giovanni, duke of Gandia, was murdered, the deed was attributed, perhaps with reason, to Cesare.

In July 1497 Cesare went to Naples as papal legate and crowned Frederick of Aragon king. Now that the duke of Gandia was dead, the pope needed Cesare to carry out his political schemes, and in Aug. 1498, Cesare was released from ecclesiastical obligations. On Oct. 1 he set forth for France with a magnificent retinue as papal legate to Louis XII., to bring him the pope's bull annulling his marriage with Jeanne of France (Louis wished to marry Anne of Brittany). In exchange he received the duchy of Valentinois, as well as military assistance for his own enterprises. He married Charlotte d'Albret, sister of the king of Navarre (May 1499). Alexander now contemplated sending Cesare to Romagna to subdue the turbulent local despots, and with the help of the French king to carve a principality for himself out of those territories, owing nominal allegiance to the pope. Cesare made Sesena his headquarters, and with an army consisting of 300 French lances, 4,000 Gascons and Swiss, besides Italian troops, he attacked Imola, which surrendered at once, and then besieged Forlì, held by Caterina Sforza, who was the widow of Girolamo Riario. She held out gallantly, but was at last forced to surrender on Jan. 22, 1500; Cesare treated her with consideration, and she ended her days in a convent. The Sforzas having expelled the French from Milan, Cesare returned to Rome in February, his schemes checked for the moment. His father rewarded him for his successes by making him gonfalonier of the church and conferring many honours on him, and he remained in Rome and took part in bull fights and other carnival festivities. In July occurred the murder of the duke of Bisceglie, Lucrezia Borgia's third husband. Again Cesare was suspected as the instigator of the deed, and in fact he almost admitted it himself. Bisceglie was related to the Neapolitan dynasty, with whose enemies the pope was allied, and he had had a quarrel with Cesare. When it appeared that he was recovering from his wounds, Cesare had him murdered, but not apparently without provocation, for, according to the Venetian ambassador Cappello, the duke had tried to murder Cesare first.

In Oct. 1500 Cesare again set out for the Romagna, on the strength of Venetian friendship, with an army of 10,000 men. Pandolfo Malatesta of Rimini and Giovanni Sforza of Pesaro fled, and those cities opened their gates to Cesare. Faenza held out, for the people were devoted to their lord, Astorre Manfredi, a handsome and virtuous youth of 18. Manfredi surrendered in April 1501, on the promise that his life should be spared; but Cesare broke his word, and sent him a prisoner to Rome, where he was afterwards foully outraged and put to death. After taking Castel Bolognese, he returned to Rome in June, to take part in the Franco-Spanish intrigues for the partition of Naples. He was now lord of an extensive territory, and the pope created him duke of Romagna. His cruelty, his utter want of scruple, and his good fortune made him a terror to all Italy. His avidity was insatiable, and he could brook no opposition; but, unlike his father, he was morose, silent and unsympathetic. His next conquests were Camerino and Urbino, but his power was now greatly shaken by the conspiracy of La Magione (a castle near Perugia where the plotters met). Several of the princes deposed by him, the Orsini and some of his own captains, such as Vitellozzo Vitelli (*q.v.*), Oliverotto da Fermo, and G. P. Baglioni, who had been given estates but feared to lose them, joined forces to conspire against the Borgia. Risings broke out at Urbino and in Romagna, and the papal troops were defeated; Cesare could find no allies, and it seemed as though all Italy was about to turn against the hated family, when the French king promised help, and this was enough to frighten the confederates into coming to terms. Most of them had shown very little political or military skill, and several were ready to betray each other. But Cesare, while trusting no one, proved a match for them all. During his operations in northern Romagna, Vitelli, Oliverotto, Paolo Orsini and the duke of Gravina, to show their repentance, seized Senigallia, which still held for the duke of Urbino, in his name. Cesare arrived at that town, decoyed the unsuspecting *condottieri* into his house, had them all arrested, and two of them, Vitelli and Oliverotto, strangled (Dec. 31, 1502).

He was back in Rome early in 1503, and took part in reducing the last rebel Orsini. He was gathering troops for a new expedition in central Italy in the summer, when both he and his father were simultaneously seized with fever. The pope died Aug. 18, while Cesare was still incapacitated, and this unfortunate coincidence proved his ruin; it was the one contingency for which he had not provided. On all sides his enemies rose against him; in Romagna the deposed princes prepared to regain their own, and the Orsini raised their heads once more in Rome. When Cesare tried to browbeat the cardinals by means of Don Michelotto and his bravos, they refused to be intimidated; he had to leave Rome in September, trusting that the Spanish cardinals would elect a candidate friendly to his house. At the Conclave, Francesco Todeschini-Piccolomini was elected as Pius III, and he showed every disposition to be peaceful and respectable.

Cesare's dominion at once began to fall to pieces; Guidobaldo, duke of Urbino, returned to his duchy with Venetian help; and the lords of Piombino, Rimini and Pesaro soon regained their own; Cesena, defended by a governor faithful to Cesare, alone held out. Pius III died Oct. 18, 1503, and a new Conclave was held. Cesare, who could still count on the Spanish cardinals, wished to prevent the election of Giuliano della Rovere, the

enemy of his house, but on Nov. 1 he was elected, and assumed the name of Julius II. Venice hoped to intervene in Romagna and establish her protectorate over the principalities, but Julius was determined to prevent this intervention, and after trying in vain to use Cesare as a means of keeping out the Venetians, he had him arrested. Borgia was obliged to surrender all his castles, and departed for Naples, where the Spaniards were in possession. The Spanish governor, Gonzalo de Cordova, had given him a safe-conduct, and he was meditating fresh plans, when Gonzalo arrested him by the order of Ferdinand of Spain as a disturber of the peace of Italy (May 1504). In August he was sent to Spain, where he remained a prisoner for two years; in Nov. 1506 he made his escape, and fled to the court of his brother-in-law, the king of Navarre, under whom he took service. While besieging the castle of Viana, held by the rebellious count of Lerin, he was killed (March 12, 1507).

Cesare Borgia was a type of the adventurers with which the Italy of the Renaissance swarmed, but he was cleverer and more unscrupulous than his rivals. His methods of conquest were ferocious and treacherous; but once the conquest was made, he governed his subjects with firmness and justice, so that his rule was preferred to the anarchy of factions and local despots. But he was certainly not a man of genius, as has long been imagined, and his success was chiefly the result of the support of the papacy; once his father was dead Cesare's career was at an end, and he could no longer play a prominent part in Italian affairs.

BIBLIOGRAPHY.—The chief authorities for the life of Cesare Borgia are the same as those of Alexander VI., especially M. Creighton's *History of the Papacy,* vol. v. (1897); F. Gregorovius's *Geschichte der Stadt Rom.* vol. vii. (Stuttgart, 1881); and P. Villari's *Machiavelli* (1892); also C. Yriarte, *César Borgia* (1889), an admirable piece of writing; Schubert-Soldern, *Die Borgia und ihre Zeit* (Dresden, 1902), which contains the latest discoveries on the subject; E. Alvisi, *Cesare Borgia, Duca di Romagna* (Imola, 1878); Rafael Sabatini, *The Life of Cesare Borgia;* and G. Portigliotti, *The Borgias,* trans. Bernard Miall (1928). (L. V.)

BORGIA, FRANCIS (1510–1572), Roman Catholic saint, duke of Gandia, and general of the order of Jesuits, was born at Gandia (Valencia) on Oct. 10, 1510, and from boyhood was remarkable for his piety. Educated from his 12th year at Saragossa under the charge of his uncle the archbishop, he had begun to show a strong inclination towards the monastic life, when his father sent him in 1528 to the court of Charles V. Here he married Eleanor de Castro, a Portuguese lady of high rank, was created marquis of Lombay, and was appointed master of the horse to the empress. He accompanied Charles on his African expedition in 1535, and also into Provence in 1536; and, on the death of the empress in 1539, he was deputed to convoy the body to the burial-place in Granada. This sad duty confirmed his determination to leave the court, and also, should he survive his consort, to embrace the monastic life. On his return to Toledo he was made viceroy of Catalonia and commander of the order of St. James. At Barcelona, the seat of his government, he lived a life of great austerity until 1543, when, having succeeded his father in the dukedom, he resigned his viceroyalty. He now powerfully encouraged the recently founded Society of Jesus. At Gandia he built a Jesuit college; and on the death of Eleanor in 1546, he resolved to become himself a member of the society. A papal dispensation allowed him, in the interests of his young children, to retain his dignities and worldly possession for four years after taking the vows. In 1550 he visited Rome, where he was received with every mark of distinction, and where he furnished the means for building the Collegium Romanum. Returning to Spain in 1551, he assumed the Jesuit habit, was ordained priest, and entered upon a life of penance and prayer. He refused a cardinal's hat, and at the command of Ignatius Loyola, he devoted himself to the work of itinerant preaching. In 1554 he was appointed commissary-general of the order in Spain, Portugal and the Indies. On the death of Lainez in 1565, Francis Borgia was chosen to succeed him as third general of the Jesuits. So great was the progress of the society under his government that he has sometimes been called "its second founder." Borgia's ideal was a simple monasticism rather than a life of manifold and influential contact with the world. He died at Rome on Sept. 30 1572. He was beatified by Urban VIII. in 1624, and canonized by Clement X. in 1671, his festival being afterwards (1683) fixed by Innocent XI. for Oct. 10.

Several works by St. Francis Borgia have been published, the principal of these being a series of *Exercises* similar to the *Exercitia Spiritualia* of Loyola, and a treatise *Rhetorica Concionandi.* The *Opera Omnia* were published at Brussels in 1675. His life was written (1592) by his confessor, Pedro de Ribadeneira. *See* A. M. Clarke, *The Life of St. Francis Borgia* (1894); P. Suan, *St. François de Borgia* (1905), *Histoire de St. François de Borgia* (1910); C. C. Martindale, *In God's Army,* vol. ii. (1917).

BORGIA, LUCREZIA (1480–1519), duchess of Ferrara, daughter of Cardinal Rodrigo Borgia, afterwards Pope Alexander VI. (*q.v.*), by his mistress Vanozza dei Cattanei, was born at Rome. Her father contemplated a Spanish marriage for her, and at the age of 11 she was betrothed to Don Cherubin de Centelles, a Spanish nobleman. But the engagement was broken off almost immediately, and Lucrezia was married by proxy to another Spaniard, Don Gasparo de Procida, son of the count of Aversa. On the death of Innocent VIII. (1492), Cardinal Borgia was elected pope as Alexander VI., and annulled the union with Procida; in June 1493 Lucrezia was married to Giovanni Sforza, lord of Pesaro. When the pope became friendly to the king of Naples, the enemy of the house of Sforza, he planned the subjugation of the vassal lords of Romagna, and Giovanni, feeling his position insecure, left Rome for Pesaro, with his wife. By Christmas 1495 they were back in Rome. The pope decided that he had done with Sforza, and annulled the marriage on the ground of the husband's impotence (March 1497). In order to cement his alliance with Naples, he married Lucrezia to Alphonso of Aragon, duke of Bisceglie, a handsome youth of 18, related to the Neapolitan king. But when Alexander backed up Louis XII. of France in the latter's schemes for the conquest of Naples, Bisceglie fled from Rome, fearing for his life, and the pope sent Lucrezia to receive homage of the city of Spoleto as governor. On her return to Rome in 1499, her husband, who really loved her, joined her once more. A year later he was murdered by the order of her brother Cesare.

After the death of Bisceglie, Lucrezia retired to Nepi, and then returned to Rome, where she acted for a time as regent during Alexander's absence. The latter now arranged a marriage between his daughter and Alphonso, son and heir to Ercole d'Este, duke of Ferrara, and in Sept. 1501 the marriage was celebrated by proxy with great magnificence in Rome. On Lucrezia's arrival at Ferrara she won over her reluctant husband by her youthful charm (she was 22), and from that time led a peaceful life. On the death of Ercole in 1505, her husband became duke, and she gathered many learned men, poets and artists at her court, among whom were Ariosto, Cardinal Bembo, Aldus Manutius the printer and the painters Titian and Dosso Dossi. She devoted herself to the education of her children and to charitable works; the only tragedy connected with this period of her life is the murder of Ercole Strozzi, who is said to have admired her and fallen a victim to Alphonso's jealousy. She died on June 24, 1519, leaving three sons and a daughter by the duke of Ferrara, besides one son (Rodrigo) by the duke of Bisceglie.

See the bibliographies for ALEXANDER VI. and BORGIA, CESARE; and especially F. Gregorovius's *Lucrezia Borgia* (Stuttgart, 1874), the standard work on the subject; and G. Campori's "Una Vittima della Storia, Lucrezia Borgia," in the *Nuova Antologia* (Aug. 31, 1866), which aims at the rehabilitation of Lucrezia.

BORGLUM, GUTZON (1871–1941), American sculptor, was born of Danish parents near Bear Lake, Idaho, March 25, 1871. His brother and pupil, Solon (1868–1922), was also a distinguished sculptor. After a boyhood schooling in Nebraska and at St. Mary's college (Kan.) Gutzon studied art in San Francisco, then in Paris at Julien's academy, 1890–93. Both painting and sculpture were admitted to the salon. In England he received important commissions and royal recognition. In 1901 he established himself in New York. A bronze group called "The Mares of Diomedes," showing a wild stampede, was the first piece of American sculpture bought for the Metropolitan Museum of New York. He poured forth with prodigal versatility such small bronzes as his "Dying Nero" and "Portrait of Ruskin"; such heroic figures as the twelve apostles for the Cathedral of Saint John, portrait statues of Lincoln, Altgeld, Wilson, Paine, Mackay,

two equestrian statues of Sheridan, and many other civil and military figures; also memorial groups of soldiers and pioneers as well as figures from mythology and poetry. But his genius turned toward what his wife, Mary Montgomery Borglum, a scholar in cuneiform and other Oriental lore, described as "the emotional value of volume." From a six-ton block of marble he executed a colossal head of Lincoln, now in the capitol at Washington. This suggested to Southern women a similar head of Robert E. Lee. But Borglum was moved to begin instead a titanic procession of Lee and his staff and soldiers marching across Stone mountain in Georgia. Disputes stopped what must have proved one of the wonders of sculpture. He was then engaged on a government stipend to turn another mountain into a monument. On Mount Rushmore in South Dakota he carved, with sublimity, the heads of Washington, Jefferson, Lincoln and Theodore Roosevelt. His engineering genius invented new methods, and he had achieved, just before he died, the most colossal sculptures ever attempted by man, leaving the last details to be completed by his son, Lincoln. The patriotic exaltation that gave these huge works spiritual grandeur was also expressed in his exposures of corruption in aeroplane manufacture during World War I, and in ardent political activities. (RU. H.)

BORGLUM, SOLON HANNIBAL (1868–1922), American sculptor, was born in Ogden, Utah, on Dec. 22, 1868, the son of a Danish wood-carver and the brother of Gutzon Borglum (*q.v.*). He studied under Louis F. Rebisso in the Cincinnati art school in 1895–97, and under Frémiet in Paris. He took as his early subjects incidents of western life, cow-boys and Indians, with which he was familiar from his years on the ranch, notable works being his "Last Round-up" and "Burial on the Plains." In 1911 he completed his bronze "God's Command to Retreat," representing Napoleon on horseback in a snowdrift. His "The Little Lady of the Dew," and "Inspiration" and "Aspiration," two statues of Indians, in stone, were unveiled in 1920 in the churchyard of St. Mark's-in-the-Bouwerie, in New York city. He was Y.M.C.A. secretary with the French army in 1918, and won the Croix de Guerre. He died on Jan. 31, 1922.

BORGOGNONE, AMBROGIO (*fl.* 1473–1524), Italian painter of the Milanese school, whose real name was Ambrogio Stefani da Fossano, was approximately contemporary with Leonardo da Vinci, but represented, at least during a great part of his career, the tendencies of Lombard art anterior to the arrival of that master—tendencies from his predecessors Foppa and Zenale, which he had adopted and perfected. His fame is principally associated with that of one great building, the Certosa, at Pavia. He seems to have lived there from 1486 to 1494, when he returned to Milan. Only one known picture, an altar-piece at the church of San Eustorgio, can with probability be assigned to a period of his career earlier than 1486. For two years after his return to Milan he worked at the church of San Satiro in that city. From 1497 he was engaged for some time in decorating with paintings the church of the Incoronata in the neighbouring town of Lodi. In 1508 he painted for a church in Bergamo; in 1512 his signature appears in a public document of Milan; in 1524—and this is the last authentic record—he painted a series of frescoes in the portico of San Simpliciano at Milan illustrating the life of St. Sisinius. The National gallery, London, has two fair examples of his work —the separate fragments of a silk banner painted for the Certosa, and containing the heads of two kneeling groups of men and women, and a large altar-piece of the marriage of the two SS. Catherine, painted for the chapel of Rebecchino, near Pavia.

BORGO SAN DONNINO: *see* FIDENZA.

BORGU or **BARBA,** an inland region of West Africa. Its name probably comes from the aquatic grass called *borgu,* which is a highly nutritive food for cattle. The western part is included in the French colony of Dahomey; the eastern in the Ilorin province of the British protectorate of Nigeria. Borgu is bounded N.E. and E. by the Niger, S. by the Yoruba country, N.W. by Gurma. It consists of an elevated plain traversed by rivers draining north or east to the Niger. Borgu is inhabited by a number of pagan Negro tribes, several of whom were dependent on the chief of Nikki, a town in the centre of the country, the chief being spoken of as sultan of Borgu. The chief or king of Bussa (*q.v.*) was another more or less powerful potentate. In 1894 Borgu became the object of rivalry between France and Great Britain. The Royal Niger company, which had already concluded a treaty of protection with the king of Bussa, sent out Capt. F. D. Lugard (afterwards Lord Lugard) to negotiate treaties with the king of Nikki and other chiefs, and Lugard succeeded in doing so a few days before the arrival of French expeditions from the west. Disregarding the British treaties, French officers concluded others with various chiefs, invaded Bussa, and established themselves at various points on the Niger. To defend British interests Joseph Chamberlain, then secretary of state for the colonies, early in 1898 sent Lugard back to Borgu. A period of great tension ensued. It was at this time that Lugard raised the West African frontier force. In the result an Anglo-French conflict was averted, and by the convention of June 1898 the western part of Borgu, including the town of Nikki, was declared French, and the eastern British, the French withdrawing from all places on the lower Niger.

Since 1898 the country has been opened, and from being the most lawless and truculent of people the Bariba have become singularly amenable and law-abiding. Elephants are still to be found in the 50 mi. strip of forest land which stretches between the Niger and the interior of the country, in which are extensive areas of land suitable for cotton.

BORIC ACID or **BORACIC ACID** is familiar as a fine white powder or as small crystals which are "soapy" to the touch, a property which accounts for its use in preparing floors for dancing. This acid was first prepared by Wilhelm Homberg (1652–1715) from borax (*q.v.*), by the action of mineral acids, and was given the name *sal sedativum Hombergi.* The presence of boric acid or its salts has been noted in almost all fruits (A. H. Allen). The free acid is found native in certain volcanic districts such as Tuscany, the Lipari islands and Nevada, issuing mixed with steam from fissures in the ground; it is also found as a constituent of many minerals (borax, boracite, boronatrocalcite and colemanite). Its formula is H_3BO_3.

The chief source of boric acid for commercial purposes is the Maremma of Tuscany, an extensive and desolate tract of country over which jets of vapour and heated gases (*soffioni*) and springs of boiling water spurt out from chasms and fissures. In some places the fissures open directly into the air, but in other parts of the district they are covered by small muddy lakes (*lagoni*). The soffioni contain a small quantity of boric acid (usually less than 0.1%), together with a certain amount of ammoniacal vapours. In order to obtain the acid, a series of basins constructed over the vents is so arranged as to permit of the passage of water through them by gravitation. Water is led into the highest basin and by the action of the heated gases is soon brought into a state of ebullition; after remaining in this basin for about a day, it is run off into the second one and is treated there in a similar manner. The operation is carried on through the entire series, until the liquor in the last basin contains about 2% of boric acid. It is then run into settling tanks from which it passes into the evaporating pans, which are shallow lead-lined pans heated by the gases of the soffioni. These pans are worked on a continuous system, the liquor in the first being concentrated and run off into a second, and so on, until it is sufficiently concentrated to crystallize. The crystals are purified by recrystallization from water. Boric acid is also obtained from boronatrocalcite by treatment with sulphuric acid, followed by the evaporation of the solution so obtained. The residue is then heated in a current of superheated steam, in which the boric acid volatilizes and distils over. It may also be obtained by the decomposition of boracite with hot hydrochloric acid. In small quantities, it may be prepared by the addition of concentrated sulphuric acid to a cold saturated solution of borax: $Na_2B_4O_7+H_2SO_4+5H_2O=Na_2SO_4+4H_3BO_3$.

Boric acid crystallizes from water in white nacreous laminae belonging to the triclinic system; it is difficultly soluble in cold water (2.6% at 40° C.), but dissolves readily in hot water (37% at 107°). It is one of the "weak" acids, its dissociation constant being only 1.69×10^{-10}, and consequently its salts are appreciably hydrolysed in aqueous solution. Boric acid is volatile in steam to

the extent of 2·8%. The free acid turns blue litmus to a claret colour. Its action upon turmeric is characteristic; a turmeric paper moistened with a solution of boric acid turns brown, the colour becoming much darker as the paper dries; while the addition of sodium or potassium hydroxide turns it almost black. Boric acid is easily soluble in alcohol, and the vapour of the solution burns with a characteristic vivid green colour. The acid on being heated above 107° C. loses water and is converted into *metaboric acid,* HBO_2; at 140° C. *pyroboric acid,* $H_2B_4O_7$, is produced; at still higher temperatures boron trioxide is formed. The salts of the normal or orthoboric acid in all probability do not exist; metaboric acid, however, forms several well-defined salts which are readily converted by acids, even by carbon dioxide, into salts of pyroboric acid. That orthoboric acid is a tribasic acid is shown by esterification to ethyl orthoborate, the vapour density of which corresponds to the molecular formula $B(OC_2H_5)_3$; the molecular formula of the acid must consequently be $B(OH)_3$ or H_3BO_3. With glycerol, boric acid forms a strong monobasic acid (*see* BORON). The metallic borates are generally obtained in the hydrated condition, and with the exception of those of the alkali metals are insoluble in water. The most important of the borates is sodium pyroborate or borax (*q.v.*).

Borax and boric acid are feeble antiseptics, hence they have been used to preserve food-substances, such as milk and butter, but this use was forbidden in Great Britain by law in 1927. In medicine boric acid is used in solution to relieve itching, but its chief use is as a mild antiseptic to impregnate lint or cotton-wool. Recent work has shown it is too feeble to be relied upon alone, but where really efficient antiseptics, such as mercuric chloride and iodide, and carbolic acid, have been already employed, boracic acid (which, unlike these, is non-poisonous and non-irritant) may legitimately be used to maintain the aseptic or non-bacterial condition which they have obtained. Borax taken internally is of some value in irritability of the bladder, but as a urinary antiseptic it is now surpassed by several more recent drugs, such as urotropine (hexamine).

BORING is employed for: (1) prospecting or searching for mineral deposits; (2) sinking petroleum, natural gas, artesian or salt wells; (3) determining the depth below the surface to bedrock or other firm substratum, together with the character of the overlying soil, preparatory to mining or civil engineering operations; and (4) geological or other scientific explorations.

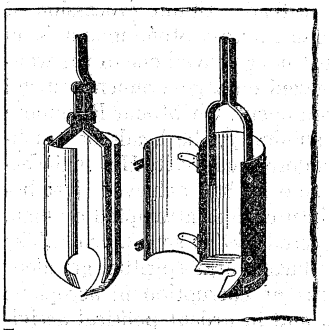
Prospecting by boring is most successful in the case of mineral deposits of large area, nearly horizontal, or at least not highly inclined; *e.g.,* deposits of coal, iron, lead and salt. Beds of such minerals may be pierced at any desired number of points, and the depth at which each hole enters the deposit and the thickness of the bed itself are readily ascertained, so that a map can be constructed with some degree of accuracy. Samples of the mineral are secured also, furnishing data as to the value of the deposit. While boring is sometimes adopted for prospecting irregular and steeply inclined deposits of small area, the results are obviously less trustworthy than under the conditions named above, and may be actually misleading unless a large number of holes are bored. Incidentally, boreholes supply information as to the character and depth of the valueless depositions of earth or rock overlying the useful mineral. Such data assist in deciding upon the appropriate method for, and estimating the cost of, sinking shafts or driving tunnels to develop and exploit the deposit.

Several of the methods of boring in soft ground are employed in connection with civil engineering operations; as for ascertaining the depth below the surface to solid rock, preparatory to excavating deeply, and for estimating the cost of large-scale excavations.

In sinking petroleum wells, boring serves both for discovering the oil-bearing strata and for extracting the oil. Since about 1918 a number of the deepest borings in the world have been made for oil or natural gas; for example, two in West Virginia of 7,386 and 7,579ft., two in south-west Pennsylvania of 6,300 and 7,248ft., two in Texas of 5,400 and 5,908ft., four in California of 6,240, 7,187, 7,212 and 7,319ft. and one in Spain of 5,285 feet. Rock salt deposits are sometimes worked through boreholes by introducing water and pumping out the brine for further treatment.

Boring is useful in mines for exploring the deposit ahead of the workings, searching for neighbouring veins and sounding the ground on approaching dangerous inundated workings. In the coal regions boreholes are sometimes used to carry steam pipes and hoisting ropes underground at points remote from a shaft.

Lastly, deep holes have been bored for geological exploration or for observing the increase of temperature in depth in the earth's crust; for example, at Czuchow, Silesia, 7,348ft. deep; at Leipzig, Germany, 6,265ft.; near Pittsburgh, Pa., 5,532ft.; and at Wheeling, W. Va., nearly 5,000 feet. The two last mentioned were bored to obtain as complete knowledge as possible of the bituminous coal and oil-bearing formations.



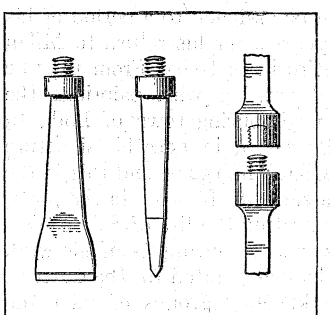
FIGS. 1 AND 2.—TWO TYPES OF POD AUGER, SHOWING RIGID AND HINGE CONSTRUCTION

Boring Methods.—Of the six boring methods—by (1) earth augers, (2) drive pipes, (3) jointed rods and drop drill, (4) the rope system, in which the rod is replaced by rope, (5) diamond drill and (6) rotary drill—the first two are adapted to soft soils only; the others are for rock.

(1) *Earth augers* comprise spiral and pod augers. The spiral resembles the wood auger used by carpenters. It is attached to a rod by a socket joint, successive lengths of rod being added as the hole is deepened. The auger is rotated by horizontal levers clamped to the rod—by hand for holes of small diameter (2 to 6in.), by horse power for the larger sizes (8 to 16in.). Cohesive soils containing few stones are readily bored; stony ground, with difficulty. The operation is intermittent; after a few revolutions the auger is raised and cleared of the soil clinging between the spirals. Depths to 50 or 60ft. are usually bored by hand; deeper holes by horse power. For non-cohesive soil, the auger may be encircled by a close-fitting sheet-iron cylinder to retain the soil.

Pod augers are generally 8 to 20in. in diameter. A common form (fig. 1) consists of two curved plates, one attached to the rod rigidly, the other by hinge and key. A few revolutions fill the pod. Figure 2 shows a type for sandy soils. For holes of large diameter the auger is handled with the aid of a light derrick.

(2) *Drive pipes* are widely used for testing the depth and character of soft material overlying solid rock and as a necessary preliminary to rock boring when some thickness of surface soil must first be passed through. In its simplest form the drive pipe consists of one or more lengths of wrought iron pipe, open at both ends and ½in. to 6in. in diameter. When of small size the pipe is driven by a heavy hammer; for deep and large holes, a light pile-driver is necessary. The lower end of the pipe has an annular steel shoe; the upper end, a drive-head for receiving the blows of the hammer. Successive lengths are screwed on as required. For shallow holes the pipe may be cleaned out by a "bailer"—a cylinder 4 to 6ft. long, with a valve in the lower end. It is lowered at intervals, filled by being dashed up and down, and then raised and emptied. If, after reaching some depth, the external frictional resistance prevents the pipe from sinking farther, another pipe of smaller diameter is inserted and driving continued. Drive pipes are often sunk by applying weights at the surface and slowly rotating by levers. Two pipes are then used, one inside the other. Water is pumped down the inner pipe, to loosen the soil and raise the debris; this is sometimes called "wash-boring." In a variation of this, for tough soil or hard-pan, a drill bit on a hollow rod is raised and dropped inside the pipe. The water, passing down the



FIGS. 3 AND 4.—DRILL BIT, CUTTING TOOL AND ROD FOR DROP DRILL WORK

rod and through holes in the bit, raises the debris. The well-known "empire drill" is an example. The "driven well" for water supply is an adaptation of the drive pipe.

(3) *Drop drill and rod* has long been used in Europe and elsewhere for deep boring. It is now rarely employed for depths greater than 200 to 300 feet. The usual cutting tool or bit is shown in fig. 3. The rod is from 1 to 2in. square in long lengths with screw joints (fig. 4). Wooden rods are occasionally used. For shallow holes (50 to 75ft.) the work is done by hand, one or two cross-bars being clamped to the rod. The men alternately raise and drop the drill, while walking round and round to rotate the bit and so keep the hole true. The cuttings are cleaned out by a bailer, as for drive pipes.

In boring by hand the practical limit of depth is soon reached, due to the increasing weight of the rod. For going deeper (100 to 300ft.) a "spring-pole" may be used—a tapering pole perhaps 30ft. long and 5 or 6in. in diameter at the small end. It rests in an inclined position on a fulcrum set about 10ft. from the butt, the latter being firmly fixed. The rod is suspended from the end of the pole, which extends at a height of several feet over the mouth of the hole. With the aid of the spring of the pole the strokes are produced by a slight effort of the driller. Speeds of 6 to 10ft. per 10 hours are easily made, to depths of 200 to 250 feet.

For deep boring the rod system (nearly obsolete) requires a more elaborate plant. The rod is suspended from a walking-beam actuated by a steam engine. By a screw-feed, the rod is fed down as the hole is deepened. A derrick carries the sheaves and ropes by which the rod and tools are manipulated. The drill bit cannot be attached rigidly to the rod as in shallow boring, because the momentum of the heavy parts would cause excessive breakage. A pair of sliding links between the rods and bit is therefore necessary. On striking, the bit comes to rest, while the rod descends to the end of the stroke, the links closing up. On the up-stroke the lower link, with the bit, is raised for another blow. For large holes the striking weight may be 800 to 1,000 lb.; length of stroke, $2\frac{1}{2}$ to 5ft.; and speed, from 20 to 30 strokes per minute. By using the sliding links the cross-section and weight of the rod may be greatly reduced. To deliver an effective blow, however, the rod and bit must drop with a quick stroke, which brings a heavy strain upon the operating machinery. To overcome this difficulty, "free-falling tools" have been devised to cause the bit to fall by gravity; the rod follows on its measured down-stroke and picks up the bit. Free-falling tools comprise: (1) those by which the bit is released automatically; (2) those operated by a sudden twist imparted to the rod by the drillman. They are not now of sufficient importance to be detailed here. Tools are sometimes used for cutting an annular groove around the bottom of the hole and raising the core so formed for observing the character of the rock.

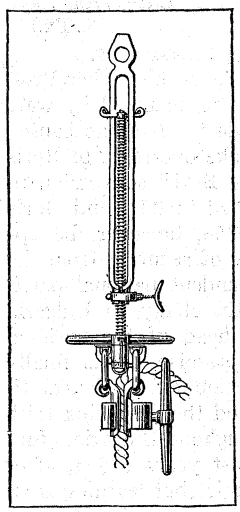


FIG. 5.—TEMPER-SCREW REGULATION FOR STROKE AND SPEED USED IN ROPE WORK

(4) *Rope and drop tools,* also known as the "churn" or "oil-well" drill, are widely used for prospecting and for oil, artesian and natural gas wells. The chief difference from rod-boring is in using rope instead of jointed rods. For deep boring this saves the large amount of time consumed in raising and lowering the rod, when the hole is to be cleaned out or a dull bit replaced, since the tools are rapidly run up or down by means of the rope with which they are operated while drilling. The speed of rope-boring is therefore but little affected by increase of depth, while with rod-boring it falls off rapidly. In its simplest form the "string of tools," suspended from the rope, consists of the bit, jars and rope-socket. The jars are a pair of sliding links, similar to those for rod-boring, but serving a different purpose, viz., to produce a sharp shock on the up-stroke, as the jars come together, for loosening the bit if it tends to stick fast. A heavy bar (auger stem) is generally inserted between the jars and bit to increase the force of the blow. The weight of another bar (sinker-bar) above the jars keeps the rope taut. The length of stroke and the feed are regulated by a "temper-screw" (fig. 5). Clamped to it is the drill rope, which is let out at intervals as the hole is deepened. The bits are usually 3 to 8in. in diameter; speed of boring, generally between 20 to 40ft. per 24 hours, according to the kind of rock. A great variety of "fishing tools" is used in case of breakage of parts in the hole or other accident. For convenience in moving from place to place, especially in prospecting, the entire drilling machinery may be mounted on a truck.

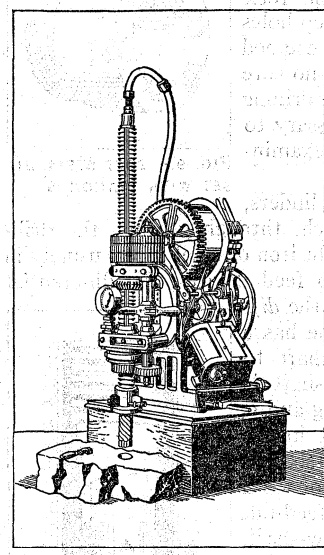


FIG. 6.—STANDARD DESIGN DIAMOND DRILL WITH DIFFERENTIAL FEED

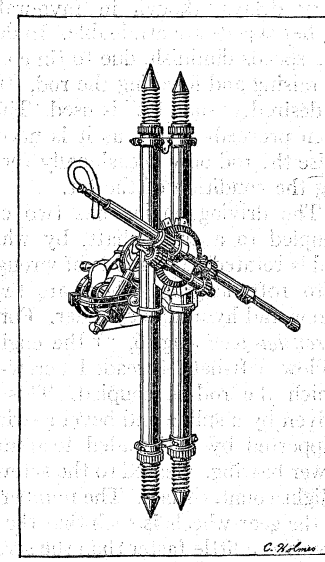


FIG. 7.—SMALL DRILL FOR UNDERGROUND WORKING OF MINES, SHOWING DIFFERENTIAL FEED

(5) *Diamond drill.*—By methods (1) to (4) holes can be bored vertically downward only. By the diamond drill, holes may be bored at any angle, from vertically downward to vertically upward. It makes an annular hole, the core of which furnishes a practically complete cross-section of the strata penetrated; the thickness and character of each stratum are revealed, with its depth below the surface. Thus, the diamond drill is well adapted to prospecting deposits from which samples are desired.

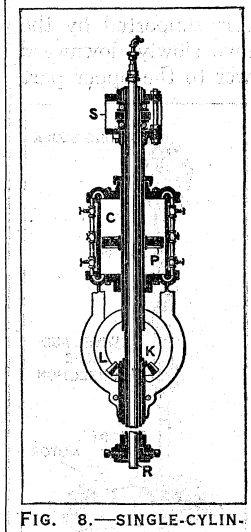


FIG. 8.—SINGLE-CYLINDER HYDRAULIC FEED FOR DIAMOND DRILL

The apparatus consists of a line of hollow rods, coupled by screw joints, an annular steel bit, set with diamonds, being attached to the lower end; by a small engine on the surface the rod is rapidly rotated and fed down automatically as the hole is deepened. The speed of rotation is from 300 to 800 revolutions per minute, depending on the kind of rock and diameter of the bit. While the boring is in progress water is forced down the hollow rod by a pump, returning to the surface through the annular space between the rod and the walls of the hole. The cuttings are thus carried to the surface, leaving the bottom of the hole clean and unobstructed. To recover the core and inspect the bit and diamonds, the rod is raised at every 3 to 8ft. of depth by a small drum and rope operated by the driving engine.

Diamond drills of standard designs (fig. 6) bore holes from $1\frac{9}{16}$ to $2\frac{3}{4}$in. in diameter, yielding cores of 1 to $1\frac{5}{16}$in. diameter and are capable of reaching depths of a few hundred to 4,000ft. or more. In the South African gold-fields several holes from 4,500 to 5,200ft. deep have been bored. Diamond drills require 8 to 30 boiler h.p. Large machines will bore shallower holes of 6, 9

or even 12in. diameter. For operating in underground workings of mines, small machines are sometimes mounted on columns (fig. 7). They bore $1\frac{1}{4}$ to $1\frac{9}{16}$ in. holes to depths of 300 to 400ft., cores being $\frac{7}{8}$ to 1in. in diameter. Hand-power and truck-mounted drills are also built. Rates of advance for core-drilling to moderate depths range usually from 2 to 3ft. per hour, including ordinary delays, though in favourable rock higher speeds are attainable. In deep holes the speeds diminish, due to time consumed in raising and lowering the rod. If no core is desired a "solid bit" is used. The drilling then proceeds faster, as it is necessary to raise the rod only occasionally for examining the condition of the bit.

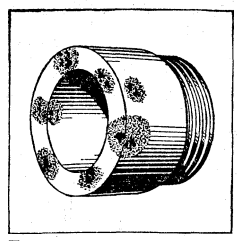


FIG. 9.—SOFT STEEL BIT SET WITH DIAMONDS

The driving engine has two cylinders, coupled to a crank-shaft, by which, through gearing, the drill-rod is rotated. The rod is of wrought iron or steel tubes, usually in 5 to 10ft. lengths. There are two feed devices, the differential screw and hydraulic cylinder. For the *differential feed* (fig. 6, 7) the engine has a hollow left-hand-threaded screw-shaft to which the rod is coupled. This shaft is driven by a spline and bevel gearing and is supported by a threaded feed-nut in the lower bearing. Geared to the screw-shaft is a light counter-shaft. The number of teeth in the gear-wheels is such that the feed-nut revolves a little faster than the screw-shaft, so that the drill-rod is fed downward a fraction of an inch for each revolution. To vary the rate of feed for different rocks, there are three pairs of gears with different ratios of teeth. The screw-shaft and gearing are carried by a swivel-head, which can be rotated in a vertical plane, for boring holes at any angle.

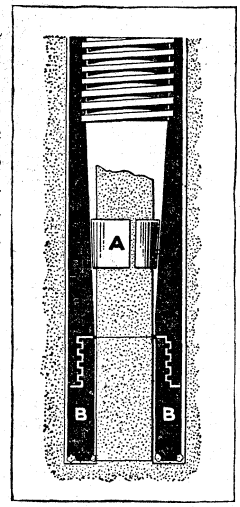


FIG. 10.—CORE LIFTER USED IN DIAMOND DRILL WORK

With the *hydraulic feed* (fig. 8) the rate of feed is independent of the rotative speed of the rod and can be adjusted with precision. There are either one or two feed cylinders, *C*, supplied with water from the pump. The rod, *R*, while rotating freely, is supported by the feed cylinder piston, *P*, and caused to move slowly downward by allowing the water to pass from the lower to the upper part of the cylinder. *S* is a ball-bearing and *K* a bevel gear, driven by a companion gear, *L*, on the engine shaft. Valves regulate the passage of the water and hence the rate of feed.

The bit, in fig. 9, is of soft steel, set with 6 to 8 or more diamonds, according to its diameter. The diamonds, usually from $1\frac{1}{2}$ to $2\frac{1}{2}$ carats in size, are carefully set in the bit, projecting but slightly from its surface. Two kinds of diamonds are used, "carbons" and "borts." The carbons are opaque, dark in colour, and being tougher than the brilliant, with no cleavage planes, are suitable for hard rock. Borts are imperfect brilliants, and are best used for softer rocks. As the bit wears, the stones must be reset from time to time. The wear of carbons in a well-set bit is small though extremely variable. Above the bit are the core-lifter and core-barrel. The core-lifter, *A* (fig. 10), grips and breaks off the core, and raises it to the surface. The barrel, 3 to 10ft. long, fits closely in the hole and may be spirally grooved for the passage of water and debris. It serves partly as a guide, tending to keep the hole straight, partly for holding and protecting the core.

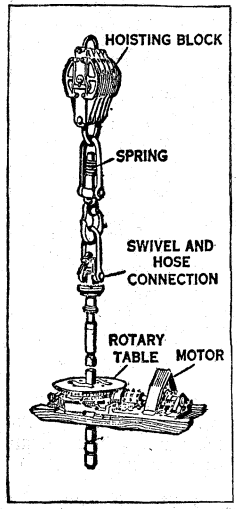


FIG. 11.—DRIVING MECHANISM FOR ROTARY DRILLING

Diamond drills do not work satisfactorily in broken, fissured rock, as the carbons are liable to be injured or torn from their settings. In these circumstances and for soft rocks, the diamond bit may be replaced by a steel-toothed bit. Another core-drill is the Davis Calyx drill. For hard rock it has an annular bit, accompanied by a quantity of chilled-steel shot ("shot-boring"); for soft rock a toothed bit is used.

Diamond-drill holes are rarely straight, usually deviating considerably from the direction in which they are started. Very deep holes may vary as much as 45° or even 60° from their true direction. This is because the rod does not fit closely in the hole and therefore bends. Deviation is likely to occur also in drilling through inclined strata, especially when the layers are of different degrees of hardness. By using a long and closely fitting core-barrel deviation is reduced but cannot be wholly prevented. Nearly horizontal holes always deflect upward, because the sag of the rod tilts up the bit. Diamond-drill holes should therefore always be surveyed. This is done by lowering into the hole instruments for observing at a number of successive points the direction and degree of deviation. If accurately surveyed a crooked hole may be quite as useful as a straight one. For details *see* Peele's *Mining Engineers' Handbook,* sec. 9, 2nd edition.

Casing.—Generally, boreholes made by any method must be lined with casing pipe to prevent caving of the walls; for details, too extensive and technical to be given here, *see* Peele's *Mining Engineers' Handbook,* sec. 9, 2nd edition. For the details of oil-well boring, *see* DRILLING, PETROLEUM.

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BORING MACHINES: *see* DRILLING, PETROLEUM.

BORIS I. (?–903), Bulgarian tsar, succeeded his father Pressian in 853. The early years of his rule were occupied by wars in Central Europe. His alliance with Ludwig the German caused the Byzantine emperor, Michael III., to make overtures to Boris with a view to an alliance, to be sealed by Boris' conversion to the Orthodox faith. A treaty was concluded in 864, and Boris was baptized in the following year. In 866, however, he approached the pope, Nicholas I., in the hope of securing from the Western Church the promise of an independent national patriarchate for Bulgaria. The pope sent Latin clergy to Bulgaria and promised to appoint an independent head of the national church; but on his failing to fulfil his promise, Boris finally decided for the Byzantine Church at the Council of Constantinople (870). The Bulgarian nation accepted the Orthodox faith and numerous monasteries sprang up throughout Bulgaria. Into one of these Boris retired to spend his last years (889), after abdicating in favour of his eldest son Vladimir; but learning from his retreat of his son's incompetent and vicious reign, he emerged, captured and blinded Vladimir, and proclaimed his youngest son Simeon tsar (893). He then returned to his monastery, where he died in the odour of sanctity on May 2, 903. He is reckoned a saint by the Orthodox Church.

Although his campaigns against Serbia (854) and Croatia (855) were unsuccessful, Boris was a strong and influential sovereign, but he is chiefly famous for his conversion to Christianity and his furtherance of the spiritual life of Bulgaria.

BORIS III. (1894–1943), king of Bulgaria, was born at Sofia on Jan. 30, 1894, the eldest son of Tsar Ferdinand I and Princess Marie Louise of Bourbon-Parma. He received at birth the title of prince of Trnovo. In 1896 his religion was changed,

for political reasons, from Roman Catholic to Orthodox. He was educated at the military academy of Sofia, and served as a major in the first Balkan War (1912). He took part in the second Balkan War (1913) and served on his father's staff in World War I. Ferdinand abdicated after the Allied victory over the Bulgarians at Dobropole in Sept. 1918 and Boris succeeded to the throne in October of that year. In 1930 he married Giovanna, daughter of King Victor Emmanuel III of Italy. With Boris' sanction, Bulgaria became a fascist country in 1934, and from the start of World War II leaned toward the axis. In 1940 Boris agreed to allow German troops to pass through his country, and in March 1941 he signed a pact which made Bulgaria a member of the axis. Bulgaria declared war on Great Britain and the United States in Dec. 1941. Boris died on Aug. 28, 1943, in Sofia. Whether he was assassinated or died of a heart attack was not immediately made clear. His six year old son succeeded him, becoming Simeon II.

BORISOGLEBSK, a town in the south of the Tambov province of the Russian Soviet Federated Socialist Republic. Pop. (1939) 52,055. It was founded in 1646 as a frontier defense of Muscovy against the Crimean Tatars and in 1696 was surrounded by wooden fortifications. It has annual fairs and trades in grain (and has an elevator), wool, cattle and leather, and has iron casting, leather, tallow and brick-making industries.

BORKEN, chief town of a western subdivision of the district of Münster, in the Prussian province of Westphalia, Germany. Pop. (1933) 7,344. The industries include the preparation of chicory and linen and cotton weaving.

BORKU or **BORGU,** a portion of the Chad colony in French Equatorial Africa between 17° and 19° N. and 18° and 21° E. It is an extension of the Chad depression (altitude 650 ft.) forming part of the transitional zone between the Sahara and the fertile central Sudan. Bounded east by the Ennedi and north by the Tibesti mountains, it is in great measure occupied by lesser hills belonging to the same system, merging south and east into the plains of Wadai and the Darfur. Southwest, in the direction of Lake Chad, is the Bodele basin. Most of Borku is barren, rocky and covered with light, drifting sand. The numerous *khors* mostly contain water for brief periods only, but subterranean watercourses give rise to oases and pasturages. Chief products are dates, a little barley, and goats and asses. The northern valleys are inhabited by a settled population of Tibbu stock, the Daza, who merge to the south with Negroid peoples. The nomadic population consists of Tedas, Nakazzas, and Arabs from the north, particularly the Ouled Sliman.

Borku (also called Borgu but not to be confused with the Borgu [*q.v.*] in Nigeria) was formerly important because of the lucrative trade, particularly in slaves, carried on through Borku between Cyrenaica and Central Africa. An Anglo-French agreement (1899) gave Borku to France, but Senussi control over the region was not broken until 1913–14. (J. G. W.)

BORKUM, a low island of Germany, in the North sea, belonging to the Prussian province of Hanover, the westernmost of the East Frisian chain, lying between the east and west arms of the estuary of the Ems. Pop. 3,911. The island, 5 mi. long and 2½ mi. broad, is a favourite summer resort.

BORLASE, WILLIAM (1695–1772), English antiquary and naturalist, was born at Pendeen, Cornwall. As rector of Ludgvan, he made in his parish a collection of mineral and metallic fossils, and thus was led to study somewhat minutely the natural history of the county and his published works concerned the antiquities and natural history of Cornwall, and the neighbouring Scilly Islands. Borlase's letters to Pope, St. Aubyn and others, with answers, fill several volumes of manuscript. There are ms. notes on Cornwall and a ms. treatise *Concerning the Creation and Deluge.* He presented a variety of fossils and antiquities to the Ashmolean museum, Oxford. His memoirs appeared in Nichol's *Literary Anecdotes,* vol. v.

BORMIO, a town, Italy, province of Sondrio, 41½ mi. N.E. of Sondrio. Pop. (1936), 2,276. It is in the Valtellina (the valley of the Adda), 4,020 ft. above sea level, at the foot of the Stelvio pass, and was of military importance in the middle ages. It contains interesting churches and picturesque houses and towers.

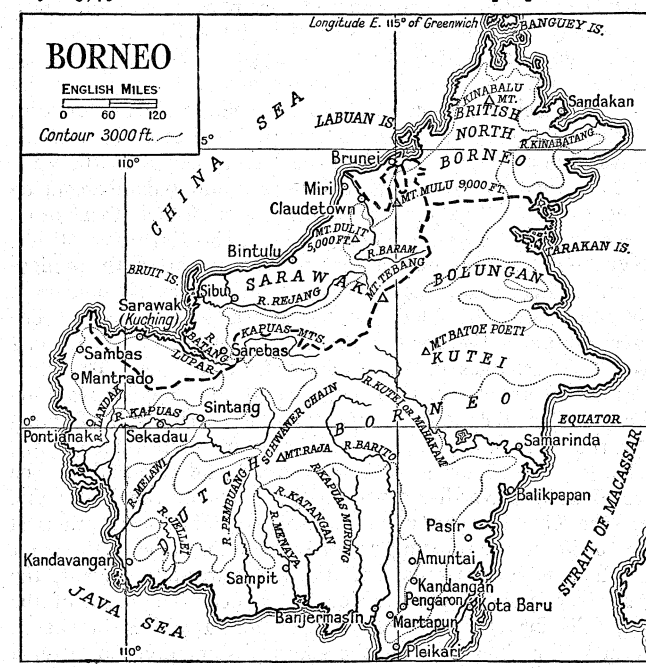
BORN, IGNAZ, EDLER VON (1742–1791), Austrian mineralogist and metallurgist, was born of a noble family at Karlsburg, in Transylvania, on Dec. 26, 1742, and died at Vienna, July 24, 1791. In 1776 he was appointed by Maria Theresa to arrange the imperial museum at Vienna, where he was nominated to the council of mines and the mint, and continued to reside until his death. He introduced a method of extracting metals by amalgamation (*Über das Anquicken der Erze,* 1786), and other improvements in mining and technical processes. His publications also include *Lithophylacium Bornianum* (1772–75) and *Bergbaukunde* (1789).

BORNA, a town lying in the west of the *Land* of Saxony, 17 mi. S. by E. of Leipzig, Germany. Pop. (1939) 14,534. It manufactures musical instruments.

BORNEO (*see* also BORNEO, STATE OF NORTH), a great island of the Malay archipelago between 7° N. and 4° 20′ S., 108° 53′ and 119° 22′ E.; 830 mi. long N.E. to S.W., 600 mi. max. breadth; area (calculations of Topographical bureau, Batavia, 1894), 293,496 square miles. Meyer, who is generally accurate, gives area 289,860 square miles. It is roughly five times as large as England and Wales. Politically Borneo is divided into four portions: (1) State of North Borneo (*q.v.*) under the Chartered British North Borneo company; (2) Brunei (*q.v.*), a Malayan sultanate under British protection with a British resident; (3) Sarawak (*q.v.*), the large territory ruled by Rajah Brooke, and with its foreign relations under British protection; and (4) Dutch Borneo, by far the largest and most valuable portion.

GEOGRAPHY AND GEOLOGY

Physical Features.—The general character of the country is mountainous, though no range attains to any great elevation, and Kinabalu, the highest peak, near the northwestern extremity, is only 13,451 ft. above sea level. There is no proper nucleus of



MAP OF THE ISLAND OF BORNEO, SHOWING POLITICAL DIVISIONS
British North Borneo, Sarawak and Brunei are British protectorates. The remainder, and much larger part of the island, belongs to the Dutch. Borneo, roughly five times the area of England and Wales, is rich in minerals but awaits development

mountains whence chains ramify in different directions. The central and west central parts of the island, however, are occupied by three mountain chains and a plateau. These chains are: (1) the folded chain of the upper Kapuas, which divides the western division of Dutch Borneo from Sarawak, extends west to east, and attains near the sources of the Kapuas river a height of 5,000 to 6,000 ft.; (2) the Schwaner chain, south of the Kapuas, 3,000 to 7,500 ft., the latter being the height of Bukit Raja, a plateau which divides the waters of the Kapuas from the rivers of southern Borneo; and (3) the Müller chain, between the eastern parts

of the Madi plateau and the Kapuas chain, a volcanic region presenting heights such as Bukit Terata (4,700ft.), long extinct. The Madi plateau lies between the Kapuas and the Schwaner chains. Its height is from 3,000 to 4,000ft., and it is clothed with tropical tree ferns. From the eastern end of the Kapuas mountains there are further to be observed: (1) a chain running north-north-east, forming the boundary between Sarawak and Dutch Borneo, the highest peak of which, Gunong Tebang, approaches 10,000ft. This chain can hardly be said to extend continuously to the extreme north, but it carries on the line of elevation towards the mountains of Sarawak to the west, and those of British North Borneo to the north, of which latter Kinabalu is the most remarkable. (2) A chain which runs eastward from the central mountains and terminates in the great promontory of the east coast, known variously as Cape Kanior or Kaniungan. (3) A well-marked chain running in a south-easterly direction among the congeries of hills that extend south-eastward from the central mountains, and attaining, near the southern part of the east coast, heights up to and exceeding 6,000ft.

Coasts.—Resting on a submarine plateau of no great depth, the coasts of Borneo are for the most part rimmed round by low alluvial lands, of a marshy, sandy, and sometimes swampy character. In places the sands are fringed by long lines of Casuarina trees; in others, and more especially in the neighbourhood of some of the river mouths, there are deep banks of black mud covered with mangroves and Nipa palms; in others there are bold headlands, cliffs, mostly of a reddish hue, clad with greenery, or rolling hills sometimes covered by a growth of rank grass. The depth of the sea around the shore rarely exceeds a maximum depth of 1 to 3 fathoms, and there are few accessible ports. The towns and seaports are, as a rule, at or near the mouths of those rivers which are not barricaded too efficiently by bars. The long coast-line of Dutch Borneo has only seven ports of call, which are normally used by the ships of the Dutch Packet company. They are Pontianak, Banjermasin, Balikpapan, Kota Baru, Pasir, Samarinda, Beru and Bulungan. The islands off the coast are not numerous. Excluding some of alluvial formation at river-mouths, and others along the shore which owe their existence to volcanic upheaval, the principal islands are the Natuna group on the west, the Tawi-tawi group to the east, Banguey and Balambangan on the north, Labuan (*q.v.*), a British colony off Brunei, Tarakan on the east, Pulo Laut on the south-east, and the Karimata islands.

Rivers.—The rivers play a very important part both as highways and as lines along which run the main arteries of population. Hydrographically the island has five principal versants. The shortest embraces the north-western slope, north of the Kapuas range, and discharges its waters into the China sea. The most important rivers of the north-west coast are the Sarawak, on which Kuching, the capital of Sarawak, is situated, the Batang-Lupar, the Saribas, the Rejang (navigable for more than 100m.), the Baram, the Limbang or Brunei river, and the Padas. The rivers of British North Borneo to the north of the Padas are, except the Kinabatangan, of no importance and of scant practical utility, owing to the proximity of the mountain range to the coast with which it runs parallel. In the south-western versant, the largest river is the Kapuas, which, rising near the centre of the island, falls into the sea between Mampawa and Sukadana at Pontianak, the chief town of the south-western division, after a long and winding course. This river, of volume varying with tide and rainfall, is normally navigable by small steamers and native prahus, of a draught of 4 to 5ft., for 300 to 400m., that is to say, from Pontianak up to Sintang, and thence as far as Benut. The middle part of this river, wider and more shallow than the lower reaches, gives rise to a region of inundation and lakes which extend as far as the northern mountain chain. The southern Melawi, with its affluent the Penuh, is a considerable tributary. It reaches the sea through several channels in a wide marshy delta. The Sambas, north of the Kapuas, is navigable in its lower course for vessels drawing 25ft. Rivers, south of the Kapuas, but less important, are the Simpang, Pawan and Kandawangan, near whose mouths or upon the adjacent coast, the principal native villages are situated in each case. The Barito, which is the principal river of the southern versant, takes its rise in the Kuti Lama lake, and falls into the Java sea in 114° 30′ E. Its upper reaches are greatly impeded by rocks, rapids and waterfalls, but the lower part of its course is wide, and traverses a rich, alluvial district, much of which is marshy. Cross branches unite it with two rivers of considerable size towards the west, the Kapuas Murung or Little Dayak, and the Kahayan or Great Dayak. The Katingan or Mendawei, the Sampit, Pembuang or Surian, and the Kota Waringin fall into the sea farther to the west. The rivers of the southern versant are waters of capacious drainage, the basin of the Kahayan having, for instance, an area of 16,000sq.m., and the Barito one of 38,000 square miles. These rivers, and the Barito's affluents, are navigable for two-thirds of their course by steamers of a fair size, but in many cases the bars at their mouths present considerable difficulties to ships drawing anything over 8 or 9ft. The south-eastern, like the north-western corner of the island, is watered by several short mountain streams. The one great river of the eastern versant is the Kutei or Mahakam, which, rising in the central mountains, flows east with a sinuous course and falls by numerous mouths into the Straits of Macassar. At a great distance from its mouth it has still a depth of three fathoms, and, in all its physical features, it is comparable with the Kapuas and Barito. The Kayan or Bulungan river is the only other in the eastern versant that calls for mention. Most rivers of the northern versant are comparatively small, as the island narrows into a kind of promontory.

Lakes are neither numerous nor very large. In most cases they are more fittingly described as swamps. In the flood area of the upper Kapuas, already mentioned, there occurs Lake Luar, and there are several lake expanses of a similar character in the basins of the Barito and Kutei and all other large rivers. A really fine natural harbour is that of Sandakan, the principal settlement of the North Borneo Company on the north coast.

Geology.—The geology of Borneo is very imperfectly known. The mountain backbone between Sarawak and the Dutch possessions consists chiefly of crystalline schists, together with slates, sandstones and limestones, all much disturbed and folded. The sedimentary deposits were formerly believed to be Palaeozoic, but Jurassic fossils have since been found in them, and it is probable that several different formations are represented. Somewhat similar rocks appear to form the axis of the range in south-east Borneo, and possibly of the Tampatung mountains. But the Müller range, the Madi plateau, and the Schwaner mountains of West Borneo, consist chiefly of almost undisturbed sedimentary and volcanic rocks of Tertiary age. The low-lying country between the mountain ranges is covered generally by Tertiary and Quaternary deposits, but there are Cretaceous beds at several localities. *Vertebraria* and *Phyllotheca,* plants characteristic of the Indian Gondwana series, have been recorded in Sarawak; and marine forms, similar to those of the lower part of the Australian Carboniferous system, are stated to occur in the limestone of Northern Borneo. *Pseudomonotis salinaria,* a Triassic form, has been noted from the schists of the west of Borneo. In the Kapuas district radiolarian cherts of supposed Jurassic age are to be found. Undoubted Jurassic fossils, of several horizons, have been described from West Borneo and Sarawak. The Cretaceous beds, long known in West Borneo, are comparatively little disturbed. They consist for the most part of marls with *Orbitolina concava,* and are referred to the Cenomanian. Cretaceous beds of somewhat later date are found in the Martapura district in south-east Borneo. The Tertiary system includes conglomerates, sandstones, limestones and marls, which appear to be of Eocene, Oligocene and Miocene age. They contain numerous seams of coal. The Tertiary beds generally lie nearly horizontal and form the lower hills, but in the Madi plateau and the Schwaner range they rise to a height of several thousand feet. Volcanic rocks of Tertiary and late Cretaceous age are extremely developed, especially in the Müller mountains of Dutch Borneo. The whole of this consists of tuffs and lavas, andesites prevailing in the west and rhyolites and dacites in the east. A great deal of survey has still to be done, especially in several parts of the mountainous interior.

Climate and Health.—The climate is hot and damp. In the hills and in the interior, regions are found which may almost be described as temperate, but on the coast the atmosphere is dense, humid and oppressive. Throughout, the average temperature is from 78° to 86°, but the thermometer rarely falls below 70°, except in the hills, and occasionally on exceptional days mounts as high as 96° in the shade. The rainy westerly winds (south-west and north-west), prevail at all the meteorological stations, not the comparatively dry south-east wind. The average rainfall over the whole island is approximately 150in. a year. The atmosphere is uniformly moist, and though days of continuous downpour are rare, comparatively few days pass without a shower. Most rain falls between November and May, and at this season the torrents are tremendous while they last, and squalls of wind are frequent and violent, almost invariably preceding a downpour. Over such an extensive area there is, of course, great variety in the climatic character of different districts, especially when viewed in relation to health. Among the native races the prevailing diseases, apart from those of a malarial origin, are chiefly such as arise from bad and insufficient food. Skin diseases are common among the natives throughout the country, and especially in the interior; elephantiasis is frequently met with on the coast. Smallpox, dysentery and fevers, frequently of a bilious character, are endemic, and occasionally epidemic. Cholera, brought in by ships, breaks out from time to time and works great havoc. Ophthalmia is common, and sometimes will attack whole tribes. About one-sixth of the native population of the interior, and a smaller proportion on the coast, suffer from *kurap,* a kind of ringworm, which is almost universal among the Sakai and Semang, the aboriginal hill tribes of the Malayan Peninsula. The disease is believed to be aggravated by chronic anaemia. Consumption is not common. Beri-beri was a scourge, where people lived on imported milled rice (*see* BERI-BERI).

Fauna.—The fauna of Borneo comprises a large variety of species, many of which are numerically of great importance. Among the large mammals the most remarkable is the orang-utan (Malay, *ôrang ûtan, i.e.,* jungle man), as the huge ape, called *Maias* by the natives, is named by Europeans. Numerous species of monkey are found in Borneo, including the gibbon, a creature more human in appearance and habits that the orang-utan, and several *Semnopitheci,* such as the long-nosed monkey (*Nasalis larvatus*), Hose's grey monkey (*S. hosei*), and a red variety with a black cross down the back and arms (*S. cruciger*). There are also three species of macaque monkeys. The large-eyed *Tarsius spectrum* and *Nycticebus tardigradus* also deserve mention. The larger beasts of prey are not met with, and there is little check on the graminivores. A small clouded tiger-cat (so-called)—*Felis nebulosa*—is the largest animal of the cat kind. The little honey-bear is common. The rhinoceros is widely distributed, but the elephant occurs only in the north; both are somewhat rare. The distribution of quadrupeds as between Borneo, Sumatra and the Malayan Peninsula is peculiar and seemingly capricious. Many quadrupeds, such as the honey-bear and the rhinoceros, are common to all, but while the tiger is common both in the Malayan Peninsula and in Sumatra, it does not occur in Borneo; and the orang-utan, so plentiful in parts of Borneo and Sumatra, has never been discovered in the Malay Peninsula. It has been suggested, but with very scant measure of probability, that the existence of elephants in Borneo, whose confinement to a single area is remarkable and unexplained, is due to importation; and the fact is on record that when Magellan's ships visited Brunei in 1522 tame elephants were in use at the court of the sultan of Brunei. Wild oxen (*Bos sondaicus*) are found all over the island, and the whole country swarms with wild swine. Four species of deer are common, including the mouse-deer, or *plandok,* of remarkable grace and beauty, about the size of a hare but considerably less heavy. There are also to be found civet-cats, bear-cats, flying-foxes, otters, porcupines, squirrels, flying-squirrels, tree shrews (*Tupaia*), rats, bats and the curious little badger (*Mydaus*). Crocodiles are found in all the rivers, but the gavial is met with less frequently. Lizards are in great variety, some of the genus *Draco* being able to fly; snakes of various kinds, from the python downward, are abundant, while the forests swarm with tree-leeches, and the marshes with horse-leeches and frogs. A remarkable flying-frog was discovered by Prof. A. R. Wallace. The most important birds are eagles, kites, falcons, owls, hornbills, pheasants—notably the argus, fire-back, and the peacock-pheasant (*Polypectron*), partridges, crows, parrots, pigeons, woodpeckers, doves, snipe, quail and swifts. The swift (*Collocalia*) builds the edible nest from which the famous bird-nest soup is made by the Chinese. Its nests are built mostly in limestone caves, and the Borneo variety is esteemed the best in the archipelago. Mosquitoes and sand-flies are the chief insect pests, and in some districts are very troublesome. Several kinds of parasitic jungle ticks cause much annoyance to men and beasts. There are also two kinds of fire-ants which are peculiarly painful. Hornets, bees and wasps of many varieties abound. The honey and the wax of the wild bee are collected by the natives. Butterflies, moths and beetles are remarkable for their number, size, variety and beauty. The swamps and rivers, as well as the surrounding seas, swarm with many kinds of edible fish. The *trobok* is a species of fish found in the sea and valued for its roe, which is salted. The natives are expert and ingenious fishermen. Turtles, sea-cucumbers and pearl-shell are also of some commercial importance.

The dog, cat, pig, and fowl are domesticated. The buffalo, a smaller breed than that met with in the Malayan Peninsula, and in some districts bullocks of the Brahmin breed, zebu, and small horses and goats are the principal domestic animals. The character of the country and the nomadic habits of many of the natives of the interior, who rarely occupy their villages for more than a few years in succession, have not proved favourable to pastoral modes of life. The buffaloes are used not only in agriculture, but also as beasts of burden, and as draught-animals. Horses, introduced by Europeans and owned only by the wealthier classes, are found in Banjermasin and in Sarawak. In British North Borneo, and especially in the district of Tempasuk on the north-west coast, Borneo ponies bred originally, it is supposed, from stock indigenous to the Sulu archipelago, are fairly common.

Flora.—The flora is very rich, the far greater portion of the surface of the island being clothed in luxuriant vegetation. The king of the forest is the *Tapang* (*Arburia*), rising to a great height without fork or branch to a splendid dome of foliage, beneath which may often be seen 50 to 70 nests of the wild bees on the larger branches. The official seats of some of the chiefs are constructed from the wood of this tree. Ironwood, remarkable for its durability, is abundant; it is used by the natives for the pillars of their homes and forms an article of export, chiefly to Hongkong. It is rivalled in hardness by the *tembesu.* In all, about 60 kinds of timber of marketable quality are furnished, but the difficulty of extraction, even in the regions near the large waterways, renders it improbable that the timber trade of Borneo will attain to any very great dimensions until other and easier sources of supply have become exhausted. Palm-trees are abundant in great variety, including the *nipah* (the leaves of which are much used for roofing); others are the cabbage, fan, sugar, coconut and sago palms. The last two furnish large supplies of food to the natives. Copra is exported, and sago factories, mostly in the hands of the Chinese, prepare sago for the Dutch, British, and other markets. Considerable rubber, also gutta-percha, camphor, cinnamon, gambier, ilippi (*shorea*) nuts, are all produced; most of the tropical fruits flourish, including the much-admired, but, to the uninitiated, most evil-smelling, durian, a large fruit with an exceedingly strong outer covering of stout pyramidal spikes, like a huge horse chestnut. It grows upon the branches of a tall tree. Yams, several kinds of sweet potatoes, melons, pumpkins, cucumbers, pineapples, oranges, pomelos, bananas, mangoes and mangosteens are cultivated, as are a large number of other fruits. Rice is grown in irrigated lands near the rivers and in the swamps, and also in rude clearings of considerable size in the interior on the hillsides, where the whole of the forest is cut down and burnt off before planting the seed padi; sugar-cane of superior quality is grown all over the country; cotton, sometimes exported in small quantities, is found on the banks of the Negara, a tributary of

the Barito, and many other rivers; tobacco, used very largely now in the production of cigars, comes from various parts of Northern Borneo; and tobacco for native consumption, of small commercial importance, is cultivated in most parts. Indigo, coffee, and pepper have been cultivated since 1855 in the western division of Dutch Borneo and also extensively in Sarawak. Among the more beautiful of the flowering plants are chlorodendrons, orchids and pitcher-plants, the latter reaching extraordinary development, especially in the northern districts about Kinabalu, Mulu, and many other mountains of the interior. Epiphytous plants are common, many that are usually independent assuming here the parasitic character; the orchid *Vanda lowii,* for example, grows on the lower branches of trees, and its strange pendant flower-stalks often hang down almost to the ground. Rafflesia, the largest flower in the world, grows at Lundu, in Sarawak. Ferns and allied plants are abundant everywhere, particularly on the limestone mountains.

See H. Keppel, *The Expedition to Borneo of H.M.S. "Dido" for the Suppression of Piracy, etc.* (1847); Posewitz, *Borneo* (trans. 1892); Hose and MacDougall, *Pagan Tribes of Borneo* (1912); H. N. Ivor Evans, *Among Primitive Peoples in Borneo* (1922). (C. H.; E. S.)

Population.—The population of Borneo was (est. 1942) 3,000,000. The Europeans numbered some 5,000 and the Chinese 250,000. According to the latest official estimates before World War II, the population of the four divisions of the island was: Dutch Borneo, 2,168,661 (census of 1930); British North Borneo, 304,000 (est. of 1939); Sarawak, 490,585 (est. of 1941); Brunei, 39,000 (est. of 1939).

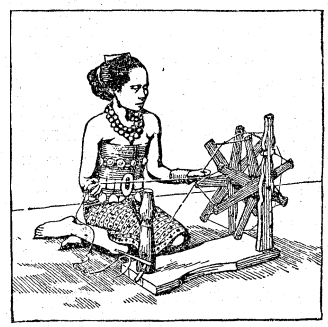
ETHNOLOGY

Races.—The peoples of the island of Borneo belong to a variety of races, each of which is of different origin and degree of civilization (*see below*).

The Chinese people seem to have been among the first civilized people who had dealings with Borneo, if the colonization of a part of the island by Hindus be excepted. Chinese annals speak of tribute paid to the empire by Pha-la on the north-east coast of the island as early as the 7th century, and later documents mention a Chinese colonization in the 15th century. Traditions of Malays and others seem to confirm the statements, and many of the leading families of Brunei in north-west Borneo claim to have Chinese blood in their veins, while the annals of Sulu record an extensive Chinese immigration about 1575. The flourishing condition of Borneo in the 16th and 17th centuries was largely due to the energy of Chinese settlers and to trade with China. In the 18th century there was a considerable Chinese population settled in Brunei, engaged for the most part in planting and exporting pepper, but consistent oppression by native rajahs destroyed their industry and led eventually to the practical extirpation of the Chinese. The Malay chiefs of other districts encouraged immigration from China with a view to developing the mineral resources of their territories, and before long Chinese settlers were to be found in considerable numbers in Upper Sarawak, at Bau and Bidi, Sambas, Montrado, Pontianak and elsewhere. They were at first forbidden to engage in commerce or agriculture, to carry fire-arms, to possess or manufacture gunpowder. About 1779 the Dutch acquired immediate authority over all strangers, and thus assumed responsibility for the control of the Chinese, who presently proved themselves somewhat troublesome. Their numbers constantly increased and were re-enforced by new immigrants, and, pushing inland in search of fresh mineral-bearing areas, they contracted frequent intermarriages with the Dayaks and other non-Mohammedan natives. They brought with them from China their aptitude for the organization of secret societies which, almost from the first, assumed the guise of political associations. These secret societies facilitated collective action, and under astute leaders they offered a formidable opposition to the Dutch Government. Later, when driven into the interior, and eventually out of Dutch territory, they cost the first rajah of Sarawak, about the year 1857, some severe contests before they were at last reduced to obedience. Serious disturbances among the Chinese are now, in Borneo, matters of ancient history, and to-day the Chinese form, perhaps, the most valuable element in the civilization and development of the island, just as does his fellow in the mining states of the Malay Peninsula. They are industrious, frugal and intelligent; the richer among them are excellent men of business, and are peculiarly equitable in their dealings; the majority of all classes can read and write their own script, and the second generation acquires an education of an European type with great facility. The bulk of the shop-keeping, trading and mining industries, so long as the mining is of an alluvial character, is in Chinese hands. The greater part of the Chinese on the west coast were originally drawn from the boundaries of Kwang-tung and Kwang-si. They are called Kehs, and are of the same tribes as those which furnish the bulk of the workers to the tin mines of the Malay Peninsula. They are a rough and hardy people, and are apt at times to be turbulent. The shop-keeping class comes mostly from Fuh-kien and the coast districts of Amoy. The Hylams make excellent domestic servants.

The classification of the peoples of Borneo is beset with difficulties, because clear lines of demarcation between types are, for various reasons, almost impossible to determine.

Causes of Admixture.—In the first place, of all the pagan tribes, the Kayans and perhaps the Punans have alone remained, in the real sense of the word, true to type. In all other cases the perpetual fusion of tribe with tribe and people with people has caused countless intermediate subtypes. Most of the tribes are migratory by nature, and whether from the mainland to Borneo, or from one part of the island to another, have advanced by fighting; as they advanced, they took captives, who, in order to strengthen and increase the tribe, were gradually absorbed by marriage.



BY COURTESY OF THE ROYAL PACKET NAV. CO.
BORNEO WOMAN ENGAGED IN SPINNING, A CHIEF NATIVE OCCUPATION

Another cause of intermixture is economic. Certain tribes especially skilful in the obtaining of valuable forest products, have been, during all periods, in great request; and isolated members, or small parties, have constantly left their home-districts for some centre where they have been able to find a ready market and good prices. In later days the demand in Europe for forest products has brought down to the coast or else to convenient up-country depots, people who otherwise would have lived remote.

The rivers are always the highways of the country, and have been responsible for a number of landslides of population on a considerable scale; *e.g.,* the movement of the Peng tribe on the Upper Mahakam of Dutch Borneo down river in 1885 (following an attack by the Ibans of Batang Lupar), and, again, from Dutch Borneo into the up-country portions of the Baram district of Sarawak in 1898–99.

Negritos.—It is probable that at one time the island was inhabited by people of the Negrito (pygmy) race. Remnants of a Negrito population are to be found in almost all the islands adjacent to the coast of Borneo, and on the island of Palawan there exists to-day a dwarfish Negrito people known as Aïta, undoubtedly an indigenous element, and, still in many places, the recognized owners of the soil.

In Borneo itself it is doubtful if any communities of this race remain, although individuals may occasionally be met with whose hair and facial characteristics strongly suggest an infusion of Negrito blood. Such cases are perhaps sufficiently accounted for by the fact that from time to time slaves and captives have been imported from outside.

Malays.—To-day the inhabitants of the island may be classified generally as *Laut* and *Dayak.*

The first word means "Sea people," and is applied by the pagan inhabitants of the island to Malays, who are Mohammedans and mostly live on the coast; the second is a Bornean word varying in exact significance according to locality, and meaning either up-country people, or more generally, all people who are not coast people or Mohammedans. The Malays first settled in Borneo,

especially on the north coast, some 700 years ago, and later penetrated inland, naturally following the course of the many rivers. They seem to have belonged, in the main, to the class known as *Orang-Benua* (men of the soil), such as are found elsewhere (*e.g.,* in Celebes, Jilolo and Madagascar) and are distinct from the cultured Malay peoples, many of whom were probably Hindus before conversion. Many of the Orang Malayu in the island today are either recent converts to Islam, or the descendants of such converts.

"Pagan" Tribes.—Regarding the origin of the older and pagan peoples, at some very remote period, a considerable migration took place, of Caucasian[1] tribes and peoples, described as a Proto-Caucasic race, and in a south-easterly direction, even reaching, at its extreme easterly limit, as far as the islands of the western Pacific. To these peoples when settled in their Asiatic home, was given the name Indonesians, meaning thereby all the earlier inhabitants of the islands and sea-coast countries from Burma to New Guinea. These Indonesians were dolichocephalic. On their way south and east they encountered, with varying results, other migratory tribes known as Southern Mongols and Oceanic Mongols, who seem to have originated in northern China and would appear to have parted company on their way south. An admixture in various degrees between them and the Caucasic peoples then formed two distinct great groups of peoples travelling south, either down the valleys of the Brahmaputra and the Irrawaddy, or through southern China and Cambodia by way of the Mekong and Sikiang and in some cases passing to their present habitat by way of the Philippines. From an admixture of these two elements are descended the pagan tribes of Borneo.

The Cambridge university anthropological expedition in 1898 confirmed Hose's suggested classification of these six groups; viz., Punans, Klemantans, Kenyahs, Kayans, Muruts and Ibans (commonly known as Sea-Dayaks); the first three representing the oldest stock in the island, Kayans, Ibans and Muruts being later arrivals. Of these tribes it is more than likely that the Kayans and Kenyahs took the westerly route, the Punans, Klemantans, Ibans and Muruts, the easterly. The Kayans and Kenyahs are, therefore, presumably akin to such peoples as the Nagas, Karens, Arakanese, and what Keane calls Tibeto-Burmese; while the Punans, Klemantans, Ibans, and Muruts (the latter of whom show considerable affinity with certain Philippine tribes) have as their kinsmen Formosans, Bugis, Javanese, Sundanese, and Malays. The Punans, Klemantans and Kenyahs have a predominant percentage of Caucasian features, the long head, wavy rather than curly hair and fair complexion. The Mongolian ingredients are shown by the Mongol "fold" of the eyelid, which is found in a very large number of cases. They arrived in Borneo as pagans and remain pagans to this day, having a number of gods of an indefinite character and personality, mostly deities derived from natural phenomena (as the sea, the forest, and so forth), but believing vaguely in one Supreme Being. They make figures of their gods and build altars, but have not reached the stage of temple-building.

The three other tribes, the Kayans, the Muruts and the Ibans, all arrived in Borneo late enough for them to be called invaders. The Kayans, though later arrivals than the Punan-Klemantan-Kenyah group, are undoubtedly the most occidental of all the peoples. They seem to have migrated very slowly, halting for long periods at the various stages, but never remaining permanently at any point until they reached Borneo. They brought with them their own culture, and hardly mingled at all with the various Mongol peoples whom they encountered. With them are to be grouped, according to Dr. A. W. Nieuwenhuis (*Quer durch Borneo,* Leyden, 1904–07), the great Bahau people found in the eastern part of Dutch Borneo.

The Muruts are rather more Caucasian than the Kayans, but they brought with them less from the west, very possibly because they took a longer time over their journey, and were more affected in habits, although not in race, by the peoples whom they met.

The third group, the Ibans, who perhaps are nearer to the Muruts than any other group and may be the latest of the invaders, stand somewhat apart, for they differ more from the other tribes than the latter do from each other. They, like Punans, Klemantans and Muruts, have been called Proto-Malayans, and are often referred to as Malays. This nomenclature, however, requires correction. The Malays are not a racial or ethnological, but a religious group; converts to Islam dating from the 12th century, who after their conversion so changed their habits of life that, acquiring great influence over all parts of Indonesia, they appeared to be a homogeneous race, though in fact made up of all sorts of tribes and peoples. These energetic sea-rovers and conquerors appear to have spread either from the peninsula or from the Sumatran district of Menangkabau, about eight or nine hundred years ago, founding permanent settlements around the Bornean sea-board and the adjacent islands of the Archipelago, and spreading eastwards almost to Papua and north to Cambodia and Annam. Among others with whom they came into close contact were the Ibans of Sarawak, who, if they were not actually converted, at least acted with them in various enterprises, chiefly piracy and the capture of slaves.

There is a tradition, which cannot be satisfactorily checked, that a few centuries ago the Ibans were brought from Sumatra into Borneo by Malay nobles of Sarawak. This is possibly correct, but it is quite probable that many settlements of Ibans had already been formed in other parts of Borneo before any Malay occupation of the coastal districts.

Ibans have undeniably associated with Malays and actually, by conversion to Islam, become Malays and intermarried with them, and the Malay language undoubtedly contains many Iban words; but they are only one of the many widely differing and widely scattered peoples out of whom the present day Malays have been built up.

SOCIAL AND POLITICAL ORGANIZATIONS

Dutch Borneo.—Dutch Borneo is divided for administrative purposes into two divisions, the western and the southeastern respectively. Of the two, the first is under the more complete and effective control. In these divisions there is an average density of ten people to the square mile. The sparseness of the population throughout the Dutch territory is due to a variety of causes—to the physical character of the country restricting population to the near neighbourhood of the rivers; to the low standard of civilization many natives have attained; to wars, piracy and head-hunting, the last of which has not even yet been wholly checked in the interior; and to aggression and oppressions in earlier times of Malayan, Arab, Bugis and other settlers. Among the natives of the north, more especially of the interior, an innate restlessness which leads to a life of poverty, insufficient nourishment, an incredible improvidence which induces them to convert into intoxicating liquor a large portion of their annual crops, feasts of a semi-religious character which are invariably accompanied by prolonged drunken orgies, and certain superstitions which necessitate frequent procuration of abortion, have contributed to check growth of population. In Sambas, Banjermasin, and some parts of Pontianak, the greater density of the population is due to immigration from Java and Sumatra, the greater fertility of the soil, the opening of mines, the navigation and trade plied on the larger rivers, and the concentration of the population at the junction of the rivers, the mouths of rivers and the seats of government. In Amuntai and Martapura, early Hindu colonization, of which the traces and the influence still are manifest, the fertile soil, trade and industry aided by navigable rivers, have led to large growth of population. Only a very small proportion of the Europeans in Dutch Borneo, Sarawak, or British North Borneo, live by agriculture or business industry, the great majority of them being officials. The Arabs and Chinese, Malays and interior tribes, are engaged in trading, mining, fishing, rubber-planting and agriculture. Of the natives, fully 90% live by the collection of forest produce or by agriculture, which, however,

[1] The words "Caucasian," "Caucasic" are here used as convenient terms without any geographical significance. "We are no more called upon to believe that the Caucasic peoples originated in the Caucasus than that the Semites are all descendants of Shem." (Keane *op. cit.*)

until recent years has been for the most part of a somewhat primitive description. The industries of the natives are confined to such crafts as spinning, weaving and dyeing, the manufacture of iron weapons and implements, boat and ship-building, and the collection of jungle products. More particularly in the south-eastern division, and especially in the districts of Negara, Banjermasin, Amuntai and Martapura, in Dutch Borneo, and amongst most of the peoples of Sarawak, ship-building, iron-forging, gold and silver smith's work, and the polishing of diamonds, are industries of high development in the larger centres of population.

The actual power and influence of a chief depend naturally on local and tribal custom and personality. Among Kayans, Kenyahs, and most Klemantans, the influence of the village chief is considerable; among Muruts and Ibans it is less marked, while among the Punans the functions of the chief are informal and are chiefly concerned with social welfare. Among the Kayans, and still more so among the Kenyahs, his position is one of greater authority and he receives much voluntary assistance, consideration, and respect.

Social Classes.—A peculiar feature especially noticeable among Kayans and Kenyahs, but one which with the diffusion of European influence is gradually disappearing, is the existence in a village of three different classes of inhabitant. Such a class distinction doubtless owes its origin to the taking of captives by conquering tribes, and is for that reason more to be observed among the Kayans than with others; in some cases also the creation of a lower class has been due to disciplinary action. Among Kayans and Kenyahs there are to-day three strata of society, more or less distinguishable and recognized by the people themselves. The upper class consists of the family of the village chief and his near relatives; they bear their part in the work of the community, such as the cultivation of crops, but their work is less prolonged and less intensive than that of the lower classes.

The lowest of the three classes is that containing descendants of captives taken in the former civil wars. The modern governments of Borneo have given such opportunities for captives to regain their independent status, that this third class is gradually dying out. Among the Ibans, who are geographically the nearest to the important centres of the Government of Sarawak on all the large rivers of the country, it can be said no longer to exist. Among the tribes where the system still remains, the position of these captured people is in no sense that of slaves except that they are attached to the house, and need certain formalities to procure their emancipation, a step rarely taken and often retraced. These dependents are either what is called "servants of the house" or "servants outside the room." Those inside the house are the families of captives, absorbed into it by marriage; their work and position are servile only in so far as they are bound to the house; in practice they are part of the tribe. The servants outside the room are hangers-on, whose connection with the house is accidental; and whose absence or presence is immaterial. They are not inclined to leave, and when they do so, are easily persuaded to return.

Between these is a middle class, who commonly comprise the majority of the people in a house. *De facto* they belong to the upper class although their voices in public affairs carry less weight. They are, as might be expected, the result of fusion or of decadence, *parvenus* who are in the process of working upwards, or members of a higher class who have fallen. As the influence of the central government spreads, these distinctions tend toward obliteration, the lowest class ceasing to be created, and the middle class being gradually absorbed into the higher.

The unit of political life is the village, which may consist of one or more long houses. Each house has its own chief, but one is recognized as the head chief of the village. Each village is independent although, as a matter of caution, before any important affair, such as a change of location or the undertaking of a war expedition, the advice and often the co-operation of neighbouring villages belonging to the same tribe is sought. Intermarriages between villages, which, especially in the case of chiefs, are common, more usually result in alliance than fusion.

Long Houses.—The Long House, which is found in all parts of the island, is derived perhaps from the pile-built houses of lake dwellers, such as are found to-day, together with raft-dwellings, along the tidal rivers and especially at Brunei, a pile-built town. These long houses, the best of which are built by Kayans, are erected on the banks of tidal rivers, out of reach of the freshets, and are usually of one type, the average length being six or seven hundred feet. They are divided longitudinally into two parts, the front forming a long gallery serving as a communal room, a sort of combination of public hall and village street. The back is divided into a number of rooms, each housing one family. The whole is built on massive piles of ironwood and raised 15 to 20ft. from the ground, the gallery being reached by ladders. A Kayan village usually consists of three to five such houses. The same is frequently the case with Kenyah and some Klemantan villages, but an Iban settlement invariably consists of a single house at no great distance from others.

The House Chief.—The powers of the house chief are concerned with house matters, such as marriage and divorce, compensation for personal injury or loss, and disputes arising from the ownership of property, especially farming and fruit lands. The village chief, who sits in council with subordinate chiefs, deals with matters which affect the village as a whole, and trials for serious personal injuries. He is also responsible for the proper observation of omens, and the regulation of *taboos* and restrictions (other than those of individuals), and various religious rites. He takes the leading part in social ceremonies and is regarded by other chiefs as largely responsible for the behaviour of his people. Above all, in war he is responsible for both strategy and tactics.

The Penghulu.—At the head of a tribe, or of a group of villages more or less scattered, is a kind of justice of the peace or native magistrate, called the *Penghulu.* The title is largely an honorary one, the Penghulu being a Government officer, elected by the people and approved by the Government and a member of the general council; whether in Dutch Borneo, Sarawak or British North Borneo, he is an essential part of the administration.

RELIGION AND BELIEFS

In the matter of beliefs the Bornean, possessing a mechanical mind, is under no illusion as to "devils" resident in machinery. At the same time, the belief in various spirits is an essential ingredient in his nature. In Borneo, as elsewhere, the progressive stages of belief range from Animism through Polymorphism to Monotheism. These forms of belief are found not only spread throughout the islands, but commonly combined in one tribe and in one individual. The belief in spiritual powers is universal, such powers being either (*a*) Anthropomorphic gods, or (*b*) vague impalpable nature spirits, for which the generic name in Kayan is *Toh,* possibly a corruption of the Malay word *Hantu,* ghost.

The Greater Gods.—Of these the first are spirits, thought of as possessing man's shape and, by certain fortunate individuals in the past, actually so seen. They are regarded with awe and gratitude, and are addressed in prayers and thanksgivings. Such gods are *Ballingo,* the Kenyah god of thunder, *Laki Pesong,* the Kayan god of fire, and three Kayan gods of life; some, such as the gods of fire and of the harvest, are friendly, others, as the gods of madness and fear, malevolent. In origin these gods are undoubtedly animistic. Images representing them are found outside most houses, but the images are not regarded either as being gods themselves or having any divine power; rather they are symbolic reminders, serving a double purpose, to the worshipper recalling the existence of the spirits, and to the gods the needs of their suppliants.

Beside and above all these is one principal god who is perhaps regarded as a sort of house or village chief among gods, and whose name, rather than his functions, varies in different tribes. Among the Kayans he is known as *Laki Tenangan,* and has a wife *Doh Tenangan,* who is especially addressed by women; among many Klemantans he is *Pa Silong,* among Kenyahs, *Penyalong.* Penyalong, with the Punans, is the title given to a crocodile god, who is almost the only personal god in whom they believe.

Toh.—The second class of spirits, the *Toh,* are vaguely conceived and may include the souls of animals and men past and present. They are regarded as malevolent and the object of fear,

surrounding the long house and infesting the rivers, the mountains, the forest, and, by coastal tribes, the sea. Death, sickness, the failure of crops and other major disasters are ascribed to the influence of these spirits which may be avoided by disguise, or propitiated by offerings. *Toh* are naturally most formidable in the least accessible places, such as mountain-tops, and, to some extent, caves and waterfalls. In the regulating of conduct they play an important part, being connected with various taboos; it is on fear of them rather than any feeling towards the major gods, that morality is based. The most important *Toh* are those connected with the dried heads of enemies, which are found in many Bornean long houses.

Iban Petara.—The Ibans do not seem to have any concept corresponding to the Supreme Spirit of the other tribes. The *Petara* of these people is a conception of one god having many manifestations and functions, each manifestation being anthropomorphic. Such are the mythical warrior, *Klieng*, and the god of war, *Singalang Burong*, who has a material animal form (that of the white-headed hawk, *Bali Flaki* of the Kenyahs); a yearly festival (*Begawai*) is held in his honour at which songs and prayers are continued for ten or twelve hours without cease.

The Unknown Helper.—Ibans, and some other tribes, have another, but a very rare belief in the *Ngarong* (*Tua* of the Malays), an invisible helper, usually the spirit of an ancestor or dead relative, who becomes the special protector of some individual, being first manifested in a dream. After such a dream the Iban wanders through the forest seeking a sign, either an animal or an inanimate object, which thereafter becomes to him the abode of his guardian spirit. The animal is most commonly a snake, a bear, a tiger-cat, a wild boar, or a gibbon. In such a case all individuals of that species become objects of special regard to the protegé of the Ngarong; he will not kill or eat any such animal, and as far as he can, restrains others from so doing. Every Iban who has no such guardian hopes to obtain some bird or beast as his helper at the Begawai, the festival of the *Petara*.

Life after Death.—The attitude of Borneans towards death and the life after death is peculiar, since a man's soul is regarded as remaining in the neighbourhood of the body so long as it remains in the house. The Kayans appear to distinguish two souls, the one (*Blua*) the true vital principle, the other a ghost-soul, which in a live man may wander far, in dreams, in sickness and in abstractions; and accordingly the word *urip*, meaning to be alive, is used as a term of respect to a person recently dead, but still, so to speak, in the neighbourhood. After death the soul is supposed to wander on foot until from a high point it views a great river, *Long Malan* (*Long Bali Matai* of the Kenyahs), in the basin of which are found the dwelling places of souls, the destination of each varying according to the manner of death. The largest of these districts is *Apo Leggan* (Kayan), where life is continued much as on earth. Other districts are *Tan Tekkan*, where suicides pass a miserable existence, and *Long Julan*, the weir leading to the lake of blood, where warriors who have met a violent end live in comfort, having for wives the ghosts of women who died in childbirth. The river of death, which all must cross, is bridged by a single log suspended from bank to bank, and constantly shaken by a guardian, *Maligang* (Klemantan). At the far end of this rocking bridge, according to the Punans, sits a giant helmeted hornbill, which frightens timid souls and causes them to fall into the river and be swallowed by a great fish.

In general the life after death is considered as not in any way much different from this life. Social distinctions, especially such as are achieved by the taking of heads in war, are perpetuated; hence the importance attached to tattooing. Death is neither greatly feared nor desired, and often old people, apparently cheerful and vigorous, will express their entire indifference to the whole matter.

Omens.—The observation of omens, whether by the cries of birds and beasts, or by the livers of sacrificial pigs, plays a most important part in the life of every tribe.

In the first place, auspices from birds are always taken by the aristocracy of a tribe, and consist in the observation of the flight of hawks made from a *tabernaculum* or booth with a rectangular frame, embracing a definite portion of the sky (*templum*). The flight of birds to the left is considered, in each case, a good omen. While the omens are being taken all sounds which might be unpropitious are drowned by the beating of gongs and drums, a band of young men being provided for the purpose. These omens, when obtained, must be corroborated by the inspection of a sacrificial animal, a pig or a fowl. In Borneo, the liver is the seat of omens, and is, for the purposes of haruspicy, divided into certain regions, which are chiefly geographical or territorial. The omens thus obtained are held to be the answer of the god to the prayers carried to him by the spirit of the pig.

The rice-harvest (*danggi*) is one of the greatest importance, and the continuity of life, in the seed-grain, with which is associated the fertility of the women of the tribe, is ensured by the ceremonial mixture of old and new rice, grains taken from a special store of rice kept in the house for this semi-religious purpose, being added each year to the grain intended for planting. The old store is on each occasion replenished by a similar quantity of new seed.

HEAD TAKING

The taking of the heads of enemies killed in battle has certain characteristic features which deserve special notice. In this matter it is necessary to distinguish clearly between the practice of the Ibans in this matter, and that of the other tribes. (*See* HEAD-HUNTING.)

Among Ibans.—Ibans alone appear to take heads for the sake of glory, and to attack other tribes with this aim. It is highly probable that they were not the originators of the habit, but having come across it in existence among other tribes, they found it to their liking and made a hobby of it. In this doubtless they were encouraged by the Mohammedan pirates with whom they co-operated between the 15th and 19th centuries and who allowed them to take the heads of such enemies as were not captured alive. To-day the spread of European influence and the fact that Ibans are mostly to be found near government stations, has done much to stamp out head-taking; but, in any case there has been, both in fiction and in sober histories, a deal of exaggeration as to the custom. Undoubtedly Ibans have been known to attack friendly villages and even rob tombs in order to obtain heads; and it is equally true that they have been encouraged by their women-folk. But to suggest, as has been done frequently, that marriage is conditional upon head-taking, or that head-hunting is a habitual exercise, is completely misleading.

Other Tribes.—Among other tribes head-taking is almost exclusively connected with retaliation on enemies, the prosperity of the rice-crop, or the funeral rites of a dead chief. In earlier days an essential part of the burial of a person of importance was the sacrifice of a slave who was to accompany and serve the departed in the next world. This appears clear from the presence, at the head and foot of coffins, of wooden effigies, to which a live fowl is attached. For slaves, economy, in the course of time, no doubt, suggested the substitution, first of an outsider, later of an enemy taken in battle; and then, for convenience, of an enemy's head. Such a head is always thickly covered with palm-leaves tied round it, as if to disguise the fact that it is a head.

Among the Kayans, whose practice is typical and largely influences that of other tribes, the period of mourning for a dead chief is only terminated by the taking of a head; but, since that termination may be indefinitely delayed, the village waits (often for years) for a *casus belli* with another tribe, when a successful raid may achieve a double purpose. Nowadays, indeed, a dried head is often borrowed from a friendly village, both for this purpose and for the harvest festival and fertility of the crops and also for the ceremony of initiation of young boys into the art of war, in which a head is struck at by tiny children in mimic warfare; while at certain stations the Government keeps a few old heads which can be borrowed. Kayans do not care to have in the house more than some 20 or 30 heads at most, and on certain occasions, *e.g.*, the removal to a new house, such as are superfluous are furtively left behind in a newly built hut where a fire kept burning for several days deceives the ghost souls of the heads.

The Rite of the Heads.—When the heads of enemies are taken they are not immediately placed in the gallery of the long house, but are lodged in a temporary hut built for the purpose. Here, outside the hut, the initiation of the boys is held. On the next day, a tall bamboo post is erected at a distance from the house near the image of the war god; this post is covered with strips of palm-leaves and from its top a single head is suspended. Before this altar-piece are placed smaller posts bearing small portions of human flesh, a thank-offering to the gods and to the omen-birds. The mourning period is terminated by a head or portion of one being carried down stream and placed on the dead chief's tomb; the ceremony is completed by the sacrifice of pigs and chickens. Later, other heads taken are brought into the house, where they are hung up amid general rejoicing, in the main verandah, opposite the principal room.

Heads and Toh.—The heads are believed to be haunted by a ghost soul or *Toh* of exceptional power and value. They are treated with respect and awe. Old men only may touch them since their hold on life is short. Fire is kept constantly burning below, a circle of small hooks is attached to them, and occasionally they are offered pork and rice-spirit.

The origin of *Toh* is probably due to the belief that the ghost-souls are resident in the human head, which, as long as it is not neglected, produces fertility in the soil, and promotes the growth of crops as well as the prosperity of the community in general and in particular that of the person who, alone, or with others, took the head. If neglected, the head is said to grind or champ its teeth, and on occasions, to cast itself on the floor, breaking the rattan by which it is suspended. The wooden hooks and bamboo cups attached to the heads of enemies mean that provision is made for additional heads and sustenance for the ghost-souls. Similar beliefs are current among the people of Assam, and this similarity is of importance in indicating the origin, migrations, and the persistence of beliefs amongst tribes which must have separated before the dawn of recorded history.

AGRICULTURE AND INDUSTRIES

The Bornean tribes seem in earlier days to have done little or nothing in the way of raising crops, being content, as are the Punans, with the products of the forest; and rice would seem to have been unknown in the island until some three hundred years ago. To-day it is the staple food of the island, having, in all likelihood, been introduced from Java by Malays or from the Philippines by the Muruts and their kindred. Muruts are credited with having introduced rice-cultivation in terraces and irrigation, and they are the best farmers in the interior of Borneo inasmuch as they raise two crops a year. Apart from rice, they cultivate a certain amount of maize, millet, tobacco and vegetables, especially gourds, cucumbers and chillies; and they are thus able to be self-supporting throughout the year. The only other tribes that produce enough to keep themselves are the Kayans and the Ibans. The Kayan is here, as in other matters, painstaking and methodical. His only crop is rice, but he takes great care in selecting various kinds so as to suit different localities. The Iban shows his versatility in the variety of produce, and he is careful not to exhaust his land. He is a hard worker and grows various vegetables in small areas cultivated by individual families.

Of the other tribes Klemantans are skilful up to a point, but they have only comparatively recently become farmers, and as their chief aim is to economize labour, they depend largely on imported food-stuffs. The Kenyah is prevented from being a good agriculturist only by his natural improvidence and his hospitality.

The cultivation of *Hevea* rubber added considerably to the prosperity of Borneo in the 20th century. In 1939 the export of this product amounted to one-fifth the total export of the Netherlands Indies.

The collection of various commercial products for sale or export is the source of various profitable industries. The chief commodities thus obtained are rattans, vegetable tallow from the seed of the Shorea tree (Punans and Ibans), rubber, both wild and (latterly) Para, beeswax, *bêche-de-mer* or *trepang* (coastal tribes); camphor (Punans), gutta-percha (Kayans, Klemantans and Ibans) and edible birds' nests (Kayans and Klemantans). The most important arts are boat and house building, ironwork (Kayans and Kenyahs), basket and mat work (Klemantans and Punans), weaving (Ibans), carving (Kayans, Klemantans and Kenyahs), and the manufacture of the blow-pipe (Kayans, Kenyahs and Punans). Tattooing is common all over the island, especially among Kayan women, with whom it has a ceremonial and religious significance.

Minerals.—The mineral wealth of Borneo is great and varied. It includes diamonds, the majority of which, however, are of a somewhat yellow colour, gold, cinnabar, copper, iron, stibnite, mineral oils, sulphur, rock-salt, marble and coal. The exploitation of the mines suffers from difficulties of transport, high duties payable in Dutch Borneo to native princes, competition among rival companies, and often the limited quantities of the minerals found. The districts of Sambas and Landak in the west, the Kahayan river, the mountain valleys of the extreme south-east, and parts of Sarawak, have furnished the largest quantities of gold, mostly from alluvial washings. Diamonds are also found widely distributed. The Kapuas valley near Landak has so far yielded the largest quantity.

Considerable progress was made in the development of oil fields in Dutch Borneo, and the Bataafsche petroleum Maatschappij, affiliated with the Shell Transport and Trading company, increased its output from 123,592 tons in 1901 to about 1,680,000 tons in 1939. At Miri, in Sarawak, great discoveries have been made (*see* SARAWAK), but in North Borneo up to the Japanese invasion in 1942 no oil in paying quantities had been found, although there are numerous indications in Kalias and other parts of the state. Coal mines have, in many instances, been opened and abandoned. Coal of good quality has been found in Pengaron and elsewhere in the Banjermasin district, but most Borneo coal is considerably below this average. It has also been found in fair quantities at various places in the Kutei valley, and in Sarawak. The coal mines of Labuan (*q.v.*) have been worked spasmodically, but success has never attended the venture. Sadong yields something under 130 tons a day, and there is the Kilingkang range of hills in Sarawak, at Selantik, an enormous coal field, well surveyed by the government. In 1825, John Crawfurd, the orientalist, learned that a quantity of antimony had been brought to Singapore by a native trader as ballast. The principal mine is at Bidi, in Sarawak, but the supply has been diminishing for several years.

HISTORY

There is no reason to believe that Borneo has ever formed a political unity; and few if any of its indigenous inhabitants have any conception of it as an island. By some *Klemantan* has been declared to be its native name, but for this there is scant warranty, natives of the archipelago speaking invariably of a particular part of the island, never of the island as a whole. The name *Borneo* is derived from Brunei (*q.v.*), the Malayan sultanate of that name on the west coast, which is to-day under British protection. The only archaeological remains are a few Hindu temples, and it is probable that the early settlement of the south-eastern portion of the island dates from about the sixth century A.D. In Borneo the primitive Hinduism, which still lingers on in Lombok and Bali, has long ago died out. There exist no data from which the early history of Borneo can be reconstructed. It began to be known to Europeans after the fall of Malacca in 1511, when d'Albuquerque despatched Antonio d'Abreu with three ships to search for the Molucca, or Spice, islands, with instructions to establish friendly relations with all native potentates whom he might meet. D'Abreu, sailing in a south-easterly direction from the Straits of Malacca, skirted the southern coast of Borneo and laid up his ships at Amboina (*q.v.*). He returned to Malacca in 1514, leaving one of his captains, Francisco Serrão, a kinsman of Magellan, at Ternate, where the latter's followers found him still living in 1521. After Magellan's death, his comrade sailing south-south-by-west, entered the Brunei river and landed at Brunei town. During the remainder of the 16th century Borneo, being on the highway between Malacca and the Spice islands, was fre-

quently visited by the Portuguese, who established a trade with Brunei. Of this the Spaniards in 1573 tried unsuccessfully to win a share, but this object was not attained till 1580, when they supported a claimant to the throne of Brunei who had appealed to them for aid. Thereafter the commercial intercourse between Brunei and the Spaniards was intermittent and hostilities frequent. In 1645 the latter sent an expedition on a larger scale to punish repeated acts of piracy, but the Spaniards and the Portuguese were both seeking trade, not territory. Proselytizing was only once essayed and Antonio Ventimiglia, a Theatine monk, its originator, was speedily killed. The monopoly of the Iberian nations in the trade of the archipelago was now assailed by the Dutch and British East India companies, and the former established trading-depots on the west coast of Borneo in 1604, and in 1608 Samuel Bloommaert was appointed Dutch head factor at Landak and Sukedana. The British reached Borneo in 1609 and by 1698 they had an important factory at Banjermasin, whence they were expelled about 1733 through Dutch influence, the latter having obtained from the Sultan of Bantam a trading-monopoly throughout his Bornean territory. In the north of the island, over which the Sultan of Sulu claimed sovereign rights, the British succeeded in establishing their influence to some extent, Alexander Dalrymple obtaining possession of the island of Balambangan and the whole of the northern promontory (Sabah). The local *Datu'* (chiefs), who resented this cession of their territories, destroyed a British fort in 1775, and this incident prevented the latter from profiting by a treaty with Brunei concluded in 1774. By the end of the 18th century British influence in Borneo was extinct; and the Dutch also, after a troublous experience, abandoned all their Bornean posts in 1809, by order of Marshal Daendels. Freed from intruders, the natives of the Bornean coast aided and stimulated by immigrants from the archipelago, devoted themselves to piracy on a large scale, putting to sea in great fleets manned by 2,000 or 3,000 men for three year cruises, and interfering materially with the trade of more civilized nations. During the British occupation of Java an embassy was sent to Sir Stamford Raffles by the Sultan of Banjermasin asking for assistance; and in 1811 Alexander Hare was sent there as Commissioner and Resident. He obtained an advantageous treaty and for himself the grant of a district. In 1816, Java having been restored to the Dutch, the latter obtained concessions from the sultan of about half his kingdom. Meanwhile George Müller, while exploring the east coast, obtained from the Sultan of Kutei an acknowledgment of Dutch authority, but was shortly afterward killed. Trouble in Java caused Borneo to be neglected by the Dutch during a prolonged period, and piracy became rampant. On the rise of Singapore a direct trade sprang up with Sarawak and Brunei, and to this the piratical adventures of the Bajaus and Ilanuns of north-west Borneo constituted a serious and constant menace. James Brooke, a retired officer of the Indian Army, who had fitted out his yacht *Royalist* for exploration in the Malay archipelago, determined to deal with the nuisance. On August 15th, 1839, he anchored off Kuching, the capital of Sarawak, and in 1841 the Sultan of Brunei ceded to him the huge district of Sarawak as a reward for his services in suppressing a civil war in that part of the country and checking piracy. By a treaty concluded with the British Government in 1888 the second Rajah Brooke surrendered the control of his foreign relations to the British Government. Piracy was finally extirpated by the British Navy by the battle of Marudi bay in 1845. The island of Labuan (*laboh-an,* "anchorage") was ceded by the Sultan of Brunei to the British Crown in 1847. The conclusion of this treaty with the Sultan of Brunei finally excluded the Dutch from the northern part of Borneo, but it stimulated them to increased activity in the south. The boundaries of British and Dutch Borneo were finally defined by a treaty concluded on June 20, 1891. The rise of British North Borneo under its Chartered Company is dealt with in a separate article. Labuan was at first only a naval outpost, but in 1848 it became a separate Crown colony, ruled by its own governor. Later, for a period, it was governed by the governor of the Chartered Company's territory. In 1907 it was annexed to the Straits Settlements and declared to be part of the settlement of Singapore. In 1912 it was constituted a separate settlement. During World War II the island fell under Japanese control. Sarawak was invaded Dec. 17, 1941, and Tarakan, off the E. coast of Dutch Borneo, fell Jan. 12, 1942. Balikpapan, Pontianak and Banjermasin were all captured within a month. (H. CL.; X.)

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BORNEO, STATE OF NORTH. A British protected state, administered by the British North Borneo company, incorporated by royal charter in 1881. The highest administrative authority is the governor, who is responsible to the court of directors in London, and whose appointment must be approved by the secretary of state for colonies. Pop. (1931) 270,223, including 340 Europeans, 236 Eurasians, 47,799 Chinese, the remainder natives of Borneo, including 97,862 Dusuns, 31,600 Bajaus, 14,959 Muruts; the total estimated population in 1939 was 304,000. Mohammedans of Malay stock and Chinese live along the coast, while the interior is inhabited by aboriginal tribes, some of them very little known. The state was occupied by Japan early in 1942.

Geography.—The area is 31,106 sq.mi., with a coast-line of over 900 miles. The interior consists almost entirely of highlands with here and there open valleys and plateaus 50 to 60 sq.mi. in extent. On the west coast the mountain range runs parallel with the seashore at a distance from it of about 30 miles. Of this range the central feature is the mountain of Kinabalu (13,451 ft.), one of the finest in the far east. Mt. Madalon, some 15 or 20 mi. to the north is 5,000 ft. in height, and inland across the valley of the Pagalan river, which runs through the Tembunan country and falls into the Padas, rises the peak of Trus Madi, estimated by some to be 11,000 ft. and by others not more than 8,000 ft. above sea level. The valley of the Pagalan is itself for the most part from 1,000 to 2,000 ft. above the sea, forming a string of small plateaus marking the sites of former lakes. From the base of Trus Madi to the eastern coast the country consists of huddled hills broken here and there by mountainous regions. The principal plateaus are in the Tembunan and Keningau valleys, in the basin of the Pagalan, and the Ranau plain to the eastward of the base of Kinabalu. Similar plateaus of minor importance are dotted about the interior. The mountains make the rivers of the northwest coast, with the single exception of the Padas, rapid, boulder-obstructed, shallow streams of little value as means of communication for a distance of more than 6 mi. from their mouths. The Padas is navigable for light-draught steam launches and native boats for a distance of nearly 60 mi. from its mouth, and smaller craft can be punted up as far as Rayoh, some 12 mi. farther, but at this point are met impassable falls and rapids. Even below Rayoh navigation is rendered difficult and occasionally dangerous by similar obstructions. None of the other rivers of the northwest coast of North Borneo is of great importance as a means of communication. The Tempasuk is noted for the Kalupis waterfall (1,500 ft.), one of the highest in the world, though the volume of water is not great. At the northern extremity of the island Marudi bay receives the waters of the Bengkoka, Bongon and Marudi rivers, of which the first is the most important, though it is navigable by small boats only. On the east coast the principal rivers are the Sugut, which rises in the hills to the east of Kinabalu; the Labuk, which has its sources 70 mi. inland and debouches into Labuk bay; and the Kinabatangan, the largest and most important river in the terri-

tory, which rises eastward of the range of which Trus Madi is the principal feature, and is navigable by steam launches drawing up to six feet as far as the mouth of the Lokan tributary, some 120 miles from the sea, and for smaller launches as far as Tangkulap. Some valuable tobacco land which, however, is somewhat liable to flood, and some remarkable burial caves are found in the valley of the Kinabatangan. The remaining rivers of the east coast are the Segamah, which rises west of Darvel bay, the Kumpong, and the Kalabakang, which debouches into Cowie harbour. North Borneo has several natural harbours which are accessible, safe and commodious. Sandakan harbour on the north-east coast (50° 40′ N., 118° 10′ E.), runs inland for some 17 mi. with a very irregular outline broken by the mouths of numerous creeks and streams. The mouth, only 2 mi. across, is split into two channels by the little, high, bluff-like island of Berhala. The depth in the main entrance varies from 10 to 17 fathoms, and vessels drawing 20 ft. can advance half-way up the bay. The principal town in the territory, and the seat of government (though some of the government departments are located at Jesselton on the west coast), is Sandakan, situated just inside Sandakan bay. At Silam, on Darvel bay, there is good anchorage; and Kudat in Marudi bay, first surveyed by Com. Johnstone of H.M.S. "Egeria" in 1881, is a small but useful harbour.

Climate.—North Borneo has an equatorial climate with heavy rains in the last three months of the year during the north east monsoon. The driest month is April with about 4 in. of rain. The mean annual range of temperature is about 3°, but temperatures ranging from 64 to 91 degrees have been recorded on the coast, and in the hills temperatures may be lower. The total rainfall varies between 60 and 180 in. according to locality; severe droughts are rare. The climate is somewhat enervating for Europeans as is the case in most equatorial regions.

Settlements and Communication.—There are a number of small stations along the coast, of which Sandakan, with a population of (1931) 13,826, is the most important. The remainder which call for separate mention are Laha Datu and Tawau on the east coast; Kudat on Marudi bay; and Jesselton on Gaya bay on the west coast. Beaufort and Tenom are important interior stations. The state railway, 125 miles long, runs along the west coast from Jesselton to Beaufort, where it bifurcates, one branch going to Weston on Brunei bay, the other along the banks of the Padas to Tenom above the rapids. Originally built as a pioneer line it since has been reconstructed. After 1918 an extension scheme for opening up North Borneo by means of roads was introduced, a metalled road connecting Jesselton with Tuaran, 20 miles to the north was begun in 1921 and completed in 1924; and work also proceeded on a road from Sandakan in a northwesterly direction towards the Labuk district. In 1928 a more comprehensive scheme was initiated. Telegraphic communication is maintained by a series of wireless stations, and direct radio services were established with Hongkong, Sarawak and the Philippines. The only remaining land telegraphic line is on the west coast which connects with the Eastern Telegraph company's cable station at Labuan.

Products and Trade.—Coal of good quality has been worked for a number of years in the neighbourhood of Cowie harbour. Gold has been found in alluvial deposits of east coast rivers. Traces of mineral oil, iron ores, copper, zinc and antimony have been found, but the wealth of North Borneo lies mainly in its agricultural and jungle produce. Like the rest of the island it possesses a great profusion of excellent timber. In 1920 a modern band sawmill was established in Sandakan, and the value of timber exported more than doubled in a decade. Cutch, a tanning extract made from the bark of certain mangrove trees—damar, edible bird's-nests, rattans, gutta, camphor, etc. are all valuable articles of export. The principal cultivated produce is rubber, tobacco, copra and sago. The area under rubber increased from 3,000 ac. in 1907 to 126,464 ac. in 1938; rubber became the principal export, valued at $4,168,000 in 1939. Between 1886 and 1900 the value of the tobacco crop increased from £471 to £200,000, but the industry in later years experienced serious reverses which brought it to the verge of extinction. Other important exports are wood, dried and salt fish, livestock, copra, hides and seed pearls. Total exports in 1939 amounted to $7,088,000.

Administration.—For administrative purposes the territory is divided into four residencies known respectively as the Sandakan and Kudat, West Coast, Interior and Tawau Residencies. These are again sub-divided into districts, each controlled by a district officer or an assistant district officer. The form of government is modelled roughly upon the system adopted in the Malay States of the peninsula during the early days of their administration by British residents. The government is vested primarily in the court of directors in London by whom the policy of the company is directed. The supreme authority on the spot is represented by the governor appointed with the approval of the secretary of state for the colonies and responsible to the court. The principal departments, whose chiefs reside at the capital or at Jesselton are the treasury, customs and excise, land and survey, public works, constabulary, protectorate, medical and judicial. The secretariat is under the charge of a government secretary who ranks next in precedence to the governor. Legislation is by ordinance enacted by the governor, but there is a legislative council meeting at irregular intervals, upon which the principal heads of departments and five unofficial members have seats. The public service is recruited by nomination by the court of directors. The governor is the president of the high court, but there is a chief justice who, sitting alone, may constitute the high court in certain cases; *e.g.*, the original criminal or civil jurisdiction of the court. The laws are the Indian Penal and Civil Procedure Codes and other adopted Indian acts, supplemented by numerous local ordinances. The native courts deal with all actions arising out of the breach of native law and custom where both parties are Asiatics. The native chiefs are responsible for the preservation of law and order and have restricted judicial powers. The constabulary numbers some 560 men and consists of a mixed force of Sikhs, Mohammedans and natives officered by a few Europeans. There is a Protestant mission which supports a church—the only stone building in the territory—and a school at Sandakan, with branches at Jesselton, Kudat, Keningau and Tambunan. The Roman Catholic mission maintains an orphanage, a church and school at Sandakan, and has missions among the Dusuns at several points on the west coast and in the Tembunan country. Its headquarters are at Kuching in Sarawak. The Chinese have their joss-houses and the Mohammedans a few small mosques, but the vast majority are pagans without religious buildings.

Finance and Money.—The revenue of North Borneo in 1940 was £503,436, the expenditure was £249,138. Imports in the same year were £1,164,198, exports were £2,364,891. Most of the trade of the state is ordinarily with Great Britain and its colonies and is carried on through Hongkong and Singapore. The principal products are rubber, timber, copra, coconuts, dried and salt fish, tobacco and manila hemp. Merchant shipping of 355,485 tons entered the ports of North Borneo in 1939, and 348,822 tons of shipping cleared from these ports. A railway 127 mi. runs from Jesselton, on Gaya bay, to Melapap, in the interior, with a branch from Beaufort to Weston, on Brunei bay. The state is in the postal union, and money orders on North Borneo are ordinarily issued in Great Britain and in most British dominions and vice versa. The unit of currency is the Singapore dollar (value 2/4) the company issuing its own coinage; there are also treasury notes for both dollars and cents issued by the company for use within the territory only. The principal medium of exchange among the natives in the interior is the large earthenware jars, imported originally, it is believed, from China, which form the chief wealth of tribes and individuals. (C. H.; X.)

History.—The British connection with northern and north-western Borneo, broken off in 1775, was not resumed till 1839. Labuan (*q.v.*) was occupied by the British as a crown colony in 1848, and in 1872 the Labuan Trading company was established in Sandakan, the fine harbour on the northern coast which later became the capital of the British North Borneo company's territory. In 1877 and 1878, through the instrumentality of Mr. (afterwards Sir) Alfred Dent, the Sultans of Brunei and Sulu

were induced to transfer to a syndicate, formed by Baron Overbeck and Mr. Dent, all their rights in North Borneo, of which they had been from time immemorial the overlords. The syndicate enlisted the support of several prominent public men, including Sir Rutherford Alcock, Admiral of the Fleet the Hon. Sir Henry Keppel, and Richard B. Martin. Early in 1881 the British North Bornéo Provisional Association Limited was formed to take over the concessions which had been obtained from the Sultans pending the grant of a royal charter, for which a petition had already (in December 1878) been presented to Queen Victoria. The charter was granted on Nov. 1, 1881, and subsequently the British North Borneo company, which was formed in May 1882, took over, in spite of diplomatic protests from the Dutch and Spanish governments, all the sovereign and territorial rights ceded by the original grants, and proceeded to organize the administration of the territory. The company subsequently acquired further rights from the Sultan of Brunei and his chiefs in addition to those already obtained at the time of the formation of the company. The Putatan river was ceded in May 1884, the Padas district, including the Padas and Klias rivers, in November of the same year, the Kawang river in February 1885 and the Mantanani Islands in April 1885. In 1888, by an agreement between the British government and the company, the "State of North Borneo" was placed under British protection, but its administration remained entirely in the hands of the company, the crown reserving control of its foreign relations. In 1890 the British government placed the colony of Labuan under the administration of the company, the governor of the State of North Borneo thereafter holding a royal commission as governor of Labuan in addition to his commission from the company. This arrangement held until 1905, when Labuan was removed from the jurisdiction of the company and attached to the colony of the Straits Settlements. In March 1898 the Sultan of Brunei ceded to the company all his sovereign and territorial rights to the districts situated to the north of the Padas river. These further territorial acquisitions, by which the state was knit into a compact whole, were viewed with considerable dissatisfaction by many of the natives, and this found expression in frequent acts of violence. The most noted and the most successful of the native leaders was a Bajau named Mat Saleh (Muhammad Saleh) who for several years defied the company. In 1898 a composition was made with him, the terms of which were unfortunately not defined with sufficient clearness, and he retired into the Tembunan country, where for a period he lorded it unchecked over the Dusun tribes of the valley. In 1899, because of his acts of aggression and defiance, it was found necessary to expel him. A short and successful campaign followed, resulting, on Jan. 31, 1900, in the death of Mat Saleh, and the destruction of his defenses.

Some of his followers who escaped raided the town of Kudat on Marudi bay in April 1900, but caused more panic than damage, and during the next few years the last smouldering embers of rebellion were extinguished. The introduction of rubber planting under European control and management stimulated progress, and in the 20th century there was considerable immigration of Chinese, but the territory continued to suffer from an inadequate population.

North Borneo is one of the territories over which the Japanese swept, with little or no resistance, during the first phase of the war with Great Britain and the United States. The state had practically no naval or air defense, and the peacetime military establishment consisted only of a native and Indian constabulary of 550 men, under five European officers. (*See* BORNEO.)

(H. CL.; X.)

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BORNEOL (also known as Borneo camphor): *see* CAMPHORS.

BORNHOLM, an island in the Baltic sea, 22 mi. S.E. of the Swedish coast, belonging to Denmark, lying in 15° E., and between 55° and 55° 18′ N., and measuring 24 mi. from southeast to northwest and 19 from E. to W. Pop. (est. 1940) 46,542. The surface is generally hilly, and the granite hill of Helligdomsklipper dominates the island. The variety of rocks in Bornholm is remarkable when the uniformity of the other Danish Islands is considered. Besides freestone, exported for building, limestone, blue marble and porcelain-clay are worked and some coal is used locally. Oats, flax and hemp are cultivated. Fishing, the manufacture of earthenware, weaving and clock-making are also carried on. The capital is Rønne (115 m. from Copenhagen); other small towns are—Svanike, Neksø (the birthplace of Madvig, 1804–1886), Hasle, Allinge and Sandvig. A railway connects Rønne with Neksø (22 m. E. by S.). The island attracts many visitors. On the north-west coast is the ruined castle of Hammershus, built in 1158, which long served as a state prison. In early times the island was the independent seat of marauding vikings. It has several round churches. In the 12th century it became a fief of the archbishop of Lund. Captured by the Hanseatic League (1510) it came under Danish sway in 1522 and in 1526 was made subject to the city of Lübeck. Though captured by Sweden (1645) the sympathies of the people were with Denmark, and the Swedish forces were expelled, the island falling finally to Denmark in 1660.

BORNIER, HENRI, VICOMTE DE (1825–1901), French poet and dramatist, was born in Lunel (Hérault) on Dec. 25, 1825, and died in Paris on Jan. 28, 1901. He served for half a century in the Arsenal library, when he rose to be director in 1889. His first volume of lyrics, *Premières Feuilles,* appeared in 1845, and his *Poésies Complètes* appeared in 1894. His best known work, however, was done for the theatre, in historical plays. The most famous were *Le Mariage de Luther* (1845), *La Fille de Roland* (1875), *Les Noces d'Attila* (1880), *Mahomet* (1888). In *La Fille de Roland,* written in verse, he went back to the national legend of Charlemagne for his subject, and the grandiose treatment of the conflict between love and honour inevitably provoked comparison with Corneille.

See Abbé Lecigne, *Henri de Bornier* (1900).

BORNITE, a copper-iron sulphide, Cu_5FeS_4, of importance as an ore of copper. It crystallizes in the cubic system, the usual form being that of interpenetrating cubes twinned on an octahedral plane. The faces are usually curved and rough, and the crystals confusedly aggregated together. The colour on a freshly fractured surface is coppery, but in moist air this rapidly tarnishes with iridescent blue and red colours; hence the names purple copper ore, variegated copper ore (Ger. *Buntkupfererz*), horse-flesh ore and erubescite (from the Lat. erubescere, "to grow red"). The lustre is metallic, and the streak greyish-black; hardness 3; sp. gr. 5·0. Owing to the frequent presence of mechanically admixed chalcopyrite and chalcocite the published analyses of bornite show wide variations, the copper, for example, varying from 50 to 70%. Bornite occurs in copper-bearing veins as one of the most impor-

tant minerals of the zone of secondary enrichment and has been mined as an ore of copper at Redruth in Cornwall, Montecatini in Tuscany, Bristol in Connecticut, Acton in Canada, etc.

(L. J. S.)

BORNU, a country in the Central Sudan, lying west and south of Lake Chad, bounded west by Sokoto, south by Muri and Adamawa, and north by the Sahara.. Formerly an independent Mohammedan sultanate, it was divided between Great Britain, Germany and France. To France has fallen a portion of northern Bornu and also Zinder (*q.v.*), a tributary state to the north-west, while the south-west part was incorporated in the former German colony of Cameroon. Three-fourths of Bornu proper, some 50,000 square m., forms part of the British protectorate of Nigeria.

Bornu slopes gradually to Lake Chad, which was formerly much larger. The Komadugu (*i.e.,* river) Waube—generally known as the Yo—and its tributaries rise south-east of Kano, and flow north and east to Lake Chad, the Yo in its last few miles marking the frontier between French and British possessions. A part of south-west Bornu drains to the Benue. The rivers are intermittent, and water in southern Bornu is obtained only from deep wells. The vast plain of Bornu is stoneless, except for rare outcrops of ironstone, and consists of the porous fissured black earth called "cotton soil" in India, alternating with, or more probably overlaid by, sand. Throughout the flat country water is apparently found everywhere at a depth of 68 ft., corresponding to the level of Chad, and the riverine areas of Chad and Chari are sometimes flooded when the lake rises. Acacia forest extends from Gongola to Gujba. The general vegetation is sub-desert with acacia bush, tamarinds and palms. South of Maifoni are baobabs, also some *Ficus*. The baobab has been taken north to Kuka, north of which grow Hyphaene palms, tamarinds and figs. Wild cotton and indigo give rise to the blue-striped cotton industry of the country, and the cotton near Lake Chad is fine. Rice and wheat are raised, but in small quantities, the staple food being *gussub* millet. Ground-nuts, yams, sweet potatoes, several sorts of beans and grains, peppers, onions, water-melons, tomatoes, limes and figs are grown. Lions, giraffes, elephants, hyenas, crocodiles, hippopotami, antelopes, gazelles and ostriches find food and cover in wood and marsh. Horse, camel and ox are used as beasts of burden. The country abounds with bees, and honey is a great delicacy.

From March to the end of June it is oppressively hot, day temperatures are often 105° to 107°, and night ones not much below 100°. In June the wet season begins, with thunder and lightning, and rivers and lakes are in flood till September, but the rainfall is only 13.78 in. at Kuka and 28.74 in. at Fort Lany. Fevers are prevalent in the rainy season but in September cooler winds blow from west and northwest and the climate becomes healthful and agreeable.

The dominant Bornuese, Berberi or Kanuri Negroes, with an infusion of Berber blood, have black skins, large mouths, thick lips and broad noses, but good teeth and high foreheads. The women tattoo extensively, stain their faces with indigo, and dye their front teeth black and their canine teeth red. The law allows polygamy, but the richest seldom have more than two or three wives. North of Chad mixture with the Tebu has given rise to the Kanembu.

The Kuka country is occupied by the Shuwas, of Arab origin, speaking a good dialect of Arabic, who came from the east Sahara in the early 17th century. They have numerous distinct clans, with villages of rudely constructed huts, of an exaggerated conical form. Another tribe, La Salas, inhabits low fertile islands in Lake Chad, separated from the mainland by fordable channels.

The Bornuese are noted horsemen, and, in war, horses, as well as riders, used to wear light iron mail. The Shuwas warriors wear only a light shirt, and the Kanembu spearmen go almost naked, and fight with shield and spear. Notwithstanding the heat, the body is enveloped in successive robes, the number indicating the rank of the wearer. The head likewise is enclosed in numerous turbans. The prevailing language in Bornu is the Kanuri. It has no affinity, according to Heinrich Barth, with the great Berber family. S. W. Koelle published grammar in 1854 as well as a volume of tales and fables, with translation and vocabulary.

The towns in Bornu are surrounded with walls 35 or 40 ft. in height and 20 ft. in thickness, having at each of the four corners a triple gate, composed of strong planks of wood, with bars of iron. The abodes of the principal inhabitants form an enclosed square, with a separate house for each wife; the chief's palace consists of turrets connected together by terraces. These are well built of a reddish clay, highly polished, so as to resemble stucco; the interior roof, though composed only of branches, is tastefully constructed. Maidugari, after 1908 the seat of native government, is a thriving commercial town some 70 m. south-west of Lake Chad. The former capital, Kuka (*q.v.*), and Ngornu (the town of "blessing"), are near the shores of Lake Chad. On the Yo are still to be seen extensive remains of Old Bornu or Birni and Gambarou or Ghambaru, destroyed by the Fula about 1809. Dikwa, the capital chosen by Rabah, lies in the Cameroon District.

HISTORY

The history of Bornu goes back to the 9th century A.D., but its early portions are very fragmentary and dubious. The first dynasty known is that of the Sefuwa, or descendants of Sef, which came to the throne in the person of Dugu or Duku, and had its capital at Njimiye (Jima) in Kanem on the north-east shores of Lake Chad. The Sefuwa are of Berber origin. Mohammedanism was adopted towards the end of the 11th century, and has since continued the religion of the country. From 1194 to 1220 reigned Selma II., under whom the power of the kingdom was greatly extended; and Dunama II., his successor, was also a powerful and warlike prince. In the following reigns the prosperity of the country began to diminish, and about 1386 the dynasty was expelled from Njimiye, and forced to seek refuge in the western part of its territory by the invasion of the Bulala. Mai Ali (I.) Ghajideni, who founded the city of Birni, rendered his country once more redoubtable and strong. His successor, Idris II., completely vanquished the Bulala and subjugated Kanem; and under Mohammed V., the next monarch, Bornu reached its highest pitch of greatness. A series of for the most part peaceful reigns succeeded till about the middle of the 18th century, when Ali (IV.) Omarmi entered upon a violent struggle with the Tuareg or Imoshagh. Under his son Ahmed (about 1808) the kingdom began to be harassed by the Fula, who had already conquered the Hausa country. Expelled from his capital by the invaders, Ahmed was only restored by the assistance of the fakir Mohammed al-Amin al-Kanemi, who, pretending to a celestial mission, hoisted the green flag of the Prophet and undertook the deliverance of his country. The Fula appear to have been taken by surprise, and in ten months were driven completely out of Bornu. The conqueror invested the nearest heir of the ancient kings with all the appearance of sovereignty—reserving for himself, however, under the title of sheikh, all its reality. The court of the sultan (*shehu*) was established at New Bornu, or Birni, which was made the capital, the old city having been destroyed during the Fula invasion; while the sheikh, in military state, took up his residence at the new city of Kuka. Fairly established, he ruled the country with a rod of iron, and at the same time inspired his subjects with a superstitious notion of his sanctity. His zeal was peculiarly directed against moral or religious offences. The most frivolous faults of women, as talking too loud and walking in the street unveiled, rendered the offender liable to public indictment, while graver errors were visited with the most ignominious punishments, and often with death itself. Kanemi died in 1835, and was succeeded by his son, Sheikh Omar, who altogether abolished the nominal kingship of the Sefuwa.

During Omar's reign, which lasted about 50 years, Bornu was visited by many Europeans, who reached it via Tripoli and the Sahara. The first to enter the country were Walter Oudney, Hugh Clapperton, and Dixon Denham (1823). They were followed in 1851–55 by Heinrich Barth. Later travellers included Gerhard Rohlfs (1866) and Gustav Nachtigal. All these travellers were well received by the Kanuri, whose power from the middle of the 19th century began to decay.

After the visit of Nachtigal the country was visited by no European traveller until 1892, when Col. P. L. Monteil resided for a time at Kuka. At this time a danger was threatening from the south-east, where the Negro adventurer, Rabah, once a slave of Zobeir Pasha, was menacing the kingdom of Bagirmi. After making himself master of the fortified town of Manifa, Rabah proceeded against Bornu, defeating the army of the sultan Ahsem in two pitched battles. In Dec. 1893 Ahsem fled from Kuka, which was entered by Rabah and soon afterwards destroyed, the capital being transferred to Dikwa in the south-east of the kingdom. Rabah had raised a large, well-drilled army, and proved a formidable opponent to the French in their advance to Lake Chad from the south. However in 1900 he was killed at Kussuri near the lower Shari, by the combined forces of three French expeditions which had been converging from the Congo, the Sahara, and the Niger.

After the defeat of Rabah French military expeditions occupied both the German and British portions of Bornu, but in 1902 on the appearance of British and German expeditions the French withdrew to their own country, east of the Shari. The British placed on the throne of Bornu Shehu Garbai, a descendant of the ancient sultans, and Kuka was again chosen as the capital of the state. From that date Bornu, as a province of the Protectorate of Nigeria, has been under effective administrative control. The people proved industrious, large areas were brought under cultivation, and taxes were collected without difficulty. Owing to its increasing commercial importance the native capital was moved, in 1908, to Maidugari. Following the conquest of the Cameroons the part of Bornu which had been under German rule was placed in 1919 under British mandate. For administrative purposes it was added to Bornu province but with a distinct native government under its own emir and council. This re-union of the dismembered parts of Bornu had beneficial results. Road and river communications were much improved. Population (1931 census) 1,118,360. Surveys for an extension of the Nigerian railway system to Bornu were undertaken in 1927–28 (*see* also NIGERIA and RABAH ZOBEIR).

BIBLIOGRAPHY.—Heinrich Barth's *Travels in North and Central Africa* (1857, new ed. 1890) contains an exact picture of the state in the period (*c.* 1850) preceding its decay. The earlier *Travels* of Denham and Clapperton (1828) may also be consulted, as well as Rohlfs' *Land und Volk in Afrika* (1870); Nachtigal, *Sahara und Sudan,* vol. i. (1879); and Monteil, *De St.-Louis à Tripoli par le lac Tchad* (1895). Lady Lugard's *A Tropical Dependency* (1905) deals with Bornu up to that date. C. K. Meek, *The Northern Tribes of Nigeria* (1925) deals with ethnology; F. W. H. Migeod, *Through Nigeria to Lake Chad* (1924), the *Annual Reports on Nigeria* issued by the Colonial Office, London; also the *Annual Report: Northern Provinces* (Lagos), first issued in 1928.

BORODIN, ALEXANDER PORFYRIEVICH (1834–1887), Russian musical composer, natural son of a Russian prince, was born in St. Petersburg on Nov. 12, 1834. He was brought up to the medical profession, and in 1862 was appointed assistant professor of chemistry at the St. Petersburg academy of medicine. He wrote several works on chemistry, and took a leading part in advocating women's education, helping to found the school of medicine for women, and lecturing there from 1872 till his death. But he is best known as a musician. His interest in music was stimulated from 1862 onwards by his friendship with Balakirev, and from 1863 by his marriage with a lady who was an accomplished pianist. He owed very much to the influence of Liszt at Weimar. His first symphony was written in 1862–1867; his opera *Prince Igor,* begun in 1869 was left unfinished at his death, but was completed by Rimsky-Korsakov and Glazunov (1889) and attained wide popularity in Russia while its brilliant Polovtsienne Dances became famous throughout Europe as a consequence of the performances of the Diaghilev Ballet. In the way of orchestral music his symphonic sketch "In the Steppes of Central Asia" is characteristically picturesque and not less noteworthy is his splendid second symphony in B minor, a work of the finest quality. He also wrote part of a third symphony (orchestrated after his death by Glazunov), a couple of admirable quartets and some delightful songs, but his total output was not very large, though sufficient even so to secure him a place among the most gifted and distinguished Russian masters of his period. He died suddenly at St. Petersburg on Feb. 28, 1887.

BORODINO, a village of Russia, 70 m. W. by S. of Moscow, on the great Moscow-Smolensk road, at the junction of the Kolotscha, Voina and Stontsa tributaries of the Moskva river, 55° 31′ N., 35° 40′ E. It is famous as the scene of a battle between the army of Napoleon and the Russians under Kutusov on Sept. 7, 1812, the last battle on Napoleon's march to Moscow. Though the battle is remembered chiefly for the terrible losses incurred by both sides, in many respects it is an illuminating example of Napoleon's later tactical methods, in which massed artillery was used as the key to the vital point of entrance in the enemy's position. After preliminary fighting on Sept. 5, both sides prepared for battle on the 6th, Napoleon holding back in the hope of confirming the enemy in his resolution to fight a decisive battle. For the same reason the French right wing, which could have manoeuvred the Russians from their position, was designedly weakened. The Russian right, bent back at an angle and strongly posted, was also neglected, for Napoleon intended to make a direct frontal attack. The enemy's right centre near the village of Borodino was to be attacked by the viceroy of Italy, Eugene, who was afterwards to roll up the Russian line towards its centre, the so-called "great redoubt," which was to be attacked directly from the front by Ney and Junot. Farther to the French right, Davout was to attack frontally a group of field works on which the Russian left centre was formed; and the extreme right of the French army was composed of the weak corps of Poniatowski. The whole line was not more than about 2 m. long, giving an average of over 20 men per yard. When the Russians closed on their centre they were even more densely massed, and their reserves were subjected to an effective fire from the French field guns. At 6 A.M. on Sept. 7 the French attack began. By 8 A.M. the Russian centre was driven in, and though a furious counter-attack enabled Prince Bagration's troops to win back their original line, fresh French troops under Davout and Ney drove them back again. But the Russians, though they lost ground elsewhere, still clung to the great redoubt, and for a time the advance of the French was suspended by Napoleon's order, owing to a cavalry attack by the Russians on Eugene's extreme left. When this alarm was ended the advance was resumed. Napoleon had now collected a sufficient target for the 400 guns which he had concentrated. A terrific bombardment by the artillery was followed by the decisive charge of the battle, made by great masses of cavalry. The horsemen, followed by the infantry, charged at speed, broke the Russian line in two, and the French squadrons entered the gorge of the great redoubt just as Eugene's infantry climbed up its faces. In a fearful *mêlée* the Russian garrison of the redoubt was almost annihilated. The defenders were now dislodged from their main line and the battle was practically at an end. Napoleon has been criticized for not using the Guard, which was intact, to complete the victory. It is a moot point, however, whether any further expenditure of men would have had good results. Napoleon had imposed his will on the enemy so far that they ceded possession of Moscow without further resistance. That the defeat and losses of the Russian field army did not end the war was due more to the national spirit and primitive national organization of the Russians, than to military miscalculations of Napoleon. As it was, the Russians lost about 42,000 men out of 121,000; Napoleon's army (of which one-half consisted of the contingents of subject allies—Germany, Poland, Switzerland, Holland, etc.) 32,000 out of 130,000 (Berndt, *Zahl im Kriege*). On the side of the French 31 general officers were casualties while the Russians lost 22 generals, amongst them Prince Bagration, who died of his wounds after the battle, and to whose memory a monument was erected on the battle-field by the tsar Nicholas I.

BOROEVIĆ VON BOJNA, SVETOZAR (1856–1920), Austro-Hungarian field-marshal, was born at Umetic in Croatia. He served through the campaign for the occupation of Bosnia in 1878, and afterwards on the general staff until he reached the rank of general. In the World War he first led the VI. Corps in the victorious battle of Komarow, and as commander of the 3rd Army

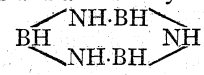
beat off the Russian attacks in the Carpathians until May 1915 He then took over the command on the Isonzo. His name is associated with the 11 victorious battles fought in the defence against Italian armies twice as numerous as the Austrians and considerably better equipped. After the collapse of the monarchy the Yugoslav Government refused the "black and yellow" general permission to return to his province. He died on May 23, 1920 at Klagenfurt.

BOROLANITE, one of the most remarkable rocks of the British Isles, found on the shores of Loch Borolan in Sutherlandshire, after which it has been named. In this locality there is a considerable area of granite rich in red alkali felspar, and passing, by diminution in the amount of its quartz, into quartz-syenites (nordmarkites) and syenites. At the margins of the outcrop patches of nepheline-syenite occur; usually the nepheline is decomposed, but occasionally it is well preserved; the other ingredients of the rock are brown garnet (melanite) and aegirine. The abundance of melanite is very unusual in igneous rocks, though some syenites, leucitophyres, and aegirine-felsites resemble borolanite in this respect. In places the nepheline-syenite assumes the form of a dark rock with large rounded white spots from $\frac{1}{4}$ to $\frac{3}{4}$in. across. In Finland, melanite-bearing nepheline rocks have been found and described as Ijolite. (J. S. F.)

BORON, one of the non-metallic elements, occurring in nature in the form of boracic (boric) acid, and in various borates such as borax, tincal, and boracite (symbol B, atomic number 5, atomic weight 10·82, isotopes 10 and 11). It was isolated by J. L. Gay Lussac and L. J. Thénard in 1808 by heating boron trioxide with potassium in an iron tube. It may also be obtained by reducing the chloride by sodium or hydrogen, or the borofluoride by potassium; or boron trioxide may more conveniently be reduced by aluminium, in which case a large excess of the oxide must be used to minimise formation of a compound of aluminium and boron. The product is extracted by hydrochloric acid, and the remaining impurities are volatilised in a vacuum at 1,200°C.; the boron can then be melted at a still higher temperature in a current of hydrogen. The resulting metallic boron is a conductor of electricity and has a density of 2·5; the amorphous variety is a chestnut-coloured powder, density 2·45. Boron is totally unaffected by air at ordinary temperatures, but at high temperatures it burns to the nitride, BN, and the oxide, B_2O_3. It combines directly with fluorine at ordinary temperatures, and with chlorine, bromine, and sulphur on heating. It does not react with the alkali metals, but combines with magnesium at a low red heat to give the boride, Mg_3B_2 (*see* below). It reduces many metallic oxides, such as those of lead and copper, and decomposes water at a red heat. Hot sulphuric or nitric acid oxidises it to boric acid, and on fusion with alkali carbonates or hydroxides it gives the corresponding borate. As in the cases of silicon and carbon, its specific heat increases rapidly with increasing temperature. Boron dissolves in molten aluminium, and on cooling, transparent, colourless crystals are obtained with a lustre, hardness, and refractivity approaching that of the diamond. Its carbide, CB_6, is equally hard (H. Moissan).

Many of the compounds of boron are of great interest in connection with the theory of valency (*q.v.*), and they show a striking similarity to the corresponding compounds of silicon, in spite of the different valencies.

For many years the hydrides of boron baffled investigators, but they are now known as well-defined individuals. When magnesium boride is treated with hydrogen chloride, an evil-smelling gas is obtained which contains hydrogen and what was regarded as a hydride; it burns with a green flame to the oxide, and deposits elementary boron if passed through a hot tube. Sir W. Ramsay and H. S. Hatfield cooled the gas in liquid air and separated hydrides of supposed composition B_3H_3 and BH_3; it was left to A. Stock and his collaborators, however, in a series of brilliant researches, to demonstrate that this gas is a mixture of hydrides, the chief of which is borobutane or tetraborane, B_4H_{10}. They have now isolated a whole series of "hydroborons" analogous to the hydrocarbons. Boroethane or diborane, B_2H_6, is the simplest, for BH_3 appears to be incapable of existence; it is formed from the above B_4H_{10} by keeping it over mercury at the ordinary temperature, by exposing it to ultra-violet light, or by heating it for some hours at 100°C. It is a colourless, malodorous gas which condenses at −88°C. and freezes at −169°C.: it is much more stable and less inflammable than B_4H_{10}, and it is decomposed quantitatively by water: $B_2H_6+6H_2O=2H_3BO_3+6H_2$. Also it reacts with hydrogen chloride or iodide to give chloro- or iododiborane. Tetraborane is synthesised from iododiborane and sodium: $2B_2H_5I+2Na=B_4H_{10}+2NaI$, in just the same way as butane from ethyl iodide (*see* CHEMISTRY: *Organic*); it condenses at 16°C. and freezes at −112°C.; it reacts with water or caustic soda to give hydrogen and boric acid or sodium borate. Pentaborane, B_5H_9; dihydropentaborane, B_5H_{11}; hexaborane, B_6H_{10}; and decaborane, $B_{10}H_{14}$ are also known. The last is a frequent decomposition product of other hydroborons, and is produced by the spontaneous decomposition of dihydropentaborane; it melts at 100°C. Hexaborane boils at about 100°C. under atmospheric pressure. A more systematic nomenclature for hydroborons was suggested by A. Stock and E. Pohland (*Berichte,* lix., 1926).

These hydroborons readily give rise to a number of compounds with ammonia, either by direct addition or by decomposition. Thus diborane gives B_2H_6, $2NH_3$, or, more probably, BH_3, NH_3; tetraborane gives the same compound together with the ammine of dehydrodiborane: $B_4H_{10}+4NH_3=2BH_3$, $NH_3+B_2H_4$ $(NH_3)_2$; pentaborane yields a tetrammine, B_5H_9 $(NH_3)_4$; and this on treatment with hydrogen chloride gives first tetrachloropentaborane tetrammine and then heptachloropentaborane tetrammine: B_5H_9 $(NH_3)_4+4HCl=B_5H_5Cl_4$ $(NH_3)_4+4H_2$; $B_5H_5Cl_4$ $(NH_3)_2$ $3HCl$ $=B_5H_2Cl_7(NH_3)_4+3H_2$. Excess of ammonia at 200°C. with diborane gives boroimide, B_2 $(NH)_3$, but if the ammine B_2H_6 $(NH_3)_2$ is heated, there is insufficient ammonia to replace all the hydrogen atoms by imino-groups and a relatively stable compound, $B_3N_3H_6$ is obtained, probably  ; it forms a trihydrate, $B_3N_3H_6$, $3H_2O$.

Boron fluoride was first prepared by Gay Lussac and Thénard, and is best prepared by heating a mixture of the oxide and fluorspar with concentrated sulphuric acid. It is a colourless, pungent, fuming gas which does not attack glass but is decomposed by sodium or potassium (*see* preparation of boron). It neither burns nor supports combustion, but reacts readily with water to give hydrofluoboric (hydroborofluoric) acid: $4BF_3+3H_2O=3HBF_4+H_3BO_3$; this acid cannot be isolated in the free state, but many of its salts are known as borofluorides or fluoborates. Boron fluoride also reacts with gaseous ammonia to give a white crystalline solid, BF_3NH_3; with excess of ammonia, colourless liquids, $BF_3,2NH_3$ and BF_3, $3NH_3$, are formed, but they lose ammonia on heating and are converted into the solid BF_3NH_3.

Boron trichloride is prepared by heating the element in a stream of chlorine, or better, by passing chlorine over a heated mixture of the oxide with charcoal, the volatile chloride being condensed in a freezing mixture. It is a colourless, fuming liquid boiling at 18°C., and readily reacting with water to give boric and hydrochloric acids; it also unites with ammonia to give first the white crystalline compound, $2BCl_3,3NH_3$, and then, with excess, boramide, $B(NH_2)_3$. The bromide may be prepared by the same methods as the chloride and has similar properties: it boils at 91°C. The iodide cannot be formed by direct union of the elements, but by the action of gaseous hydrogen iodide upon the amorphous element; it is also formed by the action of iodine on diborane. It is a white crystalline solid melting at 48°C. and boiling at 210°C. With a solution of phosphorus in carbon disulphide it gives a red powder, PBI_2, which may be sublimed in a vacuum at 200°C., condensing as red crystals, and when heated in a current of hydrogen yields the phosphide PB.

Boron nitride is formed when boron burns in air or nitrogen, or better by heating anhydrous borax with twice its weight of ammonium chloride in a platinum crucible. It is a white powder, insoluble in water and unaffected by most reagents, but dissolves slowly in hydrofluoric acid, and is slowly converted into the oxide and boric acid or a borate by the action of steam or caustic alkali solution.

Boron sulphide, B_2S_3, can be obtained by the direct union of the elements at a white heat or from the iodide and boiling sulphur, but is better prepared by heating a mixture of the oxide and charcoal in a current of carbon disulphide vapour, or by heating the oxide with aluminium sulphide in an atmosphere of nitrogen. The almost colourless crystals have a disagreeable smell and are rapidly decomposed by water to hydrogen sulphide and boric acid. It combines with ammonia to give B_2S_3, $6NH_3$, which decomposes on gentle heating to give the imide $B_2(NH)_3$, or on stronger heating to the nitride. A pentasulphide, B_2S_5, is also known.

Boron forms only one oxide which is best prepared by strongly igniting the acid; it rapidly absorbs water to regenerate boric acid. It is not volatile below a white heat and is therefore able to displace sulphur trioxide when it is heated with alkali sulphates, forming the corresponding borate. It also forms compounds with most metallic oxides, and as many of these possess characteristic colours, they are utilised in the "borax bead" test in analysis (*see* CHEMISTRY: *Analytical*). It dissolves in fairly concentrated sulphuric and phosphoric acids to give sulphates (B_2O_3, SO_3, $4H_2O$ and $3B_2O_3$, SO_3, $3H_2O$, according to M. Levi and L. F. Gilbert) and a phosphate, BPO_4; all these are very difficult to crystallise and very hygroscopic. Borax and boric acid are described under separate headings, and the perborates are included with the former.

Many organic compounds of boron are known; thus, ethyl and methyl borates, $B(OC_2H_5)$ and $B(OCH_3)$, are produced from the appropriate alcohol and either boron trichloride or sulphuric acid and a borate; they are colourless liquids of boiling points 119°C. and 72°C., respectively and are readily decomposed by water. The latter is utilised in the analysis of boron compounds (*see* below). Ethyl borate and zinc ethyl or methyl react to give boron triethyl or trimethyl, $B(C_2H_5)_3$ and $B(CH_3)_3$. These both combine with ammonia to give, *e.g.*, $B(CH_3)_3$, NH_3, compare BH_3 NH_3. Mixed alkylen, alkyloxy- and alkylen-hydroxy-compounds are known, and also compounds with acetylacetone: $[(C_5H_7O_2)_2B]$ Cl, which ionises, and $[(C_5H_7O_2)BF_2]$, which is non-ionic (G. T. Morgan and R. B. Tunstall). The later are of interest in that they show boron to have a co-ordination number of four. Phenylboric acid, $C_6H_5B(OH)_2$, is a powerful antiseptic.

Atomic weight determinations based on borax are untrustworthy since this suffers slight loss of sodium oxide on heating (*see* BORAX); determinations based on the boron trichloride are therefore preferred, and these give values of 10·82–10·84 (H. V. A. Briscoe and P. L. Robinson).

Soluble borates give a white precipitate with silver nitrate, and from their concentrated solutions sulphuric or hydrochloric acid precipitates boric acid. The acid gives a characteristic brown colour with turmeric paper, becoming bluish-black on addition of alkali. Borates heated with concentrated sulphuric acid and methyl alcohol give methyl borate (*above*), the vapour of which burns with a green flame. If this vapour is passed over heated lime, it is retained as B_2O_3, and this method may be used quantitatively. Borates may also be estimated as potassium borofluoride, which is insoluble in an alcoholic solution of potassium acetate; if substances other than boric acid or potassium borate are present in solution, the boron must be separated by means of the methyl ester, which is absorbed in potash. Direct alkalimetric titration of boric acid is impossible owing to its extreme weakness as an acid, but if excess of glycerol or mannitol is added, and the solution is made just neutral to methyl-orange, the complex acid formed can be titrated as a monobasic acid, phenolphthalein being used as an indicator. (A. D. M.)

BORORO AN, an independent linguistic stock of South American Indians, so called from the Bororos who are its most important tribe. These Indians (known also as "Coroados," a term applied to various entirely unrelated tribes) occupy or once occupied a considerable area between the headwaters of the Paraguay and San Lourenco rivers on the west, and the upper Araguaya on the east, in southern Matto Grosso, Brazil. They are a short, warlike folk, practising some agriculture, but also depending largely on hunting and fishing. The men wear only a plantain leaf cover, the women a breech-clout and a bark corset-like garment. Labrets are worn by the men. The bow and spear are their main weapons. Chiefs are selected for their ability as singers, the best singer in a village being the chief. These have very considerable power, and issue daily or rather nightly orders to their people. Boys are brought up in a separate men's-house. Monogamy is the rule, although polygamy is allowed. Infidelity leads to the woman being made a prostitute in the men's-house. Elaborate ceremonies are held, in which feats of strength are exhibited.

See K. von den Steinen, *Unter den Naturvölkern Zentral-Braziliens* (Berlin 1894); V. Fric, and F. Radin, "Contributions to the Study of the Bororo Indians" (*Jour. Roy. Anthrop. Inst. Gr. Brit. and Ireland.* vol. xlvi, pp. 393–406).

BOROUGH [BURROUGH, BURROWE, BORROWS], **STEVEN** (1525–1584), English navigator, was born at Northam in Devonshire on Sept. 25, 1525. In 1553 he took part in the expedition which was despatched from the Thames under Sir Hugh Willoughby to look for a northern passage to Cathay and India. Borough's ship, being separated from the others by a storm, sailed into the White Sea, and, in the words of his epitaph, he "discouered Moscouia by the Northerne sea passage to St. Nicholas" (Archangel). In a second expedition, made in the "Serchthrift" in 1556, he discovered Kara Strait, between Novaya Zemlya and Vaygach island. In 1560 he was in charge of another expedition to Russia, and, probably in 1588, he also made a voyage to Spain. 1563 he was appointed chief pilot and one of the four masters of the queen's ships in the Medway. He died on July 12, 1584.

His younger brother, WILLIAM BOROUGH, born in 1536, also at Northam, journeyed to Russia in 1553, and subsequently made many voyages to St. Nicholas. Later he transferred his services from the merchant adventurers to the Crown. As commander of the "Lion" he accompanied Sir Francis Drake in his Cadiz expedition of 1587. He was the author of *A Discourse of the Variation of the Compas, or Magneticall Needle* (1581). Some of his charts are preserved in the British Museum and Hatfield. He died in 1599.

BOROUGH. At no time before 1835 can a precise legal definition be found for the borough. Alike in the 11th and in the 18th century the popular use of the word covers so wide a variation in custom and so long a gradation of powers that both lawyer and historian are defeated in the attempt to frame an adequate generalization. The borough, nevertheless, plays a most important part in the history of English self-government. A natural economic centre which acquired mercantile and administrative independence, it became the field where the political instincts of the middle-class first found scope and thus training ground for a wider citizenship. The Plantagenet device of summoning representatives of the boroughs to parliaments transferred to the national stage men who were well used to responsibility. The life of numbers of vigorous independent political entities went to build up the House of Commons: it was the *communitas communitatum,* the assembly of the communities.

THE ENGLISH BOROUGH

There is no evidence for the theory of continuity of organization between the Roman colony and the old English borough. It is not until the Danish invasions of the 8th and 9th centuries that anything like municipal institutions is discernible. Mainly as a result of these invasions the English kings pursued a policy which both recognized and accelerated the growth of town life and town government. In the first place, mercantile transactions were confined to *ports;* that is, recognized marketing centres. Secondly, in the campaigns against the Danes the most effective military device was found to be the erection of burhs or forts, for the upkeep and garrisoning of which the men of the surrounding district were made responsible, and these garrisons of themselves must have brought more custom. Both commercial and military centres enjoyed special legal privileges, notably the borough-peace, under which offences against the peace incurred a heavier penalty if committed inside a borough. Thirdly, after the reconquest of the Danelaw the burhs or boroughs of the midlands became the centres of the new shires which were organized around and named after them. Lastly, by a law of about 960,

King Edgar recognized the existence of a special law court for the borough, and ordered that it should meet three times a year. Dwellers in the borough were apparently henceforth exempt from attendance at the hundred-moot though not from the shire-moot, and in their own moot could maintain and enforce their own special legal customs. Much archaic law and many interesting local customs were thus preserved and recorded at a later date in the borough custumals edited by Mary Bateson. At the borough moot the borough-reeve presided, assisted by senior burgesses, called lawmen in the Danelaw and aldermen or wise men elsewhere, who declared the law in doubtful cases and otherwise upheld its authority. Besides the three compulsory full sessions, other meetings must have been held at shorter intervals for judicial purposes, at which other borough business could be discussed. To such smaller gatherings and their administrative activities may be traced the beginnings of a town council.

By the time of the Norman Conquest, then, the borough was well on the way to becoming a self-governing unit. It had legal, judicial and economic privileges; it was generally the seat of a mint and in most cases it was outside the hundred. It was still, however, for some purposes under the control of the earl and the sheriff, the heads of the shire government; and very frequently the chief gentry or *thegns* of the shire owned houses, held land, and had considerable influence in the shire borough, their private jurisdictions or sokes cutting across the sphere of action of the borough-reeve.

Effect of the Norman Conquest on the Borough.—The Norman Conquest, by linking up England with the Continent, stimulated the natural economic development of towns; it also led to the deliberate foundation of new boroughs by both king and barons. At least 25 boroughs were founded between 1066 and 1086. When the Domesday Survey was made in that year, some 90 boroughs were in existence, of which about a third had baronial lords. These, under the feudal theory then generally applied, held their privileges from their lords who held of the king, and so were known as medial or mesne boroughs. In a few instances, such as Leicester and Northampton, an older royal borough was granted to a magnate, Leicester was held by its earls until they became kings of England in 1399; Northampton reverted to royal control in the 12th century. A large proportion of seignorial boroughs may be regarded as experiments that failed. The judgment of the local lords who founded them was often at fault. Nineteen of the 23 boroughs founded in Lancashire in the middle ages relapsed sooner or later into villages; municipal privileges could not make a borough where the economic *raison d'être* was lacking.

The 12th and 13th centuries are the period of the most rapid advance of the English borough. Besides the new foundations, additional privileges were being granted to boroughs already in existence. The revolutionary municipal movement on the Continent affected the English towns and in the 12th century communes after the French model were proclaimed in London and elsewhere. The government of England, however, kept a firm hand on the development of municipal independence, and the boroughs of England never ceased to be an integral part of the national administrative system, exercising their political powers by grant from and at the good pleasure of the crown. Even London, pre-eminent by its municipal privileges, was taught its place by being "taken into the king's hand" time after time, and never approached the status of the free cities of the Netherlands, Germany or Italy.

The Chartered Privileges of the Mediaeval Borough.—Some 760 borough charters are extant for the period 1066–1307, and many lost grants of privilege must have been made. Of these some 250 belonged to the reigns of Richard I. and John (1189–1216), which owing to the crown's urgent need for money and the burgesses' desire for liberties proved the period of greatest activity in charter granting. An analysis of these charters shows a very wide range of privileges. The only *sine qua non* of a borough was the much coveted burgage tenure, which freed the burgesses from the customary burdens of manorialism, enabling them to pay a money rent for their land and to sell and devise it freely. Besides legal privileges the other main classes of privilege granted were mercantile, fiscal, jurisdictional and administrative. The commercial privileges included grants of markets and fairs, with accompanying trade monopolies, rights to take toll, freedom of the burgesses from toll elsewhere and the right to have a merchant guild with power to regulate the trade of the borough. The organization evolved for the exercise of these rights coincided in some boroughs with the town government and in others was kept distinct. Whilst each borough has its own history it may be said generally that advance towards self-government was achieved by emancipation, first from the fiscal, then from the judicial and finally from the administrative interference of the sheriff. In the 11th century the customary revenue due from the borough to the crown was generally collected and paid over by the sheriff, who accounted for a fixed sum known as the farm of the borough (*firma burgi*). In the first half of the 12th century special farmers were frequently appointed, who paid over their farms to the king and extorted what they could from the burgesses. Henry II. (1154–89) began the practice, made permanent by Richard and John, of selling to the burgesses the right to collect the farm themselves and account for it at the Exchequer by their own reeves. Once the borough had acquired the right to deal directly with the royal exchequer the appointment of its officials became of more than internal interest. Concession of the right to choose the reeve who accounted at the exchequer was followed by leave to choose a mayor (granted to London by Richard, and to Northampton, and possibly some other boroughs, by John) and borough coroners. Then came the extension of the jurisdictional powers of the borough courts, and finally, about the middle of the 13th century, the right to execute all royal writs. This meant that not only the shire coroners but also the sheriff was henceforth excluded from the borough until the borough officials had failed to execute the writs which he was now bound to pass on to them. After this, though the borough had to appear by 12 jurors before the justices in eyre, no royal official below the rank of a king's justice need be admitted into the borough. By the end of the 13th century the average borough had acquired sufficient powers and evolved an adequate staff for carrying on its own government and enforcing the law of the land without intervention from outside: and this self-sufficiency was in most cases reinforced, in the 16th century, by the grant of a special commission of the peace for the borough.

The Struggle of Classes Within the Borough.—From the first the full rights of a burgess were not enjoyed by all inhabitants of a borough. The "freedom," both political and mercantile, was carefully guarded. In the middle of the 13th century, at the time of the Barons' wars, vain efforts seem to have been made by the poorer townsmen in various boroughs (*e.g.*, London, Oxford, Bury St. Edmund's and Northampton) to obtain a share of the power monopolized by the wealthier burgesses. But in most cases the power remained in the hands of a ring whose members exercised in turn the functions of office and controlled the admission to the freedom of the borough. In many towns the contest took the form of a struggle between different guilds for the control of the town government. In the 14th century a typical form of government was that by a mayor and council, consisting largely of ex-officials, who exercised the judicial and administrative powers, and a town assembly or common council which, in form at least, elected the officials annually and had powers, varying from borough to borough, of legislation or registration of decrees. In the 15th century a renewed endeavour on the part of the lesser townsmen to influence the town government led to riots and disturbances which furnished the pretext for the limitation by law of the composition and of the powers of the assembly. Practical needs, combined with the development of the law of corporations, made the boroughs apply for charters of incorporation, and in these the national government definitely placed power and responsibility in the hands of the governing clique, and narrowed or even eliminated popular control. From the time of Henry VII. royal policy steadily strengthened the position of the oligarchy, and the borough more and more became identified with the close corporation that administered its govern-

ment. By the 19th century in only a few exceptional cases, notably at Berwick, Norwich and Ipswich, was there any trace of democracy in the borough constitution: it was only in connection with parliamentary elections that, here and there, the whole body of townsmen had any share in the liberties of their town.

The King and the Borough.—From the time of Henry III. onwards representatives of the boroughs were summoned to the king's parliaments. Whilst some boroughs may have found the duty of attendance irksome and costly, for it entailed liability to a higher rate of taxation as well as payment of the members' wages, there is evidence that in others the burgesses welcomed the opportunities thus afforded. At the outset Edward I. often summoned representatives of both boroughs and "merchant towns," but economic facts and the passive resistance of the smaller communities led to the dropping out of many names, and ultimately the right to receive a summons to parliament became a working means of classifying boroughs. As the House of Commons began to exercise effective political power, a new motive for royal interference in the boroughs began to operate. Both Elizabeth and James I. created new boroughs freely in order to secure submissive parliaments, and under Charles II. and James II. a determined attempt was made to control both the personnel and the policy of the corporations with the double object of influencing local administration and parliamentary representation. Under the Corporation Act of 1661 the town councils were purged of persons suspected of disaffection to the crown, and in 1682 a general attack on the borough franchises began. First London and then a series of other towns were charged, under writ of *quo warranto,* with having exceeded the powers granted in their charters. In the existing state of the law it was easy to give judgment for the king, and the charters were forfeited. The new charters which replaced them secured to the crown the veto on all important municipal appointments, and power to remove officials at will. A special commission of 1687 even ordered the election to the corporations of specific supporters of James' policy. The old charters were restored in 1688, and the corporations, guarded alike from royal interference and in most cases from popular control, became irresponsible close bodies, regarding the borough revenues as their own property and themselves practically as clubs, whose vested interests were sacred and whose policy it were impertinence to criticize. The material and social needs of the rapidly growing boroughs of the 18th century had for the most part to be supplied by other agencies, both statutory and voluntary. The advance of nonconformity further emphasized the unrepresentative character of the corporations, whose social and political bias even influenced, in some cases, the administration of justice by the borough magistrates. By 1830, with some shining exceptions, they were strongholds of corrupt and bigoted obscurantism in the midst of a country transformed by industrial development and alive with new political, economic and social movements.

Municipal Reform in the Nineteenth Century.—Parliamentary reform dealt the first blow to the powers of the close corporations. The parliamentary franchise varied from borough to borough; but even where the franchise was widest, the mayor, as returning officer, could and did determine the results of elections. When the tide of party feeling ran high the county magnates bid against each other for the support of the corporations and the corporations spent the borough funds lavishly in the interests of their own party. At Leicester the corporation advanced £10,000 towards the expenses of the election of 1827 which was never repaid. By the creation of a uniform borough franchise the Reform Act of 1832 removed the main source of the corrupt political power of the corporations. The first reformed parliament set up in 1833 a Royal Commission of Inquiry into the existing state of municipal corporations, whose accurate and lucid reports give a vivid picture of the stagnation and decay of municipal institutions in the majority of the boroughs. The Municipal Reform Act of 1835 swept away the whole mass of obsolete and unrepresentative institutions, and set up the form of government by mayor, aldermen and council, elected by the ratepayers, which, modified by a succession of later Acts consolidated in the Municipal Corporations Act of 1882, with various minor amendments of which the latest are 15 Geo. V., ch. 11., and 15 and 16 Geo. V., ch. 54, has since formed the code of borough administration in England. The Local Government Act of 1888 created the county borough, exempt from the jurisdiction of and with powers equivalent to those of the county council. By it any borough might apply to be constituted a county borough if it had a population of 50,000 and upwards: by the County Boroughs and Adjustments Act of 1926 the minimum was raised to 75,000, and procedure by private bill in place of the provisional order of the Ministry of Health was made obligatory. It may be doubted, however, whether the control by the central government does not unduly hamper the activity and enterprise of such county boroughs as Manchester, whose population is three times that of the self-governing dominion of Newfoundland, and whose annual budget exceeds that of some of the smaller European states.

IRISH AND SCOTTISH BOROUGHS

The Anglo-Norman influences which moulded the development of the English borough were extended, with the settlement of the Anglo-Norman nobles, to both Scotland and Ireland. From this point of view Ireland may be regarded as an English colony in which municipal institutions developed on lines similar to those of the mother-country, and the borough charters of the 12th and 13th centuries, the new foundations of the 17th and the corruption of the 18th, are closely paralleled. In Scotland, with the same general similarity, some difference in detail developed in the course of time. The royal burgh was the equivalent of the royal borough in England, but its mercantile privileges were greater. Scotland was, in effect, divided into a number of districts within each of which a royal burgh had the monopoly of trade, no other grants of market or fair were made, and no other borough could be created save by royal licence. The mesne boroughs were known as burghs of regality or of barony and were always, in theory, created by royal grant. Two other special features in Scotland were the association of the free burghs in the north of Scotland called the Hanse, by which a common standard of rights and duties was maintained among the members; and the convention or separate assembly of royal burghs, dating apparently from 1487, which saw to "the welfare of merchandise and the common profit of the burghs," revised the methods of municipal election, and assessed the division among the burghs of the parliamentary subsidy due from them. Representatives of the burghs sat in Scottish parliaments from 1295 onwards, and the existence of this separate convention is attributable to the comparative powerlessness of the lower house in the Scottish parliaments. By the 19th century municipal reform was even more urgently needed in Scotland than in England, and the Scottish Burghs bill of 1833, which set up representative town councils and vested them with the property and rights of the old corporations, served as an important precedent for the English measure of 1835.

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In the United States, boroughs existed in colonial Virginia, first, in 1619, as mere election districts for the House of Burgesses. Later, in 1722, a borough charter, somewhat similar to the borough organization in England, was granted to Williamsburg, with others to Norfolk and Richmond, all given by the

governor. The name borough was dropped after the Revolution and now it is used only in the United States to designate the five administrative sub-divisions of New York City; Manhattan, The Bronx, Brooklyn, Queens and Richmond, which are co-terminous with the five counties of New York, The Bronx, Kings, Queens and Richmond (Staten Island). Each of these New York City boroughs has a President elected by the voters, and he is a member of the city's Board of Estimate. These boroughs have taken over the work to a great degree of the several municipalities which were merged into the greater New York City when it was created in 1898. The term borough is also applied to incorporated towns or villages in New Jersey, Pennsylvania, Connecticut and Minnesota.

BOROUGHBRIDGE, market town, West Riding of Yorkshire, England, 22m. N.W. of York on a branch of the L.N.E. railway. Pop. (1931) 862. It lies in the central plain of Yorkshire on the river Ure near its confluence with the Swale. About ½ m. to the west of Boroughbridge are three prehistoric monoliths known as the Devil's Arrows.

When the site of the Great North Road was altered, towards the end of the 11th century, a bridge was built across the Ure, and called Burgh bridge or Ponteburgem. This caused a village to spring up, and it afterwards increased so much as to become a market town. It was deeply concerned in the war with Scotland in the early 14th century and a battle was fought here in 1322. In 1504 the bailiff and inhabitants of Boroughbridge received a grant of two fairs, and Charles II. created three new fairs in the borough. It has maintained its agricultural interests. Boroughbridge is in the Ripon parliamentary division.

BOROUGH ENGLISH, a custom which prevailed in certain ancient English boroughs, and in districts attached to them (where the lands are held in socage), and also in certain copyhold manors (chiefly in Surrey, Middlesex, Suffolk and Sussex), by which in general lands descend to the youngest son. It was found most frequently among the unfree class. Generally Borough English, apart from specialties, may be said to differ from gavelkind in not including collaterals.

The origin of the custom has been much disputed. It is first mentioned by Glanvil, without, however, any explanation. Littleton's explanation is that custom casts the inheritance upon the youngest, because after the death of his parents he is least able to support himself, and more likely to be left destitute of any other support. Blackstone derived Borough English from the usages of pastoral life, the elder sons migrating and the youngest remaining to look after the household. It appears to have been customary in the early Irish tribal system. Elton claims it to be a survival of pre-Aryan times. It was referred to by the Normans as "the custom of the English towns." In the *Yearbook,* 22 Edw. IV., fol. *32b,* it is described as the custom of Nottingham, which is made clear by the report of a trial in the first year of Edward III., where it was found that in Nottingham there were two districts, the one the *Burgh-Fraunçoyes,* the other the *Burgh-Engloyes,* where descent was to the youngest son, from which circumstance the custom has derived its name. The custom has been abolished by S. 45 of the Administration of Estates Act, 1925. (*See* also GAVELKIND; INHERITANCE; PRIMOGENITURE; TENURE.)

See Blackstone's *Commentaries;* Coke's *Institutes;* Comyn's *Digest;* Elton's *Origin of Eng. Hist.;* Pollock and Maitland, *Hist. Eng. Law;* Vinogradoff, *Villeinage.*

BORROMEAN ISLANDS, four islands on the west of Lago Maggiore off Baveno and Stresa. Isola Bella is famous for its château and terraced gardens, built by Count Vitaliano Borromeo (d. 1690); north-east of this is the Isola Madre, the largest of the group, with a château; north again, off Pallanza, is the little Isola S. Giovanni.

BORROMEO, CARLO (*bŏr-rō-mā'ŏ*) (1538–1584), saint and cardinal of the Roman Church, son of Ghiberto Borromeo, count of Arona, and Margarita de' Medici, was born at the castle of Arona on Lago Maggiore on Oct. 2, 1538. When in 1560 his uncle, Cardinal Angelo de' Medici, was raised to the pontificate as Pius IV., Borromeo was made prothonotary and created cardinal with the administration of Romagna and the March of Ancona, and the supervision of the Franciscans, the Carmelites and the knights of Malta. He was thus at the age of 22 practically the leading statesman of the papal court. Soon after he was raised to the archbishopric of Milan. In compliance with the pope's desire, he lived in great splendour; yet his own temperance and humility were never brought into question. Owing to his influence over Pius IV., he was able to facilitate the final deliberations of the Council of Trent, and he took a large share in the drawing up of the Tridentine catechism (*Catechismus Romanus*).

On the death of Pius IV. (1566), the skill and diligence of Borromeo contributed much to the suppressing of the cabals of the conclave. He had been all powerful during the later years of Pius IV., but he did not use this power, as he no doubt might have done, to secure his own election as pope. By the choice of Michele Ghislieri, he ensured the triumph of his own ideals of ascetisism and piety, and the suppression of corruption in the hierarchy. Subsequently, he devoted himself wholly to the reformation of his diocese. He made a series of pastoral visits, and restored decency and dignity to divine service. In conformity with the decrees of the Council of Trent, he cleared the cathedral of its gorgeous tombs, rich ornaments, banners, arms, sparing not even the monuments of his own relatives. He divided the nave of the church into two compartments for the separation of the sexes. He extended his reforms to the collegiate churches (even to the fraternities of penitents and particularly that of St. John the Baptist), and to the monasteries; and he established seminaries, colleges and communities for the education of candidates for holy orders. He founded the fraternity of the Oblates, a society whose members were pledged to give aid to the Church when and where it might be required. He further paved the way for the "Golden" or "Borromean" league formed in 1586 by the Swiss Catholic cantons of Switzerland to expel heretics, if necessary by armed force. In 1576, when Milan was visited by the plague, he went about giving directions for accommodating the sick and burying the dead, avoiding no danger and sparing no expense. Borromeo met with much opposition to his reforms. The governor of the province, and many of the senators, fearing encroachment upon the civil jurisdiction, addressed remonstrances and complaints to the courts of Rome and Madrid. But Borromeo had more formidable difficulties to struggle with, in the inveterate opposition of several religious orders, particularly that of the Humiliati (Brothers of Humility). He died at Milan on Nov. 4, 1584. He was canonized in 1610, and his feast is celebrated on Nov. 4.

Besides the *Noctes Vaticanae,* to which he appears to have contributed, the only literary relics of this intrepid and zealous reformer are some homilies, discourses and sermons, with a collection of letters. His sermons were published at Milan, 1747–48, and have been translated into many languages. Contrary to his last wishes a memorial was erected to him in Milan cathedral, as well as a statue 70ft. high on the hill above Arona, by his admirers who regarded him as the leader of a Counter-Reformation.

His nephew, FEDERIGO BORROMEO (1564–1631), was archbishop of Milan from 1595, and in 1609 founded the Ambrosian library in that city.

See *Acta Ecclesiae Mediolanensis* (Milan, 1599); G. P. Giussano, *Vita di S. Carlo Borromeo* (1610, Eng. ed. by H. E. Manning, 1884); A. Sala, *Documenti circa la vita e la gesta di Borromeo* (1857–59); Chanoine Silvain, *Histoire de St. Charles Borromée* (1884); and A. Cantono, *Un grande riformatore del secolo XVI.* (1904); article "Borromaus" in Herzog-Hauck, *Realencyklopädie* (Leipzig, 1897).

BORROMINI, FRANCESCO (1599–1667), Italian architect, was born at Bissone on Sept. 25, 1599. He was the chief exponent of the style known in architecture as "baroque," which marked a fearless and sometimes reckless departure from the traditional laws of the Renaissance. A pupil of Carlo Maderna, he became after his master's death architect of St. Peter's under Bernini's direction. Borromini developed a highly decorative style. He was much employed in the middle of the 17th century at Rome. His principal works are the church of St. Agnese in Piazza Navona, the church of La Sapienza in Rome, the church of San Carlino alle Fontane, the church of the Collegio di Propaganda,

and the restoration of San Giovanni in Laterano. He died by his own hand at Rome on Aug. 2, 1667. Engravings of his chief compositions are to be found in the posthumous work, *Francisci Borromini opus Architectonicum* (1727).

BORROW, GEORGE HENRY (1803–1881), English traveller, linguist and author, was born at East Dereham, Norfolk, on July 5, 1803, of a middle-class Cornish family. From 1816 to 1818 Borrow attended the grammar school at Norwich. After leaving school he was articled to a firm of Norwich solicitors, where he neglected law, but studied languages. Encouraged by William Taylor, the friend of Southey, he picked up a knowledge of French, German, Danish, Welsh, Irish, Latin, Greek and, for he was already attracted by the gipsies, Romany. On the death of his father, in 1824, he went to London to seek his fortune as a literary adventurer. In 1826 he published a volume of *Romantic Ballads* translated from the Danish. Dissatisfied, Borrow began tramping. As he stood considerably more than 6ft. in height, was a fairly trained athlete, and had a countenance of extraordinary impressiveness, if not of commanding beauty—Greek in type, with a dash of the Hebrew—we may assume that there had never before appeared on the English high-roads so majestic-looking a tramp as Borrow. He soon found himself on Salisbury Plain. Then his extraordinary adventures began. He met the splendid road-girl, born at Long Melford workhouse, whom he has immortalized under the name of Isopel Berners. It would be a mistake to accept *Lavengro* and *The Romany Rye* as a strict autobiographical record. One of his biographers, Mr. Edward Thomas, has said of *Lavengro*, "a representation of a man's life in the backward dream of memory."

As agent to the Bible Society, Borrow visited St. Petersburg (1833–35), where he published *Targum, or Metrical Translations from Thirty Languages and Dialects* (1835). He then visited Spain, Portugal and Morocco (1835–40). From 1837 to 1839 he acted as correspondent to the *Morning Herald*. The result of these travels and adventures was the publication, in 1841, of *Zincali, or The Gypsies in Spain*. In 1843 appeared *The Bible in Spain*, which suddenly made Borrow famous. Every page of the book glows with freshness, picturesqueness and vivacity. In 1840 he married Mary Clarke, the widow of a naval officer. Probably Borrow would never have told the world about his vagabond life in England as a hedgesmith had not *The Bible in Spain* made him famous as a wanderer. *Lavengro* appeared in 1851 with a success which, compared with that of *The Bible in Spain*, was at the time only partial. In 1857 he published the sequel, *The Romany Rye*. In 1844 he travelled in south-eastern Europe, and in 1854 he made a tour with his step-daughter in Wales. This tour he described in *Wild Wales*, published in 1862. In 1874 he brought out a volume of ill-digested material upon the Romany tongue, *Romano Lavo-lil, or Word-book of the Gypsy Language*. He died at Oulton, July 26, 1881. The variety of Borrow's attainments is shown by his translation of the Church of England *Homilies* into Manchu, of the Gospel of St. Luke into the Git dialect of the Gitanos, of *The Sleeping Bard* from the Cambrian-British and of *Bluebird* into Turkish.

BIBLIOGRAPHY.—A complete list of the works of George Borrow will be found in T. J. Wise, *Bibliography of the Writings of Borrow* (1912). *See* also Knapp, *Life, Writings and Letters of George Borrow* (1899); H. Jenkins, *The Life of George Borrow* (1912); E. Thomas, *George Borrow* (1912); C. K. Shorter, *George Borrow and his Circle* (1913); and introductions by T. Watts-Dunton, T. Seccombe and others to various editions of individual works. Borrow's *Letters to the British and Foreign Bible Society* appeared in 1911.

BORSIPPA (mod. BIRS or BIRS-NIMRUD), ancient city about 15m. S.W. of Babylon and 10m. from Hillah, on the Hindieh canal. It was the sister city of Babylon, and in the inscriptions is often called Babylon II.; its patron god was Nebo (*q.v.*). Borsippa is not mentioned in the oldest inscriptions, but comes into importance first after Hammurabi had made Babylon his capital, about 2100 B.C. He built or rebuilt the temple E-Zida at this place, dedicating it to Marduk (*q.v.*), subsequent kings recognizing Nebo as the deity of E-Zida and making him the son of Marduk; and his temple was second only to that of Marduk in Babylon. As with Babylon, the time of Nebuchadrezzar was the period of Borsippa's greatest prosperity; there is evidence that the temple school and the school of astronomy for which Borsippa had for centuries been famous were still in existence in the late 6th century B.C., but, in general, it shared the fate of Babylon, falling into decay after the time of Alexander.

The site of the ancient city is represented by two large ruin mounds. Of these the north-westerly, the lower but larger of the two, is called Ibrahim Khalil, from a shrine of Abraham which stands on its highest point; eastern legend has it that at this spot Nimrod sought to throw Abraham into a fiery furnace. Excavations were first conducted here by the French in 1852, and in 1879–80 Hormuzd Rassam worked more extensively though still unsystematically, finding many inscribed tablets and the like, now in the British Museum; but by far the greater part still remains unexplored. The south-westerly mound, the Birs proper, an ambitious but incomplete and ruinous *ziggurat* built on the site of a predecessor by Nebuchadrezzar, has been supposed by some to have afforded local attachment for the story of the Tower of Babel (*q.v.*). It rises from a hill over 100ft. high as a pointed mass of vitrified brick split down the centre, over 40ft. high, about which lie huge masses and single enamelled bricks, generally bearing an inscription of Nebuchadrezzar, twisted and broken, apparently by great heat. In 1854 Rawlinson showed it to be the "house of the seven divisions of heaven and earth," of E-Zida, the temple of Nebo. It was a pyramid of seven solid terraces ornamented with the seven planetary colours, the lowest being 272ft. square and perhaps 45ft. high, and on the seventh being an ark or tabernacle. It was destroyed by Xerxes and partly restored by Antiochus I. but was in ruins long before the middle ages.

See H. C. Rawlinson, *Journal of the Royal Asiatic Society* (1860); J. P. Peters, *Nippur* (1896); H. Rassam, *Asshur and the Land of Nimrod* (1897); M. Jastrow, *Religions of Babylonia and Assyria* (1898); also BABYLON, BABEL.

BORSTAL SYSTEM. In the domain of criminal law, the notable change in public attitude and opinion with regard to the treatment of juvenile crime finds expression, so far as Great Britain is concerned, in the two acts of parliament of 1908; viz., The Prevention of Crime (Borstal) Act and the Children Act.

In the middle of the 19th century strong protests were made against a penal system under which young persons and even children were subject to the harsh penalties of imprisonment, and penal servitude and transportation were commonly inflicted on young and old alike. Effort was then concentrated on the attempt to substitute for such penalties a system of industrial and reformatory treatment; and in 1854 the principle was established that at least up to the age of 16 this method should, in suitable cases, be adopted. In 1894 two public enquiries into the administration of prisons and of Home Office schools arrived, almost simultaneously, at the same emphatic conclusion; viz., "that the age 16–21 was the dangerous age; that we must concentrate on that; on the incipient criminal," or, as he was officially christened, the juvenile adult. At this time about 20,000 young criminals of this age, 16–21, were coming every year to prison. They constituted a veritable recruiting ground or nursery for the dangerous professional criminal of later years. To find a remedy for this was the purpose of what has now become known as the Borstal System.

Under the acts above quoted, the following principles were established:—

1. The age of criminal "majority" was extended to 21, with power to raise to 23.

2. In lieu of the ordinary sentence of imprisonment, a special form of detention was devised, under special rules, of which the purpose was to develop mentally, physically and morally all inmates (not prisoners). The duration to be for not less than one year nor more than three.

3. Except in very special cases, no sentence of imprisonment could be passed on any person under 16.

The new system took its name from the village of Borstal, Kent, where the early experiments on boys between the ages of 16 and 21 were carried out in an old convict prison, prior to the passing of the act. The act gives power to the court to order

detention in any case, 16–21, "where it shall appear to the court that by reason of criminal habit or tendency it is expedient that the offender shall be subject to such instruction and discipline as appears most conducive to his reformation and to the repression of crime."

The rules and regulations are based on the principle that, up to a certain age, every offender may be regarded as potentially a good citizen; that his lapse into crime may be due either to physical degeneracy or bad social environment; that it is the duty of the State at least to try to effect a cure, and not to class the offender offhand and without experiment with the adult professional criminal. The Act of 1908 further provided for the establishment of an association, whose special duty would be to provide for the after-care of all persons of both sexes discharged from Borstal Institutions. This association, known as the Borstal Association, is a highly organized method of care and supervision. Without this supplementary work of patronage the Borstal System could not have attained the conspicuous success which can be claimed for it, because, of the 6,000 lads released after training in Borstal establishments since the act came into operation, only about 35% have again come into conflict with the law. Broadly, about two out of every three Borstal lads are reclaimed.

This result is achieved by the "personality" of the superintending staff, from the Borstal commissioner himself to, in a descending scale, governor, house master, and a carefully selected instructing staff, each with a strong optimism and belief that by an appeal to what is best in each individual—his honour, corporate spirit, pride in his house, love of sport, and rivalry in games and competitions: by all these subtle weapons, wisely and steadily employed, it is possible, though not easy, to recreate young natures and dispositions not yet thoroughly depraved.

When the day of freedom comes, gained after long and patient trial and test, in the form of a conditional licence to the care of the Borstal Association, which is only granted when "there is a reasonable probability that the offender will abstain from crime," the licencee faces life again with a changed outlook. The Borstal System ranks as a work well done, justifying the ideals of its founder: he determined to save the young and careless from a wasted life of crime. Through his vision and persistence a system of repression has been gradually replaced by one of leadership and training. We shall remember him as one who believed in his fellow-men.

There are now in England four Borstal institutions—at Chatham, Feltham and Portland for youths, and that for girls at Aylesbury. Portland is a particularly interesting institution, as it takes the worst and most difficult cases in surroundings that seemed at first sight exceedingly unfavourable. Under the present management, however, the authorities have met with extraordinary success, and have been able to promote to a wonderful degree the spirit of self-development in the inmates, while allowing them a large measure of freedom. The recently established juvenile prison at Wormwood Scrubs serves a most useful purpose. Whilst boys are there on remand, all their peculiarities, physical and mental, their social conditions and special temptations, are carefully studied, and a report on these is available for the court which ultimately determines their future.

BIBLIOGRAPHY.—The reader should consult the quarterly review published by the Borstal Institution, Rochester. From July 1923 to Oct. 1924 it appeared as *The Borstalian;* and from Jan. 1925 onwards as *The Phoenix.* (W. C. HA.)

BORT or **BOART,** an inferior kind of diamond, unfit for cutting, but useful as an abrasive agent. The typical bort occurs in small spherical masses, of greyish colour, rough or drusy on the surface, and showing on fracture a radiate crystalline structure. These masses, known in Brazil as bolas, are often called "shot bort" or "round bort." Much of the bort consists of irregular aggregates of imperfect crystals. In trade, the term bort is extended to all small and impure diamonds, and crystalline fragments of diamonds, useless as gem-stones. A large proportion of the output of some of the South African mines consists of such material. This bort is crushed in steel mortars to form the diamond powder used by lapidaries. (*See* DIAMOND.)

BORY DE SAINT-VINCENT, JEAN BAPTISTE GEORGE MARIE (1780–1846), French naturalist, was born at Agen. He was naturalist with Captain Nicholas Baudin's expedition to Australia in 1798, but left the vessel at Mauritius, and spent two years in exploring Réunion and other islands. Joining the army on his return, he was present at the battles of Ulm and Austerlitz, and in 1808 went to Spain with Marshal Soult. In 1815 his name was consequently placed on the list of the proscribed; but after wandering in disguise from place to place he was allowed quietly to return to Paris in 1820. In 1829 he was placed at the head of a scientific expedition to the Morea, and in 1839 he had charge of the exploration of Algeria. He edited the *Dictionnaire classique d'histoire naturelle;* among his separate productions were *Essais sur les Îles Fortunées* (1802), and *Voyage dans les Îles d'Afrique* (1803).

BORZHOM, a town in the Georgian Soviet Socialist Republic, on the Kura river in a gorge of the Little Caucasus. Lat. 41° 48′ N., Long. 43° 10′ E. Alt. 2,750 ft. Pop. (1935) 8,218. It is a popular health and summer resort, with a warm, mild climate, hot springs (71½°–82° F.), and beautiful parks, and is popularly called "The Pearl of the Caucasus." Its mineral waters are bottled and exported.

BOSA, an episcopal see on the west coast of Sardinia, province of Nuoro, 30 mi. W. of Macomer by rail. Pop. (1936) 6,929. The Malaspina castle stands above the town. There are some tanneries, and the fishing industry is important. The district produces oil and wine. The present town of Bosa was founded in 1112 by the Malaspina of Genoa, 1½ mi. from the site of the ancient town (Bosa or Calmedia), where a well-preserved church still exists. The old town is mentioned by Pliny and Ptolemy as a station on the coast-road in the Itineraries.

BOSANQUET, BERNARD (1848–1923), was born on June 14, 1848, the son of the Rev. R. W. Bosanquet, of Rock Hall, Northumberland. He was educated at Harrow and at Balliol college, where he came under the influence of Jowett, T. H. Green and W. L. Newman. From 1871 to 1881 Bosanquet was a fellow and tutor at University college, but from 1881 he made his home in London, devoting himself to philosophical writing and to work on behalf of the Charity Organization Society and of various associations. He married in 1895 Helen Dendy. Eight years later, he returned to academic life as professor of moral philosophy at St. Andrews, a post which he held until 1908. In 1911 and 1912 he delivered in the University of Edinburgh his Gifford lectures on *The Principle of Individuality and Value* and *The Value and Destiny of the Individual.* He died in London on Feb. 8, 1923.

Although Bosanquet, like Bradley, owed much to Hegel, his first writings, *Knowledge and Reality* (1885) and *Logic* (1888), show the influence of Lotze, whose *Logic and Metaphysics* he had already edited and translated in 1884. The fundamental principles in these works, which are brought out more clearly in the later and smaller *Essentials of Logic* (1895) and *Implication and Linear Inference* (1920), turn on the dynamism of logical thought and the notion of system and coherency, and are summed up in his remark: "Logic, or *the spirit of totality,* is the clue to reality, value and freedom."

In middle life, Bosanquet turned to aesthetics and ethics. Previously in 1886 he had introduced a comparatively new subject into British philosophy by his translation of the Introduction of Hegel's *Philosophy of Fine Art.* His own *History of Aesthetics* (1892) and the later *Three Lectures on Aesthetics* (1915) show his belief that aesthetics can reconcile, as he himself says, "this world and the other, the *a posteriori* and the *a priori,* the natural and the supernatural." In his ethical and social philosophy, the more practical side of which appears in his *Suggestions in Ethics* (1918), he shows the same desire to think of reality as a concrete unity wherein "the other world" and "this," pleasure and duty, egoism and altruism are reconciled. This desire he says was inspired by Plato's passion for the unity of the universe, a passion which reappeared in Christianity as the doctrine of the divine spirit present in human society. In social life, the most valuable thing, for Bosanquet, is that communal will which grows out of individual co-operation and at the same time supports the indi-

vidual, making him free and bestowing upon him the fruits of participation in the whole. This doctrine is developed at length in the famous *Philosophical Theory of the State* (1899) and *Social and International Ideals* (1917).

In later life, Bosanquet became more interested in metaphysics. In the Gifford lectures (*see* above), he started with Hegel's conception of the dynamic character of human knowledge and experience, and insisting that the content and the object of thought are inseparable, and that thought, as he expresses it in *Three Chapters on the Nature of Mind* (published posthumously in 1923), is "the development of connections" and "the sense of the whole," arrived at an indispensable reality beyond and behind experience, a reality which determines the true mutual relations of all beings. He observes in his paper on the formation of his philosophy for *Contemporary British Philosophy* (1924) that experience has value in so far as the fullness of the whole is reflected in it, and knowledge is true in proportion as a system has adequate determination and the minimum of alternative possibilities. It was his overemphasis on the incoherencies and hazards of finite personality which led him to deny to this ultimate reality or the Absolute the applicability of the word "personality" and to prefer "individuality." And just as he believed that it could not be the supreme end of the Absolute to give rise to beings such as he experienced himself to be, so he concluded that the desire for personal immortality is unworthy, since the content of the self and the continuance of that for which we care most is secured in the Absolute.

Apart from the works mentioned above, Bosanquet's more important writings are *Civilization of Christendom* (1893), *Companion to Plato's Republic* (1895), *Psychology of the Moral Self* (1897) and *Meeting of Extremes in Contemporary Philosophy* (1921). A number of his papers which appeared in various philosophical journals were edited by J. H. Muirhead and R. C. Bosanquet under the title *Science and Philosophy* (1927). *See* also the short biography *Bernard Bosanquet* by his wife (1924).

BOSBOOM-TOUSSAINT, ANNA LOUISA GEERTRUIDA (1812–1886), Dutch novelist, was born at Alkmaar in north Holland. In 1851 she married the Dutch painter, Johannes Bosboom (1817–1891). Her first romance, *Almagro,* appeared in 1837, followed by the *Graaf van Devonshire* (*The Earl of Devonshire*) in 1838; the *Engelschen te Rome* (*The English at Rome*) in 1840, and *Het Huis Lauernesse* (*The House of Lauernesse*) in 1841, an episode of the Reformation, translated into many European languages. These stories, mainly founded upon some of the most interesting epochs of Dutch history, betrayed a remarkable grasp of facts and situations, combined with an undoubted mastery over her mother tongue, though her style is sometimes involved, and not always faultless. Ten years (1840–50) were mainly devoted to further studies, the result of which was revealed in 1851–54, when her *Leycester in Nederland, Vrouwen van het Leycestersche Tydperk* (*Women of Leicester's Epoch*), and *Gideon Florensz* appeared, a series dealing with Robert Dudley's adventures in the Low Countries. After 1870 Mrs. Bosboom-Toussaint abandoned historical romance for the modern society novel, but her *Delftsche Wonderdokter* (*The Necromancer of Delft,* 1871) and *Majoor Frans* (1875) did not command the success of her earlier works. *Major Frank* has been translated into English (1885). She died at The Hague where her novels have been published in a collected edition (1885–88).

BOSCAN ALMOGAVER, JUAN (1490?–1542), Spanish poet, was a Catalan of patrician birth, and, after some years of military service, became tutor to the duke of Alva. His poems are divided into sections which mark stages of his poetical evolution. The first book contains poems in the old Castilian metres, written before 1526, in which year he became acquainted with the Venetian ambassador, Andrea Navagiero, who urged him to adopt Italian measures; this advice gave a new turn to Boscán's activity. The remaining books contain a number of pieces in the Italian manner, the longest of these being *Hero y Leander,* a poem in blank verse. He also published, in 1534, an admirable translation of Castiglione's *Il Cortegiano.* Italian measures had been introduced into Spanish literature by Santillana and Villalpando; Boscán naturalized them definitively and founded a poetic school.

The best edition of his poems was issued at Madrid in 1875 by W. J. Knapp. *See* F. Flamini, *Studi di storia literaria italiana e straniera* (Livorno, 1895).

BOSCASTLE, small seaport, watering place and coastguard station, North Cornwall, England, 4½ mi. N. of Camelford station, on the Southern Ry. Pop. (civil parish of Forrabury and Minster) 692 (1931). The village rises steeply above a very narrow cove, sheltered, but difficult of access, vessels having to be warped into it by means of hawsers. A mound on a hill above the harbour marks the site of a Norman castle. The parish church of St. Symphorian, Forrabury, also stands high, overlooking the Atlantic from Willapark Point. The tower is without bells, and the tradition that a ship bearing a peal hither was wrecked within sight of the harbour, and that the lost bells may still be heard to toll beneath the waves, has been made famous by a ballad of the Cornish poet Robert Stephen Hawker, vicar of Moorwinstow. The coast scenery near Boscastle is severely beautiful, with abrupt cliffs fully exposed to the sea, and broken only by a few picturesque inlets such as Crackington Cove and Pentargan Cove. Inland are bare moors, diversified by narrow dales, rising to the mountain mass of Brown Willy (1,300ft.).

BOSCAWEN, EDWARD (1711–1761), British admiral, was born Aug. 19, 1711, and died at Guildford, Jan. 10, 1761. He was the third son of Hugh, 1st Viscount Falmouth. He early entered the navy, and in 1739 took part in the siege of Porto Bello. At the siege of Cartagena, in March 1741, at the head of a party of seamen, he took a battery of fifteen 24-pounders, while exposed to the fire of another fort. On his return to England in the following year he married, and entered Parliament as member for Truro. In 1744 he captured the French frigate "Médée," commanded by M. de Hocquart, the first ship taken in the war. In May 1747, at the battle off Cape Finisterre, Hocquart again became his prisoner, and the French ships, ten in number, were taken. On July 15 he was placed in command of the expedition to the East Indies. On July 29, 1748, he arrived off Fort St. David's, and soon after laid siege to Pondicherry; but the sickness of his men and the approach of the monsoons led to the raising of the siege. Soon afterwards he received news of the peace and Madras was delivered up to him by the French. In April 1755 he intercepted the French squadron bound to North America and took the "Alcide" and "Lys" of 64 guns each. Hocquart became his prisoner for the third time, and Boscawen returned to Spithead with his prizes and 1,500 prisoners. For this exploit, he received the thanks of Parliament. In 1758 he was appointed admiral of the blue and commander-in-chief of the expedition to Cape Breton, when, in conjunction with Gen. Amherst, he took the fortress of Louisburg and the island of Cape Breton—services for which he again received the thanks of the House of Commons. In 1759, being appointed to command in the Mediterranean, he pursued the French fleet, commanded by M. de la Clue, and after a sharp engagement in Lagos Bay, took three large ships and burnt two, returning to Spithead with his prizes and 2,000 prisoners. The victory defeated the proposed concentration of the French fleet in Brest to cover an invasion of England. In Dec. 1760 he was appointed general of the marines, with a salary of £3,000 per annum, and was also sworn a member of the privy council.

BOSCH or **BOS, JEROM** (*c.* 1460–1516), a name given from his birthplace, Hertogenbosch, to Hieronymus van Aeken, the Dutch painter. He was probably a pupil of Albert Ouwater, and may be called the Breughel of the 15th century, for he devoted himself to the invention of bizarre types, *diableries,* and scenes of the kind generally associated with Breughel, whose art is to a great extent based on Bosch's. He was a satirist much in advance of his time, and one of the most original and ingenious artists of the 15th century. He exercised great influence on Lucas Cranach, who frequently copied his paintings. His works were much admired in Spain, especially by Philip II., at whose court Bosch painted for some time; several pictures by him are in Madrid. One of his chief works is the "Last Judgment" at the Berlin gallery, which also owns a little "St. Jerome in the Desert." "The Fall of the Rebellious Angels" and the "St. Anthony"

triptych are in the Brussels museum, and two important triptychs are at the Munich gallery. The Lippmann collection in Berlin contains an important "Adoration of the Magi," the Antwerp museum a "Passion," and a practically unknown painting from his brush is at the Naples museum.

BOSCOVICH, ROGER JOSEPH (1711?–1787), one of the foremost Serbo-Croat scientific writers, and among the earliest of foreign *savants* to adopt Newton's gravitation theory, was born at Ragusa in Dalmatia on May 18, 1711, according to the usual account, but ten years earlier according to Lalande (*Éloge,* 1792). In his 15th year he entered the Society of Jesus. He studied mathematics and physics at the Collegium Romanum; and in 1740 was appointed professor of mathematics in the college. He published dissertations on the transit of Mercury, the Aurora Borealis, the figure of the earth, the observation of the fixed stars, the inequalities in terrestrial gravitation, the application of mathematics to the theory of the telescope, the limits of certainty in astronomical observations, the solid of greatest attraction, the cycloid, the logistic curve, the theory of comets, the tides, the law of continuity, the double refraction micrometer, various problems of spherical trigonometry, etc. In conjunction with Christopher Maire, an English Jesuit, he measured an arc of two degrees between Rome and Rimini, and in 1755 published *De Litteraria expeditione per pontificam ditionem ad dimetiendos duos meridiani gradus a PP. Maire et Boscovich.* The value of this work was increased by a carefully prepared map of the States of the Church. A French translation appeared in 1770. In 1771 he published at Vienna his famous work, *Theoria philosophiae naturalis redacta ad unicam legem virium in natura existentium,* containing his atomic theory (*see* MOLECULE, CHEMICAL). During a visit to England on a diplomatic mission, Boscovich was elected a fellow of the Royal Society. In 1764 he was called to the chair of mathematics at the University of Pavia, and this post he held, together with the directorship of the observatory of Brera, for six years. On the suppression of his order in Italy (1773) he accepted an invitation from the king of France to Paris, where he was naturalized and appointed director of optics for the marine, an office instituted for him, with a pension of 8,000 livres. He remained there ten years, but his position became irksome and at length intolerable. In 1783 he returned to Italy, and spent two years at Bassano, where his *Opera pertinentia ad opticam et astronomiam, etc.,* appeared in 1785 in five volumes quarto.

BOSE, SIR JAGADIS CHUNDER (1858–1937), Indian plant physiologist and physicist, was born on Nov. 30, 1858, and educated at St. Xavier's college, Calcutta, and Cambridge university, gaining high honours in 1884. He was awarded D.Sc. from the same university in 1896. He was professor of physical sciences at the Presidency college, Calcutta, 1885–1915, and founder and director of Bose Research institute, Calcutta, 1917–37. He died in Giridih, Bengal on Nov. 23, 1937.

Bose made great contributions to physical science by his work on electrical radiation and by verifying the laws of reflection, refraction and polarization of electric waves. His work in the field of animal and especially plant physiology was so much in advance of his time that the precise evaluation of it was not possible in 1945. He introduced new experimental methods and invented many delicate and sensitive instruments, such as his crescograph for recording plant growth, magnifying a small movement as much as 10,000,000 times. He also devised apparatus for demonstrating the effects of sleep, air, food, drugs, etc., on plants and proved a complete parallelism between the responses of plant and animal tissues. His publications are voluminous; the most important are: *Response in the Living and Non-Living* (1902); *Plant Response* (1906); *The Motor Mechanism of Plants* (1928), etc.

See P. Geddes, *The Life and Work of Sir Jagadis C. Bose* (1920) and *Sir J. C. Bose: His Life and Speeches* (1920); *Chron. Bot.,* vol. iv (1938) and *Nature,* vol. cxl (1937).

BOSNIA AND HERCEGOVINA, two Balkan provinces successively Turkish, in Austrian occupation and annexed to Austria, but since the post-war settlement included in the Serb-Croat-Slovene state or Yugoslavia. *See* BALKAN PENINSULA and YUGOSLAVIA.

HISTORY

Mediaeval Period.—Under Roman rule Bosnia formed part of Illyria (*q.v.*); only with the coming of the Slavs did it develop an identity of its own, existing precariously between Hungary and Croatia on the north and Byzantium and the rising Serbian power on the south and east. Bosnia's first ruler of mark was the Ban Kulin (1180–1204), whose reign is depicted by the Ragusan chroniclers as one of great prosperity. In it we find the beginnings of the mining industry, and also of the strange heresy of the Bogomiles (*q.v.*). Both he and his second successor, Ninoslav, were infected by the new doctrine. The Papacy was eager to extend Catholicism in the Balkans, and the crusade waged by it through the medium of Hungary against Bogomilism was a counterpart of the abortive attempts to detach the Serbian and Bulgarian dynasties from the Orthodox faith. The Tartar invasion of 1241 temporarily checked Hungarian aggression, but in 1254 Béla IV. asserted the suzerainty of the Hungaro-Croatian kings over the Bans of Bosnia. In the years 1293–99 two powerful Croat nobles, Paul and Mladen Subić, obtained from the last Arpád kings of Hungary the banships of Croatia, Dalmatia and Bosnia, but in 1322 these were again separated by Charles Robert. Stephen Kotromanić was invested with Bosnia, held loyally to Hungary and extended his rule to the principality of Hum or Zahumlje, the future Hercegovina, which had led a more or less independent existence since the early 10th century, though sometimes subjected by Byzantium or Serbia. He thus acquired a short coastline at the mouth of the Neretva and was in close relations with Venice and Ragusa. He found it expedient to accept Catholicism, thereby securing the support of the west and of Hungary against the encroachments of Tsar Dušan. His connection with Hungary was still further strengthened in 1353, when his daughter Elisabeth married Louis the Great.

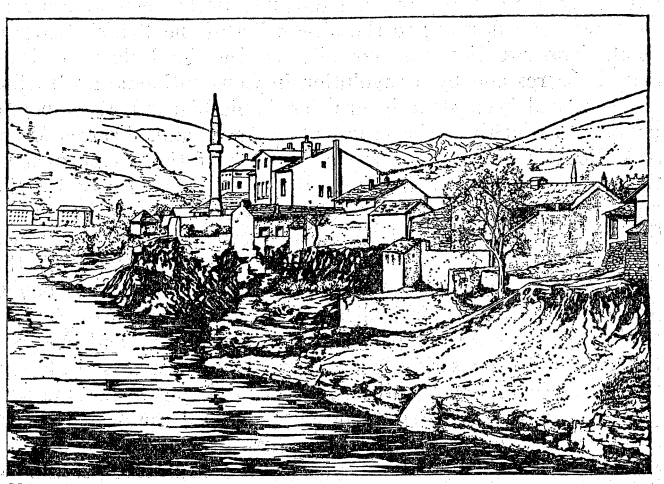
Kotromanić died in the same year, and was succeeded by his nephew Tvrtko, who, after a stormy minority, found his situation much eased by Serbia's rapid decline after the death of Tsar Dušan. Tvrtko took advantage of the dissensions among the great Serbian nobles and, in return for military aid to Prince Lazar, obtained from him a cession of territory near Sjenica, strengthened his hold over Hum and expelled the Balšić family from the little principality of Travunja (Trebinje) in 1375–76. In 1376 he assumed the title "Stephen Tvrtko, in Christ God King of the Serbs and Bosnia and the Coastland." He had himself crowned at Mileševo at the grave of St. Sava, with the two crowns of Bosnia and Serbia. Henceforth he and all his successors asserted their right to the Serbian throne. He was almost at once recognized by Ragusa and Venice. He married a Bulgarian princess, and on Louis the Great's death in 1382 took advantage of his cousin Elisabeth's distress to obtain the peaceful cession of Cattaro. Elisabeth and her daughter becoming involved in conflict with the turbulent Croat nobility, Tvrtko fished in troubled waters and aimed definitely at the conquest of the coast. This design was delayed by the Turkish invasion; for Tvrtko understood the danger and sent a strong contingent to Lazar's aid at Kosovo (1389). But after this disastrous battle Tvrtko's interest turned westwards once more, and in 1390 he secured the submission of Spalato, Trau and other Dalmatian cities, and assumed the title of "King of Dalmatia and Croatia." In 1391, however, he died before he could consolidate his power, and his brief attempt to unite the Southern Slavs failed.

Struggles with the Turks.—His brother, Stephen Dabiša, had to surrender Croatia and Dalmatia to Sigismund of Hungary, and dying in 1395 left the throne to a minor, whose mother vainly defended him against the great Bosnian magnates. The first Turkish inroad into Bosnia (1398) helped to rally the country round Stephen Ostoja (1398–1404 and 1408–18), who is believed to have been an illegitimate son of Tvrtko. Neither he nor his son Ostojić (1418–21) were capable of arresting the slow decline of Bosnia, which was a prey to warring factions among the nobles and weakened by the old religious struggle. In 1421 Tvrtko II. asserted his right to his father's throne; but he, too, was unequal to the situation and became involved in

profitless conflicts with his own Voivodes (*q.v.*)—such as Radosav Pavlović, who made war on his own account upon the Republic of Ragusa (1432)—and with his neighbours Stephen Lazarević and George Branković of Serbia. In 1433, while at war with the latter, he was attacked by his own rebellious vassal, Sandalj Hranić, and forced to fly to Hungary, where he remained three years in exile. Bosnia thus offered an easy prey to the Turks, who imposed in 1436 an annual tribute of 25,000 ducats. Meanwhile Stephen Vukčić, the nephew of Hranić, made himself master of the south and ruled as "Great Voivode" of the districts, which thus acquired the name of Hercegovina (Herzegovina) or "the Duchy." Tvrtko in his need looked to Venice and Hungary, but did not survive King Vladislav's great campaign against the Turks in 1444. Leaving no son, he was succeeded by Stephen Thomas, an illegitimate son of Ostojić, who threw himself into the arms of John Hunyádi (*q.v.*), then the soul of Christendom's defence against the Turks. In the belief that Bosnia's hope of rescue lay in the west, Stephen Thomas turned away from the Bogomiles, who had grown stronger than ever since the beginning of the century, and accepted Catholicism; but he made the fatal blunder of persecuting his former co-religionists (1450), and the proselytism of the Legate and the Franciscans increased the internal disintegration. Many Bogomiles fled abroad; some even appealed to the Turks for help. Vukčić, whose daughter Catherine had married Stephen Thomas, was involved in war with Ragusa just when all Christian forces should have been united against the Turkish danger (1453); Hunyádi's death left Bosnia almost defenceless, and the accession of Mohammed II. had increased the danger. After the death of George Branković (1456), Stephen Thomas seized a large section of Serbian territory, and in 1458 his son Stephen succeeded as despot of Serbia, with the active approval of King Matthias and the Hungarian parliament. But in 1459 the Turks overran Serbia; rightly or wrongly, the king of Bosnia was blamed by Hungary and the pope as responsible for the disaster. Stephen Thomas died in 1461 and his son Tomašević, relying on help from the west, refused tribute to the Sultan. Thereupon Mohammed invaded Bosnia in person (1463), captured and executed King Tomašević on a hill near Jajce, and reduced the country to a Turkish province. The kingdom was at an end, but Matthias in the same year recovered the north-west districts, including Jajce and Banjaluka, and held it as a banat under the Hungarian Crown. Hercegovina still resisted under Stephen Vukčić, and after his death in 1466 under his three sons; but in 1483 it also was completely overrun by the Turks. Finally the banat of Jajce fell into Turkish hands in 1528, as a result of the collapse of Hungarian power at Mohács two years earlier.

Bosnia as a Turkish Province.—Under Turkish rule Bosnia and Hercegovina formed more than ever a world of their own, isolated not merely from Europe but even from Constantinople itself. The religious discords which had rent them in mediaeval times were perpetuated in a new form; for the great nobles—partly to save their lands and power, partly because as Bogomiles they preferred Islam to militant Catholicism—apostatized as a class. Thus a large section of the native population became Muslim, few true Turks settling in the two provinces. A governor imposed by the Porte resided at Banjaluka or Travnik, and later at Sarajevo, but interfered very little with local affairs so long as the taxes were paid. The real power lay in the hands of 48 hereditary *kapetans,* exercising feudal jurisdiction over their tenants and liable to provide military service for the sultan. Thus there grew up the institution of the *čiflik*—a whole village holding its lands from one of the big lords or lesser landowning begs, on condition of paying him one-third of its total product. Though called "Turks" for ecclesiastical reasons, the Muslims of Bosnia continued to speak the purest Serb and never adopted polygamy. The new era did not make for prosperity; the famous mediaeval mining industry decayed and finally disappeared, trade and commerce, though upheld for a time by the Ragusans, languished after the great earthquake of 1667, which dealt so deadly a blow to their republic; the manufacture of weapons and wrought metals alone survived. Many Bosnians, however, rose to high distinction in the Turkish service—among them such famous grand viziers as Mohammed Sokoli (or Sokolović).

During the 16th and 17th centuries Bosnia was an important Turkish outpost in the constant warfare with the Habsburgs and with Venice. When Hungary was at last reclaimed from the Turkish yoke, the imperialists in their turn penetrated into Bosnia, and in 1697 Prince Eugene captured Sarajevo. By the Treaty of Karlowitz (1699) the Save, forming the northern boundary



MOSTAR, THE FORMER CAPITAL OF HERCEGOVINA, IS SITUATED ON THE NARENTA ABOUT 30 MILES FROM SARAJEVO. AFTER THE WORLD WAR, HERCEGOVINA WAS CEDED BY AUSTRIA TO YUGOSLAVIA

of Bosnia, became also the northernmost limit of the Turkish empire; and by that of Požarevać (Passarowitz, 1718) Novi and part of Bosnia east of the Una were ceded to Austria. These were restored to Turkey in 1739, and the frontiers remained unchanged till 1878.

In the 19th century the great Bosnian families, intensely conservative and fanatical, resented all interference from Constantinople and denounced Mahmud II. as the "Giaour (or Infidel) Sultan." A first revolt broke out in 1821, while the Porte was occupied with the Greeks, and a second during the Russo-Turkish War of 1828, under the leadership of Mustafa Skodra Pasha, a reputed descendant of the Crnojević dynasty, who made his headquarters at Scutari. Even more formidable was the rising of 1831; Hussein Kapetan, known as "the Dragon of Bosnia," preached a holy war against the sultan and denounced reform. He and Mustafa together overran most of Macedonia, northern Albania and even parts of Bulgaria. After a severe struggle the Grand Vizier Reshid Pasha quelled the rebellion, helped largely by internal dissensions. Eventually the Dragon was driven across the frontier into Croatia, and ended his days in banishment at Trebizond. In 1837 the abolition of the Kapetanates led to fresh trouble, and the Hattisheriff of reforms with which Abdul Medjid inaugurated his reign was keenly resented. The Hercegovinian chief, Ali Pasha Rizvanbegović, who had sided with the Porte during the earlier rising, made himself virtually independent and had his own quarrels and reconciliations with Montenegro, regardless of the views of the Porte, whose authority was only effectually restored in 1850 by Omer Pasha, the famous renegade Croat, who had begun life in an Austrian frontier regiment, fled the country owing to embezzlement, embraced Islam and made a rapid career at Constantinople. By ruthless measures he destroyed the old feudal régime in Bosnia, introduced a new, centralized administration and a system of taxation which opened the door to every kind of licence and exaction. In 1862 the Christians in their turn revolted under Luka Vukalović. They were eventually reduced, but unrest was chronic and discontent universal; Christians and Muslims, despite acute differences, united in their dislike of Ottoman bureaucracy and corruption.

Crisis of 1875–78: Austrian Occupation.—In 1875 local troubles near Nevesinje, in Hercegovina, spread rapidly into insurrection throughout the two provinces. Only a few weeks earlier Francis Joseph had paid his first visit to Dalmatia, and

at Ragusa, so near to the disturbed area, had been ostentatiously greeted by Prince Nicholas of Montenegro, who urged joint Austro-Russian intervention at the Porte. In August the consuls of the three imperial Powers tried to mediate between the Turkish authorities and the insurgents, but without success; and the Sultan's decree of Oct. 2, offering reduction of taxes, religious liberty and a provincial assembly, was also rejected. Count Andrássy's note (Dec. 30, 1875), proposing a limited autonomy, did not go far enough, and the so-called Berlin memorandum of May 1876 failed owing to the abstention of the British Government. The situation was complicated by the Bulgarian rising and massacres and by a revolution in Constantinople itself. Excitement had been steadily growing in Serbia and Montenegro, union with which was the insurgents' avowed aim. Princes Milan and Nicholas hesitated to move, in view of the disapproval of the Powers, but their hands were forced, not merely by the mutual rivalry of Obrenović and Petrović—each aspiring to the throne of an enlarged and united southern Slav State—but also by the presence of Prince Peter Karageorgević (head of the third native Serb dynasty) as a leader of the insurgent bands. The liberation of Bosnia had long been an aspiration of Serbian public opinion, and its partition between Serbia and Austria-Hungary had been seriously considered by Beust and Andrássy, though, since the Russophil current in Serbia again became predominant in 1871, Austria-Hungary developed the design of exclusive annexation by herself. On June 30 Serbia and Montenegro declared war upon Turkey, while the insurgents proclaimed union with them, and numerous Russian volunteers joined the Serbian army. Turkey's speedy victory upset the calculations on which Austria-Hungary and Russia had reached a secret agreement at Reichstadt (July 6). Serbia's renewed defeat in October, after the expiry of the armistice, ended her real hopes of winning Bosnia. Indeed, as early as September the tsar, in an autographed letter to Francis Joseph, had made clear that he also disapproved of "a large Serb State," and actually proposed Austria-Hungary's occupation of Bosnia-Hercegovina. By the secret convention of Budapest (Jan.–Mar. 1877) Russia recognized Austria-Hungary's right to occupy, as a condition of her neutrality in the impending war with Turkey. Serbia re-entered the war three days after Plevna's surrender; but could no longer influence events. At the Congress of Berlin (*see* BERLIN, CONGRESS OF) her aspirations and those of the insurgents were entirely disregarded, and Bosnia-Hercegovina assigned to Austria-Hungary by a mandate of all Europe, on the proposal of Lord Salisbury. Francis Joseph and Andrássy could have secured approval for full annexation if they had wished, but mainly for reasons of internal politics preferred the more provisional formula of occupation. The insurgents attempted armed resistance, and Austria-Hungary had to mobilize an army of 200,000 men. Gen. Filipović occupied Sarajevo on Aug. 19, 1878, and with the fall of Bihač a month later the rising was virtually at an end (*see* also EASTERN QUESTION).

Period of Austrian Occupation.—The two provinces were at first administered by a special commission inside the foreign office at Vienna, under Joseph Szlávy, but when in 1880 he became joint Austro-Hungarian finance minister they were placed permanently under the control of that ministry, the local administration being concentrated in Sarajevo under a governor, a so-called *Ziviladlatus,* and several heads of departments. In 1882 Benjamin Kállay became finance minister and for 21 years directed every department of Bosnian policy. Six years' residence as Austro-Hungarian diplomatic agent in Belgrade had given him a unique knowledge of Southern Slav problems, but his whole influence was exercised in an anti-national sense. He tried to evolve a "Bosnian" consciousness, to check Serb national feeling, to create dissensions between Serb and Croat and between Orthodox, Muslim and Catholic, and to prevent so far as possible all intercourse of the two provinces with Serbia and even with Croatia. Meanwhile he set himself to establish public order and material prosperity, and achieved really remarkable results; he built a network of roads and railways, and many public institutions, founded an incorruptible bureaucracy and a system of law, and fostered trade and industry. But though he also opened a number of admirable secondary and technical schools, primary education was sadly neglected, and no serious attempt was made to solve the land question, which continued to envenom the whole situation. Further defects in Kállay's régime were the reduction of the Orthodox hierarchy to a state of subservience, and the creation of a widely ramified police system. His whole outlook towards the Southern Slav problem had been that of a Magyar, interested in disunion between Serb and Croat for reasons of Hungarian internal policy; and on his death (1903) Bosnian affairs were again entrusted to a Magyar, Baron Stephen Burián. During the next decade there was a rapid growth in national feeling in the provinces, stimulated by events in Serbia after the fall of the Obrenović régime and in Croatia and Dalmatia (*q.v.*) since the departure of Count Khuen. Burián, faced by the clamour of the Bosnian Serbs for self-government, made certain concessions. In 1905 the Orthodox Church received a charter of autonomy and its Serbian nationality was recognized for the first time. In 1907 an assembly of 71 Serb delegates from every district was allowed to put forward a programme of reform, in which the land question figured prominently, with, most significant of all, the demand for an autonomous position *as part of the Turkish empire.* Meanwhile the Croats of Bosnia were organizing politically, and the Catholic archbishop of Sarajevo, Mgr. Stadler, was extremely active, with the backing of the Viennese Clericals, and aroused heartburnings among the Muslims by his proselytizing tendencies.

Annexation by Austria-Hungary.—Faced by the growing ferment inside the provinces, Austria-Hungary was already convinced of the need for some change in status, when the Turkish Revolution of 1908 brought matters to a head. The Young Turks contended that Bosnia-Hercegovina must be represented in the new parliament at Constantinople, and the Bosnian nationalists saw in this demand a convenient legal basis for their agitation. Influenced also by the strategic considerations pressed upon him by the general staff, Baron Aehrenthal advised Francis Joseph to annex Bosnia-Hercegovina to the dual monarchy and thus solve once and for all their constitutional status. This was done by an imperial rescript of Oct. 7, 1908, and the opposition of the Triple Entente Powers to this attempt to amend the public law of Europe by a one-sided and arbitrary act, instead of by formal revision at a fresh congress, made the Bosnian question the main issue in a prolonged international crisis. In Serbia in particular the annexation was keenly resented, as giving permanence to a situation which the Serbs had persisted in regarding as provisional and which shut the door upon national unity. Serbia's main backing came from Russia, who was secretly embarrassed by the existence of a whole series of engagements to support Austria-Hungary's claim to Bosnia (Reichstadt, 1876; Budapest, 1877; at the Congress of Berlin, 1878; and under the *Dreikaiserbund* of June 11, 1881). Some obscurity still surrounds the interview between Aehrenthal and Izvolsky at Buchlau in Sept. 1908, at which it is alleged that Russia's consent to the annexation was given in return for Austro-Hungarian support regarding the straits. On March 25, 1909, Russia yielded to German pressure, and in April the annexation was recognized by all the Powers, without a fresh congress being convoked. From this time dates the acute friction between Austria-Hungary and Serbia which culminated in the explosion of 1914. (*See* BISMARCK, OTTO, PRINCE VON.)

Vienna was committed to the grant of some measure of representative government to Bosnia and Hercegovina, and as neither Austria nor Hungary would consent to its being attached to the one rather than to the other, or to its partition beween them, a hybrid form of constitution was devised, by which the two provinces received a diet and special laws of association and assembly, but were not represented in the two central parliaments and delegations, and thus had no say in foreign affairs. The new constitution, proclaimed on Feb. 17, 1910, had the capital defect of stereotyping sectarian and social differences by dividing the electorate into three "Curiae" (electoral colleges) and by assigning in each of these a fixed proportion of seats to the Ortho-

dox, Muslim and Catholic elements. The diet was expressly excluded from any control of the executive, which remained under the governor (*Landeschef*), his deputy (*Ziviladlatus*), the departmental heads in Sarajevo, and the joint ministry of finance in Vienna as supreme instance.

These carefully hedged concessions were very badly received. The emperor's visit to Bosnia in the summer of 1910 was intended to symbolize to the outside world the permanence of Austro-Hungarian rule; but the opening of the diet was marred by an attempt on the life of the governor, Gen. Varešanin, by the student Žerajić, who at once committed suicide. Burián now tried to win the Serbian element for co-operation with the Government, and openly described them as the most progressive element in the country. But the situation in Croatia reacted more and more on Bosnia, rendered Burián's half-measures ineffectual, and strengthened the self-confidence of the Serbs. In Feb. 1912 he was succeeded by Ritter von Bilinski, a prominent Polish Conservative who enjoyed the confidence of Francis Joseph; but any hope of clearing up the internal situation was frustrated by Hungary's establishment of a dictatorship in Croatia (April 1912), and by the victories of Serbia in the Balkan War (October–November)—events which roused the whole Yugoslav population of Austria-Hungary to feverish excitement.

The Bosnian group was specially active among the Yugoslav students, who began to found organs of their own in Prague, Vienna and Zagreb as well as Sarajevo. The younger generation devoted their efforts to inculcating revolutionary ideas among the university and middle school youth in Bosnia and the neighbouring provinces. They were completely successful, and the confidential memoranda prepared by high officials in Sarajevo and Vienna on the very eve of World War I show them to have been altogether at a loss as to what policy to adopt.

The Bosnian situation was further complicated by the increasing jealousy between the provincial Government in Sarajevo and its nominal superior, the finance ministry in Vienna, or, in personal terms, between the military governor, Potiorek, representing the views of the general staff and of the archduke Francis Ferdinand, and the civilian minister Bilinski as the confidant of the emperor. In May 1913 Potiorek, despite Bilinski's disapproval, had closed the Bosnian diet and dissolved various Serbian societies and the headquarters of the Serb Radicals. He continually urged the adoption of still more stringent measures, and tended increasingly to act without consulting Bilinski. The most notorious instance was the decision reached between Potiorek and Francis Ferdinand that the latter should attend the military manoeuvres in Bosnia in June 1914. Bilinski was not consulted or even notified, and the entire arrangements remained in military hands. To this circumstance must be ascribed a large share of the blame for the assassination of the archduke Francis Ferdinand and his consort, the duchess of Hohenberg, during their visit to Sarajevo on June 28, 1914.

The Sarajevo Murder.—This outrage was the work of Bosnian revolutionary students (*see* EUROPE; SERBIA). The governor, Potiorek, far from being blamed for his lack of precautions, remained in high favour, was placed in command of the Austro-Hungarian forces invading Serbia and was mainly responsible for their severe defeat at Rudnik in Dec. 1914. After the murder, the mob of Sarajevo had, with police connivance, sacked many Serbian houses and institutions, and destroyed the Serbian printing presses and newspaper offices. During the following winter numerous treason trials were instituted against the youth of Bosnia —65 from the gymnasia of Sarajevo and Trebinje, 22 from Banjaluka, nine from Mostar and 38 from Tuzla—thus demonstrating the widespread nature of the movement. Most notorious of all was the Banjaluka treason trial (Nov. 1915–April 1916), in which 98 out of the 151 prisoners were condemned to sentences varying from 20 years to two months, and 16 to death (afterwards reprieved).

Union with Yugoslavia.—During the war all political life ceased, but when Austria's Balkan front collapsed in Oct. 1918 a national committee was formed in Sarajevo, which acted in close accord with the Yugoslav national council at Zagreb. After its formal recognition of union with Serbia, the fate of Bosnia was bound up with that of the new Yugoslavia. Many vital problems of local concern, however, survived. The very difficult Bosnian land question, which Austria-Hungary failed to solve in her 40 years' rule, was solved all too drastically and on party lines. The State promised the big Muslim landlords compensation, but did not fulfil its pledge, once more for party reasons; but though the large estates were split up, a new agricultural and urban proletariat was created. Sarajevo and other towns lost much of their prosperity, owing to the centralist tendencies of Belgrade (*see* YUGOSLAVIA). (R. W. S.-W.)

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BOSPORUS or **BOSPHORUS.** By the ancients this name, signifying a strait, was especially applied to the *Bosporus Cimmerius* (*see* below), and the *Bosporus Thracius* (Gr. Βόσπορος ox-ford, traditionally connected with Io, who, in the form of a heifer, crossed the Thracian Bosporus in her wanderings). It now denotes the latter strait, which unites the Black sea with the Sea of Marmora and forms part of the boundary between Europe and Asia. The channel is 18m. long, and has a maximum breadth at the northern entrance of $2\frac{3}{4}$m., a minimum breadth of about 800yd., and a depth varying from 20 to 66 fathoms in midstream. In the centre there is a rapid current from the Black sea to the Sea of Marmora, but in the opposite direction a countercurrent sets in below the surface and along the shores. The scenery on both sides is varied and beautiful. Many villages line each well-wooded shore, while on the European side are numerous fine residences. After the treaty of 1841, no ship of war other than Turkish was allowed to pass through the strait (or through the Dardanelles) without the consent of the Turkish authorities. They in turn were under the control of an International Straits commission after 1918. In 1923, however, under the terms of the Treaty of Lausanne, Turkey was given more power in the straits zone and the commission, put under a Turkish chairman, lost much of its independence. In 1936 it was abolished altogether, and Turkey was allowed to remilitarize and reoccupy the straits. (*See* also CONSTANTINOPLE; STRAITS QUESTION, THE.)

BOSPORUS CIMMERIUS, the ancient name for the Straits of Kerch or Yenikale, connecting the Black sea and the Sea of Azov (*see* CIMMERII). The straits are about 25m. long and $2\frac{1}{2}$m. broad at the narrowest, and are formed by an eastern extension of the Crimea and the peninsula of Taman, a continuation of the Caucasus. This in ancient times seems to have formed

a group of islands. The whole district was dotted with Greek cities; on the west side, Panticapaeum (Kerch, *q.v.*), often called Bosporus, and Nymphaeum (Eltegen); on the east Phanagoria (Sênnája), Cepi, Hermonassa, Portus Sindicus, Gorgippia (Anapa). These were mostly settled by Milesians, but Phanagoria was a colony of Teos, and Nymphaeum had some connection with Athens. The towns have left hardly any architectural or sculptural remains, but the numerous barrows in their neighbourhood have yielded gold work, vases from Athens, textiles and specimens of carpentry and marquetry. The numerous terracottas are rather rude in style.

The locality was governed from 480 to 438 B.C by the Archaeanactidae, who gave place to a tyrant Spartocus (438–431 B.C.), a Thracian. He founded a dynasty which endured until *c.* 110 B.C. The Spartocids have left many inscriptions which tell us that the earlier members of the house ruled as archons of the Greek cities and kings of various native tribes, notably the Sindi of the island district. Satyrus (431–387) established his rule over the whole district, adding Nymphaeum to his dominions and laying siege to Theodosia, a commercial rival by reason of its ice-free port and direct proximity to the cornfields of the eastern Crimea. It was reserved for his son Leucon (387–347) to take this city. He was succeeded by his two sons, Spartocus II. and Paerisades; succeeding princes repeated the family names, but we cannot assign them any certain order. The last of them, a Paerisades, called in the help of Diophantus, general of Mithridates VI. (the Great) of Pontus, against the power of the natives, promising to hand over his kingdom to that prince. He was slain by a Scythian Saumacus who led a rebellion against him. The house of Spartocus was well known as a line of enlightened and wise princes, they maintained close relations with Athens, their best customers for the Bosporan corn export; we have many references to this in the Attic orators. The Athenians granted Leucon Athenian citizenship and set up decrees in honour of him and his sons. Mithridates the Great entrusted the Bosporus Cimmerius to his son Machares, who, however, deserted to the Romans. But even when driven out of his own kingdom by Pompey, Mithridates was strong enough to regain the Bosporus Cimmerius. After the death of Mithridates (63 B.C.), Pharnaces (63–47) made his submission to Pompey, but tried to regain his dominion during the civil war. He was defeated by Caesar at Zela, and was slain by Asander who ruled as archon, and later as king, until 16 B.C. In 8 B.C. Aspurgus, son of Asander, founded a line of kings which endured until A.D. 341. Their kingdom covered the eastern half of the Crimea and the Taman peninsula, and extended along the east coast of the Sea of Azov to Tanais at the mouth of the Don, a great mart for trade with the interior. They carried on a perpetual war with the native tribes, and in this were supported by their Roman suzerains, who lent the assistance of garrison and fleet. In A.D. 255 the Goths and Borani were enabled to seize Bosporan shipping and raid the shores of Asia Minor. The kingdom succumbed to the Huns. In later times it was revived under Byzantine protection, and Byzantine officers built fortresses and exercised authority at Bosporus, which was constituted an archbishopric.

The Bosporan kingdom is interesting as the first Hellenistic State, the first, that is to say, in which a mixed population adopted the Greek language and civilization. It depended for its prosperity upon the export of wheat, fish and slaves, and this commerce supported a class whose wealth and vulgarity are exemplified by the contents of the numerous tombs.

We possess a large series of coins of Panticapaeum and other cities from the 5th century B.C. The gold *staters* of Panticapaeum bearing Pan's head and a griffin are specially remarkable for their weight and fine workmanship.

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BOSQUET, PIERRE FRANÇOIS JOSEPH (1810–1861), French marshal, was born at Mont de Marsan, Landes, on Nov. 8 1810, and died at Toulouse, Feb. 5 1861. He entered the artillery in 1833 and served in Algeria with great distinction from 1834 to 1853, when he returned to France a general of division. Bosquet was among the earliest chosen to serve in the Crimean War, and at the battle of the Alma his division led the French attack. When the Anglo-French troops formed the siege of Sevastopol, Bosquet's corps of two divisions protected them against interruption. His timely intervention at Inkerman (Nov. 5 1854) secured the victory for the allies. During 1855 Bosquet's corps occupied the right wing of the besieging armies opposite the Mamelon and Malakov. He himself led his corps at the storming of the Mamelon (June 7), and at the grand assault of Sept. 8 he was in command of the whole of the storming troops. In the struggle for the Malakov he received a serious wound. In 1855 Bosquet became a senator and a marshal of France.

BOSS, a round protuberance; the projecting centre or "umbo" of a buckler (O.E. *boce,* a swelling; *cf.* Fr. *bosse*); in geology a projection of rock through strata of another species; in architecture, the large projecting stone at the intersection of the ribs of a Gothic vault, sometimes moulded and frequently decorated by rich foliage, grotesque figures or heraldic and symbolic forms. In industry boss is a colloquial term for master, employer or foreman, originating in the United States, but now used in all parts of the English-speaking world. The word is apparently derived from the Dutch *baas,* master. It is also used in American, but not in English, politics. Thus, we find Bryce, in his *American Commonwealth,* writing: "He dispenses places, rewards the loyal, concocts schemes . . . he is a boss."

BOSSI, GIUSEPPE (1777–1816), Italian painter and writer on art, was born at Busto Arsizio, near Milan, and died at Milan on Dec. 15, 1816. The greater part of his life was given to the study of Leonardo da Vinci. At the desire of Prince Eugene he made the copy of "The Last Supper," from which the mosaic by Raffaelli at Vienna was executed. His most important work is *Del Cenacolo di Leonardo da Vinci* (1810).

BOSSU, RENÉ LE (1631–1680), French critic, was born in Paris. He studied at Nanterre, and in 1649 became one of the regular canons of Sainte-Geneviève. He wrote *Parallèle des principes de la physique d'Aristote et de celle de René Descartes* (1674), and a *Traité du poème épique,* highly praised by Boileau, the leading doctrine of which was that the subject should be chosen before the characters, and that the action should be arranged without reference to the personages who are to figure in the scene.

BOSSUET, JACQUES BÉNIGNE (1627–1704), French divine, orator and writer, was born at Dijon on Sept. 27, 1627, the son of a judge of the *parlement* at Dijon, afterwards at Metz. The boy was sent to school with the Jesuits till 1642, when he went up to the college of Navarre in Paris. There he gained a great reputation for hard work; fellow-students nicknamed him *Bos suetus aratro*—an ox broken to the plough. In 1652 he was ordained priest. The next seven years he spent at Metz, where his father's influence had got him a canonry at the early age of 13; to this was now added the more important office of archdeacon. He was plunged into the thick of controversy, for nearly half Metz was Protestant, and Bossuet's first appearance in print was a refutation of the Huguenot pastor Paul Ferry (1655). To reconcile the Protestants with the Roman Church became the great object of his dreams; and for this purpose he began to train himself carefully for the pulpit, an all-important centre of influence in a land where political assemblies were unknown, and novels and newspapers scarcely born. In 1659 he settled in Paris, and three years later mounted the pulpit of the Chapel Royal.

Bossuet possessed the full equipment of the orator, voice, language, flexibility and strength. He never needed to strain for effect; his genius struck out at a single blow the thought, the feeling and the word. What he said of Martin Luther applies peculiarly to himself: he could "fling his fury into theses," and thus unite the dry light of argument with the fire and heat of passion. These qualities reach their highest point in the *Oraisons funèbres.* Bossuet was always best when at work on a large canvas; besides, here no conscientious scruples intervened to prevent him giving much time and thought to the artistic side of his subject. For the *Oraison,* as its name betokened, stood

midway between the sermon proper and what would nowadays be called a biographical sketch. At least, that was what Bossuet made it; for on this field he stood not merely first, but alone. His three great masterpieces were delivered at the funerals of Henrietta Maria, widow of Charles I. (1669), her daughter, Henrietta, duchess of Orleans (1670), and the great soldier Condé (1686).

Apart from these State occasions, Bossuet seldom appeared in a Paris pulpit after 1669. In that year he was gazetted bishop at Condom in Gascony, though he resigned the charge on being appointed tutor to the dauphin, only child of Louis XIV. Bossuet wrote for his pupil's instruction (or rather, to fit himself to give that instruction) a remarkable trilogy. First came the *Traité de la connaissance de Dieu et de soi-même,* then the *Discours sur l'histoire universelle,* lastly the *Politique tirée de l'Écriture Sainte.* The three books fit into each other. The *Traité* is a general sketch of the nature of God and the nature of man. The *Discours* is a history of God's dealings with humanity in the past. The *Politique* is a code of rights and duties drawn up in the light thrown by those dealings. Not that Bossuet literally supposed that the last word of political wisdom had been said by the Old Testament. His conclusions are only "drawn from Holy Scripture," because he wished to gain the highest possible sanction for the institutions of his country—to hallow the France of Louis XIV. by proving its astonishing likeness to the Israel of Solomon. Then, too, the veil of Holy Scripture enabled him to speak out more boldly than court-etiquette would have otherwise allowed, to remind the son of Louis XIV. that kings have duties as well as rights. Louis had often forgotten these duties, but Louis' son would bear them in mind. The tutor's imagination looked forward to a time when France would blossom into Utopia, with a Christian philosopher on the throne. That is what made him so stalwart a champion of authority in all its forms: *"le roi, Jésus-Christ et l'Église, Dieu en ces trois noms,"* he says in a characteristic letter. Philosophy proved that a God exists, and that He shapes and governs the course of human affairs. History showed that this governance is, for the most part, indirect, exercised through certain venerable corporations, civil as well as ecclesiastical, all of which demand implicit obedience as the immediate representatives of God. Thus all revolt, whether civil or religious, is a direct defiance of the Almighty. Cromwell becomes a moral monster, and the Revocation of the Edict of Nantes is "the greatest achievement of the second Constantine." Not that Bossuet glorified the *status quo* simply as a clerical bigot. The France of his youth had known the misery of divided counsels and civil war; the France of his manhood, brought together under an absolute sovereign, had suddenly shot up into a splendour only comparable with ancient Rome. Why not, then, strain every nerve to hold innovation at bay and prolong that splendour for all time? Bossuet's own *Discours sur l'histoire universelle* might have furnished an answer, for there the fall of many empires is detailed. But then the *Discours* was composed under a single preoccupation. To Bossuet the establishment of Christianity was the one point of real importance in the whole history of the world. Over Mohammed and the East he passed without a word; on Greece and Rome he only touched in so far as they formed part of the *Praeparatio Evangelica.* And yet Bossuet made a heroic attempt to grapple with origins and causes, and in this way his book deserves its place as one of the very first of philosophic histories.

In 1681 he became bishop of Meaux; but before he could take possession of his see, he was drawn into a violent quarrel between Louis XIV. and the pope (*see* GALLICANISM). Here he found himself between two fires. To support the pope meant supporting the Jesuits; and he hated their casuistry and *dévotion aisée* almost as much as Pascal himself. To oppose the pope was to play into the hands of Louis, who was frankly anxious to humble the Church before the State. So Bossuet steered a middle course. Before the general assembly of the French clergy he preached a great sermon on the unity of the Church, and made it a magnificent plea for compromise. As Louis insisted on his clergy making an anti-papal declaration, Bossuet got leave to draw it up, and made it as moderate as he could. And when the pope declared it null and void, he set to work on a gigantic *Defensio Cleri Gallicani,* only published after his death.

The Gallican storm a little abated, he turned back to a project very near his heart. Ever since the early days at Metz he had been busy with schemes for uniting the Huguenots to the Roman Church. In 1668 he converted Turenne; in 1670 he published an *Exposition de la foi catholique,* so moderate in tone that adversaries were driven to accuse him of having fraudulently watered down the Roman dogmas to suit a Protestant taste. Finally in 1688 appeared his great *Histoire des variations des églises protestantes,* perhaps the most brilliant of all his works. For the moment the Protestants were pulverized by this vigorous work; but before long they began to ask whether variation was necessarily so great an evil. Between 1691 and 1701 Bossuet corresponded with Leibnitz with a view to reunion, but negotiations broke down precisely at this point. Individual Roman doctrines Leibnitz thought his countrymen might accept, but he flatly refused to guarantee that they would necessarily believe to-morrow what they believe to-day. "We prefer," he said "a Church eternally variable and for ever moving forwards." Next, Protestant writers began to accumulate some startling proofs of Rome's own variations; and here they were backed up by Richard Simon, a priest of the Paris Oratory, and the father of biblical criticism in France. He accused St. Augustine, Bossuet's own special master, of having corrupted the primitive doctrine of Grace. Bossuet set to work on a *Défense de la tradition,* but Simon calmly went on to raise issues graver still. Under a veil of politely ironical circumlocutions, such as did not deceive the bishop of Meaux, he claimed his right to interpret the Bible like any other book. Bossuet denounced him again and again; Simon told his friends he would wait until "the old fellow" was no more. Another Oratorian proved more dangerous still. Simon had endangered miracles by applying to them lay rules of evidence, but Malebranche abrogated miracles altogether. It was blasphemous, he argued, to suppose that the Author of nature would break through a reign of law He had Himself established. Bossuet might scribble *nova, mira, falsa,* in the margins of his book and urge on Fénelon to attack them; Malebranche politely met his threats by saying that to be refuted by such a pen would do him too much honour. These repeated checks soured Bossuet's temper. In his earlier controversies he had borne himself with great magnanimity, and the Huguenot ministers he refuted found him a kindly advocate at court. Even his approval of the Revocation of the Edict of Nantes stopped far short of approving dragonades within his diocese of Meaux. But now his patience was wearing out. A dissertation by one Father Caffaro, an obscure Italian monk, became his excuse for writing certain violent *Maximes sur la comédie* (1694) wherein he made an outrageous attack on the memory of Molière, dead more than 20 years. Three years later he was battling with Fénelon over the love of God, and employing methods of controversy at least as odious as Fénelon's own (1697–99). All that can be said in his defence is that Fénelon, 24 years his junior, was an old pupil, who had suddenly grown into a rival; and that on the matter of principle most authorities thought him right.

In the midst of these controversies Bossuet died. Meaux found him an excellent and devoted bishop, much more attentive to diocesan concerns than his more stirring occupations would seem to allow. Bossuet was one of the greatest controversialists of his own or any age. But his best praise is to have brought all the powers of language to paint an undying picture of a vanished world, where religion and letters, laws and science, were conceived of as fixed unalterable planets, circling for ever round one central Sun.

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a modest *Bossuet* by Mrs. Sidney Lear (1874), two remarkable studies by Sir J. Fitz-James Stephen in the second vol. of his *Horae Sabbaticae* (1892) and *Bossuet: a study* by Ella K. Sanders (1921).

BOSTANAI (*c.* 660), the man who restored the dignity of Prince of the Captivity, or Exilarch (*q.v.*) of Mesopotamian Jewry after the Muslim conquest. The office was filled by his descendants until its extinction.

BOSTON, THOMAS (1676–1732), Scottish divine, author of *The Fourfold State,* was born at Duns on March 17, 1676. In 1699 he became minister of the small parish of Simprin, where he found in 1704 a book which had been brought into Scotland by a commonwealth soldier. This was "E. F.'s" famous *Marrow of Modern Divinity,* a compendium of the opinions of leading Reformation divines on the doctrine of grace and the offer of the Gospel. On Boston's recommendation, Hog of Carnock reprinted *The Marrow* in 1718; Boston also published an edition with notes of his own and, with eleven others, defended the book against the act of the general assembly (1720) which condemned it. The book, whose authorship is sometimes attributed to Edward Fisher (fl. 1627–65), became the standard of a far-reaching movement in Scottish Presbyterianism. The "Marrow Men" remained Calvinists, and therefore could not preach a universal atonement; they were in fact extreme particular redemptionists. In 1707 Boston was translated to Ettrick, where he died on May 20, 1732. *The Fourfold State* (1720) treats of the four states of humanity, primitive integrity in the Garden of Eden, the fall, salvation on earth, and its consummation in heaven. But even more popular in Scottish peasant homes were Boston's *Crook in the Lot* and his *Autobiography* (1776; ed. D. Low 1908).

See A. Thomson, *Life of Thomas Boston* (1895).

BOSTON, a municipal borough and seaport in the parts of Holland and the Holland and Boston parliamentary division of Lincolnshire, England, on the river Witham, 4 mi. from its mouth in the Wash, 107 mi. N. of London by the L.N.E. ry. Pop. (1938) 23,020. Area 5.1 sq.mi. It lies in a flat agricultural district, drained by numerous cuts, some of which are navigable. Boston (Incanhoe, St. Botolph or Botolph's Town) derives its name from St. Botolph, who in 654 founded a monastery here, which was destroyed by the Danes in 870. Although not mentioned in Domesday, Boston was probably granted as part of Skirbeck to Alan, earl of Brittany. The excellent commercial position of the town at the mouth of the Witham explains its speedy rise to importance. King John by charter (1204) granted the bailiff of Boston sole jurisdiction in the town. By the 13th century it was a great commercial centre second only to London in paying £780 15*s.* 3*d.* for two years to the tax of one-fifteenth levied in 1205. In 1257 a market was granted to the abbot of Crowland and in 1308 to John, earl of Brittany. The great annual mart was held before 1218 and attended by many German and other merchants. Edward III made it a staple port for wool and other commodities in 1369. The Hanseatic and Flemish merchants largely increased its prosperity, but on the withdrawal of the Hanseatic league about 1470 and the break-up of the gild system Boston's prosperity began to wane, and for some centuries it remained almost without trade. Nevertheless it was raised to the rank of a free borough by the charter of 1546, confirmed in 1547, 1553, 1558, 1573 and 1608. Boston returned two members to parliament until 1885 and one member from then until 1918. Two annual fairs and two weekly markets, granted by the 1546 charter, are still held. The Great Mart survives only in the Beast Mart held on Dec. 11. The church of St. Botolph is a Decorated building, one of the largest and finest parish churches in the kingdom. A chapel in it was restored by citizens of Boston (Mass.), U.S.A., in 1857, in memory of the connection of that city with the English town. The western (mainly Perpendicular) tower, 290 ft. high, commonly known as Boston Stump, forms a landmark for 40 miles. There are a 15th century guildhall; Shodfriars hall, a half-timbered house; the free grammar school, founded in 1554, with a fine gateway of wrought iron of the 17th century brought from St. Botolph's church; and the Hussey tower, part of a mansion of the 16th century. In the 18th century the river had silted up so far as to exclude vessels exceeding about 50 tons. In 1882–84 a dock some 7 ac. in extent was constructed, with an entrance lock giving access to the quay sides for vessels of 3,000 tons. The bed of the river was deepened to 27 ft. for three miles below the town, and a new cut of three miles was made from the mouth into deep water. A new quay 2,440 ft. long was opened in 1938. An iron swing-bridge connects the dock with the L.N.E. railway.

Industries include the canning of peas, fruit, etc., label and tag making and feather purifying, while there is a considerable deep sea and coastal fishing business.

BOSTON, the capital city of the state of Massachusetts, U.S.A., comprises the greater part of Suffolk county, 42° 21′ 27–6″ N., 71° 3′ 30″ W. The city is ninth in population in the United States: (1930) 781,188; (1940) 770,816. Its metropolitan district (federal census), within 25 mi. of the state house, is fifth in population; (1930) 2,307,897; (1940) 2,350,514. The city is the terminus of the Boston and Albany (New York Central), the New York, New Haven and Hartford, and Boston and Maine railways. The American Airlines operated 24 daily flights in 1941. There is daily steamship service to New York city.

Physical Features.—Boston and its harbour stands at the head of Massachusetts bay. It occupies much of the Boston basin, a territory lying within a ring of hills. It stands on a surface of granite, conglomerate, slate and lavas between geological "faults" at the Blue hills on the south and Arlington heights on the north. It was, in its colonial days, rocky and irregular, a peninsula lying between the south bay, the Charles river and the Back bay flats. The town was almost an island, being connected with the Massachusetts mainland by the very narrow Roxbury neck. As originally built it covered and surrounded three hills, Beacon, Copp's and Fort. No city has undergone greater physical changes than Boston since the Revolutionary War. To-day there are only a few blocks in two sections on the water front which were on the original boundary. A town of 780 ac. is now a city of 28,019 ac. of land area, so increased by annexation of surrounding territory and by 2,944 ac. of made land. The total present area including water is 42,176 ac. or 65.9 sq.mi. (land area alone 46.1). Of the hills which dominated Boston in colonial days, Copp's hill alone stands unaltered. Fort hill, near the water front, has been entirely levelled and Beacon hill, once a rigid peak sustaining the Beacon from which it was named, has now a rounded top approached by a gradual and gentle rise almost from the water front, which with the gilded dome of the State capitol dominates the landscape. Although the city is almost surrounded by made land and the narrow neck which connected it with the mainland has long since been quite obliterated, the greatest project of reclamation was that commenced in 1856 in filling in the so-called Back bay, a very large tract in the rear of the city. Boston Common then had its western boundary on the river. The bay and the flats were filled in so that the Common simply touches on that side the Public Garden, a large conventionally laid out park which in turn is touched by Commonwealth avenue, a long residential street traversing the made land and reaching far out of the city. Here was once the most aristocratic residential section of the city.

Additions.—The municipalities and sections added to Boston by annexation are as follows: East Boston, an island in the harbour settled by Samuel Maverick almost coincidentally with the mainland and having no regular municipal entity, annexed in 1637. In 1804 South Boston, a peninsula coming close to the city was annexed. It contains Dorchester heights, the fortification of which, by the Continental army, made British occupation of the city untenable in 1776. In 1868 Roxbury, which until the filling in of the Back bay had been the only town through which Boston could be approached by land, was annexed. It was a city at the time and like Boston and the surrounding colonial towns, has an individual history of its own. Six years later, in 1874, four communities were added: the city of Charlestown, and the towns of Dorchester, Brighton and West Roxbury. No further annexations were made until 1912 when Hyde Park was added from Norfolk county. Boston proper has for many years been losing population in favour of the outlying districts. From 1930 to 1940 the west and south ends steadily increased in population, while the areas near the retail centre lost more than 10%.

Population.—The population of Boston has increased as follows: (1790) 18,320; (1800) 24,937; (1810) 32,787; (1820) 42,228; (1830) 61,392; (1840) 93,383; (1850) 136,881; (1860) 177,840; (1870) 250,526; (1880) 362,839; (1890) 448,447; (1900) 560,892; (1910) 670,585; (1920) 748,060; (1930) 781,188; (1940) 770,816. The citizens of colonial antecedents are only a small minority, but the number of foreign-born whites is decreasing: (1920) 238,919; (1930) 229,356.

The trend toward urban decentralization brought about by the automobile and declining immigration increased the population of the metropolitan area by 3·5% (1930–40) while Boston lost 3·5%. This area is an economic and social unit with no physical indications of the political boundaries of such large cities and towns as Brookline, Cambridge, Somerville, Newton and Quincy. Thirty-seven of these cities and towns form a metropolitan district which controls their water supply and the great park system.

Streets.—Despite extensive construction and traffic regulation, the street system is increasingly inadequate for the growing volume of automobile traffic. Washington street, in the heart of the retail district, is one of the narrowest business streets in the United States. A plan to eliminate through traffic by an overhead highway awaits the approval of the state legislature. The famous crooked streets, following the lines of colonial paths and lanes, are mainly in the north and west ends and in some of the suburbs. Most of the modern streets are laid out at right angles.

Boston Harbour.—The harbour is practically land-locked and is only 6½ mi. from open sea. The main ship channel is 35 ft. deep at low water. Its wharfage extends along what can roughly be called the three sides of an open rectangle, comprising the water front at South Boston, Boston proper and East Boston, with a broad passage northeast of Boston leading to the Charlestown water front along the Charles and Mystic rivers. This frontage is eight miles in length and comprises 40 mi. of berthing space. The great Commonwealth pier at South Boston, constructed by the state just before the war of 1914–18, is 1,200 ft. long and 400 ft. wide. Its three steel and concrete warehouses contain 900,000 sq.ft. of floor space. The South Boston army base has more than a mile of berthing space, turned to commercial use. The railroad terminals also provide dock and pier facilities. The U.S. dry dock in South Boston is the largest in the western hemisphere. Extensive additions to the facilities of the dry dock, the naval air base at Squantum, and the navy yard at Charlestown were begun in 1940. These, with the Bethlehem Steel company's Fore river shipbuilding plant at Quincy, make Boston harbour one of the most important centres of naval building.

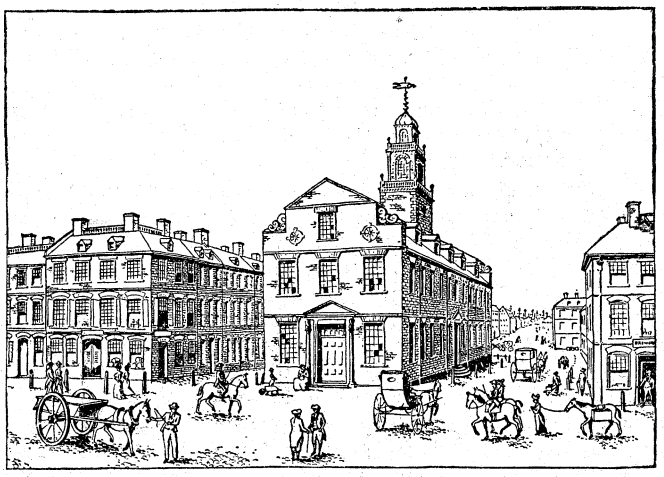
Boston is served by freight and passenger lines to the chief ports of Europe. Freight lines go to and from the Far East, South America and Australia. It has a large coastwise trade. In foreign trade it is the tenth city in the United States. In imports alone it is second, while it is third in volume of overseas passengers.

In 1941 the state took over the municipal airport started in East Boston in 1922. Passenger service was inaugurated in 1927. In 1940 the airport provided air service for 173,031 passengers.

Federal Buildings.—The post office, a structure costing in the neighbourhood of six million dollars, is twenty-two stories high and houses not only the post office but the sub-treasury, the Federal courts and other U.S. Government activities as well. It is located on Post Office square, convenient to the office-building centre of Boston. But the highest building in Boston is still the custom house tower, erected by the United States on territory nationally owned and beyond municipal restriction. The old custom house was first occupied in 1856. To make needed enlargements the central part of the old building was extended into a tower of a fraction less than 500 feet. This was finished and occupied in 1915. There are no other buildings in the city so high, as their erection in the business district is restricted to 155 feet.

Ancient Landmarks.—Ancient landmarks still cherished in Boston include public buildings, residences, old graveyards and the Boston Common. The Common, purchased by the town from Blaxton, the original settler in 1634, was originally set aside for training and common pasturage. Since a burial ground was early set off within it, it has never been encroached upon for any utilitarian purpose except when, in 1895, part of the Boston subway was built under its eastward edge. It contains various monuments, the foundation of Saint-Gaudens's Shaw memorial, a small artificial pond known, quite without reason, as the Frog pond and the "Parade ground," often used for military events.

The old Boston cemeteries are the King's chapel burying ground containing the bodies of John Winthrop and John Cotton; the old



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A SOUTH-WEST VIEW OF THE OLD STATE HOUSE AT BOSTON IN 1793
The old State House, built in 1748 and restored in 1880, was the seat of the royal Government of Massachusetts. The question of colonial rights was debated within its walls and the so-called Boston "Massacre" of 1770 took place near by

Granary, in which are interred John Hancock, Samuel Adams, James Otis, the parents of Franklin and many other Boston notables; and Copp's hill, wherein lie the Mathers. The burial ground on the south side of the Common is not so old as these colonial burial places, having been put to that purpose after the Revolution.

Christ church (1723), on Copp's hill, is the oldest Episcopal church in the city, from whose tower, it is said, lanterns were hung on April 18, 1775 to warn Paul Revere of the route of the British to Concord. The Old South meeting-house (1730–82) while still a church, was used for town meetings, orations and other patriotic purposes. The British turned it into a riding school during the siege of Boston. The Old State house (1748) was the seat of the provincial government. Here Otis delivered his oration against the writs of assistance and the Declaration of Independence was read to the people from the balcony. The Boston Massacre occurred almost beneath its windows. Faneuil hall and market (1762–63) was the gift to the city of Peter Faneuil. The hall, containing many historic paintings, has been for many years the public forum of Boston. It is called "The Cradle of Liberty." The greater market house adjoining it, known as Quincy market, was the first municipal improvement of importance after Boston became a city. King's chapel (1749–54) was the first Episcopal church built in Boston (the first edifice being erected in 1688). It was also the first Boston church to become Unitarian (see *History*). It was called the Stone chapel in the days of the Revolution, when royalty was anathema and its early name was not restored for many years.

The dominating building of Boston since it was built in 1795–98 has been the State capitol of Massachusetts, familiarly known as the State house, occupying the present summit of Beacon hill, the original portion having been designed by Charles Bulfinch. The central or original structure is of red brick, with pillared portico surmounted by a dome, which has been gilded since 1874. Additions were made in 1831, 1859, 1889 and 1914. It is now flanked by two great wings of white marble standing at right angles to the old edifice and joined to it by buildings of the same material, while a large addition in the rear bridging Mt. Vernon street, extends for two blocks. It has a total floor area of nearly half a million feet. It contains many paintings, tablets and

sculptures of a memorial nature and its Memorial hall contains glassed-in niches, in which are the Massachusetts battle flags of the Civil, Spanish-American and World (1914–18) wars. Opposite it, on the Common, at the street boundary, is Saint-Gaudens' famous and beautiful bas-relief memorial to Robert Gould Shaw and his Negro regiment which gained fame at Ft. Wagner.

Banks and Banking.—The Federal Reserve bank of the New England district is in Boston. The 16 largest national banks and trust companies had in Dec. 1938 total resources of $1,353,580,000 and deposits of $1,743,618,000. The First National bank alone had resources of $765,081,000 and deposits of $622,094,000. There are 23 savings banks with $755,246,000 and 39 co-operative banks with total assets of $108,978,067. There are seven Federal Savings and Loan associations. Bank clearings in 1940 were $12,106,585,000.

Exports and Imports.—For the Massachusetts customs district (Boston and nine minor ports) in the calendar year 1940, the total value of exports was $28,628,929, an increase of 22·4% over 1935 and of 24·4% over 1939; of imports, $163,464,164, an increase of 47·8% over 1935 and of 12·4% over 1939. Boston's total commerce (1939) amounted to 17,842,212 tons (of 2,000 lb.); imports, 2,169,610 tons; exports, 428,999 tons. Calls of ships in foreign trade: (1939) 1,695; (1940) 1,387. Boston is the chief United States wool market and an important fishing port. Wool receipts (1939): domestic, 233,106,000 lb.; foreign, 91,619,000 lb. Fish landed (1939): 295,353,381 lb.; value, $8,007,425.

Manufactures.—Small factories and a great diversification of industry are characteristic of Boston. The leading industries are printing and publishing, clothing, boots and shoes, confectionery, bread and bakery products, electrical machinery and supplies, furniture, druggists' supplies and patent medicines, house furnishings and beverages. In 1938 there were 2,225 manufacturing establishments with an invested capital of $222,167,918; value of materials used, $185,363,524; value of the year's product, $367,366,715; average number of employees, 54,160; total wages paid, $64,603,088. In 1935 there were 3,330 wholesale establishments with total sales of $1,333,016,000; average number of employees, 32,334; yearly pay roll, $60,753,000. Boston ranks sixth in the United States in the volume of retail trade. In 1939 there were 11,817 retail stores with total sales of $487,774,000; number of employees, 73,297; yearly pay roll, $74,000,000.

Educational Institutions.—Boston is the centre of a large district in which many notable educational institutions are situated; just beyond the city limits in Cambridge are: Harvard university, which, while never in Boston, has had a profound influence on Boston life; Radcliffe college (for women); and the Massachusetts Institute of Technology, which was formerly in Boston. Boston college, the great Jesuit college, is now located in Newton; Tufts college at Medford and Wellesley college at Wellesley are not far away. In Boston proper is Boston university with its numerous colleges and schools; the schools of medicine, dentistry and public health, the graduate school of business administration, the Bussey institution for graduate work and research in applied biology and the Arnold arboretum, a botanical garden, all of Harvard university. The Soldier's field, with its great stadium where the principal athletic contests take place, is also situated in the city just across the river from Cambridge. Here also is Simmons college for women; Wentworth institute for technical mechanical training; Emerson college for men and women; Northeastern university, connected with the Young Men's Christian association; Suffolk university; and the Portia college and Portia law school for women.

Public and Private Schools.—Boston's school system is the oldest in the country. The present Boston Latin school was the first public school in America, established in 1635. It is probable that elementary as well as higher branches were taught but its main purpose soon became what it is today, the fitting of young men for college. A similar school, the Grammar school, in the easterly part of Roxbury, now the Roxbury Latin school was founded in 1645. These two schools survive, both as free schools, the first a part of the Boston school system, the second as an endowed institution in which tuition is free to all boys living within the wide limits of the original Roxbury survey. The Boston school system maintains a teaching force of 4,611 teachers for about 120,000 pupils in kindergarten, elementary, intermediate and high-school grades, besides a number of specialized schools including two Latin schools, schools of mechanic arts, practical arts, trade schools, a clerical school, continuation schools and a Teachers' college. The Roman Catholic Church maintains an elaborate system of schools of grades paralleling those of the public system. Its high school, which is maintained by Boston college, is in the buildings once occupied by the college itself. There are also convent schools for young ladies and there are private schools to be found in the city.

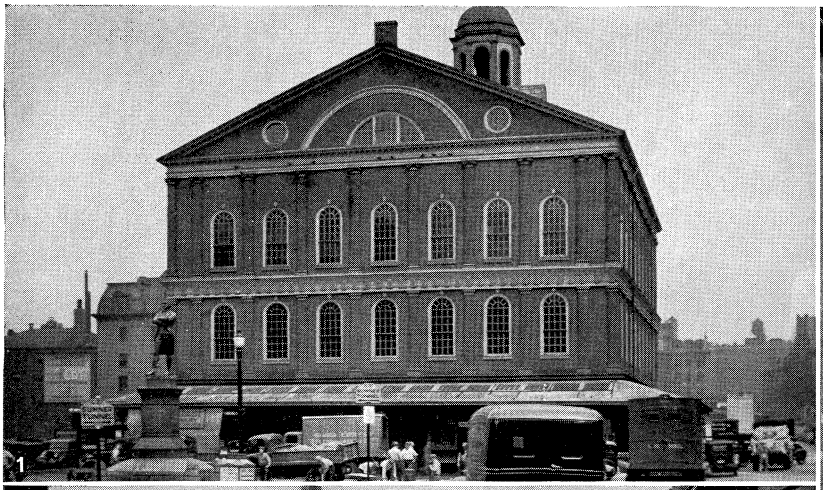
Libraries.—The Boston public library, now in Copley square, is one of the most famous libraries in the world. It was founded in 1852 and for many years occupied a convenient site opposite the southern boundary of the Common. Its present building was erected in 1888–95 at a cost of nearly $2,500,000 and enlarged in 1918. It is a very simple and striking building in the Italian Renaissance style. The library contains a statue of Sir Henry Vane by MacMonnies, and in Bates hall, the main reading room and in the corridors are busts of notable Bostonians, eminent writers and benefactors of the institution. The most famous decorations in the library are the three series of mural paintings. That by Puvis de Chavannes illustrates the ancient growth of literature and art. The John S. Sargent paintings with the notable frieze of the prophets and heavily-decorated symbolic paintings depict the growth of religion. Edwin A. Abbey's contributions in the delivery room are illustrations of the legend of the Holy Grail. The library contained, in 1939, 1,701,166 volumes (7th largest in U.S.). It has a lecture hall and maintains a course of free lectures each year. Among the special collections owned by or loaned to the main library are: the New England library collected before 1758, the private library of President John Adams, the best existing collection of original letters bearing on the antislavery movement, the gold medal presented to Washington on the evacuation of Boston in 1776. The Boston public library maintains 30 branch libraries containing (Jan. 1, 1941) 439,276 volumes.

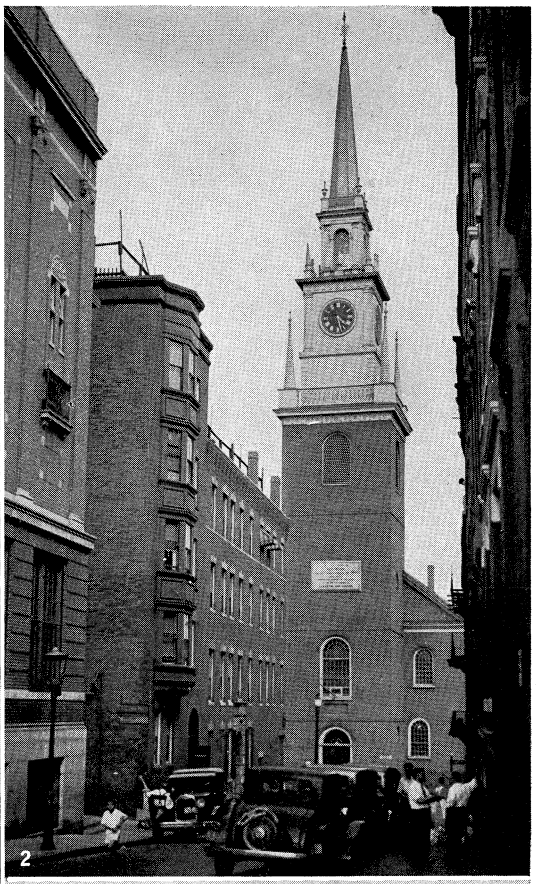
Another important library is that of the Boston Athenaeum, supported by endowments and the annual assessments on the share owners. It was incorporated in 1807 and occupies a large building on Beacon street near the State house. It contains 328,548 volumes, including a large part of the library of George Washington. Other important libraries are the Massachusetts State library with over half a million volumes; the Baker library of the Harvard graduate school of business administration of 140,000 books and 1,000,000 pamphlets; that of the Massachusetts Historical society which includes about 126,000 volumes and the same number of pamphlets, and one of the largest collections of manuscripts in America; the New England Historical Genealogical library of about 72,000 books, 61,000 pamphlets and "innumerable manuscripts," as the librarian reports; the library of the Boston Society of Natural History of 57,000 books and 56,000 pamphlets; and that of the American Academy of Arts and Sciences of 44,000 volumes.

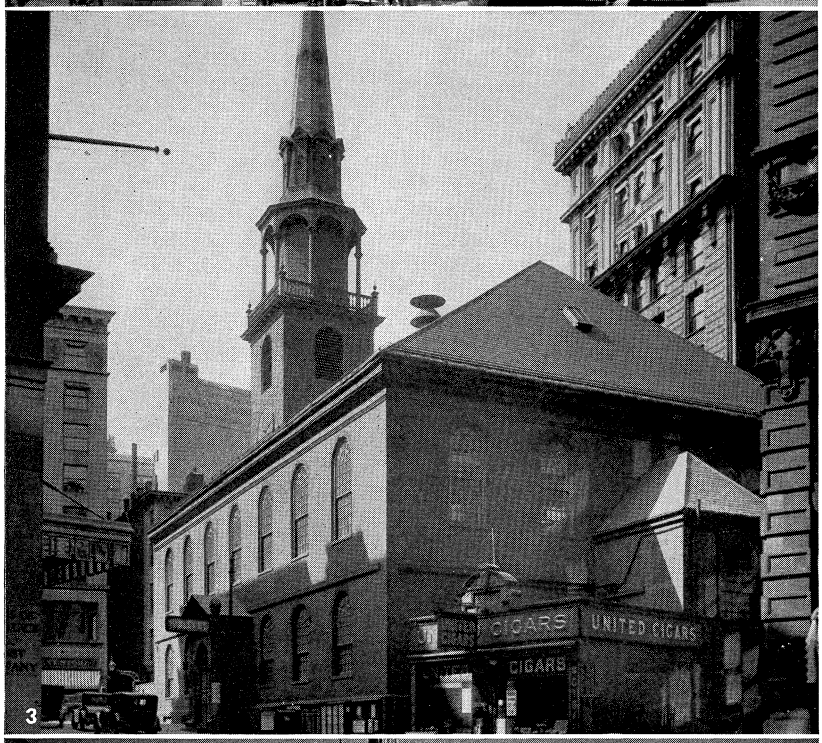
Art.—The Boston Athenaeum at one time maintained a large art gallery. This gallery led to the founding (1870) of another great endowed institution, the Boston Museum of Fine Arts, the art works of the Athenaeum being the nucleus of its collection. Its first building was situated on Copley square; its present building, on the upper part of Huntington avenue, was opened in 1909 and is one of the chief art museums of America. It contains the well-known portraits by Stuart of George and Martha Washington, landscapes, portraits and other paintings by the eminent masters, ancient and modern; statues, busts and casts, a very noble tapestry gallery, a fine collection of ceramics and metal work. The museum's collection of oriental art is especially notable. It is free to the public.

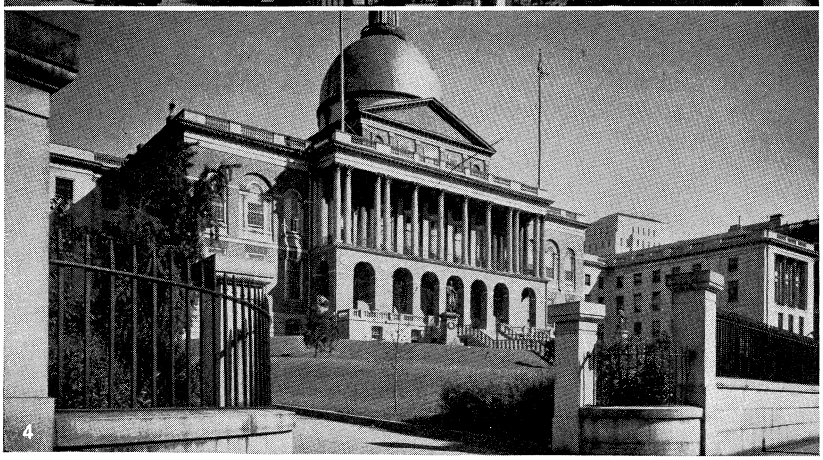
Musical Organizations.—Symphony hall, on Huntington avenue, is the home of the Boston Symphony orchestra. This orchestra, founded in 1881 by Henry L. Higginson, banker and civic philanthropist, is the chief musical organization of Boston

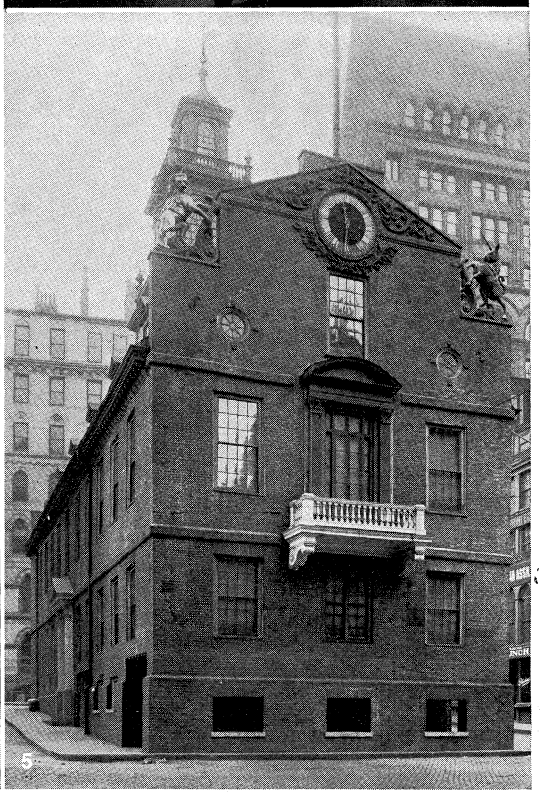
BOSTON









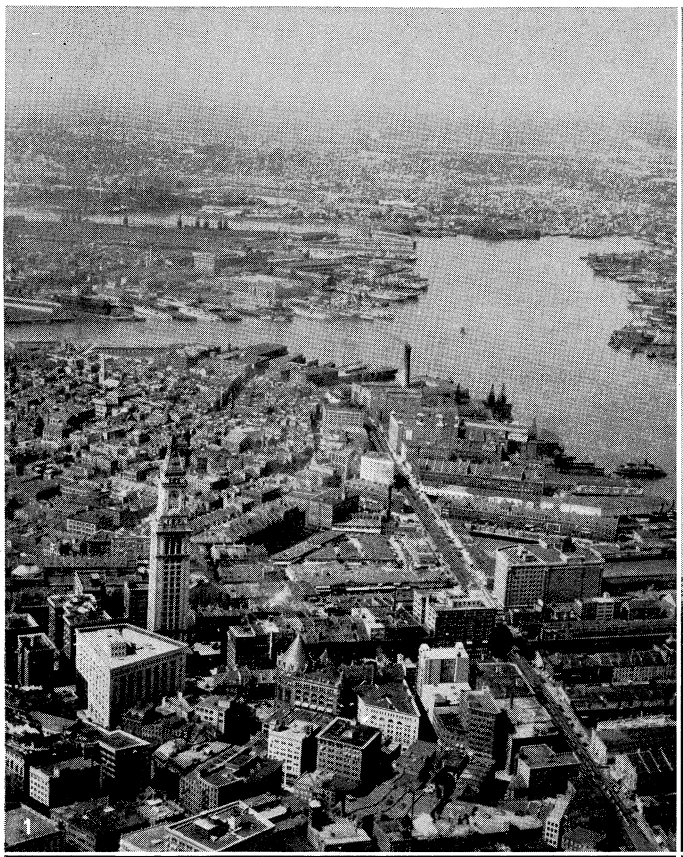


PHOTOGRAPHS, (1, 2, 4) EWING GALLOWAY, (3) MC RAE FROM EWING GALLOWAY

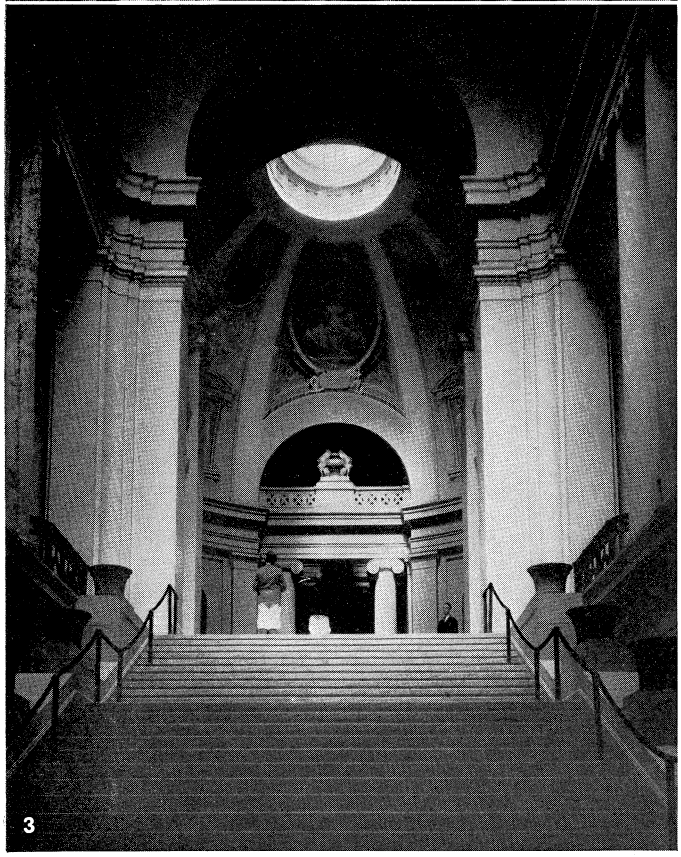
HISTORIC BUILDINGS OF BOSTON

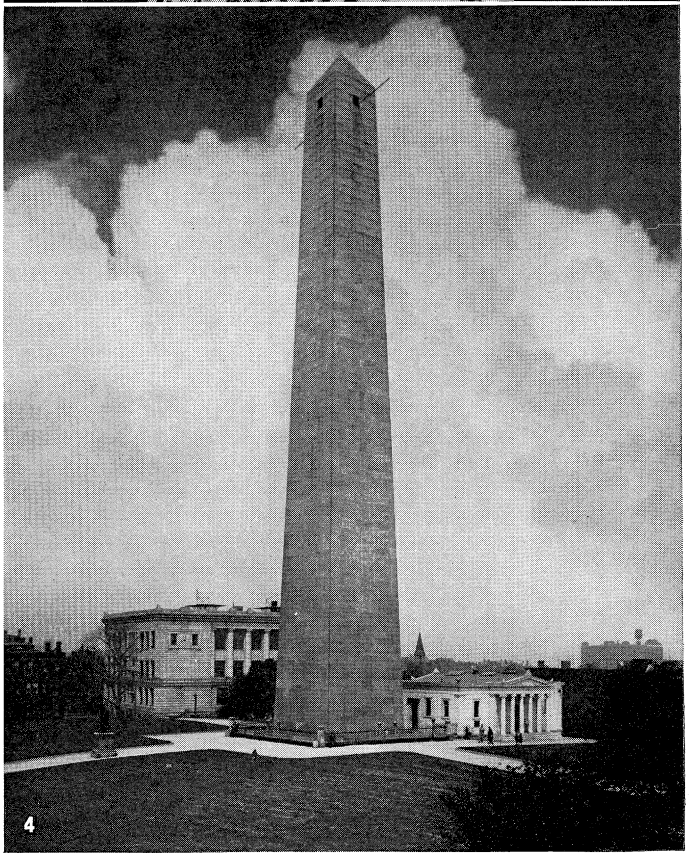
1. Faneuil hall, popularly called "The Cradle of Liberty." Originally completed in 1742, it was destroyed by fire in 1761, then rebuilt and enlarged. A market place still exists on the street floor
2. Christ church, known as the Old North church, built in 1723. From the steeple, it is said, were hung the lanterns that signalled to Paul Revere the British route to Lexington and Concord
3. The Old South meeting-house, an 18th century church with characteristic New England spire. In this building, as in Faneuil hall, many town meetings were held before the American Revolution
4. The State house, on Beacon hill, built between 1795 and 1798. The original red brick structure, designed by Charles Bulfinch, was later flanked by two wings of white marble and additions in the rear
5. The Old State house (1748), restored during the 19th century, is probably the oldest public building existing in the United States

BOSTON









PHOTOGRAPHS, (1) OFFICIAL PHOTOGRAPH U.S. ARMY AIR CORPS, (2-4) EWING GALLOWAY

BOSTON AND ITS VICINITY

1. Air view of Boston and the harbour, with the tall Custom House tower in the centre
2. The 75 Federal Street building, 26 stories high, is one of Boston's few tall buildings
3. Rotunda of the Boston Museum of Fine Arts
4. The Bunker Hill monument at Charlestown, on the approximate site of the first serious engagement of the Battle of Bunker Hill in 1775. It is 221 ft. high and 30 ft. square at the base

and in the front rank in America. Symphony hall was erected in 1900. It is dignified and simple in its lines and its acoustics make it an ideal hall for music on a large orchestral scale. Nearby is the Jordan hall of Boston Conservatory of Music. A Symphony orchestra plays weekly on Sunday afternoons at one of the theatres. There are three choral societies in Boston, the Handel and Haydn, the Cecilia and the Apollo Clubs, and various other vocal and instrumental organizations.

The Boston Opera house was sold for commercial purposes in 1940 and the yearly opera series was given in the Metropolitan motion-picture theatre.

Theatres.—Boston supports five first class commercial theatres: the Shubert, Plymouth, Colonial, Tremont, Majestic, and two theatres which house other legitimate productions of a varied nature—the Copley and the Repertory. The last mentioned building was constructed by subscription at a cost of more than half a million dollars. It is a remarkably equipped theatre, having the most improved lighting and mechanical apparatus. It is conducted by a board of trustees and not for profit and is tax exempt, as an educational and non-commercial institution. The oldest theatre now existing is the Howard Athenaeum, once a fine legitimate house, now a burlesque theatre. The rise of the motion picture has led to the erection of a great number of motion-picture and motion-picture and vaudeville theatres of which the most pretentious and by far the handsomest is the Metropolitan, which was built in 1926.

Water System.—The water supply of Boston is under the control of the Metropolitan district commission, the surrounding cities and towns being included in the Metropolitan district. Its present chief source is the great Wachusett basin, with its dam at Clinton, Mass., which feeds through aqueducts the various local supply reservoirs. At the present time another great dam is being constructed nearly 60 mi. west of Boston, forming a basin which will utilize the flood flow of the Swift river. This basin, known as the Quabbin reservoir, is connected by an aqueduct with the Wachusett reservoir. In 1938 four townships with an area of 120 square miles were taken over and cleared of inhabitants for inclusion in the reservoir area.

Bridges.—The Charles river is spanned by about a dozen bridges between Boston and its northern shore. Among them may be mentioned the Charlestown and Warren bridges, connecting the city with the Charlestown district. The granite Longfellow bridge, which connects the west end of Boston with East Cambridge, is the most striking and ornate large bridge over the river, built from a Russian original, with eight large towers. The Viaduct bridge is used at the Charles river dam by the elevated railway. Still farther west, the Harvard bridge connects the upper Back bay at Massachusetts avenue with the most direct road to Harvard square and the college buildings. The Larz Anderson bridge, erected as a memorial to Larz Anderson, American diplomat, connects Cambridge and Brighton district and the road between Harvard university and the Soldiers' field. The John W. Weeks Memorial bridge crosses the river opposite the Harvard graduate school of business administration.

Park System.—Boston's park system forms a semi-circle around the city. The Marine park at South Boston is connected by a parkway with the Franklin, the park of greatest acreage, which contains beside much pleasant woodland, a zoo, an aviary, tennis courts, golf links, a children's playground and some beautiful gardens in which the natural beauties are stressed beyond the artificial laying out. From Franklin park a parkway leads to the Jamaica pond, passing the Arnold arboretum, the Harvard college botanical garden which, being open to the public, is practically part of the system. On the shores of Jamaica pond is the Children's museum. From the Jamaica pond reservation the parkway extends along the Muddy river which separates Boston and Brookline, to the Back bay fens and thence to the Charles river embankment. Boston Common is connected with this system by the adjoining Public garden, laid out more conventionally than the natural gardens of Franklin park, with its tiny artificial lake on which are row-boats and foot-propelled "swan boats." From the Public garden a parkway runs through Commonwealth avenue to the Back bay fens. The Metropolitan district commission has reserved much wild land in the district, some of which is in West Roxbury, within the city limits.

Churches.—There are two cathedrals in Boston, the cathedral of the Holy Cross (Roman Catholic) and St. Paul's cathedral (Episcopal). Neither is among the notable cathedrals of the country although St. Paul's (in the retail district opposite the Common) is a fine example of early 19th century architecture. It was built as a church and has only become a cathedral within the last 15 years. The most notable church edifice is Trinity church (Episcopal) on Copley square, built in the Romanesque style of southern France. It has a number of large memorial windows by LaFarge, William Morris, Burne Jones and others. Christ church, in the North End, is a fine example of the colonial meeting-house, as is the Old South not now used for church purposes. The First church in Roxbury, built in the first decade of the 19th century, is a beautiful example of 17th century Puritan meeting-house, that style of architecture surviving at that time. The largest and most magnificent church building is the so-called extension of the First church of Christ (Scientist), built adjoining the original Mother church, still standing and used as an emergency auditorium.

Transportation.—Local transportation is carried on by the Boston Elevated Railway company by surface tracks, an elevated system and a municipal system of subways, built by the city and leased to the road. The mileage of subway now in operation in Boston is 11.8m., including a tunnel under the harbour to East Boston. This subway system was begun in 1895.

Public Welfare.—The principal channel of charity is the Community fund, raised each year by 200 institutions in the metropolitan area. The total raised in 1940 was $4,512,011. Six of the 28 hospitals are tax supported. The city is trustee for 195 funds for civic betterment and charity totalling nearly $15,000,000. The Boston housing authority controls nine low-cost housing projects.

HISTORY

Colonial and Provincial Period.—It is probable that the early Norsemen explored Boston harbour. Capt. John Smith made explorations and mapped the locality in 1614. A party of prospectors from the Plymouth plantations visited it in 1621. It was known to the white man long before a real settlement was made and there were several individual settlers living within the borders of the present city, William Blaxton (Blackstone) on the Trimountaine peninsula, Thomas Walford in Charlestown and Samuel Maverick on Noddle's island. In 1628 the Massachusetts Bay settlement, the first great Puritan settlement, was inaugurated at Salem, under John Endicott as governor. He was joined in a few months by Winthrop, who in 1630 with his followers settled temporarily at Charlestown. Finding some difficulty in water supply, he crossed the river at the invitation of Blaxton and made his settlement in Shawmut, or Trimountaine, as it was variously called. The accepted day from which the city dates its beginning is Sept. 17, 1630 when it was ordered by the Court of Assistants that the town should be called Boston after the Boston in Lincolnshire, the leading town of the region from which the principal Puritan leaders had come.

For a short time, Boston, Newtowne (Cambridge) and Charlestown flourished in about equal degree but the excellent commercial situation of Boston soon put it to the fore and in 1632 it was made the capital of the Colony. During the first ten years 20,000 settlers came to Massachusetts Bay, most of whom landed in Boston, a great proportion settling there. Cromwell and Hampden were among those who contemplated settling in New England. Then the political tide turned in England and with the rise of the Puritan Party, the stream of emigration largely subsided.

The Congregational churches, the first in date to flourish in Massachusetts Bay, were the outcome of this Puritan influx. It is to be borne in mind that the Puritans, unlike the Pilgrims of Plymouth, were not Separatists. They were originally reformers within the English Church. But when they came to the new country they found nothing to reform, either in church or government, thus they were forced to create. This brought into being

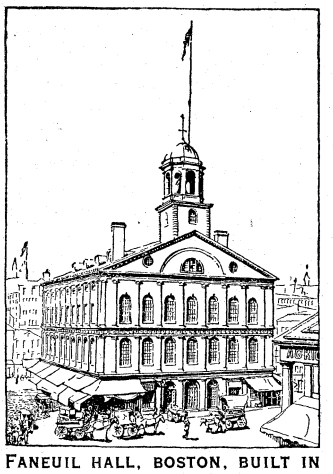
a church almost the duplicate of that of the Separatists in the adjoining Colony, a self-sustaining, self-governing religious unit. The first church of the Boston settlement had been founded before they left Charlestown under a covenant adopted by Winthrop, Thomas Dudley, Isaac Johnson and the pastor, John Wilson. It bound the members "to walk in our ways according to the rule of the gospel, and in all sincere conformity to His (Christ's) holy ordinances, and in mutual love and respect to each other, so near as God shall give us grace." Under the intent to reform, qualified by the conditions of pioneering, there was thus brought about, naturally and peaceably, a great religious revolution. In Boston as well as in all the rest of Massachusetts Bay the religious test came to be applied to citizenship. In the General court held in Boston, it was ordered "that for time to come no man shall be admitted to the freedom of this body politic but such as are members of some of the churches within the limits of the same." This was at first no very oppressive test, for the early settlers were all of one mind religiously, but it did establish a State church. The church government was liberal. Within this church there was pure democracy. The ministers had great influence but they were not entrenched as to powers. A sermon regularly preceded election, but it was not to be one in which the citizenship were to be told for whom to vote, and when, in an election sermon Rev. John Cotton preached upon the inadvisability of superseding experienced officials, Gov. Winthrop was immediately defeated.

The town was governed by the town-meeting system. The citizens of the town met together at least once a year and usually oftener. There they fixed taxes, made appropriations, voted on municipal improvements and elected the town officers. It was absolutely democratic, the right of vote and speech on any and all matters belonged to every citizen within the assemblage. As the commercial advantages of Boston became known, the importance of the town increased. At the same time the difficulties of carrying on the Puritan theocratic government became more and more apparent. There was an influx into Boston of immigration which had nothing in common with the spirit of the pioneers. Self-betterment, commercial advantages, became its impetus in place of the zeal of the early settlers and their desire to worship freely without touch of rivalry or opposition. Not only did the Puritans oppose sects but they abused individuals. The banishing of Roger Williams (*q.v.*) and later of Anne Hutchinson (*q.v.*) are examples of personal intolerance.

The witchcraft delusion did not pass Boston by. It was a superstition which put its stamp on many communities in both the old and new worlds. It was to come to its most ghastly American fruition in Salem. In Boston there were two or three cases which culminated in the execution of the persons accused. The notable Boston divine, Cotton Mather, espoused the delusion and argued for it in various polemical books and even went to Salem and attended an execution, replying to the victim's speech, which had aroused the spectators almost to the point of rescue, and assuring them the sentence was just.

In spite of the rigour of Puritan rule it became increasingly difficult to maintain the theocratic principle in Boston. The colony as a whole was not discontented, but it was in Boston that the commercial population made itself felt. They were not impelled by religious reformation but by clear cold figures of pounds and shillings. They included able and intelligent men who did not join a Congregational church and therefore could not achieve the franchise. Nor could they worship in a church of their own faith. A party among the Puritans which espoused the trader's cause, came to be known as the Moderates and were strongly opposed by the radical Theocrats of the unyielding type. The struggle was finally carried to England, where the influence of the trading class brought about the abrogation of the old colonial charter in 1686. This led to the first defiance of authority in the New England Colonies. The abrogation of the charter was succeeded by a brief interval under the presidency of Joseph Dudley, son of one of the original settlers, Gov. Thomas Dudley. Then the new royal governor arrived in the person of Sir Edmund Andros. He was an honest and well-intentioned man but he governed autocratically. His administration drove the divided Puritans, radical and moderate, together again. The residents of Boston learning that William of Orange had landed in England, made common cause with that revolution and on April 18, 1689 they rose, seized and deposed Andros, kept him in comparatively easy confinement for nearly a year and sent him back to England.

A new charter was granted by William. It assured the Colonies in their liberties and freedom of worship, but it protected the English churchmen in their right of worship and extended the franchise so that it no longer rested on church membership. The election of governor was never restored to the people while under English rule. Under the Provincial Charter, which approximately began the 18th century, Boston and Massachusetts history are closely interwoven (*see* MASSACHUSETTS). In the middle of the 18th century, the population was about 15,000, the houses were principally of wood, some of brick and stone. The town maintained a town watch and an organization of fire wards but it suffered from destructive fires in 1676, 1690, 1711, 1747 and 1760. The town had 17 churches in 1750, the larger number being Congregational, but there were other denominations represented as well, Episcopal, Anabaptist, French Huguenot and Quaker. Although the religious test had been abolished for suffrage, the town continued to make money grants to the Congregational churches and foster them officially.



FANEUIL HALL, BOSTON, BUILT IN 1762, CALLED THE CRADLE OF AMERICAN LIBERTY

Revolutionary Period.— The period of the colonial wars quickly merges itself into the days of uncomfortable relations with the mother country, becoming more and more strained until open revolt merged itself into the American Revolution. (*See* UNITED STATES: *History.*) The questions were largely financial, although the Quebec act which recognized the entity of the Roman Catholic church in that province, gave the Protestant citizenship in the Colonies some uneasiness. The first important outward manifestation of discontent came in Boston when Paxton, the collector of customs, through a deputy at Salem petitioned the court for "writs of assistance" established under Charles II., which would enable the customs officers to enter homes and warehouses in the exercise of their duty. On a hearing of the petition, James Otis made a dramatic plea built largely around the legal axiom that "an Englishman's house is his castle." The writs having been established in legislation by the British Parliament, the court sustained the officers of the Crown. But Otis had profoundly stirred the people and as John Adams afterwards said, "then and there the child independence was born." This was in 1761. The Sugar act of 1764 was followed by the Stamp act of 1765, which was strenuously resisted. On Aug. 26, 1765, the most destructive and disgraceful riot of the period attacked the house of Hutchinson, then lieutenant governor, and later chief justice, gutted it and destroyed his magnificent library containing many irreplaceable sources of Massachusetts history.

Other and soberer methods were legitimately and effectively used. Business men refused to use the stamps. Trade came to a practical standstill as the tax stamps had to be affixed to invoices and other written evidences of transactions. Even the courts closed for lack of triable causes, for the writs and all other documents had to be stamped. The Stamp Act was a failure and nothing remained for Parliament to do but to repeal it, which it did in 1766. Of all the American towns Boston was the most enthusiastic in this opposition and at the back of Boston was the Caucus Club of active citizens bent on influencing opinion and action. The most influential member of this club was Samuel Adams, whose activities have given him the title of Father of the

American Revolution. With the repeal of the Stamp Act came the Declaratory Act in which Parliament declared its right to tax the Colonies. Under this declaration of policy the Townshend Acts were passed, placing duties on lead, glass, papers, paint and tea. This led to a prompt boycott by the Boston merchants. The merchant class were not revolutionaries at heart but they made common cause with Samuel Adams and the proletariat for trade purposes. Probably they thought they were making use of Samuel Adams for their own purposes while he was quite as certain that he was using them for his. The time was to come when he would lead them farther than they probably intended and they found themselves in a position from which they could not draw back. The matter was now so acute that it had mounted to chronic defiance and two regiments of regulars were despatched to the town and camped on the Common, being denied housing among the citizens. Friction was inevitable. At last, on March 5, 1770, a group began to harass a sentinel on King (now State) street near the town house. Finally the squad called to his support, fired, killing several men. The Boston Massacre, as it came to be called, showed that in view of the feeling of the moment, troops could not be quartered in the town without danger both to the citizens and the troops themselves. A committee with Samuel Adams as its head, demanded the withdrawal of the regiments to the castle. Hutchinson, now acting governor, demurred and sought to compromise on one regiment but to Adams's reply "both regiments or none," he yielded. It became evident to the British Parliament that these Acts could not be enforced and they were repealed except the tax on tea which was kept for the assertion of the principle involved. Samuel Adams and his associates led the opposition to the principle. Finally, three ships bearing cargoes of tea arrived in the harbour and were moored at Griffin's wharf. For several days there were conferences and meetings in which Adams played the leading part, looking toward the return of the ships without landing the tea. On Dec. 16, 1773, at the close of a town meeting, which adjourned with Adams's statement: "This meeting can do nothing more to save the country," a group of citizens, largely responsible men, disguised more or less thoroughly as Indians, proceeded to the wharf, boarded the vessels, opened their chests and threw the tea into Boston harbour. So entirely was the mob an orderly one and the radical act so conservatively carried out that it evinced not a spontaneous act, but a carefully premeditated one. It was an act which could only be passed unnoticed if the Government intended to waive all but ostensible sovereignty. This it was not prepared to do and the Boston Port bill was the result. This closed the port of Boston and, as this meant the ruin of the city, it precipitated formal revolt. More troops were sent to preserve order. Gage, in command, was a rather mild administrator and did his best in trying circumstances. The Colonies formed a skeleton military organization called Minute Men, prepared to muster on the shortest possible notice, and gathered ammunition and supplies. Gage promptly sent a detachment to that part of Charlestown now Somerville and destroyed some of these stores. In April 1775 he decided to send a secret expedition to capture or destroy military stores at Concord. His plans were suspected by the insurgents and his movements noted. On the evening of April 18 an expedition was sent out. By an agreed plan of signals Paul Revere, waiting at the Charlestown shore, learned the route by which it had started and on a horse borrowed for that purpose, rode through the country arousing the inhabitants. He was joined by William Dawes, who had left Boston by another route and by the time the regulars reached Lexington green, their pathway was obstructed by a small company of Minute Men. This was the first armed resistance. After an exchange of volleys, in which eight of the militia were killed, they gave way. The regulars proceeded to Concord but found that the greater part of the stores had been carried to safety. There occurred the fight at the Bridge (in which both sides lost men) and the withdrawal of the British. As the Minute Men came in from the country they harassed the British column until the withdrawal became a retreat and the retreat a rout. Thus the American Revolution began with British troops out of Boston, contesting with militia aroused by Boston men. The war was accepted by the colonies. Siege was immediately laid to the town by a half ring of forts erected on the landside. These New Englanders were reinforced by troops from the other Colonies. The Continental Congress, though it had not yet declared independence, made George Washington commander-in-chief of the American armies. Before he reached Cambridge, Gen. Ward, then in command, sent a detachment of troops under Prescott and Putnam, to fortify Bunker hill in Charlestown, which commanded the town on the north. Howe, then in command of the British forces, decided to carry the hill by storm. The colonials were courageous men and excellent marksmen. They repelled the first attack with great slaughter; a second was made, the steady Britishers reforming and mounting the hill again only to meet another sanguinary repulse. On the third attack the ammunition of the colonials was exhausted and after a bayonet struggle, they made an orderly and soldierly retreat. Technically a victory for the British, it was purchased at such a cost that it gave the colonies great encouragement and its anniversary is celebrated in Boston to this day. The siege continued unabated until, after the Colonials occupied Dorchester Heights closely overlooking the town, Howe evacuated the city on March 17, 1776. Boston was never again in the theatre of the war during the Revolution. Its entire population was not in accord with the revolt. Howe carried with him great numbers of loyalists to Halifax and others remained to bear reprisals.

Four years before the treaty of peace was signed, a convention was held in Boston and formed a State Government for Massachusetts. The town, under the Articles of Confederation and the Constitution maintained the old town-meeting system.

Post-Revolutionary Period.—From the time of the ratification of the treaty of peace until 1822 when it became a city, the history of Boston is blended with the broader history of national and State politics. It early became Federalist in its tendencies and was the chief Federalist centre of the country so long as that party existed, wavering but once and then briefly at the time of the negotiation of Jay's treaty. During the Shays's rebellion it strongly supported the firm policy of Gov. Bowdoin and returned a substantial majority for his re-election, although he was defeated in the State. It strongly supported the ratification of the Federal Constitution. The town was vigorously anti-Jeffersonian especially upon his embargo policy. Although the town was not averse to a declaration of war at the moment, this peaceful commercial warfare was almost as destructive to its life, as the Port bill had been a third of a century before. It was at this time that John Quincy Adams warned the administration that treason and secession were afoot in Boston. Although things did not go so far as that, there certainly was much discussion as to the State's relations to the Union and the possibilities contained in a separation. Bostonians were sent as delegates to the Hartford convention and its chairman, George Cabot, was a Bostonian. The action of this body set New England and its chief city apart from the rest of the country, in the eyes of many of the inhabitants of other states, as an independent thinking, superior feeling, critical section, a feeling to be soon intensified by the anti-slavery movement which had its beginning 20 years later.

A movement which had a deep effect on the life of Bostonians was the shift of religious belief from the Trinitarian to Unitarian Congregationalism, marking the disintegration in many of the old historic churches of the Puritan theology. Jonathan Mayhew, one of the patriot ministers of the middle of the 18th century, began the movement. It progressed slowly at first but with increasing momentum. By 1780 many pulpits were filled by liberal ministers. The rector of King's chapel, at the time of its separation after the Revolution from the Church of England, made his own revision of the prayer book, leaving out the Trinity. He was refused ordination by two American bishops and in 1782 he was ordained by the congregation. This was the first Unitarian Church organization in America (*see* UNITARIANISM). In 1825 the American Unitarian Association was organized and its headquarters has always been maintained in the city.

The City of Boston.—In 1822 Boston outgrew the town meeting. It then adopted a city charter, with a mayor, a board of

aldermen and a common council. The legislative branch for many years had certain administrative functions through its committees and elected certain officers such as assistant assessors. The first mayor was John Phillips, elected after one trial which had resulted in a stalemate between Josiah Quincy and Harrison Gray Otis. Both were chosen subsequently. Josiah Quincy, the second mayor, even to-day, goes down as the executive of the greatest activity, broadest municipal outlook, and practical sense of any mayor the city has had. The original charter has been changed many times by the State legislature. The mayor's term was extended, first to two years, then to four. The administrative functions of the committees of the city council have been abolished, and the police department put under State control, obviating or at least minimizing such scandals coming from the control of the police by predatory political machines, as have risen in other cities. The board of aldermen and the common council have been abolished, and a comparatively small single chamber has been substituted with powers greatly curtailed. A Finance commission has been created, appointed by the governor of the State, with powers of summoning witnesses and administering oaths; it has sometimes been effectual in uncovering official corruption and even more by the restraint its very existence puts on administrative abuses. Numerous efforts to abolish it on the part of corrupt politicians at elections have so far been fruitless. Party designations at elections have been abolished with the intent to concentrate municipal thought on local rather than national issues. Candidates are nominated on petition, thus abolishing party responsibility but leaving nothing else in its place.

After the organizing of the city under the original charter, the next important event was the Boston Anti-Slavery movement. The abolition movement began in 1831 when William Lloyd Garrison, a native of Newburyport, removed to Boston and began the publication of *The Liberator*. A year later the New England Anti-Slavery Society was organized by a small number of the uninfluential citizens. Their opponents consisted of the wealthy and aristocratic class. They had southern investments in business which was adjusted to slavery both north and south. In 1835 a public pro-slavery meeting was called and was presided over by the mayor of the city with the most aristocratic and exclusive Bostonians among the vice presidents and speakers. The sentiments of this meeting led to the mobbing of Garrison in his office on Oct. 21, 1835. Garrison was soon joined in his activities by Wendell Phillips, son of the first mayor, a young lawyer, stung to espouse the cause largely by the defence of the conservatives in the murder of Lovejoy in Illinois. They attracted others. Even "the best people" found their enthusiastic kinsmen joining the movement. In 1850 the south played into the hands of the Abolitionists by the passage of the Fugitive Slave law. Opposition to the act reached its peak following the arrest of Anthony Burns on rendition process on May 24, 1854. The anti-slavery leaders determined upon mob violence. Clergymen, philanthropists, scholars, felt it their duty to engage in this attempt. But the sortie, which was planned to follow a protest meeting, failed through the tentative plans leaking out. Burns was carried to the ship by the entire military strength of the county, with loaded muskets and cannon loaded with grape at street corners, between rows of buildings draped in black as though for the death of a national ruler. Lincoln himself once inferentially stated that Boston more than any other city was responsible for the agitation which led to secession and the Civil War.

In the Civil War, Boston sent organized troops at Lincoln's first call to the relief of Washington. It organized the 54th Regiment consisting of Negro soldiers, the first Negro gesture of earned freedom. Like all large cities it had its disloyal elements whose disturbances culminated in a riot at the Cooper street armory at which the commander of the artillery swept the street with grape shot.

Before and after the Civil War Boston was the literary centre of the United States. America's chief essayists, historians, poets, philosophers and novelists lived in and around the city. Nearly contemporary with one another were Emerson, Hawthorne, Bancroft, Prescott, Motley, Parkman, Thoreau, Whittier, Longfellow, Holmes, Lowell, R. H. Dana, Jr., and later Thomas Bailey Aldrich.

The greatest physical calamity within the history of the city was the great fire of Nov. 9–10, 1872. It broke out on a Saturday night in the wholesale district and spread rapidly over 67ac. on which stood 767 buildings filled with merchandise. Property, real and personal, to the estimated amount of over $75,000,000 was destroyed in less than 24 hours. Beyond the loss of 14 lives, the disaster was almost entirely commercial, as there was little residential property within the burned district. The city made a quick recovery and a new district was soon built of better material, with streets straightened and widened.

In Sept. 1919, the Boston Social club, formed of the great majority of the police patrolmen of Boston, began to agitate for certain reforms in their conditions, especially concerning salary. The commissioner (a State officer) was Edwin U. Curtis, ex-mayor of the city. He endeavoured to obtain a rise in pay for the force, but was balked by the mayor of the city. The members of the Social club then sought to join the American Federation of Labor and to organize a policemen's union. Curtis, treating his force as a military body in which a union can have no place, forbade the police from joining such a union. It was formed in face of his orders. Curtis ordered the leaders before a court of inquiry by whom they were found guilty and dismissed from the force. This was followed by the overwhelming majority of the patrolmen of Boston going on strike. A night of pillage ensued, followed by several days of spasmodic out-breaks in different parts of the city. A small force of volunteers joined the few loyal patrolmen, but no effective action could be taken because of friction between the mayor and the commissioner. Governor (later President) Coolidge then ordered out the entire State Guard and as commander-in-chief took control of the situation and immediately recalled Curtis to active command. Order was restored and the State guard continued to do police duty until a practically new police department was recruited and organized. The strikers were deemed deserters and have never been re-instated, though efforts have been made in their behalf.

Until the middle of the 19th century Boston, though it had changed in some measure in the prevailing religious opinions and had increased in population, had altered very little indeed in its racial balance. There was the same prevailing New England stock, coming with more or less directness from the 17th century settlers and about the same proportion of other nationalities which it has always possessed. But with the famine in Ireland, the Irish immigration began. It came in an ever increasing flood. Other nationalities, Hebrew (very largely from Russia), Italian, Canadian, Polish, Scandinavian, Armenian, Lithuanian and Balkan peoples have followed in large numbers. By the beginning of the 20th century it had become a non-Anglo-Saxon city, with strong influential threads of old time English, Scotch and Scotch-Irish running through the fabric. In influence it is predominantly Irish, as any list of its city government within 30 years will clearly show. It has been Puritan, then Unitarian; it is now Roman Catholic. It has had its spasms of ill feeling, its religiously proscriptive movements. Now the change is accepted and recognized. The Protestant churches have faced a difficult problem. Largely the old congregations have moved outside the city limits and there has been much church consolidation. The city, for years conservative in ordinary matters, has become largely, if not philosophically, radical. All the inevitable shifting of population which comes with great metropolitan growth, has come about in Boston. Yet it is only fair to say that its historical heritage has been potent and is cherished by its present population. It is no longer the centre of the New England idea but a typical American city, lacking in racial homogeneity, and having characteristics shared by its sister municipalities of metropolitan proportions.

Gardner Museum.—The Isabella Stewart Gardner museum is in the Back bay fens. It was originally built for a residence by Mrs. Gardner, in imitation of an Italian palace. Here she brought many art treasures. By her will the building and its contents were left to the public and is open to it at stated intervals. It is less formal than most art museums, and has the appearance of being inhabited.

Charles River Basin.—The Charles river dam was completed in 1910. This piece of engineering has removed the flats previously exposed at low water. The dam and machinery of control maintains the water of the basin at an even height. Covered canals on either side of the river take the excess sewage and deposit it beyond the dam in the tide water. The basin and the embankments are used for perch purposes and on the Boston side are memorials to Oliver Wendell Holmes and Edwin U. Curtis.

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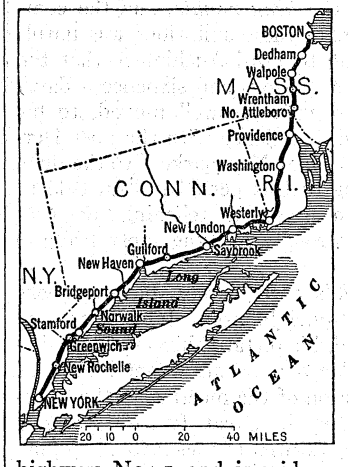
BOSTON, a game of cards invented during the last quarter of the 18th century. It is said to have originated in Boston, Massachusetts, during the siege by the British. It seems to have been invented by the officers of the French fleet which lay for a time off the town of Marblehead, and the name of the two small islands in Marblehead harbour which have, from the period of the American Revolution, been called Great and Little Misery, correspond with expressions used in the game. William Tudor, in his *Letters on the Eastern States,* published in 1821, states somewhat differently that "A game of cards was invented in Versailles and called in honour of the town, Boston; the points of the game are allusive, 'great independence,' 'little independence,' 'great misery,' 'little misery,' etc. It is composed partly of whist and partly of quadrille, though partaking mostly of the former." The game enjoyed an extraordinary vogue in high French society, where it was the fashion at that time to admire all things American. "The ladies . . . filled my pockets with bon-bons, and . . . called me *'le petit Bostonien.*" It was indeed by the name of Bostonian that all Americans were then known in France.

The rules of Boston recognized in English-speaking countries differ somewhat from those in vogue in France. According to the former, two packs of 52 cards are used, which rank as in whist, both for cutting and dealing. Four players take part, and there are usually no partners. Counters are used, generally of three colours and values, and each hand is settled for as soon as finished. The entire first pack is dealt out by fours and fives, and the second pack is cut for the trump, the suit of the card turned being "first preference," the other suit of the same colour "second preference" or "colour," while the two remaining suits are "plain suits." The eldest hand then announces that he will make a certain number of tricks provided he may name the trump, or lose a certain number without trumps. A player may pass, and the next player bids. Succeeding players may "overcall," *i.e.,* overbid, previous bidders. Players passing may thereafter bid only *"misères."* If a player bids seven but makes ten he is paid for the three extra tricks, but on a lower scale than if he had bid ten. If no bid should be made, a *"misère partout"* (general poverty) is often played, the trump being turned down and each player striving to take as few tricks as possible. Payments are made by each loser according to the value of the winner's bid and the overtricks he has scored. There are regular tables of payments. In America overtricks are not usually paid for.

BOSTON AND MAINE RAILROAD, THE, one of the principal systems in the North-eastern States of the United States, with important connections between New England and the South, the West and Canada, is the result of the gradual amalgamation of 111 separate railroads. Included are the former Boston and Lowell, first steam railroad projected in New England (incorporated June 5, 1830); the former Fitchburg railroad, the former Eastern railroad and the original Boston and Maine, an outgrowth of the Andover and Wilmington (chartered in 1833). The present system operates 3,778 mi. of track in Massachusetts, New Hampshire, Maine, Vermont and New York. It is administered from Boston, the principal terminal. Other terminals and important connection points are at Troy and Mechanicville-Rotterdam, N.Y., on the west; Portland, Me., on the east; Bellows Falls, White River Junction and Wells River, Vt., and Woodsville, Groveton and Berlin, N.H., on the north; and at Worcester and Springfield, Massachusetts, on the south. The Boston and Maine operates a fast freight service, bringing perishables, coal, raw materials and commodities into New England from the rest of the United States and Canada, and carrying manufactured and other products to the nation's markets. It is also one of the country's largest carriers of milk and potatoes. Serving a thickly populated section with local and commuting passenger service, the road also provides fast through service between Boston and Canadian Maritime Provinces, Quebec and Montreal, and via the Mohawk trail and Hoosac tunnel to Chicago and the West; as well as connecting services between its northern points and New York, Philadelphia and Washington. The Boston and Maine serves visitors to many historic shrines and scenic and recreation spots of New England. The capital of the road (capital stock and funded debt) was, in 1939, $251,605,296.45; leased road capital, $19,673,700. (E. S. F.)

BOSTON FERN, a variety (*bostoniensis*) of the sword fern (*Nephrolepis exaltata*) originated in cultivation. It was introduced in 1895 by F. C. Becker and named in honor of the city of Boston, Mass., in the vicinity of which it was discovered. It is a strong, free-growing plant, with drooping, dark-green foliage, and is much less stiff in habit than the typical sword fern. It is one of the best ferns for decorative purposes, growing well indoors in pots or baskets, and is hardy out-of-doors in gardens and rockeries in the southern States. From this mutant, or from variants derived from it, have arisen numerous remarkable forms with very finely cut, crisped or otherwise peculiarly developed leaflets. Among these are the varieties *elegantissima, robusta, magnifica* and *superbissima* which are interesting also as examples of rapid evolutionary development.

BOSTONITE, in petrology, a fine-grained, pale-coloured, grey or pinkish rock, which consists essentially of alkali-felspar (orthoclase, anorthoclase, microperthite, etc.). Some bostonites contain a small amount of interstitial quartz (quartz-bostonites); others have a small percentage of lime, which occasions the presence of a plagioclase felspar (lime-bostonite). Other minerals, except apatite, zircon and magnetite, are typically absent. They have very much the same composition as the trachytes; and many rocks of this series have been grouped with these or with the orthophyres. Typically they occur as dikes or as thin sills, often in association with nepheline-syenite.



BOSTON IVY: *see* VIRGINIA CREEPER.

BOSTON POST ROAD, THE, extends from New York to Boston and is 235m. in length. It had its origin in the Old Post road of colonial days, but has since been relocated, shortened and improved. It forms part of the Atlantic highway and U. S. highway No. 1 and is wide enough for 4 rows of vehicles. A beautiful shore drive for much of the way, it passes through historic southern New England and includes Stamford, Bridgeport, New Haven, New London, Providence and Wrentham in its course.

BOSTRÖM, CHRISTOFFER JACOB (1797–1866), Swedish philosopher, was born at Piteå Jan. 1, 1797, and died March 22, 1866, at Uppsala. He studied at Uppsala, where he was professor of practical philosophy from 1840 to 1863. His philosophy was a rational idealism, founded on the principle that

the only reality is spiritual. From this he developed a political theory of the ideal state as a constitutional monarchy with willing and obedient subjects. *See* H. Höffding, *Filosofien i Sverig* (1879), and *History of Modern Philosophy* (Eng. trans. 1900). Boström's works were edited by H. Edfelt (2 vols. Uppsala, 1883).

BOSWELL, JAMES (1740–1795), the biographer of Samuel Johnson, was born at Edinburgh on Oct. 29, 1740. He was the eldest son of Alexander Boswell, who on being raised to the bench took the title of Lord Auchinleck. According to the son's account, he had "all the dignified courtesy of an old baron"; but he was also an ardent Whig, whilst James, at the age of five, "wore a white cockade and prayed for King James." But one of his uncles gave him a shilling and the boy promptly prayed for King George instead. "So you see," said Boswell to Johnson in later years, "that Whigs of all ages are made in the same way." James was sent to the High School and afterwards to the University of Edinburgh. Here his friendship began with William Johnson Temple, afterwards vicar of Mamhead in Cornwall; at the end of their first term Boswell suggested that they should write to each other and thus was begun a correspondence which was to last 37 years.

The earliest extant letters from Boswell to Temple are dated July 29 and Dec. 16, 1758, and are thoroughly characteristic of the series. Boswell thanks God that he is in pretty good health and spirits; the violence of his passion for Miss W——t has given place to a rational esteem of her good qualities; he has but little hope of her hand since she is now a fortune of £30,000, but how transporting to think of such a lady to entertain Temple at Auchinleck! Meantime he is vastly happy with the thoughts of the northern circuit, though he contrasts his laborious study of the law with Temple's less exacting course at Cambridge. He has begun to keep an exact journal and to contribute trifles to the magazines. A few of his poems are enclosed for Temple's delectation.

Here is the authentic Bozzy, who two years later described himself in doggerel verse but with accurate self-perception:

Boswell is pleasant and gay,
For frolic by nature design'd;
He heedlessly rattles away
When the company is to his mind.
"This maxim," he says, "you may see,
We never can have corn without chaff";
So not a bent sixpence cares he,
Whether *with* him or *at* him you laugh.

In 1759 Boswell sat under Adam Smith in Glasgow and in the following year came to London for the first time, his mind "filled with the most gay ideas—getting into the Guards, being about Court, enjoying the happiness of the *beau monde,* and the company of men of Genius." The first of these ambitions was unfulfilled, the duke of Argyll declaring to Lord Auchinleck that the boy "must not be shot at for three shillings and sixpence a day." On his second visit to London in 1762 Boswell moved, to his delight, in gay circles. He formed an alliance with the poet Derrick and dedicated his poem "The Cub at Newmarket" to the duke of York. Another poem belonging to this period is "An Ode to Tragedy," dedicated by Boswell to himself as relishing "the productions of a serious muse" as strongly as "the most brilliant sallies of sportive fancy."

The *annus mirabilis* in Boswell's early career, however, was 1763, the year in which he met Samuel Johnson. Johnson was 53 years old—his dictionary published, his dictatorship established—Boswell was 23, a young Scotch lawyer and an ardent hunter of celebrities. Boswell's own description of the meeting in the back-parlour of Tom Davies's book-shop in Great Russell street is one of the best pages in English literature. Davies, after enjoying Boswell's temporary discomfiture, shrewdly reassured him: "Don't be uneasy: I can see he likes you very well." It was a true estimate. In a little more than a month Boswell was supping *à deux* with Johnson at the Mitre and sitting over a sober bottle till between one and two in the morning; the friendship ripened quickly and, *inter alia,* Johnson helped Boswell, who had earlier toyed with Roman Catholicism, to become "a rational Christian." Boswell was also making other and different friendships: he found John Wilkes, for instance, "a most agreeable companion." In Aug. 1763 Johnson gave a signal proof of his attachment to Boswell by travelling with him to Harwich, whence Boswell embarked upon his Continental tour. At Utrecht he divided his time between study and amusement and, in spite of "many beautifull and amiable ladies," claimed to have repelled dissipation. With one lady, however, Isabella de Zuylen (Zélide) Boswell formed a remarkable friendship, addressing to her from Berlin a long letter of discursive frankness. Even more remarkable were his letters to Rousseau with whom, as with Voltaire, he determined to obtain an interview. These two men were to him "greater objects than most statues and pictures." To Rousseau Boswell described himself as "a man of singular merit." "Open your door," he wrote, "to a man who dares to say that he deserves to enter there. Trust a unique foreigner. You will never repent it. . . ." Later he was able to thank him for "a truly gracious welcome." Boswell was also successful in obtaining an hour's "very serious" conversation (the most brilliant he had ever heard) with Voltaire. At Naples, Boswell developed his intimacy with John Wilkes, who declared that Boswell, "the most liberal man he had ever met with," would be engraven upon his heart.

But the main objective of Boswell's continental tour was Corsica. He wished, he said, for "something more than just the common course of what is called the tour of Europe" and Corsica occurred to him as a place which nobody else had seen. Further, Corsica made a double appeal to Boswell's romantic sensibility: it suggested to him, first, the "state of nature" where there dwelt a "prisca gens mortalium" and, secondly, its people were a nation "actually fighting for liberty" against the Genoese under the heroic leadership of Pasquale Paoli. Boswell became a fervid enthusiast for the Corsican cause, regarding himself as the "ambasciadore Inglese" and writing careful paragraphs about his progress for *The London Chronicle.* Finally, he cultivated the society of Paoli with that minute and skilful care which he was afterwards to bestow upon Johnson. In the costume of a Corsican chief he obtained an interview with Chatham; but, politically, his advocacy of the cause of the Corsicans was a failure. "We cannot be so foolish," said Lord Holland, "as to go to war because Mr. Boswell has been to Corsica." Meanwhile *An Account of Corsica, The Journal of a Tour to that Island and Memoirs of Pascal Paoli* had been published in 1768 by Charles Dilly, who paid one hundred guineas for the copyright. The *Journal,* which was recognized by others besides Johnson as "in a very high degree curious and delightful," was Boswell's first literary experiment of importance and, in particular, the "Boswellizing" of Paoli was the first indication of Boswell's sureness of touch in biographical selection and composition. The writing of the *Account of Corsica* had, according to Boswell's own record, elevated his soul and made him *spernere humum.* On the other hand, he could never resist the allurements of sundry "little charmers." "Can I do better," he wrote to Temple, "than keep a dear infidel for my hours of Paphian bliss?" Then a little later he would be abashed and determine to keep the strictest watch over his passions. For a time his letters are full of the praises of Miss Blair; then Zélide reappears; then in 1768, "la belle Irlandoise" (Miss Mary Anne Montgomery) had for a time no rival; he had never, he wrote, been so much in love. But the charming Mary Anne would not treat him seriously and so he turned to his cousin Margaret Montgomerie, who had been commended to him by Sir Alexander Dick as a lady of "nutritive" conversation. "Indeed," wrote Boswell, "it is such as nourishes me and like sweet milk, tempers and smooths my agitated mind." The marriage took place at Lainshaw in Ayrshire in Nov. 1769. Sir Joshua Reynolds's portrait of Mrs. Boswell, now at Malahide castle, shows her to have been a beautiful woman.

As a lawyer, Boswell had not been wholly idle. He had been admitted as an advocate in 1766 and he told Temple that he earned 65 guineas in the winter of 1766–67. Shortly afterwards, the famous Douglas case came up for trial, the issue being whether Archibald Douglas was the real heir to the Douglas estates. In the court of session the claimant was defeated, but the decision was reversed by the House of Lords. Anything in the nature of a *cause célèbre* held a peculiar attraction for Boswell and in

June 1767 he wrote a little book entitled *Dorando, A Spanish Tale,* in which the Douglas case was summarized under a thin disguise. It was published just before the decision of the Scottish court was pronounced and three editions were published before it was suppressed. Later in the year Boswell wrote a more ambitious volume, *Essence of the Douglas Cause,* on the same subject.

For the first years after his marriage Boswell was not much in London and he found it hard to make Johnson a frequent or regular correspondent; accordingly, he begged Mrs. Thrale, as a generous rival, to put "the Oracle" in mind to write to him. In 1772, however, Boswell visited London and was busy with his biographical note-book. In particular, he beheld, with reverential awe, the spectacle of Johnson studying his large folio Greek Testament during the course of Passion Week. The year 1773 was even more memorable in Boswell's career. He arrived in London on April 2, having previously addressed a charming letter of congratulation to Goldsmith on the success of *She Stoops to Conquer,* its first night (March 15) coinciding with the birth of Boswell's eldest daughter, Veronica. It was during this visit to London that Boswell was elected to membership of the club and even more gratifying to him was Johnson's final consent to accompany him on a Scottish tour. The plan had been discussed ten years before, and on April 14, 1773, Boswell had the satisfaction of walking arm-in-arm with his friend up the High street of Edinburgh, though he could not prevent "his being assailed by the evening effluvia." From Edinburgh the travellers went north to St. Andrews, Dundee, Montrose and Aberdeen. At Aberdeen Johnson received the freedom of the city, "not in a gold box, but in good Latin." At Fort George they were entertained by Sir Eyre Coote and the 37th Foot; by the side of Lochness Johnson found a woman living in an earth hovel and hardly able to speak a word of English. Crossing the Atlantic in an open boat from Skye, Johnson "sat high on the stern like a magnificent Triton"; and at Rasay he declared, "This is truly patriarchal life: this is what we came to find." These and many other "exquisite traits of character" are recorded in Boswell's *Journal of a Tour to the Hebrides* (1785). A visit on the way back from the Hebrides to Boswell's home was less fortunate: in spite of Johnson's promise to eschew political discussion with Lord Auchinleck, the talk turned inevitably to politics and "Whiggism and Presbyterianism, Toryism and Episcopacy were terribly buffeted." Boswell in his *Journal* expressed the charitable hope that both men had subsequently met in happiness, and "in a place where there is no room for Whiggism."

For the ten years after the tour to the Hebrides, the record of Boswell's life is a not very edifying story of quarrels with his father, difficulties in money matters, and failure to resist the pleasures of fermented liquor—"not drunk, but intoxicated," was his own careful description of himself on a particular evening. He generally contrived to visit London in the spring and made the best of his opportunities for intercourse with Johnson, accompanying him to Lichfield, Ashbourne and Oxford. One of Boswell's note-books for the years 1776 and 1777 (*see* bibliography) is good evidence both of the minute attention he was giving Johnsonian detail at this time and also of the literary skill with which the new material was fashioned into biographical narrative. Nor was Boswell idle as a journalist. For the *London Magazine* he wrote a series of about 70 papers called *The Hypochondriack* (1777–83). In 1782 Lord Auchinleck died, and succession to the family estate fired Boswell with political ambitions. He attacked Fox's India Bill with a pamphlet entitled *A Letter to the People of Scotland* and for a time contemplated candidature for Parliament. The *Letter,* in Boswell's own opinion, was an "excellent pamphlet," but Johnson warned him that it might not make him a Minister of State. At Sir Joshua Reynolds's house, on June 30, 1784, Boswell dined with Johnson for the last time. After dinner they drove together as far as the entry to Bolt court. "When he had got down from the foot-pavement," writes Boswell, "he called out, 'Fare you well'; and, without looking back, sprung away with a kind of pathetick briskness. . . ." On Dec. 13 Johnson died.

The remaining years of Boswell's life are marked by one not very important appointment (the recordership of Carlisle), by a number of pathetic failures—his second *Letter to the People of Scotland,* his dearth of briefs at the English bar, his unlucky speculations, his vain attempts to enter parliament—and by one supreme achievement, the publication of his *Tour to the Hebrides* (1785) and of his *Life of Samuel Johnson* (1791). The immediate success of both volumes served to revive the author's waning self-esteem, but debts and dissipation induced a recurrent melancholy. Boswell had moved to London at the end of 1788. His wife, however, disapproved of London fogs and shortly returned to Auchinleck, where she died. Boswell reproached himself bitterly for leaving her—the reflection, he said, would pursue him to the grave. Two years later, however, he was contemplating "several matrimonial schemes"; among them one relating to the daughter of a dean, "a most agreeable woman, *d'un certain âge* and with a fortune of £10,000." But neither prospective dowries nor the spontaneous praise of literary critics could properly restore his earlier buoyancy. Worn out by the violence of his pleasures, he died in 1795.

The study of Boswell's personality has, until lately, suffered an undue neglect. Macaulay, by far the most powerful influence on Victorian literary taste, settled the matter to his own satisfaction in his famous essay of 1832 and, in spite of Carlyle's more penetrating view, it was Macaulay's essay that determined the English reader's attitude to Boswell for three generations. About Boswell the biographer Macaulay had no doubts: Eclipse was first and the rest nowhere. But what could be said of Boswell the man? "Servile and impertinent, shallow and pedantic, a bigot and a sot. . . ." How could such a man have written the greatest biography in literature? Macaulay is ready with his famous *lucus a non lucendo*: "If he had not been a great fool, he would never have been a great writer." But the "inspired idiot" theory has by now been many times exploded. A reading of Boswell's letters, or even of his *Advertisement* to the first edition of the *Life* is, indeed, sufficient to confute the suggestion that his triumph is accidental. He had been obliged, he said, to run half over London, in order to fix a date correctly, and was genuinely astonished at his own determination. Those of his proof-sheets which have been preserved contribute further evidence of his careful workmanship. "I am much pleased with this sheet as now arranged," he wrote on the "revise" of the first sheet. "As I have made a little alteration, which will only shorten a note a line or so, let me have another *Revise* . . ."; and again, on the fourth sheet, "Pray be very attentive that I may have no cancels and few Errata." Furthermore, Boswell was convinced not only that he was doing his work with thoroughness but that his "mode of biography" was "the most perfect that can be conceived." About this self-assessment there may still be legitimate difference of opinion, but few would dispute Boswell's claim that his book was "more of a Life than any work that [had] ever yet appeared." Boswell's peculiar skill lay in utilizing his qualities as a journalist in the building of his biographical structure. A born interviewer and note-taker, he realized that his notes and recollections were not merely to be thrown together to make a farrago of reminiscence, but were to be treated as the raw material of the literary artist. His instinct as a journalist prompted him to record a hundred incidents and conversations which the academic biographer would have discarded as inconsiderable trifles; at the same time he knew that his first-hand knowledge, which was confined to a small portion of Johnson's life, must be supplemented by the hard labour of biographical research. As for the skill he displayed in welding his material into dramatic narrative, it is only necessary to recall such an account as that of the first meeting between Johnson and Wilkes. Finally, Boswell, for all his hero-worship, treated Johnson not merely as a commanding figure which inspired him to "Johnsonize the land," but as the centre of the 18th-century English scene. He knew that Johnson, whose greatest terror was loneliness, would appear at his best and most "characteristical" in the company of his contemporaries; and it is not the least of Boswell's glories that his book is at once an intimate portrait of the Great Lexicographer and an encyclopaedia of 18th-century social life. On his title-page he described his work as "exhibiting a view of literature and literary men in Great Britain for near half a century"; and

the title-page, like the rest of the book, was drafted with deliberate care and accuracy. From first to last Boswell was the conscious artist.

BIBLIOGRAPHY.—Boswell's commonplace-book was published by C. Rogers in 1876, with notes and a memoir, under the title *Boswelliana;* there is also a *Life* by Percy Fitzgerald (2 vols., 1891), and a shorter work by W. Keith Leask (1896). In *Young Boswell* (1922), a series of essays on Boswell's earlier career, C. B. Tinker introduced extracts from unpublished letters which were afterwards incorporated in his edition of *The Letters of James Boswell* (1924). This edition included the letters to W. J. Temple (originally published in 1857 and re-edited by T. Seccombe in 1908), the letters already printed in the *Life of Johnson* and elsewhere and nearly 100 letters not printed before. In 1927 the material upon which the definitive *Life* of Boswell will no doubt be based was sold by Lord Talbot de Malahide, a descendant of Boswell on his mother's side, to Colonel Ralph Isham, an American collector. This material, prepared by Geoffrey Scott, was first printed privately, 1928–34. Boswell's *Life of Johnson* went through ten editions before Croker's edition of 1831, which provoked the famous essays of Macaulay and Carlyle. (*See* JOHNSON, SAMUEL.) Of the early editions the third (1799) and the sixth (1811) are the safest. Napier's edition of 1884 contained some valuable material, but the edition *par excellence* is that of Birkbeck Hill (6 vols., 1887). Four volumes contain the *Life,* one the *Tour to the Hebrides,* and one a monumental *Index.* This edition is at present out of print and is being revised by L. F. Powell. There are many handy reprints of the *Life* (*e.g.,* the Oxford, Globe and Everyman editions); the best illustrated edition is that of Roger Ingpen (first published in 1907 and re-issued in 1925). Of Boswell's other works the *Tour to the Hebrides* has been re-edited in company with *Johnson's Journey to the Western Islands* by R. W. Chapman (1924); and the *Journal of a Tour to Corsica* by S. C. Roberts (1922). *The Hypochondriack* has been elaborately edited by Margery Bailey (1928). One of the best collections of *Boswelliana* is that of R. B. Adam, of Buffalo. In particular, this collection contains one of Boswell's notebooks for the years 1776 and 1777. This was published (1925) with corresponding passages from the *Life* printed on opposite pages and with an introduction and notes by R. W. Chapman. R. B. Adam issued a privately printed edition in facsimile of the proof-sheets of the *Life. The Literary Career of James Boswell,* by F. A. Pottle (1929), contains the first exhaustive bibliography of Boswell. Pottle, with others, also compiled *Index to Private Papers of James Boswell* . . . (1937). (S. C. R.)

BOSWORTH FIELD, BATTLE OF, a decisive battle fought on August 22, 1485, on ground 12m. W. of Leicester, from which city King Richard III. moved out with his host. Its military insignificance is altogether disproportionate to its political results, which were to place the Tudor dynasty on the English throne and largely to aggrandize the autocracy of the Crown. Richard's usurpation and tyrannous acts incited many among the English nobility to support Henry Tudor, Earl of Richmond, in his claim to the Crown as heir in the Lancastrian line. Richmond, who had fled to France, organized rebellion, and landed on August 7 at Milford Haven with a small group of friends and 1,800 mercenaries. This force was augmented as he marched through Wales; Shrewsbury opened its gates to him; and he reached Atherstone, in Warwickshire, on August 20, by which time a considerable English contingent had joined his banner. At the battle his army did not exceed 5,000 men. King Richard had thrice this strength in numbers, but the loyalty of his followers was questionable. The king arrayed his force on the gently rising slope of Ambion Hill, Leicestershire, in the customary three bodies, or "battles" Richmond's army was drawn up in two divisions.

Although so greatly outnumbered, the earl attacked, confident of treachery in his enemy's ranks. A short march to circumvent a morass brought him upon the lower slope, where the first collision occurred. The earl of Northumberland, in command of the royalist left wing, held back when an advance should have taken place. The fate of the battle was decided by the defection from the royalist cause of Lord Stanley, who threw his retainers from Lancashire and Cheshire upon the king's flank and rear. All attempts to keep an order of battle thereupon ended. Richard was advised to quit the field, but declared that he would die King of England, and, sighting Richmond's banner flying, he charged with maddened fury upon it, accompanied only by his bodyguard. He killed Sir William Blandon, Richmond's standard bearer, with a blow, unhorsed Sir John Cheney, and was said to have actually engaged Richmond himself, but being borne down by numbers his head was split open and his brains scattered. The golden crown that had fallen from his head was picked up in a gorse bush, and Sir William Stanley (Lord Stanley's brother) set it upon the victor's head, while the ranks acclaimed Richmond as king. His losses were less than 100. The accepted estimate of 1,000 as Richard's losses is probably exaggerated. Richmond was crowned at Westminster five weeks later as King Henry VII. (W. G. B.)

BOTANICAL ARTICLES. The scope and range of the subject is indicated in the article BOTANY, while more detailed treatment of various aspects is given in the articles on the main branches: thus PLANTS AND PLANT SCIENCE gives a general account of the structure, physiology and distribution of the members of the vegetable kingdom; the history of the rise of the orders and their relations to one another is dealt with in the article PALAEOBOTANY; special structures are the subject of articles as those on FRUIT, FLOWER, LEAF, etc. The main groups of plants are described in more detail, with an account of their evolutionary history as far as is known, in such articles as ALGAE, ANGIOSPERMS, BRYOPHYTA, GYMNOSPERMS, PTERIDOPHYTA, FUNGI, etc. The important economic status of the last-named group is fully dealt with, and their association with certain algae described at length in the article LICHENS. Among the flowering plants, in addition to the general articles already mentioned, there is a shorter article on each of the more important families, *e.g.,* COMPOSITAE, GRASSES, LEGUMINOSAE, ROSACEAE, RANUNCULACEAE; while numerous short articles are devoted to individual plants, *e.g.,* ACACIA, BARLEY, BREADFRUIT, DANDELION, DAISY, RUBBER, TOMATO, WHEAT, etc. The important group of the Bacteria is dealt with in the article BACTERIOLOGY and such phenomena as plant CHIMAERA and WITCHES' BROOMS are also the subject of separate headings.

BOTANIC GARDEN. The original conception of a botanic garden was that literally implied by the name, that is, a garden, with the plants arranged according to some system of botanical classification. In the forerunners of the modern botanic garden, such as the gardens of simples commonly associated with schools of medicine in the 16th and 17th centuries, the planting was primitive and possibly based on the use of the plants, in medicine or otherwise, rather than on the more or less crude botanical concepts of the time. A botanic garden differs from a park, where the plants are usually arranged solely with reference to securing a beautiful landscape effect. The primary purpose of a park, moreover, is recreation, while that of a botanic garden has always been science and education. A botanic garden is properly defined as a scientific and educational institution whose purpose is the advancement and diffusion of a knowledge and love of plants.

A collection of living plants, out-of-doors or under glass, must always remain a major feature of botanic gardens, but the modern gardens usually possess, in addition, a herbarium, a library, experimental grounds for plant-breeding and other investigations, laboratories, classrooms, lecture halls and, in some cases, botanical museums, together with scientific, educational, and administrative staffs. Different institutions place the emphasis on different aspects of the work; and this may be determined by climate, area, tradition, resources, or ideals.

Botanic gardens have gradually developed by a process of evolution from such gardens as the early olive orchards and the temple gardens, like that, for example, at Karnak, Egypt—one of the earliest of which there is authentic record, dating from the reign of Thotmes III, about 1500 B.C. It seems probable that the very earliest gardens were utilitarian in purpose—for the growing of food and fibre plants and fruit trees. Temple grounds, however, were early planted; and to this practice we are probably indebted for the preservation, until now, of the "maidenhair tree," *Ginkgo biloba.* (*See* GINKGO.) One of the first gardens developed for the purpose of facilitating the study of plants was that of Aristotle, an ardent student of plants, who wrote books on botany, now lost. This garden was in charge of his pupil, Theophrastus, who continued and improved it after the death of the master. It would thus appear that, in modern terminology, the first patron of botany of whom we have record was Aristotle (*c.* 350 B.C.), and the first "director" of a botanic garden, Theophrastus, who also wrote

books on botany, two of which are still extant. Laërtius is authority for the statement that Demetrius Phalereus provided Theophrastus with the necessary funds for improving this garden, thus becoming, after Aristotle, one of the first wealthy patrons of botany.

The history of botanic gardens during the period between those of antiquity and the 15th or 16th century appears never to have been traced in detail. During the 16th and 17th centuries the herbalists (predecessors of the modern botanists) began to cultivate private gardens for the purpose of plant study. Perhaps the best known of these is the garden of John Gerard in Holland. These private gardens were the forerunners of the modern botanic gardens. The botanic garden idea spread rapidly in countries of older civilization during the 18th and 19th centuries. There were also vigorous attempts to establish botanic gardens in the United States, as Bartram's garden near Philadelphia, Pa. (1728), Evan's garden, also near Philadelphia (1828, an offshoot from Bartram's garden) and the Elgin Botanic garden, New York city (1801), established by David Hosack, M.D., and located on the site of Rockefeller center. Notwithstanding the phenomenal growth of the United States, the botanic garden idea was slow to take root; and it was nearly 60 years from the Elgin garden to the establishment of Shaw's garden (now the Missouri Botanical garden), at St. Louis, Mo., in 1859. This garden appears to be the oldest existing botanic garden in America organized as an independent institution. The Cambridge (Mass.) Botanic garden, of about seven acres, established in 1807, is the oldest of all existing botanic gardens in the United States. It has always been a part of Harvard university.

Modern botanic gardens in all countries are organized along closely similar lines. There is a director with a scientific (and sometimes an educational) staff, one or more head gardeners, a number of gardeners and a force of labourers for the maintenance of walks, driveways, and lawns. In the case of governmental gardens (*e.g.,* Kew in London, Edinburgh in Scotland, Glasnevin at Dublin, Ireland, the United States in Washington, Paris, Berlin, Buitenzorg in Java, Singapore, Port-of-Spain in Trinidad, Hope and Castleton gardens in Jamaica, and others) the director reports to a governmental minister or bureau, and the financial support comes wholly or chiefly from governmental appropriations. In the case of independent institutions (*e.g.,* Missouri Botanical garden at St. Louis; Rancho Santa Ana Botanic garden, Anaheim, Calif.; Boyce Thompson Southwestern arboretum at Superior, Ariz., and others) there is a board of trustees who administer the permanent funds and other income. Gardens that form integral parts of universities or other institutions (*e.g.,* Cambridge in England, Harvard at Cambridge, Mass., the Hortus Botanicus at Amsterdam, Holland, and Brooklyn at Brooklyn, N.Y.) are administered by the trustees of the given institution. A fourth group comprises those gardens which are supported in part by municipal or other governmental appropriations and in part by private funds administered by a board of trustees, as is the case, for example, with the New York Botanical garden and the Brooklyn Botanic garden. Various botanic gardens in Europe derive their support wholly or chiefly from the city in which they are located, as, for example, Bath (England), Bern (Switzerland), Marseilles (France), and Valencia (Spain).

Among botanic gardens that form an integral part of the botanical departments of colleges and other schools or are closely affiliated with them may be mentioned the following: Aberdeen, Dundee and St. Andrews universities in Scotland; Birmingham, Cambridge and Oxford universities, and the Royal Agricultural college at Cirencester (Gloucester) in England; Trinity college, Dublin, in Ireland; those at the Universities of Budapest (Hungary), Czernowitz and Cluj (Rumania), Krakow and Lwow (Poland), Praha (Czechoslovakia), Vienna (Austria); at Ghent and Liége in Belgium; at Copenhagen in Denmark; at the Catholic university in Lille, France; at the medical college and the veterinary college in Lyons, France; at Strasbourg (France); at Madrid (Spain); at the Universities of Bonn, Breslau, Göttingen, Halle, Münich and Würzburg in Germany; at Athens (Greece), Groningen, Leiden and Utrecht (Holland); Genoa and Modena (Italy); Kiev, Odessa and Leningrad (Russia); Basel and the Jardins Alpins de l'Université de Grenoble (Switzerland); Nikko and Tokyo (Japan); the Botaniska Trädgärd of the University of Helsingfors (Finland); and in the United States those of the Universities of California (Berkeley), Harvard (Cambridge, Mass.), Smith college (Northampton, Mass.), Mt. Holyoke college (South Hadley, Mass.), Michigan Agricultural college (East Lansing), the University of Michigan (Ann Arbor), the University of Minnesota (Minneapolis), the University of Pennsylvania (Philadelphia) and the Johns Hopkins university (Baltimore); and in Canada, the University of British Columbia (Vancouver). Harvard university maintains a botanical garden at Soledad, Cienfuegos, Cuba—the Atkins institution of the Arnold arboretum.

There are approximately 325 botanic gardens outside of the United States. Among the more notable of these are the following, which are mentioned in the order of age, the year given being the date of the garden's foundation.

Old World Gardens.—*Pisa,* Italy (1543, *fide* Emilio Chiovenda and Lavallée), founded by order of the Grand Duke Cosimo de Medici I. This is one of the earliest gardens devoted to the public study of botany and became famous under its second director, Andreas Caesalpinus. His work (*De plantis libris XVI,* 1583) marks the beginning of modern systematic botany, and influenced botanical science for more than a hundred years.

Padua, established by a decree of the senate of the republic of Venice enacted June 29, 1545, contends with Pisa for first place in point of founding. The controversy is discussed in C. Stuart Gager's *Botanic Gardens of the World,* pp. 283–285.

Musée d'Histoire Naturelle, Paris (1635), founded by Guy de la Brosse, physician to the French king. Its first name was Jardin Royal des Plantes Medicinales but was changed to the present form in 1790. The garden proper, still generally known as the Jardin Botanique, occupies an area of 34.6 ac.

Chelsea Physic Garden, London (1673), was established on the bank of the Thames by the Society of Apothecaries for the express purpose of advancing the teaching of botany and of providing study material for research and teaching. In the earlier years the garden grew medicinal plants in sufficient amount to supply the members of the society with crude drugs in commercial quantities. The original plot of four acres was enlarged in 1722 by additional ground deeded as a gift by Sir Hans Sloane with the provision that the growth of drug plants for commerce should cease, and the garden thenceforth be devoted exclusively to scientific and educational work. Its influence along these lines can scarcely be overestimated. Among its famous directors were Philip Miller, author of the classic *Dictionary of Gardening,* and John Lindley (appointed in 1835), author of *Flora Medica* and other important botanical works. Many important publications grew out of the work of the garden, including Curtis's *Botanical Magazine* and *Flora Londinensis,* Lindley and Moore's *Treasury of Botany,* and others. The private library of Charles Darwin is housed in the laboratory building.

Der Botanischer Garten und Museum, Berlin-Dahlem, Germany (1679), was established in Schöneberg, near Berlin, as an exhibition or model garden (Mustergarten). Here it remained for over 200 years. A new site was chosen at Dahlem where in 1897–1907 the present garden was laid out under the direction of Dr. Adolf Engler, who was director from 1889 to 1921. The area is approximately 100 ac. It is primarily a research institute for botanical science and instruction of Berlin universtiy. The plantations comprise five main sections: (1) plant geography; (2) morphology-oecology; (3) the arboretum; (4) systematic botany; (5) economic plants. The Botanical museum comprises the herbarium and the public exhibits. There is a library of more than 61,000 volumes and pamphlets. Dr. Ludwig Diels became director in 1921.

Royal Botanic Gardens, Kew, near London (1759). The nucleus of the collections at Kew was the plants grown by Lord Capel, who came into possession of Kew house by marriage in 1696. Frederick, prince of Wales, leased the property about 1730, and after his death his widow, Princess Augusta of Saxe-Coburg-Gotha, engaged a former pupil of the Chelsea garden, William Aiton (*q.v.*), to develop a physic garden in 1757. From this year Kew ranks as a true botanic garden. The total area is 288 ac. It was Aiton who inaugurated the plan of sending botanical exploring expeditions to foreign countries. The material collected on these expeditions has greatly enriched the scientific collections at Kew, and also our knowledge of the vegetation of the world from the standpoint not only of pure science, but of economic botany as well. The gardens (as stated in a Kew guide book) stand in relation to botanical science much as Greenwich does to astronomy.

The botanical survey of the empire has resulted in the publication of floras of all the overseas dominions. Among commercial plants distributed by Kew to new centres are bread-fruit, pineapple, banana, tea, coffee, cocoa, rubber, various fibres, timbers and dyes, and quinine and other drugs. The quinine plant (*Cinchona*) was introduced by Kew from South America to India in 1860. Most of the crude rubber used so extensively throughout the world is derived from trees of the Para rubber plant (*Hevea brasiliensis*) raised from seeds collected by Sir Henry Wickham under the auspices of Kew in Brazil in 1875. Kew acts as botanical adviser to all government departments. The gardens maintain a school of horticulture for the training of gardeners and are visited by more than a million people annually. Aiton resigned in 1841 and was succeeded by Sir William Hooker (1841–65), Sir Joseph Hooker, his son (1865–85), Sir W. T. Thistleton-Dyer (1885–1905), Sir David Prain (1905–22), Sir Arthur W. Hill (1922–1941), Sir Geoffrey Evans, Acting (1941–). One of the most important publications is the *Index Kewensis,* an alphabetical list of every plant name published (numbering hundreds of thousands), with citations to the place of original publication. This project was originally conceived and financed by Charles Darwin. The important *Index Londinensis* (6 vols.; supplement, 2 vols.) to the published illustrations of flowering plants, ferns, and fern allies was prepared under the auspices of the Royal Horticultural society at the Royal Botanic gardens, Kew.

Among other important European botanic gardens may be mentioned those at Amsterdam where Hugo Devries (*q.v.*) carried on his investigations leading to the formulation of the epoch-making mutation theory, Budapest (1771), Cambridge (1762), Oslo (1815), Coimbra (Portugal, 1773), Copenhagen (1600), Genoa, Hanbury (La Mortola, Ventimiglia, Italy, 1867), Helsingfors (1828), Leyden (1587), Leningrad (1843), Madrid (1755), Rome (1884), Uppsala (1787).

In Asia and the Pacific islands: Tokyo (1638); Calcutta, Sibpur (1787); Buitenzorg, Java (1817); Hongkong, Paradeniya, Ceylon (1822); Melbourne, Australia (1842) and Hobart, Tasmania (1844). *In Africa:* Durban (1849) and Kirstenbosch, Cape Town (1913). *In South America:* Rio de Janeiro (1808) and Buenos Aires (1892).

American Gardens.—*Missouri Botanical Garden* (St. Louis, Mo., 1859). This is known locally as "Shaw's gardens," from the name of the founder, Henry Shaw, who first opened the garden (as a private garden) to the public in 1859. The area is about 75 ac.

The garden co-operates closely with the Henry Shaw School of Botany, at Washington university, St. Louis, members of the scientific staff of the garden serving as professors in the school. During the administration (1889–1912) of the first director, Dr. William Trelease (*q.v.*), the *Annual Reports,* enriched with scientific contributions, became known throughout the scientific world. Under his successor, Dr. George T. Moore (1912–), the *Annals,* a scientific quarterly, and a monthly *Bulletin,* devoted to the horticultural and floricultural activities of the garden, were initiated, and the scientific and educational work was expanded.

In 1925, 1600 ac. of land 35 mi. S.W. of the city were acquired to be developed as an arboretum. This serves as a source of plants, trees, and shrubs for the city garden; affords areas for establishing a pinetum, a wild flower reservation, and other features not possible in the city; provides greenhouses for some 20,000 orchid plants. The tropical station established in the Canal Zone (Isthmus of Panama) in 1926, was released to the Canal Zone government in 1937.

Arnold Arboretum (Forest Hill, Boston, Mass., 1872), the living tree museum of Harvard university. The principal collection of trees and shrubs was planted in 1886. The area of approximately 250 ac. includes meadow, hill and valley, and the permanent (endowment) funds are nearly $2,862,000. There is a library of about 45,400 vol. and 13,500 pamphlets, and a herbarium of the woody plants of the world of about 500,000 sheets. No undergraduate instruction is given, but special research students are received from Harvard university and Radcliffe college. Publications include: *Journal of the Arnold Arboretum, Arnoldia* (formerly *Bulletin of Popular Information*), *The Bradley Bibliography* (a 5 vol. guide to the literature of the woody plants of the world before the 20th century), *Sargentia,* which replaced the *Contributions* (1932–38), and the *Bibliography of Eastern Asiatic Botany.* After the death of the first director, Prof. Charles Sprague Sargent, who served from 1872 to 1927, Prof. Oakes Ames was made supervisor, Mr. E. H. Wilson, keeper. Prof. Elmer D. Merrill succeeded Professor Ames as acting supervisor in 1935, becoming supervisor in 1936 and director in 1937.

As a part of the Arnold arboretum the Atkins institution of 230 ac. at Soledad, Cienfuegos, Cuba, is being developed as a tropical botanic garden. It has a small endowment of its own ($185,141 in 1943).

New York Botanical Garden (Bronx park, New York city, 1895). This comprises an area of approximately 280 ac.; its permanent funds exceed $2,500,000. In addition to extensive outdoor plantings there is a large range of conservatories. The museum building houses the public museum exhibits, the herbarium of more than 2,000,000 specimens, the library of nearly 50,000 bound volumes and 150,000 pamphlets, together with research laboratories and offices of administration. Courses of free public lectures are given throughout the year, and classes from the public schools visit the garden at frequent intervals for special instruction. The garden has from the beginning carried on systematic exploration of the West Indies and of continental North America. Publications include: *Journal* (monthly), *Mycologia* (bi-monthly), *North American Flora* (published in fascicles), *Addisonia* (annually), and *Brittonia.* The *Memoirs* was discontinued with vol. 7 (1927). The garden is supported by both municipal and private funds. Directors: Dr. N. L. Britton (*q.v.*) (1895–1929); Dr. E. D. Merrill (1930–35); Dr. M. A. Howe (1935–36); Dr. H. A. Gleason (acting) (1936–37); Dr. W. J. Robbins (1937–). Affiliated with Columbia university.

Brooklyn Botanic Garden (Brooklyn, N.Y., 1910). This includes an area of about 50 ac.; its work includes anything scientific or educational based upon plant life. Many popular courses are given for the general public, both children and adults. Its program of public education is probably more extensive than that of any other botanic garden. There is a children's garden and children's greenhouse and building. Boys and girls frequently take consecutive voluntary instruction for periods of five to ten years, finally entering upon a life work of botany, horticulture, or some other aspect of plant science or industry. The research work is with the experimental aspects of botany (pathology, genetics, ecology, physiology), as well as with systematic botany. Graduate work done at the garden has been credited toward advanced degrees by Columbia university and New York university. The garden co-operates extensively with public and private schools. More than 73,000 pupils with their teachers visit the garden in one year for instruction, and pupils are supplied annually with vegetable and flower seeds for planting in school and home gardens—more than 1,500,000 packets in 1943. The library, containing over 23,000 volumes and over 21,000 pamphlets, is open free daily to the public. The herbarium contains: flowering plants, 215,000 specimens; fungi, 81,000; bryophytes 11,000; algae, 3,000. The conservatories contain tender and tropical economic and other plants. The garden is supported in part by appropriations by the city of New York and in greater part by private funds. It was developed under the supervision of the first director, Dr. C. Stuart Gager, 1910– (*q.v.*). Its publications include *Ecology* (quarterly), *Genetics* (bi-monthly), *Memoirs, Contributions, Leaflets,* and *Record* (quarterly, comprising *Annual Report*), annual *Seed Exchange List, Guides* to the plantations and collections; *Botanic Gardens of the World* (July, 1938).

United States Botanic Garden (Washington, 1850). This garden was first initiated by act of congress, May 8, 1820, on a site of 5 ac., which was increased to 22.5 ac. in 1824. After about 20 years it was discontinued and the property, which had been assigned to the Columbian institute for botanic garden purposes, reverted to the federal government. It was re-established by act of congress, May 15, 1850, on a site on the mall. The name "Botanic garden" was not applied to the site until 1856, when congress placed it under the supervision of the joint committee on the library. From July 3, 1934, David Lynn, architect of the capitol, acted as director. A preliminary report on the garden by the house committee on the library, Congressman Kent E. Keller, chairman, published in 1934, stated that the activities of the garden formerly consisted chiefly in the raising of ornamental flowering plants and cut flowers for "members of Congress and friends." This was discontinued by act of congress approved June 30, 1932. The garden was removed from the mall to a new site south of Maryland avenue in 1933 and is conducted chiefly as a display garden. Botanical research and the botanical library and the herbarium are administered by other branches of the federal government.

National Arboretum (Washington, D.C.). Established by act of congress, March 4, 1937. The national congress in 1927 authorized the secretary of agriculture to establish a National arboretum on a tract of nearly 400 ac. on the Anacostia river about 4 mi. N.E. of the centre of Washington. The act provides that, "The arboretum shall be administered by the Secretary of Agriculture, separately from the agricultural, horticultural, and forestry stations of the Department of Agriculture, but it shall be so correlated with them as to bring about the most effective utilization of its facilities and discoveries." Mr. B. Y. Morrison, principal horticulturist of the U.S. department of agriculture, is in charge of the arboretum (1943).

Boyce Thompson Institute for Plant Research, Inc. (Yonkers, N.Y., 1921). This was established by a gift of William Boyce Thompson of approximately $10,000,000, the larger part of which has been set aside as a permanent endowment fund. The institute was incorporated and the laboratories were opened in 1924. The stated purpose is the carrying out of every phase of research on plant life and the dissemination of information relative thereto. In 1928 a tract of about 325 ac. on the eastern edge of Yonkers was secured for the development of an arboretum, where it was planned to grow every hardy species of woody plant. This collection primarily serves as a basis for the study of methods of propagation, pathology, and disease control. The publications include the *Contributions* (quarterly) and *Professional Papers* (irregularly).

Among other botanic gardens in the U.S. are the Letchworth Park arboretum, north of Portage, N.Y.; the Morton arboretum (Lisle, Ill.), and the botanic gardens at various colleges and universities, among them: Harvard, Marsh (at Yale university), University of Pennsylvania, Smith, Mt. Holyoke, Michigan (at Ann Arbor), North Carolina (at Chapel Hill), Havana (Cuba), and Bermuda (Hamilton). (*See* ARBORETUM.)

(C. S. G.)

BOTANICAL AND HORTICULTURAL SOCIETIES: *see* HORTICULTURAL AND BOTANICAL SOCIETIES.

BOTANICAL SOCIETY OF AMERICA. This society consists of a group of botanists, active in various fields, resident chiefly in the United States and Canada. It was founded in 1894 and reorganized in 1906, when a union of the original society with the Society for Plant Morphology and Physiology and the American Mycological society occurred. Its membership is unlimited, being in 1943 about 1,375. Corresponding members, elected from prominent foreign botanists, may be chosen to the number of 40; in 1943 there were 33 such members. The publications of the Society are the *American Journal of Botany* and the *Miscellaneous Series,* including *Year Book, Proceedings of the Society, Programmes, etc.* In 1939 the Committee on Teaching of Botany published two pamphlets entitled *Achievement Tests in Relation to Teaching Objectives in General College Botany* and *An Exploratory Study in the Teaching of Botany in the Colleges and Universities of the United States.* (P. R. BR.)

BOTANY is the science which deals with plants, living and extinct. In all parts of the world where races of men developed, the kinds of plants about them influenced and largely determined their whole mode of existence: the kind and variety of food they ate, the material from which their clothing was made, and the type of shelter over their heads. Moreover, plants have had some influence on man's religious expressions, his architecture and ornament. And, the earliest written records of the Chinese, the Hindus and Egyptians reveal that all sorts of plants were used for their actual or supposed medicinal properties. Botany had its beginnings in the observation and use of those plants which furnished food, clothing, shelter and medicines.

It was natural that through the centuries there would be scientists who would turn their attention to plants—their uses, classification, anatomy, physiology, relation to the environment, geographical distribution, chemical composition, improvement by selection and breeding, and in fact all phases of investigation which would contribute to a knowledge of the plant world. Botany today, through its contributions to human welfare, and particularly as an aid in solving the world's food problems holds its place as a science parallel with zoology, physics, chemistry, geology and other concrete sciences. Botany is foundation subject matter in the training of students in forestry, plant pathology, plant breeding, horticulture, agronomy, landscape gardening, and in all those branches of scientific agriculture which have to do with plants. Also, some understanding of the plant world, of the relation of plants to human economy and welfare, of the interrelation of plants and animals, of plants and soil, of plants and climate all may well be a part of the individual's liberal education.

The place of botany among the sciences may be judged, in part, by the following. In accordance with a resolution passed at the Fifth International Botanical congress, at Cambridge, England, in 1930, an *International Address Book of Botanists* was prepared. It is a directory of individuals and scientific institutions, universities and societies in all parts of the world interested in botany. This address book contains the names of 11,422 botanists, and 2,324 institutions and societies furthering botanical knowledge. In 1939 the American Society of Plant Physiologists published an *International Address List of Plant Physiologists,* which contains a total of 2,701 names. *The Year Book* (1942–43) of the Botanical Society of America shows a total of 1,343 members. The foregoing lists undoubtedly do not give all who properly should be included, but they show that the number of active botanists is substantial.

The scope of botany, as a pure and as an applied science, may be summarized by the following outline of its various branches. The three main broad subdivisions are:

Systematic botany or taxonomy, a study of the arrangement and classification of plants. It involves a consideration of such topics as the concept of genera and species, nomenclature, plant evolution, geographical distribution, climatic and edaphic variations, etc. There are reference books and monographs dealing with all the important divisions of plants, such as algae, fungi, mosses, ferns, gymnosperms and flowering plants; monographs of families and genera; systematic treatments of special groups such as crop plants, weeds, forage plants, trees, shrubs, poisonous plants, medicinal plants, edible wild plants, etc.; there are manuals and floras treating in systematic fashion the plants of different regions, large and small, of the earth; and there are popular works on trees, wild flowers, mushrooms, ornamentals, cultivated evergreens, etc.

Plant morphology, a study of the form and structure of plants, including the arrangement and relationships of the organs, internal structure (anatomy) of the organs, and structure of the cells (cytology). It involves consideration of such special subject matter as histological technique, ecological anatomy, wood technology, microscopy of industrial products, life histories, embryology, cytogenetics and phylogeny.

Plant physiology, a study of the life processes and functions of the entire plant and its organs and tissues. It involves biophysics and biochemics; it is concerned with such subject matter as plant nutrition, soil-plant relations, reproduction and germination, plant responses to environmental factors, hormones and vitamins, and growth. Plant ecology, a branch of plant physiology, pays particular attention to the relations between plants and their environment.

In addition to the three broad fields of botany are many specialized ones such as: plant pathology or phytopathology (study of plant diseases), paleobotany (study of fossil plants), genetics (study of the facts and causes of heredity), bacteriology (study of bacteria), mycology (study of fungi), algology (study of algae), bryology (study of mosses), agrostology (study of grasses) and others. Besides these, there are various applied fields of botany, such as forestry, horticulture, floriculture, landscape gardening, agronomy, plant breeding and pharmacy.

About 300 B.C., Theophrastus, a Greek philosopher and pioneer in the field of science, wrote *The Enquiry into Plants,* and in this was made the first serious attempt at describing and classifying plants. He was somewhat familiar not only with the plants of Greece but with those in countries visited by Alexander the Great, who apparently took with him on his expeditions men who could make accurate observations of the plants they saw and who brought back with them specimens, particularly of plants having medicinal value. About A.D. 50, Dioscorides, a Greek botanist and a physician in the Roman army, described some 400 medicinal plants in his *Materia Medica.* His contemporary, the elder Pliny, described about 1,000 plants, many of reputed medicinal virtue. The writings of Theophrastus, Dioscorides and the elder Pliny were standard botanical works up to the 16th century. In that century there appeared a number of *herbals,* large books with descriptions of plants, and illustrated by beautiful woodcuts, but with little attempt at systematic classification, and with scarcely any contribution to botanical knowledge. The best known *herbalists* of this period were Otto Brunfels (German), Leonhard Fuchs (German), Hieronymus Bock (German), William Turner (English) and John Gerard (English).

In 1583 Andreas Caesalpinus, a Florentine, published his *De Plantis,* in which he classified 1,520 plants then known to him into 15 classes, the distinguishing characters being taken from the seed and fruit. From 1686–1704, the Englishman John Ray in his *Historia Generalis Plantarum* outlined a system of classifying plants which was based somewhat on a present day interpretation of the natural affinities of plants. He was the first to recognize the significance, from the standpoint of classification, of plants with one cotyledon (seed leaf) and those with two. But, like his predecessors, he still clung to herbs and woody plants as the two main divisions of his classification. There followed (1694–1700) the system of Joseph Pitton de Tournefort, who described about 8,000 species of plants, and distributed them into 22 classes, chiefly according to the form of the corolla (the coloured parts of a flower). He may have been influenced by his contemporary, Rudolf Jakob Camerarius, a German, who was the first to demonstrate that flowering plants have sex, and that pollen is necessary for fertilization and seed formation.

Tournefort's system was replaced by that of the Swedish natu-

ralist, Carl von Linné or Linnaeus, which appeared in his *Systema Naturae,* published in 1737. He divided the plant kingdom into 24 classes, based principally on the number and variations in the stamens (pollen-bearing organs). The classes were divided into orders based mostly on the number and variations in the pistils (seed-bearing organs). The Linnaean system, also sometimes referred to as the "sexual system," although an artificial one, and not always expressing the true affinities of plants, was a step forward, and a great stimulus to students of botany. Linnaeus rightly has been called the founder of modern taxonomy (plant classification).

Since Linnaeus' time, several systems of classification have been put forward, each in most instances representing a distinct advance over the preceding. Among these were the systems of Bernard and Antoine Laurent de Jussieu, of France (1789), that of Augustin Pyrame de Candolle and his fellow workers, embodied in the *Prodromus Systematis Regni Vegetabilis* (1824), that of George Bentham and Joseph Hooker, published in *Genera Plantarum* (1862–83), and that of Adolf Engler, first published in 1892. Engler's *Die Natürlichen Pflanzenfamilien,* the result of the co-operation of many specialists, consists of more than 20 well illustrated volumes. The Englerian system has been the dominant scheme of classification in most countries since 1900. The system of classifying flowering plants, proposed by Charles Edwin Bessey, long a professor of botany in the University of Nebraska, has received attention in the United States; it was published in its final form in 1915. Also, reference should be made to Friedrich Wettstein's system which appears in his *Handbuch der Systematischen Botanik* (last edition, 1924); to that of Alfred Barton Rendle, of the British museum, in *The Classification of the Flowering Plants* (1925, 1930); and to that of John Hutchinson, of the Royal Botanic Gardens, Kew, England, in his *The Families of Flowering Plants* (1926).

When the origins and relationships of plants are being studied, data are derived from various sources: fossils, comparative body form and anatomy, reproductive organs and chromosomal relations, geographical distribution and migration paths. Thus, the findings of botanists working in the fields of paleobotany, comparative morphology and plant geography have enabled systematic botanists to formulate more natural systems of classification, *i.e.,* systems which recognize presumed relationships between different kinds of plants and correspond as closely as possible with their actual evolution. In the modern systems, as compared with earlier ones, reproductive organs and flowers have been increasingly used as a basis of classification. Such structures, as contrasted with vegetative organs, such as roots, stems and leaves, seem to possess greater stability and are of relatively greater value in showing relationships.

The current method of naming plants and animals is called binomial nomenclature. Every distinct kind or species of plant or animal is known by a scientific name, which consists of two parts, the name of the genus and the name of the species. For example, common black mustard is *Brassica nigra. Brassica* is the generic name, *nigra* the specific name. Although Gaspard Bauhin, a Swiss, made some use of binomial nomenclature as early as 1576, it was Linnaeus (1753) who first used the method extensively, and through whom it came into general use among botanists and zoologists in all countries. It is customary to place after the binomial an abbreviation of the name of the individual who is considered responsible for the naming of the species. Linnaeus named a great number of the now commonly known plants and animals, and accordingly the initial letter of his name is attached to many scientific names; for example, *Beta vulgaris* L. (common beet), *Pisum sativum* L. (garden pea), *Avena sativa* L. (cultivated oat), etc.

More than 300,000 distinct kinds or species of plants are recognized in the world. In 1853 Linnaeus recognized but 5,950 species of plants. Species are being discovered every year. Some of these are collected in parts of the world previously unexplored, others in areas many times traversed by botanists. It is estimated that approximately 4,700 proposed new species among the higher groups of plants alone are described each year. Specimens of plants come to a systematic botanist who has given special attention to the group (family or genus) to which the plant in question belongs. In identifying it, the botanist compares it with allied forms, of which he has herbarium specimens or published descriptions; he may find that the plant has characters similar to those of a species heretofore described and named; or he may find that the plant has characters so different from those of any known species that he concludes it is a "new" species (*species novum,* sp. nov.); in other words, it is one that has never been described, there is no recognized or recorded specimen like it in any herbaria of the world, or any description of it in any publication. Accordingly, he describes the new species and gives it a name. The description is published in one of the many recognized botanical journals, and the specimen or specimens he used in making the description are properly labelled and deposited in one or more herbaria. This specimen is known as the "type specimen."

There are more than 400 botanic gardens in the world, found in nearly every country. There are also hundreds of herbaria associated with botanic gardens, with universities and colleges, and also many valuable and critical private herbaria. These gardens and herbaria are organized primarily for botanical research or instruction, or both. The gardens have plantings of species from all parts of the world, usually arranged by plant families, or according to habitats. The herbaria contain systematic collections of pressed, dried and properly labelled specimens.

The foregoing has been a brief outline of the history and scope of systematic botany (taxonomy). Much of the early botanical work was systematic and nothing more. Even today the popular conception of a botanist is one who can classify and name plants. Such an individual is indeed a botanist, but in only one special subdivision of the broad field of plant science. Today, there are many special subdivisions of botany, and many workers who properly may be called botanists, or if preferred, plant scientists.

Plant morphology, in a broad sense, is concerned with the form and structure of plants. It involves a study of the external form, the arrangement and relationships of the various plant organs, and their internal structure (anatomy); it also includes a phase of anatomy, known as cytology, which has to do with the structure and behaviour of cells, the small chambers or compartments which make up the plant.

Progress in plant morphology, as well as in all phases of botany, has at all times been strictly dependent upon advances in allied sciences. Following the invention of the compound microscope by Zacharias Janssen, a maker of spectacles at Middelburg, Holland, in 1590, and its later improvement by Robert Hooke, an Englishman, knowledge of plant morphology increased rapidly. Hooke observed that cork tissue was composed of minute hollow compartments, which he called "cells," probably because of their resemblance to the cells of honeycomb. The term "cell," first applied by Hooke (1665), has come into general use for the structural units of both plants and animals. Although Hooke's microscope did not enable him to see clearly the contents of cells, he was aware of their presence and refers to the *"Succus nutritious,* or appropriate juices of vegetables." Although Matthias Jakob Schleiden and Theodor Schwann (1838), both Germans, are often credited with promulgating the cell theory, some two centuries after the time of Hooke, there is much evidence that other workers, notably René Joachim Henri Dutrochet (French, 1824) and Meyen (German, 1828, 1830) had a clear concept of animal and plant cells as the units of structure. The first systematic studies of the cellular structure of plants were made by Marcello Malpighi (1675), an Italian, and Nehemiah Grew (1682), an English physician. The importance of the nucleus and its constant occurrence in living cells was pointed out by Robert Brown in 1831. Thus was the foundation laid for plant morphology in general, but particularly cytology, that specialized branch of biology concerned with the cell.

With continued improvements in the compound microscope and in techniques involved in preparing plant materials for microscopic study, remarkable discoveries were made in the years that

followed. There is a considerable body of knowledge concerning the general morphology, including anatomy, of all the most important groups of plants—algae, fungi, liverworts, mosses, ferns and their allies, and seed plants. Moreover, through use of the petrographic microscope, the structure of many plants known only in fossil form has been determined. Comparative morphology has been indispensable to the systematic botanist in his efforts to determine the natural relationships of plants. Moreover, only by a proper understanding of the morphology of plants can the physiologist explain the functions of cells, tissues and organs, and the responses of plants to environmental factors, such as water, light, fertilizers, relative length of day and night, temperature, etc. The morphology of many important crop and other economic plants is fairly well known. This knowledge is invaluable to the plant breeder, the horticulturist, the agronomist, and others in applied fields of botany. Also known are many of the details of cell division, the behaviour and significance of chromosomes, thus giving a physical basis for heredity, the cellular changes in the life cycles of plants, and the processes of pollination and fertilization. Above all, cytology has made significant contributions to the fields of genetics and taxonomy.

Likewise, the findings by chemists and physicists have aided the botanist to understand many of the physiological processes of plants: absorption of substances (inorganic salts) from the soil, manufacture of foods, movement of materials in the plant body, storage of foods, respiration, assimilation and growth. Plant physiology is a subdivision of botany which has contributed much knowledge that has found practical application in the production of plants and crops. Growth, as expressed in yield of roots, fruit, seed, or other plant parts, or in quality (chemical composition, colour, flavour, texture, etc.) of plant products, is the resultant of all the processes which the plant carries on. These processes are influenced by environmental factors. These factors, in turn, can be influenced and modified by means under the control of man. Therefore, it becomes of paramount importance that the plant physiologist be familiar with the functions of plants and the environmental factors which affect them.

One of the earliest workers in plant physiology was Stephan Hales (English). In his *Vegetable Staticks* (1727) he gave an account of numerous experiments and observations which he made on the nutrition of plants and the movement of sap. He showed that some of the gaseous constituents of the air contribute largely to the nourishment of plants, and that the leaves are organs which synthesize foods. He also suggested that light played a role in food formation. Aristotle, centuries before, had pronounced the dictum that plants derive their nutrition wholly from the soil. In 1773 Joseph Priestley observed that plants growing in an atmosphere rich in carbon dioxide produced oxygen; about the same time Sheele, in Sweden, observed that his experimental plants produced carbon dioxide. It remained for Jan Ingenhousz (1768), a Dutch physician, by careful experimentation to explain the contradictory results of Priestley and Sheele. Ingenhousz was the first to demonstrate that green plants subjected to sunlight purified the air (exhaled oxygen); that the action was more rapid in bright sunlight than in the shade; and that plants in darkness rendered the air impure. There followed the brilliant discoveries of Antoine Laurent Lavoisier (1784), who determined the chemical composition of carbon dioxide and the nature of combustion. Later (1804) Nicolas Théodore de Saussure, by quantitative methods, established the facts that green plants must have carbon dioxide for their development, and that oxygen also is essential, and thus pointed to the relation between photosynthesis and respiration. The chemists, Hales, Priestley, Ingenhousz, and de Saussure, may be said to have founded the science of plant physiology.

Justus von Liebig's application of chemistry to plant physiology and agriculture established firmly the roles of the atmosphere and soil in the nutrition of plants. Among other things he refuted the long-held theory that plants derive their nourishment from soil humus. He emphasized the role and importance of mineral fertilizers. Numerous other examples might be cited to show the part that physical and chemical studies have played in the advancement of every phase of plant physiology. Special mention should be made of investigations pertaining to colloids and protoplasm, cell permeability, salt antagonisms, mechanism of absorption, transpiration, rise of sap, enzymes, metabolic processes, transport of solutes and foods, and respiration.

The close interrelationship and interdependence of the physical and biological sciences are so well established that they have become commonplace. As regards the various subdivisions of botany itself, one is not fully justified in claiming that one field is more important than the other. Plant taxonomy, plant morphology, plant physiology, all in their broadest scope, are interdependent, and each is of service to the advancement of the other. The ultimate aim of all is to make contributions to our knowledge of the plant world. That botanists have contributed greatly to human welfare is attested to by the part they have taken in agriculture, including forestry, horticulture, agronomy, landscape gardening, and such special fields of these as plant diseases, poisonous plants, fertilizers, weed control, plant breeding, irrigation practices, seed growing and germination, storage and dehydration of vegetables and fruits, and plant propagation; further, by the contributions which have been of aid to the textile industries, to medicine, to the plastic industries, in fact, to all of those professions and industries which utilize plant products. Botanists are found, not only in the field collecting plants, or as teachers in schools, colleges and universities, or as research workers in herbaria and in educational state and federal institutions, but also in industrial laboratories of all sorts where materials of plant origin are utilized.

Not to be overlooked are the ethical and cultural influences of the study of botany. It gives one acquaintance with the plant life of the world, the part it plays in the lives of all peoples, and its relation to society, to population, politics and even war; it heightens enjoyment of the beauty of ornamental plants and natural vegetative coverings; and it gives a more intelligent understanding and appreciation of life phenomena, and the relation of the activities of plants to animal life, and to the cycles of chemical changes occurring in nature. Flowers, trees, forests, meadows and many other manifestations of plant life have been the inspiration of poetry and song. Plant forms have furnished inspiration in ornamentation of all sorts: painting, sculpture, architecture, interior decoration and design. We see conventionalized flowers and other parts of plants in mural decorations, in the capitals of columns, in mouldings and scrollwork, in friezes and panels, in iron fences, jewellery, pottery, rugs, fabrics and wallpaper. A knowledge of plants has aided somewhat in evaluating and interpreting these influences on our cultural life.

Botanists have explored all parts of the world. Thus has knowledge of plant geography been enhanced. Moreover, they have introduced into use hundreds of economic plants, including those used as a source of food, medicine, oil, perfumery, fibre, and also plants for use in hybridization and as ornamentals. The question of the mode in which the floras of islands and continents have been formed has given rise to important speculations by such eminent botanical travellers as Charles Darwin, Sir Joseph Dalton Hooker, Alfred Russel Wallace, H. B. Guppy and others. The connection between climate and vegetation has also been studied. Ecology, the study of plants in relation to each other and to their environment, has become the subject of systematic investigation. Plant ecology has made notable contributions to reforestation and grazing practices, to soil erosion problems, to plant-soil-water relations, to land classification for agricultural purposes and other agricultural problems.

The origin of cultivated plants has been given study. The first comprehensive work on this subject was by Alphonse de Candolle (French) in 1892. More recently, we have the investigations of N. I. Vavilov (Russian) and his associates. Present-day cultivated plants have come from species which at one time grew wild somewhere on the earth. There is evidence that certain ones, such as wheat, barley, rice, date, fig, olive, apple, grape, flax, hemp and others, were in cultivation at least 4,000 years ago. Other cultivated plants are of more recent origin. Among these are parsnip, raspberry, currant, strawberry, gooseberry, musk-

melon and coffee. Some success has been attained in determining the geographical regions where the probable progenitors of cultivated plants grew, or are growing, in the wild state. For example, a form of wheat grows wild in Syria and Palestine; the wild progenitors of many of our fruit trees are found on the northern slopes of the Caucasus and adjacent regions. On the other hand, some cultivated plants like common bean and maize have not yielded wild progenitors. It is probable they may have originated in accidental hybrids, and that subsequent changes through cultivation may have been so great as to obscure their relationships. The study of the origin of cultivated plants has recently been undertaken from the viewpoint of genetics and plant breeding. Intimate knowledge of variations in the many wild forms, and discovery of the geographical distribution of these variants direct the plant breeder to material which may be used in the development of new and improved kinds of useful plants. (*See* also PLANTS AND PLANT SCIENCE.)

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BOTANY BAY, an inlet on the coast of New South Wales, Australia, in lat. 34° S., *c.* 5 mi. S. of Port Jackson, which it resembles in being a drowned valley feature (Cook's and George's rivers) shut in by peninsular headlands (La Perouse and Kurnell). Historically it is of interest as marking Captain James Cook's first landing place upon Australian soil, of which he took possession in the name of the British crown. The "Endeavour" lay off there April 29–May 7, 1770, the bays and creeks were explored, and Joseph Banks, the botanist, discovered a profusion of new flowers and plants. The bay, at first styled Sting-Ray harbour (Stingrays bay) was consequently renamed Botany bay, apparently by Cook himself upon his homeward voyage. In 1788 a penal settlement was established and maintained there for some years until removed to near the site of Sydney. With the growth of Sydney, the shores of Botany bay were abandoned for some time to the more unsavoury forms of industry (glue, tallow rendering, wool-scouring works), but suburbs of Sydney now occupy its shores. The headlands are national reserves. A monument marks the traditional site of Cook's first landing.

BOTETOURT, NORBORNE BERKELEY, BARON DE (1718?–1770), colonial governor of Virginia, was born in England. He served in the North Gloucestershire militia with the rank of colonel in 1761 and was subsequently a member of parliament for North Gloucestershire until 1764, when he was made a peer. In 1768 he was appointed governor of Virginia to succeed Sir Jeffrey Amherst, and he gained immediate popularity with the colonists in his new position. In 1769, however, the Virginia assembly, incensed with the transportation of Boston political offenders to England for trial, passed resolutions demanding that Americans be tried in America and that the colonies themselves be given the exclusive power of taxation in America. Botetourt, although secretly in sympathy with the colonists, felt it necessary to dissolve the assembly, most of whose members met the next day to adopt a series of nonimportation measures against British-taxed goods. Botetourt, who still retained the colonists' favour, entered into correspondence with the British secretary of state for the colonies, the earl of Hillsborough, advocating repeal of all parliament-imposed taxes. The earl promised that such repeal would be forthcoming but failed to keep his promise. Botetourt died in Williamsburg, Va., Oct. 15, 1770. The story goes that his failure to establish good relations between the colonies and parliament hastened, if it did not cause, his death. The colonial assembly held him in such esteem that they caused a life-sized statue of him, which still stands in Williamsburg, to be erected after his death. His name survives in Botetourt Co., Va.

BOTEV, CHRISTO (1847–1867), Bulgarian revolutionary and poet, was born in Kalofer, central Bulgaria, on Dec. 24, 1847. When at school in Odessa in 1864 he became involved in the Russian revolutionary movement and had to return home, whence he was soon compelled to flee to Rumania. There he lived in great poverty, devoting himself ardently to the Bulgarian revolutionary movement, of which his literary genius and talent for organization made him the leader. Believing that the nation would revolt, he invaded Bulgaria with 200 companions and reached Mt. Veslez in the western Balkans, but was there surrounded and killed, May 20, 1867, by regular Turkish troops. Despite his failure, he greatly influenced the Bulgarian national movement. His poems are among the purest lyrics in the Bulgarian language.

BOTFLY, the name given to flies of the families Oestridae, Cuterebridae and Gasterophilidae, the larvae of which are parasitic in mammals. The horse bots (Gasterophilidae) occur wherever horses are found. *Gasterophilus intestinalis* lays its eggs on the chest, legs or belly from where they are licked off by the horse. *G. haemorrhoidalis* lays its eggs on the lips. Other species lay eggs in different places, the larvae eventually reaching the stomach or intestines. The robust botflies (Cuterebridae) attack various kinds of animals. *Cuterebra* are parasites of rodents, rabbits and monkeys. *Cephenemyia,* the deer bots, attacking deer in North America are reputedly the speediest living of animals; C. H. T. Townsend (*Scientific Monthly,* April 1926, vol. 22) having claimed a speed of 815 m.p.h. Many have questioned this and the actual speed has not been determined. *Dermatobia hominis,* the human bot-fly, normally attacks deer and monkeys. It captures mosquitoes and flies laying its eggs upon them; ticks are also used as hosts. When the egg-bearing flies settle upon a warm-blooded animal, the eggs hatch and the larvae bore into the flesh. They are sometimes fatal to man if killed within the body. In Brazil they attack cattle, causing enormous damage, the hides frequently being useless. The warbles, gadflies, heel flies, bomb flies or nose flies (Oestridae) attack large mammals; *Oestrus ovis* lays eggs in the nostrils of sheep, the larvae developing there or in the sinuses and often causing "staggers." *Oedemagena tarandi* is a pest of reindeer. *Hypoderma lineata* and *H. bovis* attack cattle in Europe and North America, developing beneath the skin of the back and often causing very serious losses. Other kinds of bots attack various animals, including the camel, elephant and rhinoceros. All botfly larvae obtain their oxygen by coming to the surface to breathe, hence the holes in the skin. During the very early stages some are able to exist for a considerable time without contact with the air. The horse bots obtain sufficient oxygen in stomach or intestines for their development. (*See* DIPTERA; ENTOMOLOGY.)

See E. O. Essig, *College Entomology* (1942); Friedrich Brauer, *Monographie der Oestriden* (1863). (C. H. CN.)

BOTH, ANDRIES and **JAN,** 17th century Dutch painters who worked together, Andries painting the figures in Jan's landscapes. Andries, the elder, was born in Utrecht about 1609 and Jan probably a year later in the same city. The brothers were at first taught by their father, Dirck Both, a glass painter, and later studied under Abraham Bloemaert. While still young they travelled to France and then to Italy where they settled in Rome. There they met Claude Lorrain, the painter who had perhaps the greatest influence on their style. The work of each of the brothers was so well attuned to that of the other that if their collaboration were unknown, it would be nearly impossible to tell that the figures and the landscape were not the work of a single man. After the death of Andries, who fell out of a gondola in Venice and was drowned, probably in 1644, Jan returned to Utrecht. Cornelis van Poelenburg, took Andries' place as the painter of figures for Jan's landscapes. Jan was alive in 1662, when his portrait was painted, but the date of his death is uncertain.

BOTHA, LOUIS (1862–1919), South African general and statesman, was born Sept. 27, 1862, near Greytown, Natal, of Boer parents, both of whom were children of *voortrekkers* from Cape Colony. The parents in 1869 migrated with their 13 children to Vrede in the O.F.S., and Botha got a thorough training in the rough and adventurous life of a border farmer. In 1884 he took part with Lukas Meyer in founding the New Republic in the Vryheid district of Zululand, and settled there with his bride Annie Emmett in 1886 as farmer and local official. In 1888 the New Republic joined the Transvaal, and Botha became field cornet of his district and for a short time native commissioner in Swaziland. In 1897 he was elected member for Vryheid and at Pretoria ranged himself with Patrus Joubert in opposition to Kruger's illiberal Uitlander policy and the system of shady concessions.

The South African War.—But, though he opposed the Boer ultimatum of Oct. 1899, when war broke out Botha put all his skill and energy at the service of his people. At first a mere field cornet under Meyer, three weeks later on Meyer's illness he succeeded him in command, under Joubert, of the forces round Ladysmith, and was responsible for the brilliant Boer successes at Colenso and Spion Kop. At the end of March 1900, after Paardeberg and Sir Redvers Buller's entry into Ladysmith, Joubert died and Botha was put in command of the Transvaal forces. He could then do little beyond delaying Roberts' march to Pretoria, and after two final battles at Diamond Hill and Bergendal joined the Free State forces under Christian De Wet in guerrilla tactics which prolonged the war for more than 18 months (*see* SOUTH AFRICAN WAR, 1899–1902). But when Botha saw that victory was hopeless and annexation inevitable he welcomed the chance of making peace at Vereeniging (May 31, 1902), whereby the honour of his people was secured and their nationality preserved. And, having made peace, he was resolute in observing its terms and in co-operating frankly in the work of the British empire to which his people now belonged. Though he took no part in crown colony government and naturally devoted his chief attention to the interests of the Boers, who looked on him as their leader, he was always ready to make friendly and informal representations to the government.

First Premier of the Transvaal.—When the Transvaal obtained responsible government in 1907, his Het Volk party won the first elections and Botha was called upon to form a ministry. One of his first duties was to attend the Colonial Conference in London, where he gained respect and sympathy by his straightforward declarations of loyalty to the empire and by his policy of racial conciliation in the colony. By his conciliatory policy in the Transvaal he promoted a better feeling between Dutch and English throughout South Africa and helped towards a closer union of the four colonies. He himself had long realized the need of such union and welcomed Lord Selborne's *Memorandum* of 1907 as a basis of discussion. The Transvaal delegation to the Convention of 1908–9, composed as it was of Dutch and English, most of whom had been fighting one another six years before, was, of all, the most effective and harmonious, owing chiefly to the tact and careful preparation of Botha and Smuts, who with their colleagues had worked out the policy which ultimately found expression in the constitution adopted. During the Convention Botha's influence was outstanding; while the final difficulty about the capital, which threatened to wreck the whole proceedings, was overcome by his personal appeal to his own die-hards.

First Premier of South Africa.—On the proclamation of the Union in May 1910 Botha was invited to form the first South African Ministry. Though he rejected the idea of a coalition ministry as impracticable at the time, he had no idea of governing solely in the interests of the Dutch; on the contrary he believed that the fusion of the two races could be best attained by showing that his South African party, mainly, but by no means entirely, Dutch in composition, could deal fairly with English as well as Dutch. Accordingly when one of his ministers made speeches provocative of racial feeling he excluded him from the ministry (Dec. 1912); and he persuaded a great meeting of his party, in spite of strong opposition led by De Wet, to endorse his policy (1913).

PART IN THE WORLD WAR

Defence of South Africa.—At the Imperial Conference of 1911 Botha had familiarized himself with the foreign policy and the military resources of the Empire. Accordingly, when war was declared against Germany in Aug. 1914, Botha, contrary to the view of many of his Dutch supporters, at once declared that South Africa, as a part of the Empire, was at war also. He offered to assure the defence of South Africa by the Union forces alone, so that the Imperial troops might be recalled for service in Europe. Further, on the invitation of the Imperial Government, he agreed to invade German Southwest Africa. But this was much further than a section of the Dutch in South Africa were prepared to go. While preparations were being made for the campaign, C. F. Beyers, the commandant-general of the Union forces, and S. G. Maritz, the commander on the German border, revolted and in October were joined by De Wet.

Before the end of the year it is estimated that 12,000 rebels were in arms in the Transvaal and the Free State. Though all the leaders and most of the rank and file of the rebels had been his comrades in the South African War, Botha never hesitated as to his duty to suppress the rising. But, to avoid racial feeling as much as possible, he employed purely Dutch commandos of his loyal followers for the purpose. Moreover, in the two short campaigns in the Transvaal and the Free State he took command himself, saying, "It is my duty and it is the only thing for me to do." Little fighting was needed to quell the revolt: on Oct. 28 he defeated Beyers' force in the Transvaal; early in November he took the field against De Wet in the Free State; and on Dec. 2, De Wet himself was captured; while on Feb. 3, 1915 Maritz's force surrendered. After this brief civil war, described by Botha as "the saddest experience of his life," he showed a wise clemency in his punishment of the leaders and at the end of two years had released all the prisoners.

Conquest of Southwest Africa.—He then turned his attention to the conquest of German Southwest Africa, delayed by the rebellion, and again took the chief command. He divided the Union forces, this time composed of men from both white races, into four columns, he himself taking under his immediate orders the column that started from Walvis Bay. In March 1915 the four columns started on a converging movement into the country, sweeping all the Germans before them. The chief difficulty came from the sandy and largely waterless country, which, in spite of an excellent organization of transport and commissariat, told heavily on the troops. Most of the fighting fell to Botha's own column, which occupied Windhoek on May 12 and obtained the final surrender of the German forces on July 9, 1915. After this Botha took no further share in active fighting, though with Smuts he helped to organize the South African Brigade for service overseas as well as the expeditionary force sent to German East Africa.

He was indeed much needed at home, for after the election of Oct. 1915, when his majority was seriously reduced, he had no easy task in governing the country, partly with the support of the Unionists. Some of his Dutch supporters were still discontented, and in 1916 and again in 1918 created trouble which, under anyone but Botha, might have led to another rising. His last voyage to Europe was to attend the peace negotiations of Versailles in 1919, as one of the delegates for South Africa. There he impressed all those present by his sound judgment, always used on the side of moderation, especially towards the conquered foe; for he never forgot that his own people also had been conquered and, as he said on signing at Versailles on June 28, 1919, "To-day I look back in thought to May 31, 1902."

He landed at Cape Town on July 24, already a very sick man, and on Aug. 28, 1919, died at his beloved farm, Rusthof in the Transvaal. The secret of Botha's power over every man who came into contact with him was his absolute sincerity, due to his simple belief in the guiding hand of God, combined with a chivalry and courtesy springing from a truly loving nature. "Never kill a man if you can capture him, or he will never have a chance to be sorry," was one of his sayings, illustrated by his every action. The service of this noble man to Britain and to South Africa can hardly be exaggerated. He fought a clean fight to the end against the whole might of Britain, but having once given his word to become with his people a part of the empire, he was better than his bond, and added to the best traditions of British statesmanship by his example, especially in doing all that in him lay to weld into one harmonious nation the Dutch and British elements in South Africa. "You in England," he said in 1911, "have given us the hand of friendship, and we have taken it and shall not let it go."

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(B. WI.)

BOTHNIA, GULF OF, the northern part of the Baltic sea (*q.v.*). The name is preserved from the former territory of Bothnia, of which the western part is now included in Sweden, the eastern in Finland.

BOTHROP, or **BOTTROP,** a mining town in the extreme southwest of the district of Münster, in the Prussian province of Westphalia, Germany. Pop. (1939) 82,875.

BOTHWELL, JAMES HEPBURN, 4TH EARL OF (*c.* 1536–1578), duke of Orkney and Shetland, husband of Mary, queen of Scots, son of Patrick, 3rd earl of Bothwell, and of Agnes, daughter of Henry, Lord Sinclair, was born about 1536.

James Hepburn succeeded in 1556 to his father's titles, lands and hereditary offices, including that of lord high admiral of Scotland. Though a Protestant, he supported the government of Mary of Guise, shewed himself violently anti-English, and led a raid into England, subsequently in 1559 meeting the English commissioners and signing articles for peace on the border. The same year he seized £1,000 secretly sent by Elizabeth to the lords of the congregation. In retaliation Arran occupied and stripped his castle at Crichton, whereupon Bothwell in November sent Arran a challenge, which the latter declined. In December he was sent by the queen-dowager to secure Stirling, and in 1560 was despatched on a mission to France, visiting Denmark on the way, where he either married or seduced Anne, daughter of Christopher Thorssen, whom he afterwards deserted, and who came to Scotland in 1563 to obtain redress. He joined Mary at Paris in September, and in 1561 was sent by her as a commissioner to summon the parliament; in February he arrived in Edinburgh and was chosen a privy councillor on Sept. 6. He now entered into obligations to keep the peace with his various rivals, but was soon implicated in riots and partisan disorders, and was ordered in December to leave the city. In March 1562, having made up his quarrel with Arran, he was accused of having proposed to the latter a project for seizing the queen, and in May he was imprisoned in Edinburgh castle whence he succeeded in escaping on Aug. 28. On Sept. 23 he submitted to the queen. Moray's influence, however, being now supreme, he embarked in December for France, but was driven by storms on to Holy island, where he was detained, and was subsequently, on Jan. 18 1564, seized at Berwick and sent by Elizabeth to the Tower, whence he was soon liberated and proceeded to France. After these adventures he returned to Scotland in March 1565, but withdrew once more before the superior strength of his opponents to France. The same year, however, he was recalled by Mary to aid in the suppression of Moray's rebellion, successfully eluding the ships of Elizabeth sent to capture him. In Feb. 1566 Bothwell, in spite of his previous matrimonial engagements—and he had also been united by "handfasting" to Janet Betoun of Cranstoun Riddell—married Jane, daughter of George Gordon, 4th earl of Huntly. Notwithstanding his insulting language concerning Mary and the fact that he was the "stoutest" in refusing mass, he became one of her chief advisers, but his complete ascendancy over her mind and affections dates from the murder of Rizzio on March 9, 1566. Mary took refuge with him at Dunbar, presented him, among other estates, with the castle there and the chief lands of the earldom of March, and made him the most powerful noble in the south of Scotland. In November she visited him at Dunbar, and in December took place the conference at Craigmillar at which both were present and at which the disposal of Darnley was arranged, Bothwell with some others subsequently signing the bond to accomplish his murder. He himself superintended all the preparations, visiting Darnley with Mary on the night of the crime, Sunday, Feb. 9 1567, attending the queen on her return to Holyrood for the ball, and riding back to Kirk o' Field to carry out the murder. After the explosion he hurried back to Holyrood and feigned surprise at the receipt of the news half an hour later.

According to Melville he had designs on the life of the young prince. On the demand of Lennox, Darnley's father, Bothwell was put upon his trial in April, but Lennox, having been forbidden to enter the city with more than six attendants, refused to attend, and Bothwell was declared not guilty. The queen's intention to marry Bothwell, which had been kept a strict secret before the issue of the trial, was now made public. On April 19 he obtained the consent and support of the Protestant lords, who signed a bond in his favour. On May 3 his divorce from his wife was decreed by the civil court, on the ground of his adultery with a maidservant, and on the 7th by the Roman Catholic court on the ground of consanguinity. On the 12th Bothwell was created duke of Orkney and Shetland and the marriage took place on the 15th according to the Protestant usage, the Roman Catholic rite being performed, according to some accounts, afterwards.

Bothwell's triumph, however, was short-lived. The nobles, both Protestant and Roman Catholic, now united to effect his destruction. In June Mary and Bothwell fled from Holyrood to Borthwick castle, whence Bothwell, on the place being surrounded by Morton and his followers, escaped to Dunbar, Mary subsequently joining him. Thence they marched with a strong force towards Edinburgh, meeting the lords on June 15 at Carberry Hill. Bothwell invited any one of the nobles to single combat, but Mary forbade the acceptance of the challenge. Meanwhile, during the negotiations, the queen's troops had been deserting; a surrender became inevitable, and Bothwell returned to Dunbar, parting from Mary for ever. Subsequently Bothwell left Dunbar for the north, visited Orkney and Shetland, and in July placed himself at the head of a band of pirates, and after eluding all attempts to capture him, arrived at Karm sound in Norway. On his identity becoming known he was sent to Copenhagen, where he gained King Frederick II.'s goodwill by an offer to restore the Orkneys and Shetlands to Denmark. In consequence the king refused all requests for his surrender. In Jan. 1568 he was removed to Malmö in Sweden. Mary demanded a divorce which was finally granted by the pope in Sept. 1570 on the ground of her prenuptial ravishment by Bothwell. After the downfall of Mary, Bothwell was placed in close and solitary confinement in the castle of Dragsholm or Adelersborg in Zealand. Here he became insane, and died on April 14, 1578.

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BOTHWELL, a town and civil parish of Lanarkshire, Scotland, on the right bank of the Clyde, 9 mi. E.S.E. of Glasgow by the L.N.E.R. and the L.M.S.R., and a residential quarter of Glasgow. Pop. (1931) 60,660. The choir of the Gothic church of 1398 (restored at the end of the 19th century) forms a portion of the parish church. Joanna Baillie, the poetess, was born in the manse. On June 22, 1679, at the battle of Bothwell bridge between the Royalists, under the duke of Monmouth, and the Covenanters, the latter lost 500 killed and 1,000 prisoners. Near this bridge, on "Bothwell bank," are the picturesque Gothic ruins of Bothwell castle that once belonged to James Hamilton of Bothwellhaugh (fl. 1566–80), the assassin of the regent Moray; and near the present farmhouse the South Calder is spanned by a Roman bridge, though this has been rebuilt.

BOTOCUDOS, the foreign name for a tribe of South American Indians of eastern Brazil, also known as the Aimores or Aimbores. They appear to have no collective tribal name for themselves. Some are called Nacnanuk or Nac-poruk, "sons of the soil." The name Botocudos (from Port. *botoque,* a plug, owing to their practice of wearing wooden plugs in their lips and ears), cannot be traced much farther back than the writings of Prince Maximilian von Neuwied (*Reise nach Bresilien,* Frankfort-on-Main, 1820).

The original home of the tribe comprised most of the present province of Espirito Santo, and reached inland to the headwaters of Rio Grande (Belmonte) and Rio Doce on the eastern slopes

of the Serra do Espinhacao, but the Botocudos are now mainly confined to the country between Rio Pardo and Rio Doce.

The Botocudos are nomads, wandering naked in the woods and living on forest products. They are below the medium height, but broad-shouldered. They are Mongolian in appearance, having flat faces, high cheekbones and light, yellowish-brown skin. (*See* BRAZIL; SOUTH AMERICA: *Ethnology.*)

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BOTORI, a Japanese game played in schools, by two sides of equal number, usually about 100, each of which defends a pole about 8ft. high firmly set in the ground, the poles being about 200yds. distant from each other. The object of each party is to overthrow the adversary's pole while keeping its own upright. Pulling, hauling, and wrestling are allowed, but no striking or kicking. A game similar in character is played by the Sophomore and Freshman classes of Amherst college (Massachusetts), called the "flag-rush." Other American colleges have similar contests during the first semester of the college year. To gain possession of the opponent's pole gives the victorious class certain privileges during the ensuing term.

BOTOSANI, a town of Rumania, capital of the department of the same name; on a small tributary of the River Jijia, and in one of the richest agricultural and pastoral regions of the north Moldavian hills. Pop. (1930) 32,107. Botosani lies on a branch railway between Dorohoi and the main line from Czernowitz to Galatz, and does a considerable transit trade. It has extensive starch and flour mills; and its flour is highly prized in Rumania, besides being largely exported to Turkey and the United Kingdom. Botosani owes its name to the Mongol chief, Batu Khan, grandson of Jenghiz Khan, who occupied the country in the 13th century. There are large colonies of Armenians and Jews.

BO-TREE or **BODHI-TREE,** the name given by the Buddhists of India and Ceylon to the Pipul or sacred wild fig (*Ficus religiosa*). It was a tree of this species beneath which the Buddha is traditionally supposed to have attained perfect knowledge. The Bo-tree at the ruined city of Anuradhapura, 80m. N. of Kandy, grown from a branch of the parent tree sent to Ceylon from India by King Asoka in the 3rd century B.C., is still worshipped by pilgrims who come long distances to revere it. Usually a bo-tree is planted on the graves of the Kandy monks.

BOTRYTIS, a minute fungus which appears as a brownish-grey mould on decaying vegetation or on damaged fruits. Under a hand-lens it is seen to consist of tiny, upright, brown stalks which are branched at the tips, each branchlet being crowned with a naked head of pale-coloured spores. It is very common, growing everywhere in the open or in greenhouses, and can be found at almost any season. Some species are known to cause destructive plant diseases. The fungi placed in the genus *Botrytis* are in part stages in the life-history of members of the genus *Sclerotinia.* These are characterized by the possession of a *sclerotium,* which is a compact mass of fungal filaments from which a cup-like ascophore arises. (*See* FUNGI.)

BOTTA, CARLO GIUSEPPE GUGLIELMO (1766–1837), Italian historian, was born at San Giorgio Canavese in Piedmont. In 1786 he received his M.D. from Turin. In 1795 he withdrew to France, only to return to his native country as a surgeon in the French army, whose progress he followed as far as Venice. Here he joined the expedition to Corfu, from which he did not return to Italy till 1798. After 1814 he became a French citizen, and in 1817 he was appointed rector of the University of Rouen, but in 1822 was removed owing to clerical influence. In 1824 he published *Storia d'Italia dal 1789 al 1814,* on which his reputation principally rests. His continuation of Guicciardini (*Storia d'Italia in continuazione al Guicciardini, 1832*) is a careful and laborious work, but is not based on original authorities and is of small value. Though living in Paris he was in both these works the ardent exponent of that recoil against everything French which took place throughout Europe.

His son, PAUL ÉMILE BOTTA (1802–70), was a distinguished traveller and Assyrian archaeologist, whose excavations at Khorsabad (1843) were among the first efforts in the line of investigation afterwards pursued by Layard.

See C. Dionisiotti, *Vita di Carlo Botta* (Turin, 1867); C. Pavesio, *Carlo Botta e le sue opere storiche* (Florence, 1874); Scipione Botta, *Vita privata di Carlo Botta* (Florence, 1877); A. d'Ancona e O. Bacci, *Manuela della Letteratura Italiana* (Florence, 1894), vol. v., pp. 245 *seq.*

BOTTESINI, GIOVANNI (1822–1889), Italian contrabassist and musical composer, was born at Crema, Lombardy, Dec. 24, 1822. He studied at the Milan conservatoire, devoting himself especially to the double-bass. On leaving Milan he spent some time in America. His first opera, *Cristoforo Colombo,* was produced in 1847 at Havana. In 1849 he made the first of many appearances in England, where he enjoyed great popularity for many years in virtue of his extraordinary power as a double-bass virtuoso. Apart from his triumphs as an executant, Bottesini was a conductor of European reputation. He directed the first performance of Verdi's "Aïda" at Cairo in 1871, and earned some success as a composer. He died at Parma, July 7, 1889.

BOTTICELLI, SANDRO, properly ALESSANDRO DI MARIANO DEI FILIPEPI (1444–1510), Florentine painter, was born at Florence in 1444, in a house in the Via Nuova, Borg' Ognissanti. This was the home of his father, Mariano di Vanni dei Filipepi, a struggling tanner. Sandro, the youngest child but one of his parents, derived the name Botticelli, by which he was commonly known, not, as related by Vasari, from a goldsmith to whom he was apprenticed, but from his eldest brother Giovanni, a prosperous broker, who seems to have taken charge of the boy, and who for some reason bore the nickname *Botticello* or Little Barrel. A return made in 1457 by his father describes Sandro as aged thirteen, weak in health, and still at school (if the words *sta al legare* are to be taken as a misspelling of *sta al leggere,* otherwise they might perhaps mean that he was apprenticed either to a jeweller or a bookbinder). Having shown an irrepressible bent towards painting, he was apprenticed in 1458–59 to Fra Filippo Lippi, in whose workshop he remained as an assistant apparently until 1467.

Some authorities hold that he must have attended for a while the much-frequented workshop of Verrocchio. But the "Fortitude" is the only authenticated early picture in which the Verrocchio influence may perhaps be traced. Like other artists of his time in Florence, Botticelli had begun to profit by the patronage of the Medici family. For the house of Lorenzo il Magnifico in the Via Larga he painted a decorative piece of Pallas with lance and shield. This is probably the fine picture of "Pallas and the Centaur," rediscovered after remaining for many years in the private apartments of the Pitti Palace and now in the Uffizi. But Sandro's more especial patron was another Lorenzo, the son of Pierfrancesco de Medici. For the villa of this younger Lorenzo at Castello Botticelli painted about 1477–78 the famous picture of "Primavera" or Spring now in the Uffizi at Florence. The design was inspired by Poliziano's poem the "Giostra" with reminiscences of Lucretius and of Horace (perhaps also, as has lately been suggested, of the Late Latin "Mythologikon" of Fulgentius). Venus, fancifully draped, with Cupid hovering above her, stands in a grove of orange and myrtle and welcomes the approach of spring who enters heralded by Mercury, with Flora and Zephyrus gently urging her on. In 1480 he painted in rivalry with Ghirlandajo a grand figure of St. Augustine on the choir screen of the Ognissanti, afterwards removed to another part of the church. About the same time we find clear evidence of his contributing designs to the workshops of the "fine-manner" engravers in the shape of a beautiful print of the triumph of Bacchus and Ariadne adapted from an antique sarcophagus (the only example known is in the British Museum) as well as in nineteen small cuts executed for the edition of Dante with the commentary of Landino printed at Florence in 1481 by Lorenzo della Magna.

At this time Botticelli was called to Rome to take part with other leading artists of the time (Ghirlandaio, Cosimo Rosselli, Perugino and Pinturicchio) in the decoration of Sixtus IV.'s chapel at the Vatican, the ceiling of which was afterwards destined to be

the field of Michelangelo's noblest labours. During the time of his stay in Rome (1481–82) Botticelli is recorded also to have painted another "Adoration of the Magi," his fifth or sixth embodiment of the same subject. Returning to Florence towards the end of 1482 Botticelli worked there for the next ten years until the death of Lorenzo Il Magnifico in 1492. To 1482–83 belongs the fine altar-piece of San Barnabo (a Madonna and Child with six saints and four angels), now in the Uffizi. Very nearly of the same time must be the most popular and most often copied, though very far from the best-preserved of his works, the round picture of the Madonna with singing angels in the Uffizi, known from the text written in the open choir-book as the "Magnificat." Somewhere near this must be placed the beautiful and highly-finished drawing of "Abundance" which has passed into the British Museum, as well as a small Madonna in the Poldi-Pezzoli collection at Milan, and the fine full-faced portrait of a young man, probably some pupil or apprentice in the studio, at the National Gallery. His superb altar-piece of the Madonna between the two saints John, now in the Berlin gallery, was painted for the Bardi chapel in the church of San Spirito in 1486. In the same year he helped to celebrate the marriage of Lorenzo Tornabuoni with Giovanna degli Albizzi by an exquisite pair of symbolical frescoes, the remains of which, after they had been brought to light from under a coat of whitewash on the walls of the Villa Lemmi, were removed in 1882 to the Louvre. Within a few years of the same date (1485–88) should apparently be placed that second masterpiece of fanciful classicism done for Lorenzo di Pierfrancesco's villa at Castello, the "Birth of Venus," now in the Uffizi, the design of which seems to have been chiefly inspired by the "Stanze" of Poliziano, perhaps also by the "Pervigilium Veneris"; together with the scarcely less admirable "Mars and Venus" of the National Gallery, and the most beautiful and characteristic of all his Madonnas the roundel of the "Virgin with the Pomegranate" (Uffizi). "The Annunciation" from the convent of Cestello now in the Uffizi, shows a design adapted from Donatello. The great altar-piece in the Uffizi with its *predelle* commissioned by the Arte della Seta in 1488 and finished in 1490 with the incomparable ring of dancing and quiring angels encircling the Virgin in the upper sky, is the last of his large altar-pieces.

Chiefly between the years of 1492 and 1495, the master undertook a set of drawings in illustration of Dante on a far more elaborate and ambitious plan than the little designs for the engraver which had been interrupted in 1481. Eighty-five of these drawings are in the famous manuscript acquired for the Berlin museum at the sale of the Hamilton Palace collection in 1882, and eleven more in the Vatican library at Rome. The series is one of the most interesting that has been preserved by any ancient master; it reveals an intimate knowledge of and profound sympathy with the text, full of Botticelli's characteristic poetic yearning and vehemence of expression, his half-childish intensity of vision; exquisite in lightness of touch and in swaying, rhythmical grace of linear composition and design. Most of the drawings remain in pen outline only, over a light preliminary sketch with the lead stylus; all were probably intended to be finished in colour, as a few actually are. To the period of these drawings would seem to belong the famous "Calumny of Apelles" at the Uffizi, inspired no doubt by some contemporary translation of the text by Lucian, and equally remarkable by a certain feverish energy in its sentiment and composition, and by its exquisite finish and richness of execution and detail.

Simone di Mariano, a brother of Botticelli long resident at Naples, returned to Florence in 1493 and shared Sandro's home in the Via Nuova. He soon became a devoted follower of Savonarola, and has left a manuscript chronicle which is one of the best sources for the history of the friar and of his movement. Sandro himself seems to have remained aloof from the movement almost until the date of the execution of Savonarola and his two followers in 1498. At least there is clear evidence of his being in the confidence and employ of Lorenzo di Pierfrancesco so late as 1496 and 1497, which he could not possibly have been had he then been an avowed member of the party of the Piagnoni. After Lorenzo's return, following on the overthrow and death of Savonarola in 1498, we find no trace of any further relations between him and Botticelli, who by that time would seem to have become a declared devotee of the friar's memory.

The mystic vein of religious and political speculation into which Botticelli had by this time fallen has its finest illustration in the beautiful symbolic "Nativity," which passed in succession from the Aldobrandini, the Ottley, and the Fuller Maitland collections into the National Gallery in 1882 with the apocalyptic inscription in Greek which the master has added to make his meaning clear. In a kindred vein is a much-injured symbolic "Magdalene at the foot of the Cross" in private possession at Lyons. Other extant pictures by the master are four panels illustrating the story of St. Zenobius, of which one is at Dresden, two are in the National Gallery, London, one is in the Metropolitan Museum, New York, and the fourth is in the collection of Lord Lee of Fareham. In 1503–04 Botticelli served on the committee of artists appointed to decide where the colossal David of Michelangelo should be placed. In these and the following years we find him paying fees to the company of St. Luke, and the next thing recorded of him is his death, followed by his burial in the Ortaccio or garden burial-ground of the Ognissanti in May 1510. The story of his work and life is fully elucidated in the work of Mr. H. P. Horne—a masterpiece of documentary research and critical exposition.

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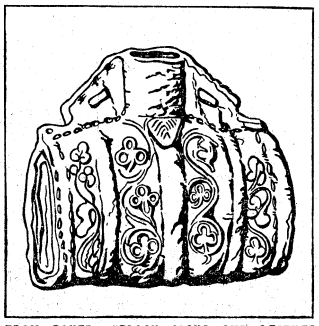
BÖTTIGER, KARL AUGUST (1760–1835), German archaeologist, was born at Reichenbach on June 8, 1760, and died at Dresden on Nov. 17, 1835. In 1791 he was appointed rector of the gymnasium at Weimar, where he entered into a circle of literary men, including Wieland, Schiller, and Goethe. In 1804 he was called to Dresden as superintendent of the studies of the court pages. In 1814 he was made director of studies at the court academy, and inspector of the Museum of Antiquities.

His chief works are:—*Sabina, oder Morgenszenen im Putzzimmer einer reichen Römerin* (1803); *Griechische Vasengemälde* (1803); *Ideen zur Archäologie der Malerei,* i. (1811) (no more published); *Kunstmythologie* (1811); *Vorlesungen und Aufsätze zur Alterthumskunde* (1817); *Amalthea* (1821–25); *Ideen zur Kunstmythologie* (1826–36). The *Opuscula et Carmina Latina* were published separately in 1837, with a collection of his smaller pieces, *Kleine Schriften* (1837–38), including a complete list of his works (56 pages). His biography was written by his son Karl Wilhelm Böttiger (1790–1862), for some time professor of history at Erlangen, and author of several valuable historical works.

BOTTLE, a vessel for containing liquids, generally as opposed to one for drinking from (though this probably is not excluded) and with a narrow neck to facilitate closing and pouring. The first bottles were probably made of the skins of animals. In the *Iliad* (iii. 247) the attendants are represented as bearing wine for use in a bottle made of goat's skin. The ancient Egyptians used skins for this purpose, and from the language employed by Herodotus (ii. 121) it appears that a bottle was formed by sewing up the skin and leaving the projection of the leg and foot to serve as a vent, which was hence termed *ποδεών.* The aperture was closed with a plug or a string. Skin bottles of various forms occur on Egyptian monuments. The Greeks and

Romans also were accustomed to use bottles made of skins; and in the southern parts of Europe they are still used for the transport of wine. The first explicit reference to bottles of skin in Scripture occurs in Joshua (ix. 4), where it is said that the Gibeonites took "old sacks upon their asses, and wine-bottles *old and rent and bound up.*" The objection to putting "new wine into old bottles" (Matt. ix. 17) is that the skin, already stretched and weakened by use, is liable to burst under the pressure of the gas from new wine. Skins are still most extensively used throughout western Asia for the conveyance and storage of water. It is an error to represent the bottles of the ancient Hebrews as being made exclusively of skins. In Jer. xix. 1 the prophet speaks of "a potter's earthen vessel." The Egyptians (*see* EGYPT: *Art and Archaeology*) possessed vases and bottles of hard stone, alabaster, glass, ivory, bone, and porcelain, bronze, silver and gold, and also of glazed pottery or common earthenware. In modern times bottles are usually made of glass, etc., occasionally of earthenware. The glass bottle industry has attained enormous dimensions, whether for wine, beer, or mineral waters; and labour-saving machinery for blowing and filling the bottles has been introduced, as well as for corking or stoppering, for labelling, and for washing them. (*See* BOTTLE MANUFACTURE.)



FROM BAKER, "BLACK JACKS AND LEATHER BOTTLES" (BURROW & CO.)

12TH CENTURY LEATHER BOTTLE FOUND IN THE TOWN DITCH, AT THE OLD BAILEY, LONDON, IN 1913

BOTTLE-BRUSH PLANTS, a genus of Australian plants, known botanically as *Callistemon,* and belonging to the myrtle family (Myrtaceae). They take their name from the resemblance of the head of flowers to a bottle-brush. Although known in greenhouse cultures, they are commonly used out-of-doors in parts of Florida and California for the beauty of their highly coloured stamens which vary from lemon to crimson. There are 17 species.



FROM BAKER, "BLACK JACKS AND LEATHER BOTTLES." BY PERMISSION OF ED. J. BURROW & CO.

17TH CENTURY BOTTLE

BOTTLE MANUFACTURE. The term "bottle" is one which includes many types of glass products. This article has to do specifically with the glass container industry, which includes milk bottles; narrow-neck packers' ware; wide-mouth packers' ware; pressed ware, such as fruit jars and jelly glasses; beverage bottles, including liquor ware and carbonated or plain beverages; medicinal, prescription and toilet preparation containers; and finally all sorts of general purpose containers. Capacities may run from a few drops to many gallons.

The tremendous growth of the glass container industry is shown by the census figures reproduced in the table. From 1899 to 1941 the value of product increased approximately ten times. More bottles were probably produced during the first six months of 1942 than during the entire year of 1935. The introduction of machinery had greatly increased the production per man-hour. In 1899 the industry employed 28,370 and produced 7,780,000 gross; in 1939 employment was only 25,753 but production was 52,533,723, a sevenfold increase.

Glass Container Production in the United States

	1899	1925	1939	1941
Number of factories	—	120	77	—
Employment	28,370	21,704	25,753	—
Total value	$21,677,000	$100,301,407	$156,365,000	$215,000,000
Food-product	—	38,125,600	60,185,000	—
Beverage	—	18,594,646	51,219,000	—
Medicinal, toilet	—	31,967,717	38,172,000	—
General purpose	—	11,613,444	6,789,000	—
Total quantity (gross)	7,780,000	26,044,000	52,533,723	70,440,000
Food-product	—	10,042,939	18,147,016	—
Beverage	—	4,063,780	14,235,324	—
Medicinal, toilet	—	10,259,170	17,994,841	—
General purpose	—	1,678,111	2,156,542	—

World War II had a pronounced effect upon the container industry. Much emphasis was placed on the substitution of glass for tin cans, because of the urgent need for conserving tin resources. There was need for elimination of many unnecessary items, as well as for simplification and standardization of bottle design and capacity so as to get the most container volume from a given weight of glass. Elimination of many items where the ratio of weight of glass to volume of contents was high was urged. Bottle designs were made with the purpose of using the minimum amount of closure (cap) materials, such as metal and plastics.

Raw Materials and Composition.—Container glass is made from three major raw materials: soda ash (Na_2CO_3), limestone (calcite, $CaCO_3$, and dolomite, $CaCO_3.MgCO_3$) and silica sand (SiO_2). The oxides resulting from the fusion of the above materials constitute, in most cases, at least 97% of the glass weight, and sometimes 99.8%.

The following serves to give an idea of the composition range:

SiO_2 (silica or silicon dioxide) 68%–74%
Al_2O_3 (alumina or aluminum oxide) 0.2%– 5%
CaO (calcium oxide) and MgO (magnesium oxide) ... 8%–14%
Na_2O (sodium oxide) 13%–16%

The aluminum oxide is usually obtained from feldspar. Small amounts of other materials are usually present, these being Fe_2O_3, or ferric oxide (up to 0.07% in flint glasses); BaO, or barium oxide, in amounts up to 0.7%, resulting from addition of barium sulphate (barytes or $BaSO_4$). In some instances boric oxide (B_2O_3) is present in small amounts (up to 1.5%), the source being borax.

For the manufacture of flint (clear or colourless) glass the Fe_2O_3 content of the final glass must be less than 0.07%, since it is a strong colourant. For this reason the basic raw materials must be quite pure. Even with only this small amount of iron oxide present, it is necessary to decolourize the glass in order to get the best flint or clear colour. The iron oxide gives a greenish cast, and this is masked by the use of selenium, which gives a light straw tint, and cobalt oxide, which gives a slight bluish tint. These materials are present, however, in such small amounts that they cannot usually be found on analysis of the glass.

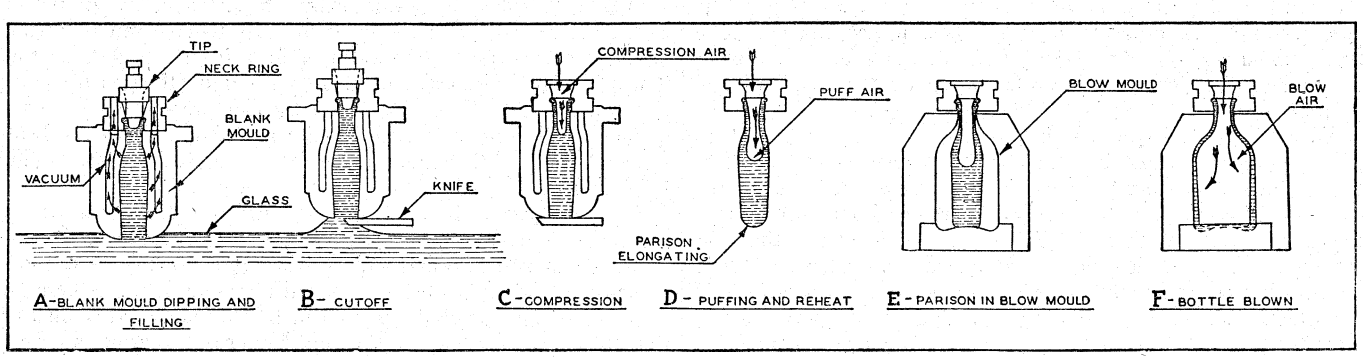


FIG. 1.—VACUUM-AND-BLOWING PROCESS (OWENS MACHINE)

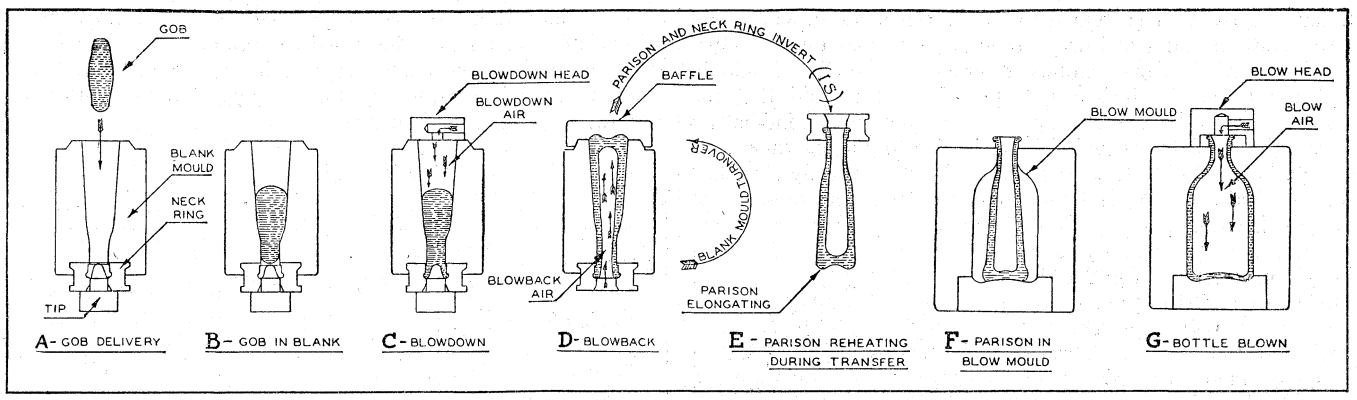


FIG. 2.—BLOWING-AND-BLOWING PROCESS

In the container industry there is considerable production of coloured glasses, particularly amber and various shades of green. The amber glass is made by the addition of carbon (sea coal) and sulphur (or pyrites, iron sulphide). The green glasses result from the addition of oxides of chromium, sometimes used together with cobalt oxide or sulphur. Quite often iron chromite is used as the source of chromium oxide, and, of course, contributes iron oxide to the glass. Green glasses can also be made with the use of oxides of iron (iron scale) and manganese dioxide.

The durability of various container glasses to the products which are packaged therein has received considerable emphasis. Many studies have been made of the resistance of the glass to various types of solutions and the changes of solutions due to soluble or insoluble components from the glass. This subject is very complex and cannot be treated in any detail here, but in many instances compositions are specifically balanced with a particular use in mind. A decrease of Na_2O in the glass increases the durability, while the use of Al_2O_3 and other stabilizing oxides is becoming more widespread.

Batch Handling and Melting.—The raw materials are usually received by freight car and are in most cases unloaded by automatic equipment. There are several methods of weighing the batch which are in commercial use. Cullet (broken glass) is always added to the batch in fair quantities, since it is almost always available and often aids in melting.

After the batch is mixed and transferred to the tank line, it is fed to the tank proper by one of several procedures. Hand feeding, where the piles of batch are pushed into the furnace by hand, is still fairly common, but automatic types of feeders are gradually being adopted. These automatic types of feeders take several forms, usually being some form of a pusher bar or a revolving screw, which gives uniformity of feeding. In some cases the batch is fed through a single opening, and in others attempts are made to feed batch along the entire end of the furnace.

The glass is melted in an open-hearth type furnace, the basic construction details of which are shown in the article GLASS MANUFACTURE. The depth of glass varies from approximately 30 in. to 48 in., and the area of the melter proper may exceed 900 sq.ft. An average melter will have 600 to 700 sq.ft. of melter area, with a depth of 42 in. Fuel for melting may be any of the ordinary types, such as producer gas, natural gas, oil, etc. The fuel and air are introduced first from one side and alternately reversed in direction on time cycles which vary from 15 min. to 40 min.

After the glass is melted, it progresses through a throat to the refiner. The throat is a submerged passage which prohibits any surface glass from getting directly into the refiner. In the refiner the temperature of the glass is reduced somewhat, since the temperature required for melting is too high for the subsequent operations. The tendency has been to increase the melter temperatures considerably, from a temperature of 2,600°–2,650° F., which was common some years ago, to temperatures of 2,750°–2,775°. These temperatures are, of course, changed according to the quality of glass which is being melted in the furnace. In the refiner the temperature of the glass is reduced to 2,200°–2,400° F. After being somewhat cooled in the refiner of the furnace, the glass flows subsequently: (*a*) to a feeder channel which further conditions the glass as to temperature for proper machine fabrication, thence to an orifice where gobs are severed; or (*b*) through an alcove and trough to a revolving pot, from which the glass is picked up by the suction or vacuum process. These two types cover at least 97% of the bottle production in the United States and provide means for temperature conditioning and delivery of the glass to the automatic machines.

Mould Loading.—The Hartford-Empire feeder (*see* GLASS MANUFACTURE) is used to deliver to the moulds a glass charge or "gob" of predetermined size, shape, weight and temperature. In the vacuum process (Owens) the glass flows from the refiner of the furnace through an alcove and a trough and drops approximately 6 in. into the edge of a revolving pot. These revolving pots are usually 10 or 13 ft. in diameter and are fired by auxiliary means under the crown constructed over them. The flow of the glass is controlled by means of a plug which is raised or lowered in the trough to maintain a constant level of glass in the revolving pot. The glass is usually 4 in. deep in the revolving pot and is picked up by a blank mould (*see* fig. 1A), which dips into the glass on an exposed portion of the pot. After the blank dips into the glass and the suction is applied, resulting in filling of the blank, the blank rises out of the glass, which is severed by a swinging cutoff knife (*see* fig. 1B). The pot revolves at a speed which is adjusted to the particular job in question, being usually of the order of two to five revolutions per minute. The entire structure is supported on a revolving framework and is driven by variable-speed electric motors.

The speed at which the suction process can be used is determined by the amount of vacuum which can be applied to the mould, the area of the opening through which the glass enters the blank mould, the time involved, the volume of glass required and the viscosity or fluidity of the glass in the revolving pot. The process is used to make 5-gal. carboys, as well as bottles weighing a fraction of an ounce. In 1937 approximately 29% of the glass containers made in the United States were made by this method of glass delivery to the machine.

Forming the Bottle.—Basically, the manufacture of bottles is nothing more than the shaping of glass to conform to certain mould contours and the removal of heat from the glass so that it will be rigid (viscous) enough to support itself upon discharge from the mould. It is almost a universal practice to have the moulds made from cast iron, usually not alloyed with the heat-resistant metals. The internal surfaces are cast against a chill for denseness.

There are several basic processes which are used in fabricating bottles. These may be classified as pressing, pressing and blowing, vacuum and blowing, and blowing and blowing. The mode of delivering glass has been discussed above. Likewise, there are many mechanical procedures used in bottle manufacture, in that the machines may be rotating continuously, rotating intermittently (station-cycle), or individual section machines, in which

the moulds only open and close. The blank moulds may be on the same rotating section as the blow moulds, or they may be on a different rotating section (two-table machines). For feeder machines, the blank moulds may invert, or they may be upside down and the glass inverted after it leaves the blank mould. The transfer from blank to blow mould is by use of the neck ring. Some machines allow an overlap of mould time (glass in both blank and blow at the same time).

Vacuum-and-Blowing Process.—The Owens machine depends upon the vacuum method of gathering glass from a revolving pot. The pot revolves in order to supply a fresh glass surface of the proper temperature for gathering, since the surface is exposed only during the gathering operation. The basic steps in the Owens process are shown in fig. 1. Fig. 1A shows the blank mould dipping into the glass and filled with glass due to the application of vacuum. In fig. 1D the blank mould has opened (broken contact with the glass), and while the parison (partially-shaped blank of glass) is gradually elongating, an additional puff of air is applied as shown. The surface of the parison is reheating during this stage. In fig. 1E the parison is shown in the unblown condition inside the blow mould and is, of course, supported by the neck ring. The last figure indicates the blown bottle in the blow mould. In subsequent operations the neck ring opens and the blown bottle, after remaining in the blow mould for a short time, is discharged to a chute and a conveyor. A wide range of timing these various steps makes the machine very flexible.

The Owens machine is made in several basic forms, the most common types being the AR machine, which has 10 heads, and the AQ machine, which has 15 heads. Each head carries its own complete mould equipment and performs the entire bottle fabrication. Bottles of ordinary size will be made at a speed of 90 to 110 on the AQ machine.

Blowing-and-Blowing Process.—This process uses a feeder to deliver a gob of glass to the blank mould. The blank mould is upside down (the neck is too small to receive the gob), as shown in fig. 2A, and the tip and neck ring are in position as the gob drops into the blank. As quickly as possible after the gob reaches the blank (fig. 2B), the blowdown head comes into position and blows the glass down to form the finish of the bottle (fig. 2C). As is shown in fig. 2D, the blowdown head is replaced by a baffle plate while the tip is removed and air pressure applied through the finish to form the blowback or complete shaping of the parison in the blank mould. Following the blowback, the blank mould, together with the neck ring, rotates 180° (turns over), after which the blank mould opens and the parison is suspended in air, supported by the neck ring. This allows reheating of the glass surface (fig. 2E). The parison is then transferred to the blow mould, which closes around it, with the neck ring opening, and the parison suspended in the blow mould and reheating, as shown in fig. 2F. The blow head then comes into place and the bottle is formed (fig. 2G). This is the typical cycle which is used in the Lynch machine.

The same basic cycle is used in the IS (individual section) machine manufactured by Hartford-Empire. In this case, however, the moulds are on sections which do not rotate, their only action being to open and close, and there is no inversion of the blank mould, which opens wide enough to allow the transfer arm (carrying the neck ring) to swing 180° for transfer to the blow mould. The IS machine can be used for a wide variety of bottle shapes and sizes. It is made in four- and eight-section machines and has the highest mould rate (bottles per cavity per minute) of any bottle machine developed up to 1943. The ordinary size bottle will be produced on a four-section machine at the rate of 25 to 40 bottles per minute with four blow moulds. For very small bottles, speeds in excess of 60 bottles on a four-section machine are attained.

Pressing-and-Blowing Process.—The basic steps in the press-and-blow operation are shown in fig. 3. The operation depends upon the feeding of a gob to the blank mould and the subsequent pressing of this gob to conform to the blank shape and to the shape of the plunger. After the parison is formed by the pressing operation, as shown in figs. 3B and 3C, the operation follows closely that of other machines. The press-and-blow operation is adaptable for wide-mouth ware only, since it is obvious that the plunger diameter controls this.

The Miller machine is a single table, start and stop, rotating unit having ten or twelve heads and one plunger. Each head carries a set of neck rings, a one-piece blank mould and a blow mould. The operations take place at the individual stations, and on this basis much time is lost between stations. The machine is capable of speeds up to approximately 50 per minute for the smaller-size ware, but for ordinary-size bottles the speeds range from 35 to 40 per minute.

In the Hartford-Empire IS machine wide-mouth attachment, the operation is quite similar, except that the blank is again upside down and the plunger comes up from underneath, being partially up as the gob is delivered to the blank. After gob delivery the baffle plate comes into position and the blank is pressed upside down. This cycle is shown in fig. 4.

Pressing Glass.—In some instances, for example in the manufacture of jelly glasses and other wide-mouth ware, it is possible to make the complete article by pressing without any subsequent blowing. In these cases the process is essentially the same as the first three stages of the press-and-blow operation shown in figs. 3A, 3B and 3C. In pressing, however, the glass is usually held under the press for a longer time so as to be more rigid as soon as the blank mould opens.

In practically all cases of feeder machines, as soon as the bottle is formed and ready for delivery, a pair of mechanically-operated tongs grips the finish of the bottle as the blow mould opens and picks up the bottle for delivery to a moving conveyor. This conveyor then charges a cross-conveyor, which feeds the lehr, making the lehr feeder an integral part of the glass forming operation.

Annealing.—The lehr is a long tunnel in which there are three distinct sections: first, a section in which the temperature gradients in the bottle are ironed out; second, a constant temperature zone, in which the strains existing in the glass are removed; and third, a cooling zone, in which the glass is gradually cooled to room temperature. The lehrs are usually of the order of 3 ft. to 6 ft. in width and 80 ft. to 150 ft. in length. The glass is carried through the lehr by means of a continuous, heat-

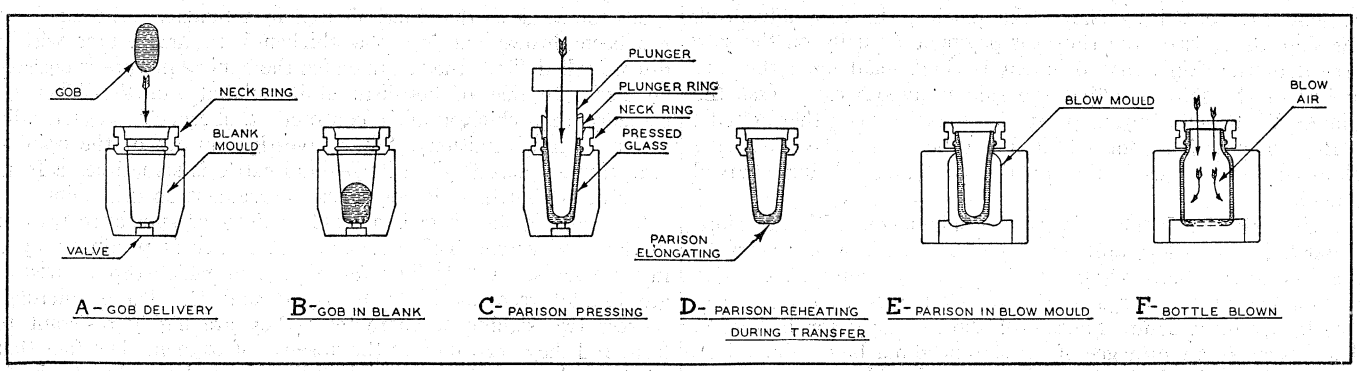


FIG. 3.—PRESSING-AND-BLOWING PROCESS

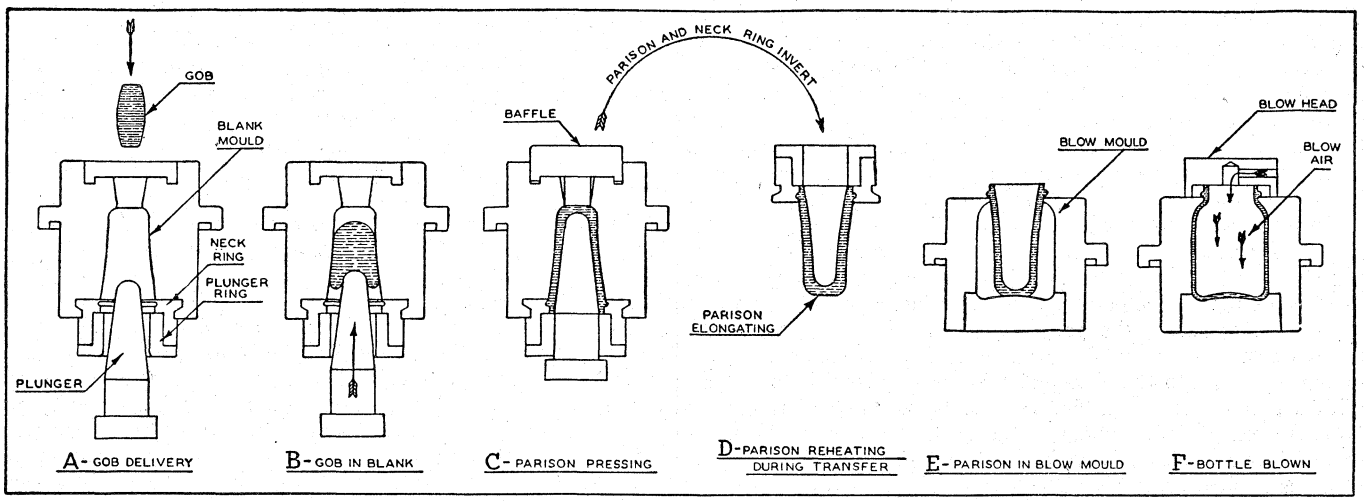


FIG. 4.—INDIVIDUAL SECTION MACHINE USING PRESS-AND-BLOW OPERATION

resistant metal conveyor chain. Lehrs may be heated by means of gas or electricity and are usually completely controlled by means of automatic regulation.

The total lehr cycle occupies a period of from one to two hours.

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BOTTOMRY, a maritime contract in the nature of a mortgage of a ship by which money is borrowed for the necessities of the ship to enable it to proceed on its voyage. The keel or bottom of the ship (as representing the whole), with the cargo and freight, are made liable for the repayment of the money borrowed, with interest. The lender cannot recover either principal or interest if the ship is lost on the voyage (*see* the "Atlas" [1827] 2 Haggard Admiralty 53). In view of the risk which the lender runs, the rate of interest is usually a high one.

As the basis for this special kind of contract, there must be the necessity of resorting to a charge on the ship. It must be impossible to obtain the funds required in any other way than by a hypothecation of the ship. The lender on bottomry becomes entitled to a maritime lien giving him precedence of certain other claimants, but he takes the risk of non-recovery should the ship be lost. Contracts of this kind, according to Lord Stowell, in the "Alexander" (1812) 1 Dodson 278, "were invented for the purpose of procuring the necessary supplies for ships which may happen to be in distress in foreign ports, where the master and the owners are without credit, and where, unless assistance could be secured by means of such an instrument, the vessels and their cargoes must be left to perish." Though bottomry is of great antiquity, this kind of contract is now seldom resorted to in practice. Increased facilities for communication and altered methods of business have rendered bottomry bonds almost obsolete.

In order to amount to bottomry the contract must be in writing. Though usually in the form of a bond, this is not essential so long as the writing shows the parties, the sum advanced, the ship, the voyage, the time for payment (usually on the safe arrival of the ship), that payment is conditional upon the safe arrival of the ship, and that the ship is hypothecated (*see* the "James W. Elwell" [1921] p. 351, and earlier cases there cited).

Respondentia is a contract similar to bottomry, the loan being obtained for the necessities of the cargo, and being charged upon it.

Communication if possible by the shipmaster with the shipowner before resort to bottomry is, by English law, necessary to the validity of a bottomry bond. A separate communication with the owners of the cargo where reasonable is also necessary. The lender must assure himself of the necessity for bottomry. The consent of a mortgagee of the ship need not be obtained, but, where practicable, the lender on bottomry should see that a mortgagee has notice of the necessity for the hypothecation before obtaining the bond (*see* the "St. George" [1926] p. 217). A bottomry bond does not transfer the property in the ship, but gives the lender a claim enforceable if necessary by legal proceedings in a court exercising Admiralty jurisdiction. The law by which the contract is governed is that of the ship's flag.

See Abbot's *Shipping* (1901); Roscoe's *Admiralty Practice* (1920); Maclachlan's *Shipping* (1923). (S. D. C.)

BOTULISM or **ALLANTIASIS.** The term botulism (Lat. *botulus,* sausage) seems to have been first applied in the early part of the 19th century to a type of sausage poisoning observed in Württemberg and some other parts of Germany. A recognizable description of this disease appeared, however, as early as 1735. Although the first outbreaks studied were traced to sausage it is now known that a variety of other foods, vegetable as well as animal, may give rise to this condition, so that the name botulism is to-day not wholly appropriate.

The symptoms of botulism are quite characteristic and, in contradistinction to several other forms of food poisoning, are mainly nervous rather than gastro-intestinal. They usually appear in from 18 to 24 hours after the eating of the poisonous food. Marked disturbance of vision occurs, double vision being especially frequent; drooping of the eyelids (ptosis) is common. Great difficulty in swallowing and in respiration is experienced. Muscular weakness is often extreme and may persist for a long time in those patients who recover. The mentality remains clear. There is little or no fever and the temperature may be subnormal. The case-fatality is high; in the large series of outbreaks in the United States recorded by Geiger, Dickson and Meyer it was slightly over 60%. In some group outbreaks every person partaking of the incriminated food has perished. This was the case in the famous Loch Maree outbreak in Scotland where every one of the eight persons who became ill after eating sandwiches made with a particular kind of potted meat died within a few days. In addition to the human outbreaks animals associated with man are sometimes affected and show, similarly, nervous symptoms and high fatality. Chickens that have eaten spoiled canned food—sometimes the same as that incriminated in a human outbreak—that has been thrown out into the chicken yard may suffer with a disease called "limberneck," in which the clinical picture is entirely analogous to that of botulism in inoculated animals. There is evidence that chickens also contract "limberneck" occasionally under natural conditions. Some investigators are of the opinion that "forage poisoning" in horses and cattle is sometimes a form of botulism, but there is not general agreement on this point.

The cause of botulism is a highly poisonous substance present in the food eaten. This poisonous substance is produced by a micro-organism, *Clostridium botulinum,* of which three varieties are usually recognized—Types A, B and C. These microbes possess two significant characters: they are highly resistant to heat, and they grow only in the absence of oxygen. The fact that most of the recent cases of botulism have been due to heat-

preserved foods protected from the access of air in cans or jars is thus readily explained. The elimination of most other micro-organisms by heat and the maintenance of conditions suitable for the development of *Clostridium botulinum* allow this organism to grow and produce its specific toxin. This toxin is formed when *Clostridium botulinum* is grown in pure cultures in the laboratory, and the symptoms and lesions produced by it in inoculated animals are entirely similar to those observed in botulism in man, and in "limberneck" in chickens. Type A produces the most, Type C the least, potent toxin. All three types are rather widely distributed in natural soils in various parts of the world and it is easy to see how they may get into all sorts of preserved foodstuffs. They are, however, particularly abundant in the soils of certain regions, the cause of the uneven distribution not being understood. In the United States most of the recorded outbreaks of botulism have occurred on the Pacific Slope or in the Rocky Mountain States—a circumstance that may be connected with the greater abundance of Type A in that region.

Knowledge of the nature and sources of botulism has aided greatly in its prevention. In the canning of foodstuffs it is possible to use sufficiently high temperatures and to insure proper heat penetration to kill even the resistant spores of the *Clostridium.* Methods based on exact determination of the degree of heat and the time of exposure necessary to effect complete bacterial destruction are now generally in use in the canning industry. It is obvious that such measures are more difficult to apply to food canned in the home, particularly in regions where the boiling point of water is lowered by the altitude, and it is perhaps significant that in recent years nearly all the outbreaks of botulism occurring in the United States have been due to home-canned food prepared in the Rocky Mountain region.

The individual consumer has some means of protecting himself against botulism. The foods that have caused botulism have in almost all the recorded instances shown signs of spoilage so that the rejection of any canned food of abnormal taste, smell or appearance constitutes a considerable safeguard. Fortunately, too, the toxin produced by *Clostridium botulinum* is itself quite readily destroyed by heat so that thorough heating of canned foods after their removal from the can is an additional factor of safety.

Once the symptoms of botulism have developed no satisfactory method of treatment has been found. Even the specific antitoxin, although more or less potent in animal experimentation, has never been used successfully in man; further experiments are, however, desirable.

Botulism has always been a very rare disease; it is becoming still more infrequent. In the United States were recorded 159 cases in the three-year period 1920–22, but only 85 in 1923–25 and 8 in 1926–27. The disease seems to have been practically eliminated as a hazard in the use of commercially canned foods, all the outbreaks for the past three years in the United States—where the consumption of commercially canned food is enormous—having been traced to home-canned foods.

See also FOOD POISONING.

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BOTZARIS or **BOZZARIS, MARCO** (*c.* 1788–1823), leader in the war of Greek independence, born at Suli in Albania, was the second son of Kitzo Botzaris, murdered at Arta in 1809 by order of Ali of Iannina. In 1803, after the capture of Suli by Ali Pasha, Marco, with the remnant of the Suliots, crossed over to the Ionian islands, where he ultimately took service in an Albanian regiment in French pay. In 1814 he joined the Greek patriotic society known as the Hetairia Philike, and in 1820, with other Suliots, made common cause with Ali of Iannina against the Ottomans.

On the outbreak of the Greek revolt, he distinguished himself by his courage, tenacity and skill as a partisan leader in the fighting in western Hellas, and was conspicuous in the defence of Missolonghi during the first siege (1822–23). On the night of Aug. 21 1823 he led the celebrated attack at Karpenisi of 350 Suliots upon 4,000 Albanians who formed the vanguard of the army with which Mustai Pasha was advancing to reinforce the besiegers. The rout of the Turks was complete; but Botzaris himself fell. Marco Botzaris's brother Kosta (Constantine) who fought at Karpenisi and completed the victory, lived to become a general and senator in the Greek Kingdom. Kosta died in 1853. Marco's son, Dimitri Botzaris (1813–70), was three times minister of war under the kings, Otho and George.

BOUCHARDON, EDME (1698–1762), French sculptor, was born at Chaumont on May 29, 1698, and died on July 27, 1762, in Paris. He was a pupil of Guillaume Coustou, and spent ten years in Rome, where he made a striking bust of Pope Benedict XIII. (1730). His most famous work is the fountain in the Rue de Grenelle, Paris, begun in 1740.

See Comte de Caylus, *Vie d'Edme Bouchardon* (1762), and Lady Dilke, *French Architects and Sculptors of the 18th Century* (1900).

BOUCHE FERMÉE, À, musical term signifying singing without words with closed, or nearly closed, mouth, the result being an inarticulate humming or buzzing. Formerly resorted to mainly for the purpose of amusing effects in humorous pieces, the device has more recently been employed with increasing frequency in quite serious works by modern composers.

BOUCHER, FRANÇOIS (1703–1770), French painter, was born in Paris on Sept. 29, 1703, and died there May 30, 1770. He was at first employed by Jean François Cars (1670–1739), the engraver, father of the engraver Laurent Cars (1699–1771), to make designs and illustrations for books. After four years spent in Rome he returned to Paris in 1731. He was made director of the Gobelins factory in 1755 and court painter in 1765, also director of the Academy and inspector of the tapestry manufacture of Beauvais, and was employed by Madame de Pompadour both to paint her portrait and to execute various decorative works. His Watteau-like style gave him the title of the Anacreon of painting. The Wallace collection, London, contains the largest number and some of his finest works. A portrait of Madame de Pompadour is in the National Gallery of Edinburgh. Boucher was also a master of etching.

See E. Michel, *François Boucher* (2nd ed. 1907); C. M. Bearne, *A Court Painter and his Circle* (1913).

BOUCHER, JONATHAN (1738–1804), English divine and philologist, was born near Wigton, Cumberland, on March 12, 1738, and died at Epsom on April 27, 1804. In early life he was a tutor in Virginia where he taught Washington's stepson. After a short stay in England for his ordination he returned to America and held various preferments there, becoming known as an eloquent preacher. He took the English side in the quarrel between England and the colonies and had to return to England, when he received a pension and the living of Epsom. Boucher contributed largely to William Hutchinson's *History of the County of Cumberland* (2 vols., 1794 *seq.*) and published *A View of the Causes and Consequences of the American Revolution* (1797), dedicated to George Washington, and consisting of thirteen discourses delivered in America between 1763 and 1775. His "Glossary of Provincial and Archaic Words," intended as a supplement to Dr. Johnson's *Dictionary,* was never published except in part, but passed into the hands of the English compilers of Webster's *Dictionary.*

BOUCHER DE CRÉVECOEUR DE PERTHES, JACQUES (1788–1868), French geologist and antiquary, was born on Sept. 10, 1788, at Rethel, Ardennes, and became a customs official. He died on Aug. 5, 1868, at Abbeville, where he was director of the douane. His leisure was chiefly devoted to the study of the Stone Age. About 1830 he had found, in the gravels of the Somme valley, flints which in his opinion bore evidence of human handiwork; but not until 1846, many years afterwards, did he make public the important discovery of a worked flint implement with remains of elephant, rhinoceros, etc., in the gravels of Menchecourt. His monumental *Antiquités celtiques et antédiluviennes* (1847–64) is a work in which he was the first to establish the existence of man in the Pleistocene or early Quater-

nary period. He was the author of several tragedies, two books of fiction, several works on travel, and a number of books on economic and philanthropic questions. To his scientific books may be added *De l'homme antédiluvien et de ses oeuvres* (1860).

See Alcius Ledien, *Boucher de Perthes, sa vie, ses oeuvres, sa correspondance* (Abbeville, 1885); Lady Prestwich, "Recollections of M. Boucher de Perthes" in *Essays Descriptive and Biographical* (1901).

BOUCHES-DU-RHÔNE, a maritime department of south-eastern France situated at the mouth of the Rhône. Area, 2,026 sq. miles. Pop. (1936) 1,224,802. Formed in 1790 from western Provence, it is bounded on the north by Vaucluse, from which it is separated by the Durance, east by Var, west by Gard, and south by the Mediterranean, along which its seaboard stretches for about 120 miles. The western portion consists of La Camargue (*q.v.*) a marshy plain between the Rhône and the Petit-Rhône, and comprising the Rhône delta. A large portion of its surface is covered by lagoons and pools (*étangs*), the largest of which is the Étang de Vaccarés. To the east of La Camargue is situated the remarkable pebble-strewn Crau (*q.v.*); and farther east and north are east-west hill-ranges. The Étang de Berre, a lagoon nearly 60 sq.mi. in area, is situated to the south-east of the Crau; it is now connected by a canal with the Rhône and by a canal tunnel through the Estaque hills with Marseilles.

Bouches-du-Rhône has a Mediterranean climate, with the drawback of the mistral, the cold north-west wind from the central plateau of France. The proportion of arable land is small, though considerably increased by artificial irrigation and by draining. Cereals, chiefly wheat and oats, are grown in La Camargue and the plain of Arles, but they are of less importance than the olive-tree, which is grown largely in the east of the department and supplies the oil-works of Marseilles. The vine is also cultivated, the method of submersion being used as a safeguard against phylloxera. In the cantons of the north-west large quantities of early vegetables are produced. Of live-stock, sheep alone are raised to any extent. Almonds, figs, capers, mulberry trees and silk-worms are sources of considerable profit. Iron is worked, but the most important mines are those of lignite; the department also produces bauxite, building-stone, lime, cement, gypsum, clay, sand and gravel, marble and sea-salt. Marseilles (*q.v.*), the capital, is the most important industrial town. In its industrial establishments is concentrated most of the manufacturing activity of the department. To these must be added the potteries of Aubagne, the silk-works in the north-west cantons, various paper and cardboard manufactories, oil distilleries, metal foundries and soap factories. Fishing is also important. The foreign commerce of the department is for the most part concentrated in the capital; the minor ports are Martigues, Cassis and La Ciotat. Internal trade is facilitated by the canal from Arles to Port-de-Bouc and two smaller canals, in all about 35 mi. in length, as well as by the canals mentioned above. The Rhône and the Petit-Rhône are both navigable within the department.

Bouches-du-Rhône is divided into the three arrondissements of Marseilles, Aix and Arles (33 cantons, 115 communes). It belongs to the archiepiscopal province of Aix, to the region of the XVth army corps, and to the *académie* (educational division) of Aix. Its court of appeal is at Aix. Near Saint-Chamas there is a Roman bridge over the Touloubre, which probably dates from the 1st century B.C. and is thus the oldest in France. At Vernègues there are remains of a Roman temple known as the "Maison-Basse." The famous abbey of Montmajour, with Romanesque church and cloister, is 2½ mi. from Arles. At Orgon there are the ruins of a château of the 15th century, and near La Roque d'Anthéron the church and other buildings of the Cistercian abbey of Silvacane, founded in the 12th century.

See also MARSEILLES; AIX; ARLES; LA CIOTAT; MARTIGUES; SALON; LES SAINTES-MARIES DE-LA-MER; ST. RÉMY; LES BAUX; TARASCON.

BOUCHOR, MAURICE (1855–1929), French poet, was born on Dec. 15, 1855, in Paris. He published in succession *Chansons joyeuses* (1874), *Poèmes de l'amour et de la mer* (1875), *Le Faust moderne* (1878), in prose and verse, and *Les Contes parisiens* (1880) in verse. His *Aurore* (1883) showed a tendency to religious mysticism, which reached its fullest expression in *Les Symboles* (1888; new series, 1895), the most interesting of his works. Bouchor was a sculptor as well as a poet, and he designed and worked the marionettes used in his imitations of the religious mysteries of the middle ages, the words being recited or chanted by himself or his friends behind the scenes.

These miniature dramas on religious subjects, *Tobie* (1889), *Noël* (1890) and *Sainte Cécile* (1892) were produced in Paris at the Théâtre des Marionettes. A collection of his works in this genre, *Mystères bibliques et chrétiens,* appeared in 1920. With the musician, Julien Tiersot (born 1857), he made efforts for the preservation of the French folk-songs, and published *Chants populaires pour les écoles* (1897).

BOUCHOTTE, JEAN BAPTISTE NOËL (1754–1840), French revolutionary, was born at Metz on Dec. 25, 1754, and died on June 8, 1840. He was minister of war under the Convention, and rendered some services in the organization of the republican armies, choosing his officers with insight, among them Kléber, Masséna, Moreau and Bonaparte.

BOUCICAULT, DION (1822–1890), Irish-American actor and playwright, was born in Dublin on Dec. 26 1822, the son of a French refugee and an Irish mother, and died in New York on Sept. 18 1890. Before he was 20 he was fortunate enough to make an immediate success as a dramatist with *London Assurance,* produced at Covent Garden on March 4 1841, with a cast that included Charles Matthews, William Farren, Mrs. Nesbitt and Madame Vestris. Other plays followed, among the most successful of the early ones being *Old Heads and Young Hearts, Louis XI.* and *The Corsican Brothers.* In June 1852 he made his first appearance as an actor in a melodrama of his own entitled *The Vampire,* at the Princess's theatre. From 1853 to 1869 he was in the United States. On his return to England he produced at the Adelphi a dramatic adaptation of Gerald Griffin's novel, *The Collegians,* entitled *The Colleen Bawn.* This play was performed in almost every city of the United Kingdom and the United States, and made its author a handsome fortune, which he lost in the management of various London theatres. It was followed by *The Octoroon* (1861). Boucicault's next marked success was at the Princess's theatre in 1865 with *Arrah-na-Pogue,* in which he played the part of a Wicklow carman. This, and his admirable creation of Con in his play *The Shaughraun* (first produced at Drury Lane in 1875), won him the reputation of being the best stage Irishman of his time. In 1875 he returned to New York city and finally made his home there, but he paid occasional visits to London, where his last appearance was made in his play *The Jilt* in 1886. Boucicault was twice married, his first wife being Agnes Robertson, the adopted daughter of Charles Kean, and herself an actress of unusual ability.

BOUCICAUT, JEAN (JEAN LE MEINGRE, called BOUCICAUT) (*c.* 1366–1421), marshal of France, was the son of another Jean le Meingre (d. 1368) also known as Boucicaut, marshal of France. Boucicaut spent his life in fighting. He had served in several campaigns before he joined the expedition to Hungary (1396), and was taken prisoner by the Turks at Nicopolis. He was ransomed, and in 1399 appeared at Constantinople with 1,400 men and a good fleet to aid the Emperor against the Turks who were threatening the city. He defeated a Turkish fleet at Gallipoli, and arrived in the Golden Horn in time to prevent the capture of Galata by the Turks. He held the Turks in check for a year, and then returned to France to seek volunteers. But he was despatched not to Constantinople, but to establish on firmer foundations French dominion in Genoa. This involved him in a brief war with Venice. Genoa threw off the French yoke in 1409 during an absence of Boucicaut. He fought at Agincourt, where he was taken prisoner, and died in England. Boucicaut, who was very skilful in the tournament, founded the order of the *Dame blanche à l'écu vert,* a society the object of which was to defend the wives and daughters of absent knights.

An anonymous account of Boucicaut's life and adventures is entitled *Livre des faits du bon messire Jean le Meingre dit Boucicaut,* published in Paris by T. Godefroy in 1620. *See* J. Delaville le Roulx, *La France en Orient: expéditions du maréchal Boucicaut* (1886).

BOUDIN, LOUIS EUGÈNE (1824–1898), French marine painter, was born at Honfleur, the son of a pilot, on July 12 1824,

and died at Deauville on Aug. 8 1898. The father gave up the sea for a small stationer's shop in Havre. Troyon and Millet came to the shop and discovered the boy's talent for art, and Courbet and Alphonse Karr found their way there. Boudin went to Paris to study, and, after a short time, returned to his native place. He was a follower of Corot, and in his turn became the master of Monet. The École St. Siméon, named after the farm which was its headquarters, dates from 1856. In this colony Boudin was a leader. The group included Millet, Courbet, Diaz, Harpignies, Jongkind, Isabey, Monet and others. Boudin presently moved to Trouville and then married and set up house in Havre. From 1875 onwards he exhibited at the Salon but without attracting much notice until his "Corvette russe" was bought by the State for the Luxembourg gallery in 1888. In 1896 the "Rade de Villefranche" was bought for the same gallery, and Boudin, then over 70, received the Legion of Honour. He died two years later.

Boudin's best work is in his small canvases. As the painter of tidal rivers Boudin is pre-eminent, and Corot called him the "master of the sea." A large number of his sketches are at Havre.

See G. Cahen, *Eugène Boudin* (1899); W. Dewhurst, *Impressionist Painting* (1904).

BOUÉ, AMI (1794–1881), Austrian geologist, was born at Hamburg on March 16, 1794, and received his early education there and in Geneva and Paris. In 1841 he settled in Vienna. He died on Nov. 21, 1881. To the Imperial Academy of Sciences at Vienna he communicated important papers on the geology of the Balkan States (1859–70), and he also published *Mémoires géologiques et paléontologiques* (1832) and *La Turquie d'Europe: observations sur la géographie, la géologie, l'histoire naturelle*, etc. (1840).

BOUFFLERS, LOUIS FRANÇOIS, Duc de, comte de Cagny (1644–1711), marshal of France, was born on Jan. 10 1644. He served in all the important French campaigns from 1663 onwards. In 1681 he became lieutenant-general. He commanded the French army on the Moselle, which opened the war of the League of Augsburg with a series of victories; then he led a corps to the Sambre, and reinforced Luxembourg on the eve of the battle of Fleurus. In 1691 he acted as lieutenant-general under the king in person; and was present with the king at the siege of Namur in 1692, and took part in the victory of Steinkirk. He was raised in 1692 to the rank of marshal of France, and in 1694 was made a duke. His chief later exploits were the heroic defence of Namur against William III. (1695), and the equally skilful defence of Lille (1708) against Prince Eugène, for which he was made a peer of France. He chose to serve under his junior, Villars, at Malplaquet (1709), and executed a safe retreat for the army. He died at Fontainebleau on Aug. 22 1711.

See "M.F.," *Vie du Mal. de Boufflers* (Lille, 1860), and Père Delarue's and Père Poisson's *Oraisons funèbres du Mal. B.* (1712).

BOUFFLERS, STANISLAS JEAN, Chevalier de (1738–1815), French statesman and man of letters, was born near Nancy on May 31, 1738. He was the son of Louis François, marquis de Boufflers. His mother, Marie Catherine de Beauveau Craon, was the mistress of Stanislas Leszczynski, and the boy was brought up at the court of Lunéville. He spent six months at Saint Sulpice, Paris, and there wrote his popular story, *Aline, reine de Golconde* (1761). Boufflers entered the order of the Knights of Malta, so that he might be able to follow the career of arms without sacrificing the revenues of a benefice he had received in Lorraine from king Stanislas. In 1785 he was sent to West Africa as governor of Senegal. He proved an excellent administrator, and did what he could to mitigate the horrors of the slave trade; and his departure in 1787 was regarded as a real calamity by both colonists and negroes. The *Mémoires secrets* of Bachaumont give the current opinion that Boufflers was sent to Senegal because he was in disgrace at court; but the real reason appears to have been a desire to pay his debts before his marriage with Mme. de Sabran. Boufflers was admitted to the Academy in 1788, and was a member of the states-general. During the Revolution he found an asylum with Prince Henry of Prussia at Rheinsberg. At the Restoration he was made joint-librarian of the Bibliothèque Mazarine. His wit and his skill in light verse had won him a great reputation and he was one of the idols of the Parisian salons. His paradoxical character was described in an epigram attributed to Antoine de Rivarol, *"abbé libertin, militaire philosophe, diplomate chansonnier, émigré patriote, républicain courtisan."* He died in Paris on Jan. 18, 1815.

His *Oeuvres complètes* were published under his own supervision in 1803. A selection of his stories in prose and verse was edited by Eugène Asse in 1878; his *Oeuvres choisies* by O. Uzanne in 1886; and the *Correspondance inédite de la comtesse de Sabran et du chevalier de Boufflers* (1778–88), by E. de Magnieu and Henri Prat in 1875.

BOUGAINVILLE, LOUIS ANTOINE DE (1729–1811), French navigator, was born in Paris on Nov. 11, 1729. He was the son of a notary, and in early life studied law, but soon abandoned the profession, and in 1753 entered the army in the corps of musketeers. At the age of 25 he published a treatise on the integral calculus. In 1755 he was sent to London as secretary to the French embassy, and was made a member of the Royal Society. In 1756 he went to Canada as captain of dragoons and aide-de-camp to the marquis de Montcalm. He afterwards served in the Seven Years' War from 1761 to 1763. After the peace, Bougainville undertook the colonization of the Falkland islands at his own expense. The French Government gave the colony to the Spaniards on condition of their indemnifying Bougainville. In Dec. 1766 he officially sailed on a voyage round the world. Passing through the Straits of Magellan, he visited Tuamotu; Tahiti, where the English navigator Wallis had touched eight months before; the Samoan group, which he named the Navigators islands; the new Hebrides and the Solomon islands. In March 1769 his vessels arrived at St. Malo. Bougainville's *Voyage autour du monde* (1771, modern ed. 1889) is written with simplicity and humour. He later projected a voyage of discovery to the north pole, but did not obtain the necessary support from the French Government. In his old age Napoleon I. made him a senator, count of the empire, and member of the Legion of Honour. He died in Paris on Aug. 31, 1811.

Bougainville's name is given to the largest member of the Solomon islands, and to the strait which divides it from the island of Choiseul. It is also applied to the strait between Mallicollo and Espiritu Santo islands of the New Hebrides group, and the climbing plant *Bougainvillea* is named after him.

BOUGHTON, GEORGE HENRY (1833–1905), Anglo-American painter, born near Norwich, England, and brought up at Albany, N.Y. He studied art in Paris in 1861–62, and then lived mainly in London; he was much influenced by Frederick Walker, and the delicacy and grace of his pictures soon made his reputation. He was elected a member of the National Academy of Design in New York in 1871, an A.R.A. in 1879, and R.A. in 1896. His pictures of Dutch life and scenery were especially characteristic; and his subject-pictures, such as "Weeding the Pavement" (Tate Gallery, London), "The Road to Camelot" (Walker Art Gallery, Liverpool), "Golden Afternoon, the Isle of Wight" (Metropolitan Museum, New York), and "When the Dead Leaves Fall" (Municipal Gallery, Rome), had a great success. Boughton also executed many fine book illustrations, notably those for *Rip van Winkle* (1893) and, for the Grolier Club of New York, *Knickerbocker History* (1886). He died in London on Jan. 19, 1905.

See articles by S. Colvin, *The Portfolio* (1871), and by A. L. Baldry (*Art. Journal*, Christmas number, 1904).

BOUGIE, a seaport of Algeria, chief town of an *arrondissement* in the department of Constantine, 120 mi. E. of Algiers. The town, fortified afresh since the French occupation, is beautifully situated on Mount Guraya amid rich vegetation (rainfall 40 in.). Behind are Mounts Babor and Tababort, rising some 6,400 ft., crowned with pinsapo fir and cedar. The most interesting buildings in the town are the ancient forts, Borj-el-Ahmer and Abd-el-Kader, and the kasbah or citadel, bearing inscriptions stating that it was built by the Spaniards in 1545. Parts of the Roman wall exist, and considerable portions of that built by the Hammadites in the 11th century. The streets are steep, and many are ascended by stairs. The three basins of the harbour, on the Gulf of Bougie, sheltered from the west by the Cape Carbon and from the east by a breakwater, cover 63 ac. and have a depth of water of 23 to 30

feet. Bougie is the natural port of Kabylia, and its commerce—chiefly in oils, wools, hides and minerals—has greatly developed; a branch railway runs to Beni Mansur on the main line from Constantine to Oran. Pop. (1936) 24,599.

Bougie, if correctly identified, is the Saldae of the Romans. Early in the 5th century Genseric the Vandal built walls and for some time made it his capital. En-Nasr (1062–1088), the most powerful of the Berber dynasty of Hammad, made Bougie the seat of his government, and it became the greatest commercial centre of the North African coast, attaining a high degree of civilization. Italian merchants of the 12th and 13th centuries had warehouses, baths and churches in the city. At the end of the 13th century Bougie passed under the Hafsites, and in the 15th century it became a stronghold of the Barbary pirates. The Spaniards under Pedro Navarro captured it in 1510, fortified it and held it against two attacks by the corsair Barbarossa, but Salah Rais, pasha of Algiers, took it in 1555. Leo Africanus, in his *Africae descriptio,* speaks of the "magnificence" of the city (*c.* 1525), but when the French took the town in 1833 it consisted of a few fortifications and ruins. It was made an Allied army base in 1942.

BOUGUER, PIERRE (1698–1758), French mathematician, succeeded his father, John Bouguer, as regius professor of hydrography at Croisic in lower Brittany. In 1729 he published *Essai d'optique sur la gradation de la lumière,* the object of which was to define the quantity of light lost by passing through a given extent of the atmosphere. He found the light of the sun to be 300 times more intense than that of the moon, and thus made some of the earliest measurements in photometry. In 1730 he was made professor of hydrography at Havre, and succeeded P. L. M. de Maupertuis as associate geometer of the Académie des Sciences. He also invented a heliometer, afterwards perfected by Fraunhofer. In 1735 Bouguer sailed with C. M. de la Condamine for Peru, in order to measure a degree of the meridian near the equator. A full account of this operation was given in 1749 in *Figure de la terre déterminée.*

The following is a list of his principal works: *Traité d'optique sur la gradation de la lumière* (1729 and 1760); *Entretiens sur la cause d'inclinaison des orbites des planètes* (1734); *Traité de navire, etc.* (1746); *La Figure de la terre déterminée, etc.* (1749); *Nouveau traité de navigation, contenant la théorie et la pratique du pilotage* (1753); *Solution des principaux problèmes sur la manoeuvre des vaisseaux* (1757); *Opérations faites pour la vérification du degré du méridien entre Paris et Amiens,* par Mess. Bouguer, Camus, Cassini et Pingré (1757).

See J. E. Montucla, *Histoire des mathématiques* (1802).

BOUGUEREAU, ADOLPHE WILLIAM (1825–1905), French painter, was born at La Rochelle on Nov. 30 1825, and died there on Aug. 18 1905. From 1843 till 1850 he studied at the École des Beaux-Arts, and in 1850 divided the Grand Prix de Rome scholarship with Baudry, the subject set being "Zenobia on the banks of the Araxes." On his return from Rome in 1855 he was employed in decorating several great houses, deriving inspiration from the frescoes which he had seen at Pompeii and Herculaneum, and which had already suggested his "Idyll" (1853). "The Martyr's Triumph," the body of St. Cecilia borne to the catacombs, was placed in the Luxembourg. Most of his works, especially "The Triumph of Venus" (1856) and "Charity," are popularly known through engravings.

BOUHOURS, DOMINIQUE (1628–1702), French critic, was born in Paris. He entered the Society of Jesus at the age of 16 and undertook educational work in various places until 1665 or 1666, when he returned to Paris, and published in 1671 *Les Entretiens d'Ariste et d'Eugène,* a critical work on the French tongue. He also wrote *La Manière de bien penser sur les ouvrages d'esprit* (1687), *Doutes sur la langue française* (1674), *Vie de Saint Ignace de Loyola* (1679), *Vie de Saint François Xavier* (1682), and translated the New Testament into French (1697).

See Georges Doucieux, *Un Jésuite homme de lettres au dix-septième siècle: Le père Bouhours* (1886). For a list of Bouhours' works *see* Backer and Sommervogel, *Bibliothèque de la Compagnie de Jésus,* i. pp. 1886 *et seq.*

BOUILHET, LOUIS HYACINTHE (1822–1869), French poet and dramatist, was born at Cany, Seine Inférieure, and was a schoolfellow of Gustave Flaubert. His *Fossiles* (1856) attracted considerable attention, on account of the attempt therein to use science as a subject for poetry. These poems were included also in *Festons et astragales* (1859). His first play, *Madame de Montarcy* (1856), ran for 78 nights at the Odéon; and *Hélène Peyron* (1858) and *L'Oncle Million* (1860) were also favourably received. But of his other plays, some of them of real merit, only the *Conjuration d'Amboise* (1866) met with any great success. Bouilhet died at Rouen, and Flaubert published his posthumous poems with a notice of the author, in 1872.

See also Maxime du Camp, *Souvenirs littéraires* (1882); H. de la Ville de Mirmont, *Le Poète Louis Bouilhet* (1888); and E. Frère, *Louis Bouilhet* (1908).

BOUILLABAISSE, a kind of stew, made of all kinds of fish, popular in the south of France, and particularly associated with Marseilles.

BOUILLÉ, FRANÇOIS CLAUDE AMOUR, MARQUIS DE (1739–1800), French general. He served in the Seven Years' War, and as governor in the Antilles conducted operations against the English in the War of American Independence. On his return to France he was named governor of the three bishoprics, of Alsace and of Franche-Comté. He brutally suppressed the military insurrections at Metz and Nancy, which had been provoked by the harsh conduct of certain noble officers. Then he proposed to Louis XVI. to take refuge in a frontier town where an appeal could be made to other nations against the revolutionists. When this project failed as a result of Louis XVI.'s arrest at Varennes, Bouillé went to Russia to induce Catherine II. to intervene in favour of the king, and then to England, where he died in 1800, after serving in various royalist attempts on France. He left *Mémoires sur la Révolution française depuis son origine jusqu'à la retraite du duc de Brunswick* (1801).

BOUILLON, formerly the seat of a dukedom in the Ardennes, now a small town in the Belgian province of Luxembourg. Pop. (1939) 2,970. It is picturesquely situated in the valley of the Semois, under the rocky ridge which preserves remains of the castle of Godfrey of Bouillon (*q.v.*), the leader of the first crusade. The stream almost encircles the castle, which provides beautiful views of the sinuous valley. In the 8th and 9th centuries Bouillon was one of the castles of the counts of Ardennes and Bouillon. Later, the family took the higher titles of dukes of Lower Lorraine and Bouillon, who all bore the name of Godfrey (Godefroy), and the fifth of them was the great crusader. In order to undertake the crusade, Godfrey sold the castle of Bouillon to the prince bishop of Liége, and the title of duke of Bouillon belonged to the bishopric till 1678. The bishops appointed "châtelains," one of whom was the celebrated "Wild Boar of the Ardennes," William de la Marck, and his descendants, "princes of Sedan and dukes of Bouillon," became semi-independent. The possession of Bouillon thenceforward became a constant cause of strife until in 1678 Louis XIV. garrisoned it under the treaty of Nijmwegen. Bouillon remained French till 1814, and Vauban called it "the key of the Ardennes." In 1760 the elder Rousseau established here the famous press of the Encyclopaedists. By the Vienna Congress (1815) Bouillon went to the Netherlands.

BOUILLON, a watery extract made from beef, and widely used as an appetizer. The finely cut meat is slowly boiled in water, the solidified fat removed after cooling, and the liquid strained, thus removing the meat fragments and coagulable proteins. The bouillon cubes of commerce are made by adding salt and a plant extract, and evaporating nearly to dryness. The caloric value of bouillon is only one-fourth that of orange juice and one-seventh that of whole milk, and it is obviously by no means a nutritive beverage. Its active principles are the purin bases, to which its appetizing flavour is due, and which directly stimulate the secretion of gastric juice. It is widely used for invalids to encourage appetite and digestion.

BOUILLY, JEAN NICOLAS (1763–1842), French author, was born near Tours. Under the Revolution he helped to organize primary education, but retired in 1799. His numerous works include the musical comedy *Pierre le Grand* (1790), for Grétry's music, and the opera *Lea Deux Journées* (1800), music by Cherubini; also *L'Abbé de l'epée* (1800), and some other plays;

and *Causeries d'un vieillard* (1807), *Contes à ma fille* (1809), and *Les Adieux du vieux conteur* (1835). His *Léonore* (1798) formed the basis of the libretto of the *Fidelio* of Beethoven.

See Bouilly, *Mes récapitulations* (1836–37); E. Legouvé, *Soixante ans de souvenir* (1ère partie, 1886).

BOULAINVILLIERS, HENRY, COMTE DE (1658–1722), French political writer, was born at St. Saire, Normandy, on Oct. 11, 1658, and died in Paris on Jan. 23, 1722. He served in the army until 1697. His most important works, which only appeared after his death, were: *Histoire de l'ancien gouvernement de la France* (La Haye, 1727); *État de la France, avec des mémoires sur l'ancien gouvernement* (London, 1727); *Histoire de la pairie de France, et du parlement de Paris* (London, 1753); *Histoire des Arabes* (1731). Boulainvilliers was an aristocrat of the most pronounced type, attacking absolute monarchy on the one hand and popular government on the other. The feudal system was, in his opinion, the ideal form of human government. His books had considerable influence, for they were quoted by the friends of authority, and, eventually, with still more effect by the revolutionaries; for instance, the theory that the nobility owed their position to their conquest of the Gauls proved to be two-edged.

BOULANGER, the name of several French artists: JEAN (1606–60), a pupil of Guido Reni at Bologna, who had an academy at Modena; his cousin JEAN (1607–80), a celebrated line-engraver; the latter's son MATTHIEU, another engraver; LOUIS (1807–67), a subject-painter, the friend of Victor Hugo and director of the imperial school of art at Dijon; the best-known, GUSTAVE RODOLPHE CLARENCE (1824–88), a pupil of Paul Delaroche, a notable painter of oriental and Greek and Roman subjects, and a member of the Institut de France (1882), who decorated the Foyer de la Danse of the Paris Opéra with terpsichorean subjects; and CLÉMENT (1805–42), a pupil of Ingres (*q.v.*).

BOULANGER, GEORGES ERNEST JEAN MARIE (1837–1891), French general, was born at Rennes on April 29, 1837. He entered the army in 1856, and served in Algeria, Italy, Cochin-China and the Franco-German War, earning the reputation of being a smart soldier. He was made a brigadier-general in 1880 on the recommendation of the duc d'Aumale, then commanding the VII. Army Corps, and Boulanger's expressions of gratitude and devotion on this occasion were remembered against him afterwards when, as war minister in M. Freycinet's cabinet, he erased the name of the duc d'Aumale from the army list as part of the republican campaign against the Orleanist and Bonapartist princes. In 1882 he became director of infantry at the war office, and in 1884 he was appointed to command the army occupying Tunis, but was recalled owing to differences of opinion with M. Cambon, the political resident. He returned to Paris, and began to take part in politics under the aegis of M. Clemenceau and the Radical party; and in January 1886, when M. Freycinet was brought into power by the support of the Radical leader, Boulanger became war minister.

By introducing genuine reforms for the benefit of officers and common soldiers alike, and by seeking popularity in the most pronounced fashion, he came to be accepted by the mob as the man destined to give France her revenge for the disasters of 1870, and to be used simultaneously as a tool by all the anti-Republican intriguers. It should be added that Boulanger was taunted in the Senate with his ingratitude to the duc d'Aumale, and denied that he had ever used the words alleged. His letters containing them were, however, published, and the charge proved. Boulanger fought a bloodless duel with the baron de Lareinty over this affair. On M. Freycinet's defeat in Dec. 1886 he was retained by M. Goblet at the war office. M. Clemenceau, however, had by this time abandoned his patronage of Boulanger, who was becoming so inconveniently prominent that, in May 1887, M. Goblet was not sorry to get rid of him by resigning. The mob clamoured for their "brav' général," but M. Rouvier, who next formed a cabinet, declined to take him as a colleague, and Boulanger was sent to Clermont-Ferrand to command an army corps. A Boulangist "movement" was now in full swing. The Bonapartists had attached themselves to the general, and even the comte de Paris encouraged his followers to support him, to the dismay of those old-fashioned Royalists who resented Boulanger's treatment of the duc d'Aumale. He was deprived of his command in 1888 for twice coming to Paris without leave, and finally on the recommendation of a council of inquiry composed of five generals his name was removed from the army list. He was almost at once elected to the Chamber for the Nord, on a programme for the revision of the Constitution. A popular hero survives many deficiencies, and neither his failure as an orator nor the humiliation of a discomfiture in a duel with M. Floquet, then an elderly civilian, sufficed to check the enthusiasm of his following. During 1888 his personality was the dominating feature of French politics, and, when he resigned his seat as a protest against the reception given by the Chamber to his revisionist proposals, constituencies vied with one another in selecting him as their representative. At last, in January 1889, he was returned for Paris by an overwhelming majority. He had now become an open menace to the parliamentary Republic. Possibly he might at this moment have effected the *coup d'état* which the intriguers had worked for, and might not improbably have made himself master of France; but the favourable opportunity passed. The government, with M. Constans as minister of the interior, had been quietly taking its measures for bringing a prosecution against him, and within two months a warrant was signed for his arrest. To the astonishment of his friends, on April 1 he fled from Paris before it could be executed, going first to Brussels and then to London. It was the end of the political danger, though Boulangist echoes continued for a little while to reverberate at the polls during 1889 and 1890. Boulanger himself, having been tried and condemned *in absentia* for treason, in Oct. 1889, went to live in Jersey. On Sept. 30, 1891, he committed suicide in Brussels.

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BOULAY DE LA MEURTHE, ANTOINE JACQUES CLAUDE JOSEPH, COMTE (1761–1840), French politician and magistrate, son of an agricultural labourer, was born at Chamousey (Vosges) Feb. 19, 1761, and died in Paris Feb. 4, 1840. Called to the bar at Nancy in 1783, he presently went to Paris, where he rapidly acquired a reputation as a lawyer and a speaker. He fought at Valmy (1792) and Wissembourg (1793) in the republican army, but his moderate principles forced him, during the Terror, to go into hiding. He represented La Meurthe in the Council of Five Hundred, of which he was twice president, but his views steadily became more conservative. He became an active member of the plot for the overthrow of the Directory in Nov. 1799. He was rewarded by the presidency of the legislative commission formed by Napoleon to draw up the new constitution; and as president of the legislative section of the council of state he revised the draft of the civil code. As director of a special land commission he settled the titles of land acquired by the French nation at the Revolution, and placed on an unassailable basis the rights of the new proprietors. After Waterloo he tried to obtain the recognition of the duke of Reichstadt. In 1815 he was proscribed and spent four years in exile, and though he was allowed to return to France in 1819, took no further active part in politics. Boulay published two books on English history—*Essai sur les causes qui, en 1649, amenèrent en Angleterre l'établissement de la république* (1799), and *Tableau politique des règnes de Charles II. et Jacques II., derniers rois de la maison de Stuart* (The Hague, 1818)—which contained much indirect criticism of the Directory and the Restoration governments. His memoirs, with the exception of a fragment on the *Théorie constitutionnelle de Sieyès* (1836), remained unpublished.

His elder son, Comte HENRI GEORGES BOULAY DE LA MEURTHE (1797–1858), was a constant Bonapartist, and after the election of Louis Napoleon to the presidency, was named (Jan. 1849) vice-president of the republic. He zealously promoted popular education.

BOULDER, the sixth largest city of Colorado, U.S.A., on Boulder creek, just east of the continental divide, 30 mi. northwest of Denver, at an elevation of 5,354 ft.; the county seat of Boulder county. It is served by the Burlington, the Colorado

and Southern and the Union Pacific railways. The population in 1930 was 11,223; in 1940 was 12,958. Protected by mountains from the winter winds, and cooled in summer by breezes from the Arapahoe, Isabel, Fair, St. Vrain and other glaciers to the west, the average monthly mean temperature ranges from 32·9° F. (February) to 70·1° (August); and the sun shines on 328 days out of 365. The water supply, sufficient for a population of 100,000, comes from the Arapahoe glacier which is owned by the city, thus making Boulder the only city in the world owning a glacier from which its water is supplied; electric energy comes from a large plant four miles east of the city. Extensive fields of lignite coal underlie the eastern third of the county; mines produce gold, silver, tungsten, lead, copper and fluorspar. The Rocky Mountain national park of 378 sq.mi. is not far to the northwest and the Colorado national forest lies a few miles west. Boulder canyon and others have great scenic beauty, and the city owns 6,000 ac. of mountain park lands. Glissading on the face of the glaciers is a popular sport, and trout abound in many lakes and streams. The Colorado chautauqua, one of the oldest and largest independent chautauquas in the country, has its permanent grounds on a beautiful site 400 ft. above the city. The University of Colorado, incorporated in 1861 and opened in 1877, is in Boulder, except for its medical school, which is in Denver. It has an annual enrolment of about 4,500, besides over 4,000 in the summer session.

The stadium, seating 25,000, is built in a natural ravine on the campus.

The first settlement here was made late in 1858, and placer gold was discovered near by in 1859. The town was laid out and organized in 1859; the first city charter was secured in 1871; and a city-manager form of government was adopted in 1917. Oil was struck three miles northeast of Boulder in 1892, and production reached its peak in 1903. For some years after 1900 most of the tungsten mined in the United States came from the Nederland region, 18 mi. west of Boulder.

BOULDER, a large stone, weathered or water-worn (*cf.* Swed. *bullersten,* a large stone which causes a noise of rippling water in a stream. A geological term for a large mass of rock transported to a distance from the formation to which it belongs; in mining, a mass of ore found at a distance from the lode.

BOULDER CLAY (TILL): *see* GLACIAL EPOCH.

BOULDER DAM: *see* COLORADO RIVER.

BOULE, PIERRE MARCELIN (1861–1942), French scientist, was born Jan. 1, 1861, at Montsalvy. Educated at Toulouse, he became assistant professor of geology at Clermont-Ferrand, and devoted himself to the study of palaeontology. He became a member of the commissions on historical monuments and the geological map of France and was also president of the French Geological Society and of the French Archaeological Institute. Later he became director of the Institute of Human Palaeontology. Among his many works are *Le plateau de Lannemezan* (1895), *Les volcans de la France centrale* (1900) and *Les hommes fossiles* (1923). He died July 19, 1942, at Montsalvy.

BOULĒ, the general term in ancient Greece for an advisory council. In the Homeric state there was a council of the leading nobles, who met, on the summons of the king, for consultation. It formed a means of communication between the king and the freemen assembled in the Agora (*q.v.*). In Sparta this form of government was retained (*see* GEROUSIA). In Athens the ancient council was called the Boulē until the institution of a democratic council, when, for purposes of distinction it was described as ἡ ἐν τῷ Ἀρείῳ Πάγῳ βουλή "the Boulē on the Areopagus," or, more shortly, "the Areopagus" (*q.v.*). It is a mistake to call the second Boulē a "senate." There is no real analogy between the Roman senate and the Athenian council of Five Hundred.

Councils existed in other Greek states, both oligarchic and democratic. A Boulē was a necessary part of a Greek oligarchy; the transition from monarchy to oligarchy was begun by the transference of the powers of the monarch to the Boulē of nobles. In the Greek democracy, the democratic Boulē was equally essential. The assembly of the people was unsuited to the management of the details of State affairs. We therefore find councils of both kinds in almost all the states of Greece. At Corinth there was an oligarchic council presided over by eight leaders. The Athenians, in imposing a constitution on Erythrae (about 450 B.C.) included a council analogous to their own. In Elis there was an aristocratic council of 90, which was superseded by a popular council of 600 (471 B.C.). In Argos there was an aristocratic council of 80 and later a popular council of much larger size.

The Boulē at Athens. History.—The origin of the second Boulē at Athens is involved in obscurity. It is generally held that Solon established the council. It has also been maintained that no Boulē existed before Cleisthenes. On the whole it is reasonable to conclude that it was Solon who invented the Boulē to act as a semi-democratic check upon the democracy. Nothing is known of the operations of this council until the struggle between Isagoras and Cleisthenes (Herod. v. 72). Solon's council was based on the four Ionic tribes. When Cleisthenes created the new ten tribes in order to destroy the local influence of dominant families, and to give the country demes a share in government, he changed the Solonian council into a body of 500 members, 50 from each tribe. After Cleisthenes, the council remained unaltered till 306 B.C., when its numbers were increased to 600. In A.D. 126–127 the old number of 500 was restored.

Constitution and Functions.—(*a*) Under Solon the council consisted of 400 members, 100 from each of the four Ionic tribes. All classes were eligible except the *Thētes* (*see* SOLON), but the method of appointment is not known. According to Plutarch the functions of this body were from the first *probouleutic* (*i.e.*, it prepared the business for the Ecclesia, *q.v.*). Others hold that this function was not assigned to it until the Cleisthenean reforms. It seems probable that the probouleutic functions were devised by Solon as a method of maintaining the balance between the aristocratic archons (*see* ARCHON) and the democracy. (*b*) Under Cleisthenes (*q.v.*) the council reached its full development as a democratic representative body. Every full citizen of 30 years of age was eligible, and, unlike other civil offices, it was permissible to serve twice, but not more than twice. From the first the *Bouleutai* were appointed by the demes, in numbers proportionate to the size of the demē, and the method of sortition was employed. After nomination each had to pass, before the old council, an examination in which his private life was scrutinized. The councillors had to take an oath that they would act according to the laws, would give the best advice in their power, and would carry out the examination of their successors in an impartial spirit. At the end of the year each councillor had to render an account of his work. The council exercised disciplinary control over its members; it could suspend a member, pending a formal trial before the whole council. There was a complete system of secretaries (*grammateis*), private treasury officials, and a paid herald who summoned the Boulē and the Ecclesia. The meetings took place generally in the council hall (*Bouleuterion*), but on special occasions in other places.

Prytaneis.—The Ecclesia was unable to meet more than three or four times a month; the council was in continuous session, except on feast days. It was impossible that the Five Hundred should all sit every day, and to facilitate the despatch of business, the system of *Prytaneis* was introduced, probably by Cleisthenes. The year was divided into ten equal periods. During each of these periods the council was represented by the 50 councillors of one of the ten tribes, who acted as an executive committee. Each of these committees was led by a president (*Epistates*), who acted as chairman of the Boulē and the Ecclesia, and a third of its numbers lived during their period of office in the *Tholos* (Dome) or *Skias*, where they dined at the public expense. It was the duty of the Boulē (*i.e.*, the Prytany which was for the time in session) to prepare all business for the consideration of the Ecclesia. Their recommendation (*probouleuma*) was presented to the popular assembly (*see* ECCLESIA), which either passed it as it stood or made amendments. The recommendation of the council had no intrinsic force until, by the votes of the Ecclesia, it passed into law.

The Boulē had large administrative and judicial control. (1) It was before it that the *Pōlētai* arranged the farming of public revenues, the receipt of tenders for public works, and the sale of

confiscated property; it dealt with defaulting collectors, exacted the debts of private persons to the State, and drew up annual estimates. (2) It supervised the treasury payments of the *Apodektai* ("Receivers") and the "Treasurers of the God." (3) It had to arrange for the provision of triremes and the award of the trierarchic crown. (4) It arranged for the maintenance of the cavalry and the special levies from the demes. (5) It heard cases of *eisangelia* (impeachment) and had the right to fine up to 500 drachmas, or hand the case over to the Heliaea (the Supreme Court). The cases which it tried were mainly prosecutions for crimes against the State (*e.g.*, treason, conspiracy, bribery). (6) The council presided over the *dokimasia* (consideration of fitness) of the magistrates (*see* ARCHON). (7) The council, as the only body in permanent session, received foreign envoys and introduced them to the Ecclesia, and with the Strategi (*see* STRATEGUS) took treaty oaths, after the Ecclesia had decided on the terms. On two occasions the council was specially endowed with full powers: it was given full powers to investigate the affair of the mutilation of the Hermae (*see* ALCIBIADES) on the night before the sailing of the Sicilian expedition; the people gave it full powers to send ambassadors to Philip of Macedon.

It will be seen that this democratic council was essential to the working of the Athenian state. Without having any final legislative authority, it was a necessary part of the legislative machinery, and it may be regarded as certain that a large proportion of its recommendations were passed without alteration or even discussion by the Ecclesia.

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BOULEUTERION, in Greek architecture, the building where the boule, or council, met. It was usually on or near the agora.

BOULEVARD (a Fr. word, earlier *boulevart,* from Dutch or Ger. *Bollwerk, cf.* Eng. "bulwark"), originally, in fortification, an earthwork with a broad platform for artillery. It came into use owing to the width of the gangways in mediaeval walls being insufficient for the mounting of artillery thereon. The boulevard or bulwark was usually an earthen outwork mounting artillery, and so placed in advance as to prevent the guns of a besieger from battering the foot of the main walls. It was as a rule circular. Semicircular *demi-boulevards* were often constructed round the bases of the old masonry towers with the same object. In modern times the word is most frequently used to denote a promenade laid out on the site of a former fortification, and, by analogy, a broad avenue in a town planted with rows of trees.

BOULLE, ANDRÉ CHARLES (1642–1732), French cabinet-maker, who gave his name to a fashion of inlaying known as Boulle or Buhl work. He was born in Paris Nov. 11, 1642, and died there Feb. 29, 1732. The son of Jean Boulle, a member of a family of cabinet-makers who had already achieved distinction, he became very famous and was, indeed, the second cabinet-maker —the first was Jean Macé—who has acquired individual renown. At the age of 30 he had already been granted one of those lodgings in the galleries of the Louvre set apart for the most talented of the artists employed by the Crown. Boulle was given the deceased Jean Macé's own lodging in 1672 by Louis XIV. In the patent conferring this privilege he is described also as "chaser, gilder and maker of marqueterie."

He was employed for many years at Versailles, where the mirrored walls, the floors of "wood mosaic," the inlaid panelling and the pieces in marqueterie in the Cabinet du Dauphin were regarded as his most remarkable work. These rooms were long since dismantled and their contents dispersed, but Boulle's drawings for the work are in the Musée des Arts Décoratifs. Not only the most magnificent of French monarchs, but foreign princes and the great nobles and financiers of his own country crowded him with commissions, and the *mot* of the abbé de Marolles, *"Boulle y tourne en ovale,"* has become a stock quotation in the literature of French cabinet-making.

Boulle was by no means the first Frenchman to practise the art of marqueterie, nor was he quite the inventor of the peculiar type of inlay which is chiefly associated with his name; but no artist, before or since, has used these motives with such astonishing skill, courage and surety. He produced pieces of monumental solidity blazing with harmonious colour, or gleaming with the sober and dignified reticence of ebony, ivory and white metal.

Boulle improved upon the work of Renaissance artists by inlaying brass devices into wood or tortoise-shell, which last he greatly used according to the design he had immediately in view, whether flowers, scenes, scrolls, etc.; to these he sometimes added enamelled metal. Indeed the use of tortoise-shell became so characteristic that any furniture, however cheap and common, which has a reddish background that might by the ignorant be mistaken for inlay, is now described as "Buhl"—a name invented by the British auctioneer and furniture-maker.

See Havard, *Les Boulles* (1893); C. Asselineau, *André Boulle* (1872) and Comte François de Salverté, *Les Ébénistes du XVIII. Siècle* (1927).

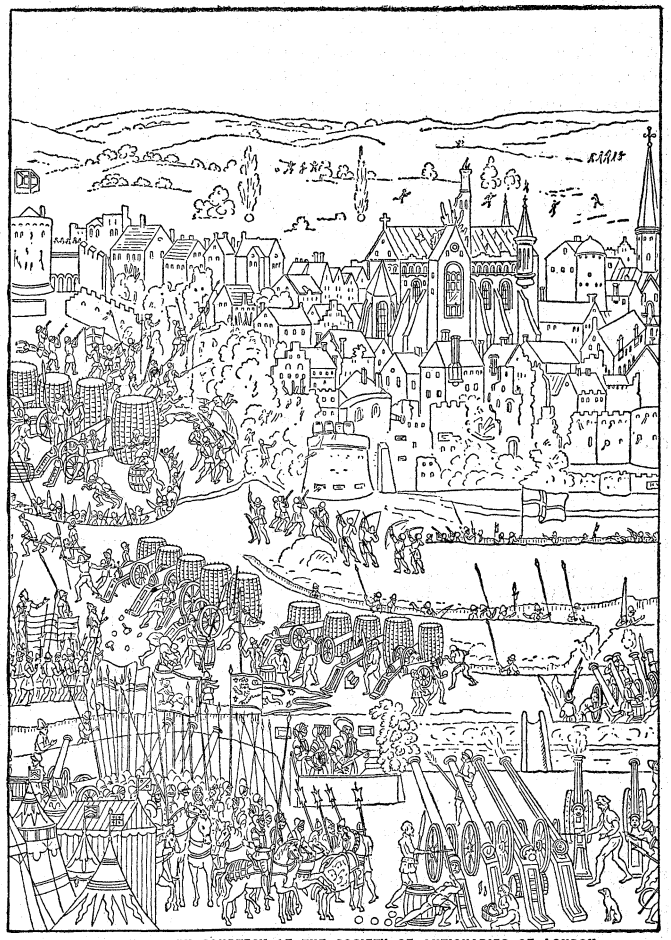
BOULOGNE or **BOULLONGNE,** the name of a family of French painters. LOUIS (1609–1674), who was one of the original members of the Academy of Painting and Sculpture (1648), became celebrated under Louis XIV. His traditions were continued by his children: GENEVIEVE (1645–1708), who married the sculptor Jacques Clérion; MADELEINE (1646–1710), whose work survives in the "Trophées d'armes" at Versailles; BON (1649–1717), a successful teacher and decorative artist; and LOUIS the younger (1654–1733), who copied Raphael's cartoons for the Gobelins tapestry, and besides taking a high place as a painter was also a designer of medals.

BOULOGNE, CONFERENCE OF (June 21–22, 1920), a meeting of the Supreme Council of the Allies, in which Japan, Greece and Belgium participated, as well as the principal European Allied Powers. Like the Conference of Hythe on May 15–17 (*see* HYTHE, CONFERENCE OF), it was preparatory to the Conference of Spa (*see* SPA, CONFERENCE OF). The question of allocating among the Allies the prospective reparation payments from Germany was taken up, and a counter proposal (the so-called "Boulogne agreement") was prepared, in view of the expected German offer of a lump sum, should that offer prove inadequate.

BOULOGNE-BILLANCOURT or **BOULOGNE-SUR-SEINE** (the former title was fixed by decree in 1925), town of northern France, in the department of Seine, on the right bank of the Seine, south-west of Paris and immediately outside the fortifications. Pop. (1936) 97,379. The town has a Gothic church of the 14th and 15th centuries (restored in 1863), founded in honour of Notre-Dame de Boulogne-sur-Mer. The settlement had previously been called Menuls-lès-St. Cloud. Laundering is extensively carried on as well as the manufacture of metal boxes, soap, oil and furniture, and there are numerous handsome residences. For the neighbouring Bois de Boulogne *see* PARIS.

BOULOGNE-SUR-MER, town of north France, capital of an arrondissement in the department of Pas-de-Calais, on the English channel at the mouth of the river Liane, 157 mi. N.N.W. of Paris on the Northern railway, and 28 mi. by sea S.E. of Folkestone, Kent. Pop. (1936) 52,321. On the site of the Roman harbour Gessoriacum which later became Bononia, it was destroyed by the Normans in 882, but restored about 912. In Carolingian times it was head of a countship, long an object of dispute between Flanders and Ponthieu. It belonged to the house of Ponthieu (965–1234), Brabant and Auvergne, until seized by Philip the Good, duke of Burgundy, in 1419. In 1477 Louis XI of France reunited it to the Crown. In 1544 Henry VIII of England took the town by siege; but it was restored to France in 1550. From 1566 to the end of the 18th century it was the seat of a bishopric. Boulogne stands upon hills skirting the right bank of the Liane with the industrial quarter, Capecure, on the left bank. The town includes Haute Ville and Basse Ville. The former, on the hill-top, is a comparatively small parallelogram surrounded by 13th century ramparts with boulevards outside. Here are the law court, château and *hôtel-de-ville* (18th century), and a belfry tower (13th and 17th centuries). At some distance northwest

stands the church of Notre Dame (1827–66), a well-known place of pilgrimage, on an old site. The modern town stretches from the foot of the hill to the harbour. The public buildings include a museum of antiquities, natural history, porcelain, etc., connected with the public library, containing 75,000 volumes and valuable manuscripts, many of them richly illuminated. The Colonne de la Grande Armée, begun in 1804 and finished under



AFTER AN ENGRAVING, BY COURTESY OF THE SOCIETY OF ANTIQUARIES OF LONDON

THE SUCCESSFUL SIEGE OF BOULOGNE BY HENRY VIII IN 1544

Henry is seen, clad in armour, and with baton in hand, directing the artillery operations from the enclosure in the foreground. To the left, and in front of the king, is the artillery park crowded with ordnance stores, sandbags, guns and mortars. The English soldiers are entrenched at the foot of the town walls, in which the artillery are making breaches, while the archers take aim at the defenders. The royal camp is in the immediate left foreground, surrounded by cavalry

Louis Philippe, commemorates Napoleon's projected invasion of England. The harbour is formed by the mouth of the Liane. The town and port were under British administration and devoted to military uses in 1914–18, and formed the main channel for reinforcements. The equipment of the port was largely developed in 1914–18 and the Loubet basin (1925) has increased the quay length. Railway improvements (1924) enable expresses from Calais to pass through Boulogne at high speed, and a scheme to rebuild the maritime station and construct a tunnel to connect with the main line at Outreau has been approved. Harbour works (1924) are to provide accommodation for large liners which, it is hoped, will make Boulogne a port of call. The Liane estuary, behind the old harbour, is to be converted into an inner harbour and dock for the important fishing industry. Boulogne imports hams, jute, wool, woven goods of silk and wool, kaolin, coal, slates, timber, machinery and iron and steel, and exports wine, brandy, woven goods, fruit, potatoes and other vegetables, poultry, objects of art, stone and cement. Raw Italian silk is shipped in large quantities to England. Herring and mackerel fishing is very important, much fish being sent to Paris by railway; and boats are sent to the Newfoundland beds for cod. The fishermen live for the most part in a separate quarter called La Beurrière, in the upper part of the town. Boulogne and its environs have foundries, cement factories, important steel-pen manufactories, oil works, dye-works, fish curing works, flax mills, saw mills and manufactories of cloth, ropes, fireproof ware, chocolate, boots and shoes and soap. Shipbuilding is also carried on. Boulogne is the seat of a subprefect, and has tribunals of first instance and of commerce, a board of trade arbitrators and a chamber of commerce.

BOULTON, MATTHEW (1728–1809), English manufacturer and engineer, was born on Sept. 3, 1728, at Birmingham. At Soho, 2 miles north of Birmingham, he undertook the manufacture of artistic objects in metal, and also the reproduction of oil-paintings by a mechanical process in which he was associated with Francis Eginton (1737–1805), who subsequently achieved a reputation as a worker in stained or enamelled glass. About 1767, Boulton made the acquaintance of James Watt. In 1772 Watt's partner, Dr. John Roebuck, got into financial difficulties, and Boulton, to whom he owed £1,200, accepted the two-thirds share in Watt's patent held by him in satisfaction of the debt. Three years later Boulton and Watt formally entered into partnership, and Boulton devoted all the capital he possessed or could borrow to making the steam-engine a commercial success. It was also owing to Boulton that in 1775 an act of parliament was obtained extending the term of Watt's 1769 patent to 1799. In 1800 the two partners retired from the business, which they handed over to their sons, Matthew Robinson Boulton and James Watt, junior. In 1788 Boulton turned his attention to coining machinery, and erected at Soho a complete plant with which he struck coins for the Sierra Leone and East India companies and for Russia, and in 1797 produced a new copper coinage for Great Britain. In the same year he took out a patent in connection with raising water on the principle of the hydraulic ram. He died at Birmingham on Aug. 18, 1809.

BOUNCING BET, the common soapwort (*q.v.*) (*Saponaria officinalis*), which has become very widely naturalized in waste grounds and along roadsides in the eastern United States.

BOUND or **BOUNDARY,** that which serves to indicate the limit or extent of land. In law, the exact boundary of land is always a matter of evidence; where no evidence is available, the court acts on presumption which may be rebutted. For example, the boundary of land on opposite sides of a road, whether public or private, is presumed to be the middle line of the road. Where two fields are separated by a hedge and ditch the boundary line will run on the field or outside edge of the ditch. As to parish boundaries, *see* PARISH.

BOUND BROOK, a borough of Somerset county, New Jersey, U.S.A., on the Raritan river and the Delaware and Raritan canal, 32 mi. southwest of New York city, at the foot of the Watchung hills. It is served by the Central railroad of New Jersey, the Lehigh Valley and the Reading railways. The population in 1940 was 7,616 by federal census. With the adjoining boroughs of South Bound Brook and Middlesex the urban unit in 1940 had a population of over 13,000. Bound Brook has a large lumber trade. The manufactures include chemicals, roofing materials, asbestos products and oil-less bearings.

Several interesting colonial houses are still standing. The Staats homestead, in South Bound Brook, still occupied by a direct descendant of its builder, was the headquarters of Baron von Steuben during the Revolutionary War. Col. Philip Van Horne's house, known as Convivial hall because of the famed hospitality of the colonel and his five daughters, was occupied for a time by Lord Stirling, and later by "Light-Horse Harry" Lee. Washington's army twice camped on the hills back of the village, known as the Heights of Middlebrook, and the site is kept as a historical monument. It is said that Washington here first (1777) unfurled the Stars and Stripes as the national flag. In 1681 all the land now occupied by Bound Brook was transferred by deed from two Indian chiefs to Philip Carteret and six other men. Settlement soon followed, but the borough was not incorporated until 1891.

BOUNDS, BEATING THE, an ancient custom still observed in many English parishes. In times when maps were rare it was usual to make a perambulation of the parish boundaries

on Ascension day or during Rogation week. In the north of England the latter is still called "gang week" or "ganging days" from this "ganging" or procession. The priest of the parish with the churchwardens and the parochial officials headed a crowd of boys who, armed with green boughs, beat with them the parish boundary-stones. Sometimes the boys were themselves whipped or even violently bumped on the boundary-stones to make them remember. The object of taking boys was to ensure that witnesses to the boundaries should survive as long as possible. The custom is as old as Anglo-Saxon days, as it is mentioned in laws of Alfred and Aethelstan. It may have been derived from the Roman festival of Terminus, the god of landmarks, to whom cakes and wine were offered, sports and dancing taking place at the boundaries. In England a parish-ale or feast was always held after the perambulation, which assured its popularity. Beating the bounds had a religious side in the practice which originated the term, Rogation, the accompanying clergy being supposed to beseech (*rogare*) the divine blessing upon the parish lands for the ensuing harvest. This was prohibited by the Injunctions of Queen Elizabeth; but the perambulation continued as a quasi-secular function, so that evidence of the boundaries of parishes, etc., might be preserved (Gibson *Codex juris Ecclesiastici Anglicani* [1761] pp. 213–214).

BOUNTY, a gift or gratuity; more usually, a premium paid by a government to encourage some branch of production or industry, as in England in the case of the bounty on corn, first granted in 1688 and abolished in 1814, the herring-fishery bounties, the bounties on sailcloth, linen, and other goods. The most striking modern example of a bounty was that on sugar (*q.v.*). Somewhat akin to bounties are the subsidies granted to shipping (*see* SHIPPING, HISTORY OF) by many countries. Bounties or, as they may equally well be termed, grants, are often given, more especially in new countries, for the destruction of beasts of prey; in the United States and some other countries bounties have been given for tree-planting; France has given bounties to parents in an endeavour to stay the fall in her birth-rate.

Bounty was also the name given to the money paid to induce men to enlist in the army or navy. During the American Civil War many recruits joined solely for the sake of the bounty offered, and afterwards deserted; they were called "bounty-jumpers." The term bounty was also applied in the British Navy to signify money payable to the officers and crew of a ship in respect of services on particular occasions.

Queen Anne's bounty (*q.v.*) is a fund applied for the augmentation of poor livings in the established church.

King's bounty is a grant made by the sovereign, of his royal bounty, to those of his subjects whose wives are delivered of three or more children at a birth.

"BOUNTY," MUTINY OF THE. At the end of 1787 Lieutenant William Bligh (*q.v.*) was sent to the Pacific in command of H.M.S. "Bounty." His severity provoked a mutiny (April 28, 1789), as a consequence of which Bligh and 18 loyal members of the crew were set adrift; after a journey approaching 4,000 mi. in an open boat they all reached Timor safely. The mutineers returned to Tahiti where some of them were subsequently captured. A party, however, migrated to Pitcairn island and founded a small colony which was not discovered till 1808. There was then only one survivor of the original crew of the "Bounty" on the island, John Adams, who survived until 1829. (*See* PACIFIC ISLANDS: *Pitcairn Island.*)

BOURASSA, HENRI (1868–), French-Canadian politician and journalist, was born Sept. 1, 1868. After a private education he studied law and was called to the bar in 1899. He established a name as a writer on political subjects, and was for a time editor and proprietor of *L'Interprète.* Later he became a leading contributor to *Le Nationaliste* and finally editor and joint proprietor of *Le Devoir.* In 1896 he was elected to the Dominion House of Commons as a Liberal. In 1899 he disagreed with Laurier regarding Canadian participation in the South African War and resigned as a protest against Laurier's policy. On his resignation he became the accredited leader of the Nationalist party and in 1900 and 1904 was elected to the Dominion Parliament in that interest. In 1907 he resigned in order to accept nomination for the Quebec Legislature. He was a member of the Quebec Legislative Assembly from 1908 to 1912, when he resigned. During the World War Bourassa opposed both the enforcement of conscription in Canada and the naval policy of the Liberal party. In 1925 he returned to politics and was elected as an Independent to the Dominion House of Commons. He attended the Imperial Conferences in the autumn of 1926 as an unofficial observer, and took the opportunity of delivering speeches outside in which he declared that the maintenance of the British connection was desirable as an obstacle to the absorption of Canada by the United States. When, at the end of the year, action by Lord Byng raised the issue of the constitutional position of the Governor-General, Bourassa became the active ally of Mr. Mackenzie King, but in accordance with the consistent policy of his political career (that of a friendly neutral in relation to the Liberal party) he declined to accept office in Mr. King's new government.

BOURBAKI, CHARLES DENIS SAUTER (1816–1897), French general, was born at Pau on April 22, 1816, the son of a Greek colonel who died in the War of Independence in 1827. He entered St. Cyr, and in 1836 joined the Zouaves, becoming lieutenant of the Foreign Legion in 1838, and aide-de-camp to King Louis Philippe. It was in the African expedition that he first came to the front. In 1842 he was captain in the Zouaves; 1847, colonel of the Turcos; in 1850, lieutenant-colonel of the 1st Zouaves; 1851, colonel; 1854, brigadier-general. In the Crimean War he commanded a portion of the Algerian troops; and at the Alma, Inkerman and Sevastopol Bourbaki's name became famous. In 1857 he was made general of division, commanding in 1859 at Lyons. His success in the war with Italy was only second to that of MacMahon, and in 1862 he was proposed as a candidate for the vacant Greek throne, but declined the proffered honour. In 1870 the emperor entrusted him with the command of the Imperial Guard, and he played an important part in the fighting round Metz.

A curious incident of the siege of Metz is connected with Bourbaki's name. A man who called himself Regnier,[1] about Sept. 21, appeared at Hastings, to seek an interview with the refugee empress Eugénie, and failing to obtain this he managed to get from the young prince imperial a signed photograph with a message to the emperor Napoleon. This he used, by means of a safe-conduct from Bismarck, as credentials to Marshal Bazaine, to whom he presented himself at Metz, telling him on the empress's alleged authority that peace was about to be signed and that either Marshal Canrobert or General Bourbaki was to go to Hastings for the purpose. Bourbaki at once went to England, with Prussian connivance, as though he had a recognized mission, only to discover from the empress at Hastings that a trick had been played on him. He returned to France, offered his services to Gambetta, and received the command of the Northern Army, but was recalled on Nov. 19 and transferred to the Army of the Loire. In command of the hastily trained and ill-equipped Army of the East, Bourbaki made the attempt to raise the siege of Belfort, which, after the victory of Villersexel, ended in the repulse of the French in the three days' battle of the Lisaine. Other German forces under Manteuffel now closed upon Bourbaki and he was eventually driven over the Swiss frontier with the remnant of his forces (*see* FRANCO-GERMAN WAR). Bourbaki himself, rather than submit to the humiliation of a probable surrender, delegated his functions (Jan. 26, 1871) to General Clinchant, and in the night fired a pistol at his own head, but the bullet, owing to a deviation of the weapon, was flattened against his skull and his life was saved. In July 1871 he again took the command at Lyons, and subsequently became military governor. In 1881, owing to his political opinions, he was placed on the retired list. In 1885 he was an unsuccessful candidate for the senate. He died on Sept. 27, 1897.

[1]The whole Regnier affair remained a mystery; the man himself —who on following Bourbaki to England made the impression on Lord Granville (*see* the *Life of Lord Granville,* by Lord Fitzmaurice, ii. 61) of being a "swindler" but honestly wishing to serve the empress —was afterwards mixed up in the Humbert frauds of 1902–03; he published his own version of the affair in 1870 in a pamphlet, *Quel est votre nom?* It has been suspected that on the part either of Bazaine or of the Germans some undisclosed intrigue was on foot.

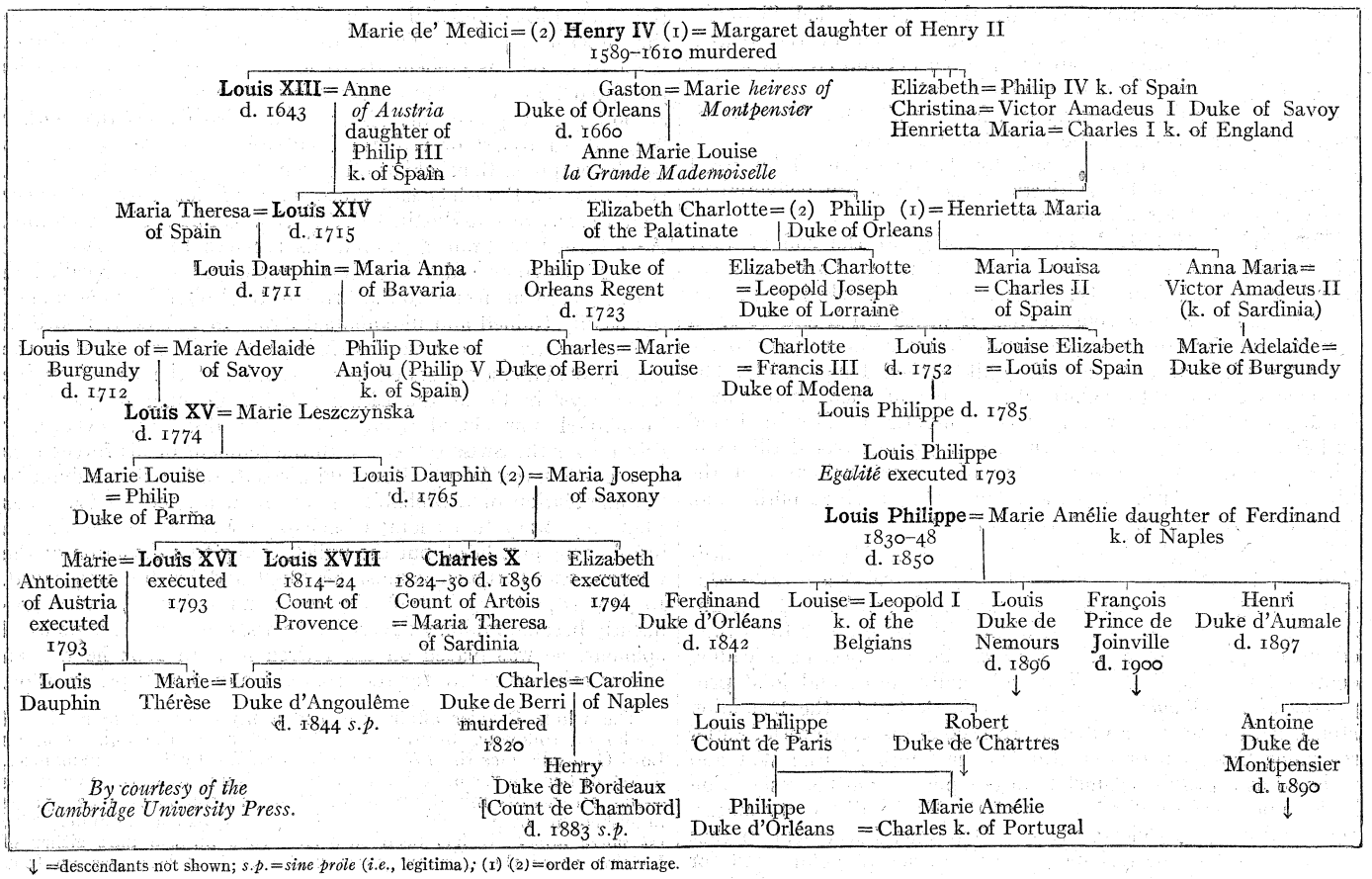
BOURBON. The noble family of Bourbon, from which so many European kings have sprung, took its name from Bourbon l'Archambault, chief town of a lordship which in the 10th century was one of the largest baronies of the kingdom of France. The limits of the lordship, which was called the Bourbonnais, were approximately those of the modern department of Allier, being on the north the Nivernais and Berry, on the east Burgundy and Lyonnais, on the south Auvergne and Marche and on the west Berry. The first of the long line of Bourbons known in history was Adhémar or Aimar, who was invested with the barony towards the close of the 9th century. Matilda, heiress of the first house of Bourbon, brought this lordship to the family of Dampierre by her marriage, in 1196, with Guy of Dampierre, marshal of Champagne (d. 1215). In 1272 Beatrix, daughter of Agnes of Bourbon-Dampierre and her husband John of Burgundy, married Robert, count of Clermont, sixth son of Louis IX (St. Louis) of France. The elder branches of the family had become extinct, and their son Louis became duke of Bourbon in 1327. In 1488 the line of his descendants ended with Jean II, who died in that year. The whole estates passed to Jean's brother Pierre, lord of Beaujeu, who was married to Anne, daughter of Louis XI. Pierre died in 1503, leaving only a daughter, Suzanne, who, in 1505, married Charles de Montpensier, heir of the Montpensier branch of the Bourbon family. With Charles, afterwards constable of France, who took the title of duke of Bourbon on his marriage, ended the direct line from Pierre I, duke of Bourbon (d. 1356). But the fourth in descent from Pierre's brother, Jacques, count of La Marche, Louis, count of Vendôme and Chartres (d. 1446), became the ancestor of the royal house of Bourbon and of the noble families of Condé, Conti and Montpensier. The fourth in direct descent from Louis of Vendôme was Antoine de Bourbon, who in 1548 married Jeanne d'Albret, heiress of Navarre, and became king of Navarre in 1554. Their son became king of France as Henry IV. The relationship of the descendants of Henry IV and of the Bourbon and Bourbon-Orleans families, are shown in the accompanying table.

Spanish Branch.—Philip, duke of Anjou, grandson of Louis XIV, became king of Spain as Philip V, in 1700. He was succeeded in 1746 by his son Ferdinand VI, who died in 1759 without family, and was followed by his brother Charles III. Charles III's eldest son became Charles IV of Spain in 1788, while his second son, Ferdinand, was made king of Naples in 1759. Charles IV was deposed by Napoleon, but in 1814 his son, Ferdinand VII, again obtained his throne. Ferdinand was succeeded by his daughter Isabella, who in 1870 abdicated in favour of her son, Alphonso XII (d. 1885). Alphonso's posthumous son became king of Spain as Alphonso XIII. Ferdinand's brother, Don Carlos (d. 1855), claimed the throne in 1833 on the ground of the Salic law, and a fierce war raged for some years in the north of Spain. His son Don Carlos, count de Montemolin (1818–61), revived the claim, but was defeated and compelled to sign a renunciation. The nephew of the latter, Don Carlos Maria Juan Isidor, duke of Madrid, for some years carried on war in Spain with the object of attaining the rights contended for by the Carlist party.

Neapolitan Branch.—The first Bourbon who wore the crown of Naples was Charles III of Spain, who on his succession to the Spanish throne in 1759, resigned his kingdom of Naples to his son Ferdinand. Ferdinand was deposed by Napoleon, but afterwards regained his throne, and took the title of Ferdinand I, king of the Two Sicilies. In 1825 he was succeeded by his son Francis, who in turn was succeeded in 1830 by his son Ferdinand II. Ferdinand II died in 1859, and in the following year his successor Francis II was deprived of his kingdom, which was incorporated into the gradually-uniting Italy.

Duchies of Lucca and Parma.—In 1748 the duchy of Parma was conferred on Philip, youngest son of Philip V of Spain. He was succeeded by his son Ferdinand in 1765. Parma was ceded to France in 1801, Ferdinand's son Louis being made king of Etruria, but the French took possession of the duchy only after Ferdinand's death in 1802. Louis' son Charles Louis was forced to surrender Etruria to France in 1807, and he was given the

HOUSE OF BOURBON AND BOURBON-ORLEANS



↓ =descendants not shown; *s.p.*=*sine prole* (*i.e.*, legitima); (1) (2)=order of marriage.

duchy of Lucca by the Congress of Vienna in 1815. In 1847, on the death of Marie Louise, widow of Napoleon, who had received Parma and Piacenza in accordance with the terms of the treaty of Paris of 1814, Charles Louis succeeded to the duchies as Charles II., at the same time surrendering Lucca to Tuscany. In 1849 he abdicated in favour of his son, Charles III., who married a daughter of the duke of Berry, and was assassinated in 1854, being succeeded by his son Robert. In 1860 the duchies were annexed by Victor Emmanuel to the new kingdom of Italy.

Bastard Branches.—There are numerous bastard branches of the family of Bourbon, the most famous being the Vendôme branch, descended from Caesar, natural son of Henry IV., and the Maine and Toulouse branches, descended from the two natural sons of Louis XIV. and Madame de Montespan.

See Désormeaux, *Histoire de la maison de Bourbon* (1782–88); Coiffier de Moret, *Histoire du Bourbonnais et des Bourbons* (1824); Achaintre, *Histoire généalogique et chronologique de la maison royale de Bourbon* (1825–26); Berand, *Histoire des sires et ducs de Bourbon* (1835); Dussieux, *Généalogie de la maison de Bourbon* (1872).

BOURBON, CHARLES, DUKE OF (1490–1527), constable of France, second son of Gilbert, count of Montpensier, was born on Feb. 17, 1490. In 1505 he married Suzanne, heiress of Peter II., duke of Bourbon, by Anne of France, daughter of King Louis XI., and assumed the title of duke of Bourbon. The addition of this duchy to the numerous duchies, countships and other fiefs which he had inherited on the death of his elder brother Louis in 1501, made him at the age of 15 the wealthiest noble in Europe. For his brilliant services at the battle of Marignano (Sept. 1515) he was made governor of the Milanese, which he defended against an attack of the emperor Maximilian. But dissensions arose between Francis I. and the constable. He was recalled from the government and in the hard fought campaign in the Netherlands against the emperor Charles V. the command of the vanguard, one of the most cherished prerogatives of the constables, was taken from him. The death of his wife without surviving issue, on April 28, 1521, weakened his territorial position, and afforded the mother of the king, Louise of Savoy, means to gratify her greed. As grand-daughter of Charles, duke of Bourbon (d. 1456), she claimed the female and some of the male fiefs of the duchy of Bourbon, while the king claimed those fiefs which were originally appanages, as escheating to the crown, and other claims were put forward. Before the *parlement* of Paris, before which the case was brought, was able to arrive at a decision, Francis handed over to his mother a part of the Bourbon estates, and ordered the remainder to be sequestrated.

Bourbon, who for some time had been coquetting with the enemies of France, renewed his negotiations with the emperor and Henry VIII. of England. It was agreed that the constable should raise in his own dominions an armed force to assist the emperor in an invasion of France, and should receive in return the hand of Eleonora, queen dowager of Portugal, or of another of the emperor's sisters. He now escaped across the frontier to the emperor's dominions, but he took no troops with him. The contemplated invasion of France by Henry VIII. and Charles V. failed. In the spring of 1524, Bourbon was with the imperial army in Lombardy which forced the French across the Sesia (where the chevalier Bayard was mortally wounded). In Aug. 1524 he invested Marseilles, but being unable to prevent the introduction of supplies by Andrea Doria, the Genoese admiral in the service of Francis, he was forced to raise the siege and retreat to the Milanese. He took part in the battle of Pavia (1525), where Francis was defeated and taken prisoner. But Bourbon's troops were clamouring for pay, and the duke was driven to extreme measures to satisfy their demands. After the treaty of Madrid (1526), Bourbon had been offered the duchy of Milan. He now levied contributions from the townsmen, and demanded 20,000 ducats for the liberation of the chancellor Girolamo Morone (d. 1529), who had been imprisoned for an attempt to realize his dream of an Italy purged of the foreigner. He declined to recognize the truce which Charles's viceroy in Naples had concluded with Pope Clement VII., and decided to satisfy his starving soldiers with the sack of Rome. On May 5, 1527, the troops appeared before the walls of Rome. On the following morning Bourbon attacked the Leonine city, and while mounting a scaling ladder fell mortally wounded by a shot, which Benvenuto Cellini in his *Life* claims to have fired. After Bourbon's death his troops took and sacked Rome.

See O. de Marillac, *Vie du Connêtable de Bourbon* (1836); E. Armstrong, *Charles V.* (1902).

BOURBON-LANCY, watering-place, east-central France, department of Saône-et-Loire, 52 mi. S.S.E. of Nevers by rail. Pop. (1936), 3,122. The town on a hill about 2 mi. from the right bank of the Loire possesses thermal springs, used in the Roman period, and ancient baths have been found. The waters, saline and ferruginous, are used for drinking and bathing, in cases of rheumatism, etc. In the middle ages Bourbon-Lancy was an important stronghold and a fief of the Bourbon family. There are a bathing establishment, a large hospital, a secularized church (11th and 12th centuries), a belfry pierced by a gateway of the 15th century, and houses of the 15th and 16th centuries. Farm implements are made.

BOURBON L'ARCHAMBAULT, town, central France, department of Allier, on the Burge, 16 mi. W. of Moulins by rail. Pop. (1936) 1,880. There are thermal springs known since Roman times, a church (12th century), and ruins of a castle of the dukes of Bourbon (13th and 15th centuries), including a cylindrical keep. Stone is quarried in the vicinity. Bourbon (*Aquae Borvonis* or *Bormonis*) was anciently the capital of the Bourbonnais and gave its name to the Bourbon family (*q.v.*). The affix Archambault is the name of one of its early lords.

BOURBONNAIS was formerly a province of France, bounded on the north by Nivernais and Berri, on the south by Auvergne, on the east by Burgundy and Forez, and on the west by Berri. It covered approximately the same area as the modern department of Allier. Bourbonnais was a purely feudal creation, and did not correspond to any ancient division of territory. It included part of the land formerly held by certain Gallic tribes mentioned by Caesar—the Arverni, the Aedui and the Bituriges-Cubi. It was later divided between Aquitaine and Lyonnaise. In the 18th century different parts of the province formed part of five dioceses, those of Bourges, Clermont, Autun, Nevers and Limoges. The principal towns of Bourbonnais are Moulins, the capital, and Gannat, Montluçon and La Palisse. The province has a military government with headquarters at Moulins. For judicial purposes it came under the *Parlement* of Paris.

See de Coiffier de Moret, *Histoire du Bourbonnais*, 2 vol. (1814–16); A. Allier, *Histoire de l'ancien Bourbonnais*, 2 vol. (1834–38); M. Fazy, *Histoire des Sires de Bourbon . . . et de la formation territoriale du Bourbonnais* (1924).

BOURBONNE-LES-BAINS, a watering-place of east France, department of Haute-Marne, east north-east of Langres. Pop. (1936) 2,770. Its hot saline springs (108°–150°F.) were known to the Romans under the name *Aquae Borvonis*. The waters are useful in skin troubles and rheumatism. The principal buildings are a 12th century church, the state bathing-establishment and the military hospital (1732); there are also the remains of a castle. Timber-sawing and plaster manufacture are carried on. In the neighbourhood are the buildings of the celebrated Cistercian abbey of Morimond.

BOURCHIER, ARTHUR (1863–1927), English actor, was born on June 22, 1863, and educated at Eton and Christ Church, Oxford. At the university he became prominent as an amateur actor in connection with the O.U.D.S., which he founded, and in 1889 he joined Mrs. Langtry as a professional. He also acted with Charles Wyndham at the Criterion, and was for a while in Daly's company in America. In 1894 he married Violet Vanbrugh, with whom he subsequently took the leading parts under his own management. In 1918 he married Miss Kyrle Bellew. Both as tragedian and comedian Mr. Bourchier took high rank on the London stage, and as actor-manager produced successful modern plays by Mr. Sutro and others. He played many Shakespearian parts, but he is best remembered for parts like the broker's man in *Tilly of Bloomsbury* and John Silver in *Treasure Island*. He used to say with pride that he was the only London actor-manager having his own theatre and working without a syndicate or a financial partner. He died in South Africa, Sept. 14, 1927.

BOURCHIER, THOMAS (*c.* 1404–1486), English archbishop, lord chancellor and cardinal, was a younger son of William Bourchier, count of Eu (d. 1420), and through his mother, Anne, a daughter of Thomas of Woodstock, duke of Gloucester, was a descendant of Edward III. Educated at Oxford and then entering the church, after holding some minor appointments, he became bishop of Worcester in 1434. In the same year he was chancellor of the University of Oxford, and in 1443 he was appointed bishop of Ely; then in April 1454 he was made archbishop of Canterbury, becoming lord chancellor of England early in 1455. Bourchier's short term of office as chancellor coincided with the opening of the Wars of the Roses, and at first he was not a strong partisan, although he lost his position as chancellor when Richard, duke of York, was deprived of power in Oct. 1456. Afterwards, in 1458, he helped to reconcile the contending parties, but when the war was renewed in 1459 he appeared as a decided Yorkist; he crowned Edward IV. in June 1461, and in 1465, his queen, Elizabeth Woodville. In 1457 Bourchier took the chief part in the trial of Reginald Pecock, bishop of Chichester, for heresy. In 1467 he was created a cardinal, and in 1475 he was one of the four arbitrators appointed to arrange the details of the treaty of Picquigny between England and France. After the death of Edward IV. in 1483, Bourchier persuaded the queen to allow her younger son, Richard, duke of York, to share his brother's residence in the Tower of London; and although he had sworn to be faithful to Edward V., before his father's death, he crowned Richard III. in July 1483. He was, however, in no way implicated in the murder of the young princes. The third English king crowned by Bourchier was Henry VII., whom he also married to Elizabeth of York in Jan. 1486. Bourchier died March 1486.

See W. F. Hook, *Lives of the Archbishops of Canterbury,* vol. v. (1860–84).

BOURDALOUE, LOUIS (1632–1704), French Jesuit and preacher, born at Bourges on Aug. 20, 1632, at the age of 16 entered the Society of Jesus, was appointed successively professor of rhetoric, philosophy and moral theology, in various colleges of the Order. His success as a preacher determined his superiors to call him to Paris in 1669 to occupy for a year the pulpit of the church of St. Louis. His eloquence ranked him in popular estimation with the great masters of style in the most brilliant period of Louis XIV.'s reign. On the revocation of the Edict of Nantes he went to Languedoc to confirm converts to Catholicism. Catholics and Protestants joined in praising his fervid eloquence in the Lent sermons preached at Montpellier in 1686. Bourdaloue died in Paris on May 13, 1704. His influence was due as much to his saintly character and to his gentleness as to his reasoning. Voltaire said that his sermons surpassed those of Bossuet (whose retirement in 1669, however, prevented Bourdaloue from being regarded as his rival); there is little doubt that their simplicity and coherence, and the direct appeal which they made to all hearers, gave them a superiority over the more profound sermons of Bossuet.

BIBLIOGRAPHY.—The only authoritative source for the Sermons is the edition of Père Bretonneau (14 vols., Paris, 1707–21, followed by the *Pensées,* 2 vols. 1734). Other editions not based on Bretonneau are inferior; some, indeed, are altogether spurious (*e.g.,* that of Abbé Sicard, 1810). Among critical works are Henri Chérot, *Bourdaloue inconnu* (1898) and *Bourdaloue, sa correspondance et ses correspondans* (1898–1904); L. Pauthe, *Bourdaloue (les maîtres de la chaire au XVIIe siècle)* (1900); E. Griselle, *Bourdaloue histoire critique de sa prédication* (2 vols. 1901); *Sermons inédits; bibliographie, etc.* (Paris, 1901); Ferdinand Castets, *Bourdaloue, la vie et la prédication d'un religieux au XVIIe siècle, La Revue Bourdaloue* (1902–04); C. H. Brooke, *Great French Preachers* (sermons of Bourdaloue and Bossuet, 1904); F. Brunetière, "L'Éloquence de Bourdaloue," in *Revue des deux Mondes* (Aug. 1904), a general inquiry into the authenticity of the sermons and their general characteristics.

BOURDON, FRANÇOIS LOUIS (d. 1797), known as BOURDON DE L'OISE, French revolutionist, was *procureur* at the parlement of Paris. Representing the department of the Oise in the Convention, he voted for the immediate death of the king. He accused the Girondists of relations with the court, then turned against Robespierre, who had him expelled from the Jacobin club for his conduct as commissioner of the Convention with the army of La Rochelle. On the 9th Thermidor he was one of the deputies delegated to aid Barras to repress the insurrection made by the commune of Paris in favour of Robespierre. Bourdon then became a violent reactionary, attacking the former members of the Mountain and supporting rigorous measures against the rioters of the 12th Germinal and the 1st Prairial of the year III. In the council of Five Hundred, Bourdon belonged to the party of "Clichyens," composed of disguised royalists, against whom the directors made the *coup d'état* of the 18th Fructidor. Bourdon was deported to French Guiana, where he soon died.

BOURDON GAUGE: *see* PRESSURE GAUGE.

BOURG or **BOURG-EN-BRESSE,** a town in the east of France, capital of department of Ain, formerly capital of the province of Bresse, 36m. N.N.E. of Lyons by the P.L.M. railway. Pop. (1936) 22,445. Bourg is at the south-western end of the Jura, on the left bank of the Reyssouze, a tributary of the Saône. It is an important railway junction. Roman remains have been discovered, but little is known of its early history. Raised to the rank of a free town in 1250, it was in the 15th century chosen by the dukes of Savoy as the chief city of Bresse. The town was finally ceded to France in 1601. In 1814 the town, in spite of its defenceless condition, resisted the Austrians, who pillaged it.

The church of Notre Dame is a 16th century transitional structure, with the Renaissance style prevailing. In the interior there are stalls and stained glass of the 16th century. The chief attraction for tourists, however, is the church of Brou, a suburb of Bourg, a remarkable monument of late Gothic (1506–32), unique in its uniformity of style. Marguerite of Bourbon, wife of Philibert II. of Savoy, had intended to found a monastery on the spot, but died too soon, and the church was built by her daughter-in-law Marguerite of Austria, in memory of her husband, Philibert le Beau of Savoy. The exterior, especially the façade, is richly ornamented, but the chief interest lies in the three mausolea with the marble effigies of Marguerite of Bourbon, Philibert le Beau and Marguerite of Austria. The rood loft, oak stalls and reredos in the Lady chapel are masterpieces in a similar style. In the former priory building the museums of Bourg are installed, including the Musée Lorin and the Musée Guillon. The church is now state property. Bourg is the seat of a prefect and a court of assizes, and has a tribunal of first instance, a tribunal and a chamber of commerce. Iron goods, mineral waters, tallow, soap, earthenware and flour are made. Trade is in grain, cattle and in the renowned poultry of Bresse (*q.v.*).

BOURGEOIS, LÉON VICTOR AUGUSTE (1851–1925), French statesman, was born in Paris May 21 1851, and received a legal education. He entered the civil service in 1876, rising in 1887 to be prefect of police. His political career opened in 1888 when he defeated Gen. Boulanger in the Marne and entered the chamber. He was a member of many administrations from 1888 onwards, and in 1895 himself formed a Radical ministry which fell in the constitutional struggle over the right of the senate to veto supply. He was minister of the exterior in the Sarrien cabinet of 1906, and was responsible for French policy at Algeciras. In the meantime he had distinguished himself at the Hague Peace Conference (1899) and in 1903 was nominated a member of the permanent Court of Arbitration; he was the French delegate at the Hague Conference of 1907. In June 1914 he took over foreign affairs in the Ribot cabinet.

During the World War he was minister without portfolio in the Briand cabinet. He had been elected to the senate in 1905, and was president of that assembly from 1920–23.

Léon Bourgeois was one of the first to suggest a league of nations. For this reason he was appointed by his government to represent France during the negotiations of 1919 concerning the League. When this was constituted he was, until a year before his death, the principal representative of France, both in the Council and in the Assembly. In 1920 he was awarded the Nobel Peace Prize. He died Sept. 29 1925.

BOURGEOIS, a French word originally meaning a freeman of a *bourg* or borough; later extended to the whole class between the worker and the landed nobility, and now used generally of the capitalist class of any country.

In printing, the name of a type, in size ("nine point") between long primer and brevier. The type in which the main body of the *Encyclopædia Britannica* is set is bourgeois. The word, in this sense, is pronounced in English "burjoyce"; the French call type of this size *gaillarde*.

BOURGES, chief town of the department of Cher, central France, 144m. S. of Paris on the Orléans railway between Vierzon and Nevers. Pop. (1936) 44,667. Bourges is built in marshy country on a hillock cut off on three sides by the Canal of Berry, the Yèvre, the Auron and smaller streams. The old town with its narrow streets forms a centre, to the south and east of which lie the industrial suburbs. Bourges occupies the site of the *Avaricum,* of the Bituriges, mentioned by Caesar as an important settlement. In 52 B.C., it was completely destroyed, but under Augustus it was made the capital of Aquitania Prima. About A.D. 250 it became the seat of a bishop, the first occupant of the see being Ursinus. It was in the hands of the Visigoths from 475 to 507. In the middle ages it was the capital of Berry. In the 15th century it became the residence of Charles VII., "king of Bourges." In 1463 a university was founded in the city by Louis XI., which was for centuries one of the most famous in France for jurisprudence, but it has long ceased to exist. On many occasions Bourges was the seat of ecclesiastical councils as in 1438, when the Pragmatic Sanction of the Gallican Church was established, and in 1528, when Lutheran doctrines were condemned. Bourges preserves portions of the Roman ramparts, and of fortifications of the 13th century. The summit of the rise on which the city is built is crowned by the cathedral of St. Étienne, one of the most important Gothic churches in France. Begun in the 12th century it was completed in the 16th, to which period belong the northernmost of the two unfinished towers flanking the façade and two of its five elaborately sculptured portals. The interior has double aisles—the inner aisles of remarkable height—and no transepts, and contains among many other works of art, magnificent stained glass of the 13th century. Beneath the choir there is a partially Romanesque crypt with traces of Roman fosses; the two lateral portals are also survivals of a Romanesque church. The hôtel Lallemand and the hôtel Cujas (now occupied by the museum) are of the Romanesque period. The hôtel de Jacques Coeur, the famous merchant, is now the law-court. It is in the Renaissance style, but two towers of the Roman fortifications were utilized in the construction of the south-west façade. The industrial activity of Bourges depends primarily on its ammunition works and on its being a military centre. The suburb of Mazières has large iron and engineering works, and there are manufactories of anvils, edge-tools, biscuits, woollen goods, oil-cloth, boots and shoes, fertilizers, brick and tile works, distilleries, tanneries, saw-mills and dye-works. The town has a port on the canal of Berry, and does a considerable trade in grain, wine, vegetables, hemp and fruit. Market gardening on the marshy soils of the neighbourhood is also important. Bourges is the seat of an archbishopric, a court of appeal, a court of assizes and a prefect. It has tribunals of first instance and of commerce, a board of trade-arbitrators and a chamber of commerce. It was occupied by the Germans in World War II.

BOURGET, PAUL CHARLES JOSEPH (1852–1935), French novelist and critic, was born at Amiens on Sept. 2, 1852 the son of a teacher of mathematics. He received his early education at Clermont-Ferrand, and afterwards studied at the lycée Louis-le-Grand and at the École des Hautes Études. In 1872–1873 he produced a volume of verse, *Au bord de la mer,* which was followed by others, the last, *Les Aveux,* appearing in 1882. Meanwhile he was making a name in literary journalism, and in 1883 he published *Essais de psychologie contemporaine,* studies of eminent writers first printed in the *Nouvelle Revue,* and now brought together. In 1884 Bourget paid a long visit to England, and there wrote his first published story (*L'Irréparable*). *Cruelle Énigme* followed in 1885; and *André Cornelis* (1886) and *Mensonges* (1887) were received with much favour. *Le Disciple* (1889) showed the novelist in a graver attitude; while in 1891 *Sensations d'Italie,* notes of a tour in that country, revealed a fresh phase of his powers. In the same year appeared the novel *Coeur de femme,* and *Nouveaux Pastels,* types of the characters of men, the sequel to a similar gallery of female types (*Pastels,* 1890). His later novels include *La Terre promise* (1892); *Cosmopolis* (1892), a psychological novel, with Rome as a background; *Une Idylle tragique* (1896); *La Duchesse bleue* (1897); *Le Fantôme* (1901), *Les Deux Soeurs* (1905); and some volumes of shorter stories—*Complications sentimentales* (1896), the powerful *Drames de famille* (1898), *Un Homme fort* (1900), *L'Étape* (1902), a study of the inability of a family raised too rapidly from the peasant class to adapt itself to new conditions. This powerful study of contemporary manners was followed by *Un Divorce* (1904), a defence of the Roman Catholic position that divorce is a violation of natural laws, any breach of which inevitably entails disaster and by *L'Émigré* (1907). *Études et portraits,* first published in 1888, contains impressions of Bourget's stay in England and Ireland, especially of the months he spent at Oxford; and *Outre-Mer* (1895) is his critical journal of a visit to the United States in 1893. He was admitted to the Academy in 1894.

Bourget dramatized his novel *Un Divorce,* and wrote other dramas, among which may be noted *La Barricade* (1910) and *Le Tribun,* described in the subtitle as *Chroniques de 1910 et 1911.* In these two plays he sought to portray the socio-political history of the time. But the form of drama did not permit of the analysis of emotion and of character in which Bourget was a master. He wrote some war-novels, but of his later works the greatest is undoubtedly the novel *Le démon du midi* (1914), which is a worthy successor of *Le Disciple,* and, like it, an invaluable contemporary historical document. Bourget's reputation as a novelist has long been assured. Deeply impressed by the singular art of Henry Beyle (Stendhal), he struck out on a new course at a moment when the realist school reigned without challenge in French fiction. His idealism, moreover, had a character of its own. It was constructed on a scientific basis, and aimed at an exactness, different from, yet comparable to, that of the writers who were depicting with an astonishing faithfulness the environment and the actions of a person or a society. With Bourget observation was mainly directed to the secret springs of human character. At first his purpose seemed to be purely artistic, but when *Le Disciple* appeared, in 1889, the preface to that remarkable story revealed in him an unsuspected fund of moral enthusiasm which steadily developed as the years passed.

See also C. Lecigne, *L'Évolution morale et religieuse de M. Paul Bourget* (1903); F. J. Landeur, *La vérité psychologique et morale dans les romans de P. Bourget* (1912). His *Oeuvres complètes* began to appear in a uniform edition in 1899.

BOURIGNON, ANTOINETTE (1616–1680), Flemish Quietist, b. at Lille, began life a Catholic, but took to self-imposed retirement, penance and mortification. Later she tried convent life and the management of an orphanage; both were failures on account of her distrust of human nature and her harsh, autocratic disposition. She soon became convinced that she was directly illuminated by God for the reforming of things temporal and spiritual, and accordingly began to attack Jesuits, Jansenists, Lutherans, Anabaptists and Quakers—in fact, every form of religious organization.

Her works exhibit a curious medley of opinions, such as the denial of the Divine foreknowledge, of the eternity of the second Person of the Trinity and of the Atonement, and the theories of the corruptibility of Christ's human nature, of a good and evil spirit in man, of the necessity for detecting and exposing the faults of others, and of the dispensability of the Scriptures for the elect.

She had many followers in Holland and France, and especially in Scotland, where her doctrines were denounced by the Presbyterian general assemblies of 1701, 1709 and 1710.

Her works were collected by her disciple, Pierre Poiret (1679), who also published her life (1679). Three have been translated into English: *The Light of the World* (1696); *A Treatise of Solid Virtue* (Amsterdam, 1699); *The Restoration of the Gospel Spirit* (1707). See *An Apology for M. A. Bourignon* (by G. Garden) (1699); *Étude sur Antoinette Bourignon,* by M.E.S. (1876); A. v. der Linde, *A. Bourignon das Licht der Welt* (Leyden, 1895); Hauck, *Realencyklopädie* (Leipzig, 1897); A. R. Macewen, *Antoinette Bourignon, Quietist* (1910).

BOURMONT, LOUIS AUGUSTE VICTOR, COMTE DE GHAISNE DE (1773–1846), marshal of France, entered the *Gardes Françaises* of the royal army shortly before the Revolution, emigrated in 1789, and served with Condé and the army of the *émigrés* in the campaigns of 1792 and 1793, subsequently serving as chief of staff to Scépeaux, the royalist leader, in the civil war in lower Anjou (1794–96). Bourmont, excepted from the amnesty of April 1796, fled into Switzerland, but soon afterwards, having been made by Louis XVIII. a *maréchal de camp* and a knight of St. Louis, he headed a fresh insurrection which after some preliminary successes collapsed (1799–1800). He then made his submission to the First Consul, married, and lived in Paris; but his thinly veiled royalism caused his arrest a few months later, and he remained a prisoner for more than three years, finally escaping to Portugal in 1804. Three years later the French army under General Junot invaded Portugal, and Bourmont offered his services to Junot, who made him chief of staff of a division. He returned to France with Junot after the convention of Cintra, and was promptly re-arrested. He was soon released, however, on Junot's demand, and was commissioned as an officer in the imperial army. He served in Italy for a time, then went on the staff of the viceroy Eugène (Beauharnais), whom he accompanied in the Moscow campaign. He was taken prisoner in the retreat, but escaped after a time and rejoined the French army. His conspicuous courage at the battle of Lützen in 1813 led Napoleon to promote him general of brigade, and in 1814 his splendid defence of Nogent (Feb. 13) earned him the rank of general of division. At the first Restoration, Bourmont was naturally employed by the Bourbons, to whose service he had devoted his life, but he rejoined Napoleon on his return from Elba. On the eve of the campaign of 1815, and at the urgent request of Count Gérard, he was given a divisional command in the army of the north. On the first day of the Waterloo campaign Bourmont went over to the enemy. He made no attempt to defend his conduct, and acted as the accuser of Marshal Ney. A year later he was given command of a division of the royal guard; and in 1823 he held an important position in the army which, under the command of the duc d'Angoulême, invaded Spain. He commanded the whole army in Spain for a time in 1824, became minister of war in 1829, and in 1830 was placed in command of the Algiers expedition. The landing of the French and the capture of Algiers were directed by him with complete success, and he was rewarded with the *bâton* of marshal. But the revolution of 1830 put an end to his command, and, refusing to take the oath to Louis Philippe, he was forced to resign. In 1832 Marshal Bourmont took part in the rising of the duchesse de Berri, and on its failure retired to Portugal. Here, as always, on the side of absolutism, he commanded the army of Dom Miguel during the civil war of 1833–34, and after the victory of the constitutional party he retired to Rome. At the amnesty of 1840 he returned to France. He died at the château of Bourmont on Oct. 27, 1846.

Charles de Bourmont, a son of the marshal, wrote several pamphlets in vindication of his father's career.

BOURNE, FRANCIS (1861–1935), English cardinal, was born at Clapham, London, March 23 1861, the second son of Henry Bourne, a high official in the Post Office, and Ellen Byrne. Educated at Ushaw college and St. Edmund's college, Ware, he went later to Cardinal Manning's seminary at Hammersmith, London, and St. Sulpice in Paris, where he received the diaconate from Cardinal Richard in 1883. After a course at Louvain, he was ordained in 1884, and worked at Blackheath, Mortlake, and West Grinstead, afterwards becoming rector of St. John's diocesan seminary, Wonersh. In 1895 he was made Monsignor by Leo XIII., and in 1896 he was consecrated titular Bishop of Epiphania and Coadjutor-Bishop of Southwark, to which see he succeeded in the following year. On the death of Cardinal Vaughan in 1903, Mgr. Bourne was nominated to Westminster as archbishop by Pius X. The cathedral, designed by Bentley, was finished at this time and was consecrated by the new archbishop. In 1911 he was made a cardinal. In connection with the meeting of the Eucharistic Congress in London in 1908 he arranged for a procession of the Host to take place in the streets, but eventually this was cancelled as it was represented that it would lead to a breach of the peace. The policy of Cardinal Bourne has been to aim at steady progress by multiplying small churches so that the faithful throughout London should find Mass within half a mile. On the education question he has sailed on an even keel between Liberal and Conservative governments. Modernism he reproved; his pastorals have been models of moderation, although one alarmed capital and another offended Sinn Fein. He declined to support the idea of a Catholic university or party in England, preferring that Catholics should join the national universities and parties. In Italy he claimed for the papacy an independence, similar to that of Belgium, based on international guarantees, not at the mercy of the Italian parliament, and allowing Italy to enjoy the honourable position of representing all nations in the guardianship of the papal sovereignty. He died on Jan. 1, 1935.

BOURNE, VINCENT (1695–1747), English classical scholar, became a fellow of Trinity college, Cambridge, in 1714. He passed most of his life as usher in Westminster school, and died on Dec. 2, 1747. He published three editions of his Latin poems, and in 1772 there appeared a handsome quarto volume containing all Bourne's pieces, but also some that did not belong to him. A number of the Latin pieces are translations of English poems. Cowper (an old pupil of Bourne's), Beattie and Lamb have combined in praise of his power of Latin versification.

See an edition (1840) of his *Poemata,* with a memoir by John Mitford.

BOURNE, a market town and urban district of Kesteven, Lincolnshire, England; lying in a fenny district 95 mi. N.W. of London. Pop. (1938) 4,635. Area 15.8 sq.mi. The church of SS. Peter and Paul is Norman with Early English and later additions; it is part of a monastic church belonging to a foundation of Augustinian canons of 1138, of which the other buildings have almost wholly disappeared. Trade is principally agricultural. Bourne is famous through its legendary connection with the ardent opponent of William the Conqueror, Hereward "the Wake." Of his reputed castle very slight traces remain. The Red hall, which now forms part of the railway station buildings, belonged to the family of Digby. The station is on the Sleaford and Essendine branch of the L.N.E.R. Bourne was the birthplace of the great Lord Burleigh.

BOURNE, an intermittent stream or brook frequent in chalk and limestone country where the rock becomes saturated with winter rain, that slowly drains away until the rock becomes dry, when the stream ceases. A heavy rainfall will cause streams to run in winter from the saturated soil. These are the winter bournes that have given name to several settlements upon Salisbury Plain such as Winterbourne Gunning. The "bourne" may be a permanent "burn"—a term applied to a northern constant stream. (2) (O.Fr. *bourne*), a boundary; the first use of the word in English is in Lord Berners's translation of Froissart's *Chronicles* (1523). The figurative meaning of limit or goal of a traveller comes from Shakespeare's *Hamlet* (1602), "the undiscovered country, from whose bourne no traveller returns."

BOURNEMOUTH, municipal, parliamentary and county borough and watering-place, Southampton, England, 107½ mi. S.S.W. of London by the Southern Railway. Pop. (1938) 122,100. Area 18.2 sq.mi. The town is wholly of modern and remarkably rapid growth, for the first house was not built until 1810 and the population was but a few hundred in the middle of the 19th century. The village of that period, set in what is now known as the centre of the town, occupied the valley of the Bourne, a small stream whence it took its name. The sandy beach of Poole Bay is here backed by considerable sandstone cliffs scored with deep picturesque dells or chines. Though there is little evidence of settlement in our era before the middle of last century, it is in reality one of the oldest civilized regions in the country. For centuries preceding the Roman occupation it remained one of the chief entrances into South Britain. The prehistoric relations of Hengistbury Head to the east are specially interesting. The sheltered position and equable climate of Bournemouth began to attract attention about 1840; in 1855 a national sanatorium was erected.

A pier was constructed in 1861 and another in 1880. After 1870, when railway communication was provided, the growth of Bournemouth proceeded at a remarkable pace. Suburbs rapidly extended inland and along the shore in both directions, much building having taken place after 1918, *e.g.*, at Pokesdown, Southbourne and Westbourne. The heath vegetation and pines were largely replaced by houses, but the municipality took control of woodland destruction and planting afresh, and preserved many parks and gardens besides the numerous private enclosures. It also bought Hengistbury Head, which was added to the borough. There are some 1,260 ac. of public parks and pleasure grounds within the borough.

The Undercliff drive extends as far as Boscombe pier and is 4½ miles long, while there are six miles of bathing beach. Notable buildings include the pavilion (1929), the town hall (1921), municipal college (1912), central public library (1913) and the Russell-Cotes art galleries (1922, extended 1926), and museum (1919).

Improved facilities for bathing and bowling were opened in 1937. The town was incorporated in 1890 and became a county borough in 1900. The boundaries of the borough include Boscombe, Pokesdown, Southbourne, Kinson and Holdenhurst. Many new parishes have been formed and churches built. The broadcasting station was opened on Oct. 17, 1923. Besides the city's permanent population there are large numbers of visitors at all seasons; and there is much tourist traffic by rail, road and steamboat. The railway stations are the Central and West (Southern and Somerset and Dorset railways), communications being maintained also by the G.W., L.N.E. and L.M.S. railways.

The corporation consists of a mayor, 15 aldermen and 60 councillors, increased from 11 and 33 respectively in 1932. Since 1918 Bournemouth returns one member to parliament.

BOURNONITE, a mineral species, a sulphantimonite of lead and copper with the formula $PbCuSbS_3$. It is of some interest on account of the twinning and the beautiful development of its crystals. It was first mentioned by Philip Rashleigh in 1797 as "an ore of antimony," and was more completely described by the comte de Bournon in 1804, after whom it was named. The crystals are orthorhombic, and are generally tabular in habit owing to the predominance of the basal pinacoid; numerous smooth bright faces are often developed on the edges and corners of the crystals. Usually the crystals are twinned, the twin-plane being a face of the prism; the angle between the faces of this prism being nearly a right angle, the twinning gives rise to cruciform groups, and when it is often repeated the group has the appearance of a cog-wheel, hence the name *Rädelerz* (wheel-ore). The mineral is opaque, and has a brilliant metallic lustre with a lead-grey colour. The hardness is 2½, and the specific gravity 5·8.

(L. J. S.)

BOURRÉE, a French name for a dance common in Auvergne and in Biscay in Spain; also a term for a musical composition or a dance-movement in a suite, somewhat akin to the gavotte, in quick time with two beats to the bar.

BOURRIENNE, LOUIS ANTOINE FAUVELET DE (1769–1834), French diplomatist, was born at Sens on July 9, 1769, and died at Caen on Feb. 7, 1834. He was educated at the military school of Brienne, where, he asserts, he was a friend of Napoleon Bonaparte, and later pursued legal and diplomatic studies at Vienna and at Leipzig. He returned to Paris in the spring of 1792, and renewed his acquaintance with Bonaparte.

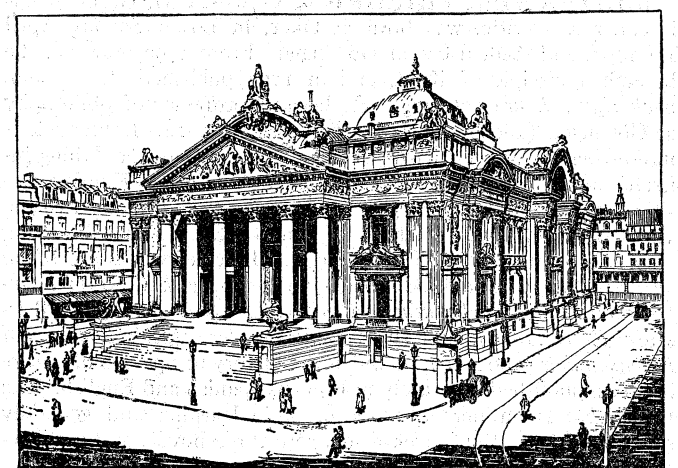
He next obtained a diplomatic post at Stuttgart, from which he returned, in 1794, to find his name on the list of political *émigrés,* though it was eventually removed by Bonaparte's influence. Bourrienne was called to Italy by the victorious general at the time of the long negotiations with Austria (May–Oct. 1797), when his knowledge of law and diplomacy was of some service in the drafting of the terms of the treaty of Campo Formio (Oct. 17). In the following year he accompanied Bonaparte to Egypt as his private secretary, and left a vivid, if not very trustworthy, account of the expedition in his memoirs, and also accompanied him on the adventurous return voyage to Fréjus (Sept.–Oct. 1799). In the autumn of 1802 he incurred the displeasure of the first consul owing to his very questionable financial dealings. In the spring of 1805 he was sent as French envoy to the free city of Hamburg. There it was his duty to carry out the measures of commercial war against England, known as the continental system; but he secretly relaxed the rules in favour of those merchants who plied him with *douceurs.* After gaining a large fortune, he was recalled to France in disgrace in 1813. In 1814 he embraced the royal cause, and during the Hundred Days (1815) accompanied Louis XVIII. to Ghent.

The fame of Bourrienne rests, not upon his achievements or his original works, which were insignificant, but upon his *Mémoires,* ed. M. de Villemarest (10 vols., 1829–31), frequently republished and translated. The best English edition of the *Mémoires* is that by Col. R. W. Phipps (1893); a new French edition was ed. by D. Lacroix (5 vols., 1899–1900). See *Bourrienne et ses erreurs, volontaires et involontaires* (1830), by Generals Belliard, Gourgaud, etc., for a discussion of the genuineness of his memoirs; also *Napoléon et ses détracteurs,* by Prince Napoleon (1887; Eng. trans., 1888).

BOURRIT, MARC THÉODORE (1739–1819), Swiss mountaineer, the son of a watchmaker at Geneva, devoted himself to the exploration of the Alps. In the years 1784–85 he was the first traveller to attempt the ascent of Mont Blanc (not conquered till 1786), but neither then nor later (1788) did he succeed in reaching its summit. On the other hand he reopened (1787) the route over the Col du Géant (11,060 ft.), which had fallen into oblivion.

His chief works are the *Description des Glacières de Savoye* (1773; English translation, Norwich, 1775–76), the *Description des Alpes pennines et rhetiénnes* (1781), and the *Description des cols ou passages des Alpes* (1803).

BOURSAULT, EDME (1638–1701), French dramatist and miscellaneous writer, was born at Mussy l'Évêque, now Mussy-sur-Seine (Aube). In Paris in 1652 he produced his first comedy, *Le Mort vivant.* This and some other pieces of small merit secured for him distinguished patronage in the society ridiculed by Molière in the *École des femmes.* Boursault was persuaded that the "Lysidas" of that play was a caricature of himself, and attacked Molière in *Le Portrait du peintre ou la contre-critique de l'École des femmes* (1663). Molière retaliated in *L'Impromptu de Versailles,* and Boileau attacked Boursault in Satires 7 and 9. Boursault replied to Boileau in his *Satire des Satires* (1669), but was afterwards reconciled with him. In 1671



THE BOURSE, OR ROYAL EXCHANGE IN BRUSSELS, BELGIUM, A HIGHLY DECORATED BUILDING IN THE STYLE OF LOUIS XIV., WAS DESIGNED BY SUYS AND OPENED IN 1874. THE PORTICO AND FAÇADE HAVE ALLEGORICAL FIGURES BY JACQUET AND, ON THE SIDE, WORK BY RODIN

he produced a didactic work, *Ad usum Delphini: la véritable étude des souverains,* which so pleased the court that its author was about to be made assistant tutor to the dauphin when it was found that he was ignorant of Greek and Latin.

See his *Oeuvres choisies* (published in 1811) and the sketch of him in Saint-René Taillandier's *Études littéraires* (1881).

BOURSE, a Continental term for a stock exchange, derived from French usage, and first used for the Paris exchange. The derivation is from Med. Lat. *bursa,* a purse. The English form, "burse," as in Sir Thomas Gresham's building, which was known

as "Britain's Burse," went out of use in the 18th century. The origin of the name is doubtful; it is not derived from any connection between purse and money, but rather from the use of a purse as a sign. At Bruges a house belonging to the family de Bursa is said to have been first used as an exchange, and to have had three purses as a sign on the front.

BOURSSE, ESAIAS (1630–1673), Dutch painter, born in Amsterdam, was a follower of Pieter de Hooch. His paintings are exceedingly rare, many of them pass under the names of Vermeer of Delft and Pieter de Hooch. Two of the paintings ascribed to the latter (one bears the false signature) at the Ryks museum in Amsterdam, are now recognized as being the work of Bourse. His subjects are interiors with figures, painted with great precision and with exquisite quality of colour. The Wallace collection has his masterpiece, an interior with a woman and a child in a cradle, reflecting something of the feeling of Rembrandt, by whom he was influenced. Other important examples are at the Ryks museum and at Aix-la-Chapelle. "Boy blowing Soap Bubbles," is in the Berlin museum.

BOUSSINGAULT, JEAN BAPTISTE (1802–1887), French agricultural chemist, was born in Paris and spent his early manhood in South America. On his return to France he held the chair of chemistry at Lyons, and then one of agricultural and analytical chemistry in Paris. His most important work, which was translated into other European languages, was *Agronomie, chimie agricole, et physiologie* (1860–74; 2nd. ed. 1884). His writings included papers on the quantity of nitrogen in different foods, the amount of gluten in different wheats, investigations on the question whether plants can assimilate free nitrogen from the atmosphere (which he answered in the negative), the respiration of plants, the function of their leaves, the action and value of manures, and similar objects.

BOUSTROPHEDON, a term descriptive of a peculiar form of writing common among the early Greeks. The direction of writing was alternately right to left and left to right in horizontal lines, or, conversely, left to right and right to left. It was a transition between the earlier right to left writing and the later left to right style. The term was derived from two Greek words meaning "ox," and "to turn," from the resemblance of the writing to the winding course taken by oxen in ploughing.

BOUTERWEK, FRIEDRICH (1765–1828), German philosopher and critic, was born at Oker, in Lower Saxony April 15, 1765, and studied law at Göttingen. From 1790, however, he became a disciple of Kant, and in 1793 published *Aphorismen nach Kants Lehre vorgelegt.* He became professor of philosophy at Göttingen (1802), where he died Aug. 9, 1828. Bouterwek is interesting for his criticism of Kant's theory of the "thing-in-itself" apart from perception. Bouterwek left the Kantian position through his opposition to its formalism, and inclined to the views of Jacobi, whose letters to him (published at Göttingen, 1868) shed much light on his thought. His chief works are *Ideen zu einer allgemeinen Apodiktik* (1799); *Aesthetik* (1806); *Lehrbuch der philos. Vorkenntnisse* (1810); *Lehrbuch der philos. Wissenschaften* (1813), and the *Geschichte der neuern Poesie und Beredsamkeit* (1801–19), of which the history of Spanish literature has been published separately in French, Spanish and English. The *Geschichte* is an uneven work of wide learning and generally sound criticism. Bouterwek also wrote three novels and a collection of poems (1802).

BOUTET DE MONVEL, MAURICE (1851–1913), French painter and illustrator, born at Orleans, studied in Paris under Cabanel, J. Lefebvre, Parrot and Carolus Duran. His first successes were obtained by his "Good Samaritan" (museum at Orleans) and "Arabes revenant du Marche" (museum at Amiens). But his talent lay chiefly with illustrations and water-colours, delicate in execution and charming in composition—"La Farce de M. Pathelin"; "Chansons et Rondes pour les Enfants"; "Chansons de France"; "Nos Enfants" and "La Vie de Jeanne d'Arc." He also executed three large mural decorations in the basilica at Domrémy illustrating scenes from the life of Jeanne d'Arc.

BOUTHILLIER, CLAUDE, Sieur de Fouilletourte (1581–1652), French statesman, began life as an advocate, and in 1619 became councillor of state and a secretary to the queen-mother, Marie de'Medici. He received the title of secretary of state in 1628, and he was able to remain on good terms with both Marie de'Medici and Richelieu, in spite of their rivalry. In 1632 he became superintendent of finances. Richelieu employed him on many diplomatic missions, and the success of his foreign policy was due in no small degree to Bouthillier's ability and devotion. He held a unique position of influence in a court torn by jealousies and intrigues. Trusted by the king, the confidant of Richelieu, the friend of Marie de'Medici, and through his son, Léon Bouthillier, who was appointed in 1635 chancellor to Gaston d'Orléans, able to bring his influence to bear on that prince, he was an invaluable mediator; and he was, next to the cardinal, the most powerful man in the kingdom. Richelieu made him executor of his will, and Louis XIII. named him a member of the council of regency which he intended should govern the kingdom after his death. Bouthillier died in Paris Mar. 13, 1652.

His son, Léon Bouthillier (1608–1652), comte de Chavigny, was named secretary of state in 1632, and seconded his father's work, so that it is not always easy to distinguish their respective parts. He was arrested twice during the Fronde, but was for a short time in power during Mazarin's exile (April 1651).

BOUTS, DIERICK (1400?–1475), painter of the Netherlandish school, a follower of the Van Eycks. Before going to Louvain about 1445 he may have worked at Brussels under the influence of Roger van der Weyden. He died at Louvain on May 6, 1475. Two authentic works of this master are known, both painted towards the end of his life. One was ordered by the Confraternity of the Holy Sacrament for the church of St. Peter at Louvain in 1464. The picture consisted of five panels. Its wings, formerly in the museums at Munich and Berlin, were returned to Belgium under the Treaty of Versailles, and are now reunited to the centrepiece in the church of St. Peter. The central panel represents the "Last Supper," and the artist seems to have introduced his own portrait and that of his sons in the background. On the wings are shown the "Feast of the Passover," "Elijah in the Desert," the "Gathering of Manna," and "Abraham and Melchisedek." The other authentic work is a series of panels, which the artist undertook to paint for the town hall at Louvain. He only completed two of these, which are now in the Brussels gallery. They represent episodes in the life of the emperor Otto III.

These works reveal a master of rich and harmonious colour schemes, a landscape painter, one who placed his figures in three dimensional spaces, correctly constructed according to the rules of perspective. He observed nature closely and his drawing as a portraitist was precise and full of character. His rendering of human anatomy was primitive and his compositions are somewhat angular, lacking the grace which his contemporary Roger van der Weyden gave to his pictures. The following is a list of the most notable works, which are generally attributed to the master on stylistic evidence. Probably his earliest extant painting is the little triptych at Madrid representing the "Annunciation," the "Visitation," and the "Epiphany." Then comes the large triptych in the cathedral at Granada representing the "Descent from the Cross," the "Crucifixion," and the "Resurrection," a replica of which is in the Colegio del Patriarca at Valencia. Other early works are: the "Entombment" in the National Gallery, London, the "Pietà" in the Louvre, Paris; the "Annunciation" at Petrograd. A "Crucifixion" in Berlin is of special interest because the skyline of Brussels is painted across the horizon in the background, making it probable that the artist worked there at the time. The following works were probably painted after the move to Louvain: "Moses and the Burning Bush" in the Johnson collection at Philadelphia; the "Virgin enthroned between St. Peter and St. Paul" in the National Gallery; the triptych in Munich, known by the name of "The Pearl of Brabant," representing the "Adoration of the Magi"; "John the Baptist" and "St. Christopher," a pair of panels, one at Lille and one at the Louvre, representing respectively Paradise and Hell; the triptych of the "Martyrdom of St. Erasmus" at St. Peter's, Louvain. Of several versions of the half-length figure of the "Madonna holding the Child,"

the one in the National Gallery (Salting collection) is among the finest. Of portraits the most notable is in the National Gallery, dated 1462, and believed by some to be a self-portrait. The Altman collection in the Metropolitan Museum also contains a portrait and a third is in the Warneck collection. After his death his two sons, Albert and Dierick, carried on his tradition in Louvain.

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BOUTS-RIMÉS, literally "rhymed ends," the name given in all literatures to a kind of verse which Addison described as "lists of words that rhyme to one another, drawn up by another hand, and given to a poet, who was to make a poem to the rhymes in the same order that they were placed upon the list." The more odd the rhymes are, the more ingenuity is required to give a semblance of common-sense to the production. For instance, the rhymes *breeze, elephant, squeeze, pant, scant, please, hope, pope* are submitted, and the following stanza is the result:—

> Escaping from the Indian *breeze,*
> The vast, sententious *elephant*
> Through groves of sandal loves to *squeeze*
> And in their fragrant shade to *pant;*
> Although the shelter there be *scant,*
> The vivid odours soothe and *please,*
> And while he yields to dreams of *hope,*
> Adoring beasts surround their *pope.*

The invention of *bouts-rimés* is attributed to a minor French poet of the 17th century, Dulot, of whom little else is remembered. About the year 1648, Dulot was complaining one day that he had been robbed of a number of valuable papers, and, in particular, of 300 sonnets. Surprise being expressed at his having written so many, Dulot explained that they were all "blank sonnets," *i.e.,* that he had put down the rhymes and nothing else. The idea struck every one as amusing, and what Dulot had done seriously was taken up as a jest. *Bouts-rimés* became the fashion. The most curious incident in their history is the fact that the elder Alexandre Dumas, in 1864, took them under his protection. He issued an invitation to all the poets of France to display their skill by composing to sets of rhymes selected for the purpose by the poet, Joseph Méry. No fewer than 350 writers responded to the appeal, and Dumas published the result in 1865.

Dante Gabriel Rossetti and W. M. Rossetti constantly practised their pens in writing sonnets to *bouts-rimés,* Dante Gabriel writing off these exercises at the rate of a sonnet in five or eight minutes.

BOUTWELL, GEORGE SEWALL (1818–1905), American statesman, was born in Brookline, Mass., on Jan. 28, 1818. He was reared on a farm, and at an early age began a mercantile career at Groton, Massachusetts. There he studied law and in 1836 was admitted to the bar. In 1842–44 and again in 1847–50 he served in the state house of representatives, and became the recognized leader on the Democratic side. In 1851, by means of "Free-Soil" votes, he was chosen governor, and was re-elected by the same coalition in 1852. The passage of the Kansas-Nebraska Bill in 1854 had finally alienated him from the Democratic Party, and he became one of the founders of the new Republican Party in the state. He played an influential part in the Republican national convention in 1860, and in 1862 after the passage of the war tax measures he was appointed by President Lincoln the first commissioner of internal revenue, which department he organized. From 1863 to 1869 he was a representative in Congress. From 1869 to 1873 he was secretary of the treasury in President Grant's cabinet, and from 1873 until 1877 was a United States senator from Massachusetts. Under an appointment by President Hayes, he prepared the second edition of the *United States Revised Statutes* (1878). He opposed the acquisition by the United States of the Philippine Islands, became president of the Anti-Imperialistic League, and was a presidential elector on the Bryan (Democratic) ticket in 1900. He died at Groton, Mass., on Feb. 28, 1905. He published various volumes, including *The Constitution of the United States at the End of the First Century* (1895), and *Reminiscences of Sixty Years in Public Affairs* (1902).

BOUVARDIA, a genus of 30 species of handsome, evergreen, greenhouse shrubs, belonging to the family Rubiaceae, mostly natives of tropical America. The flowers are in terminal, many-flowered, flat clusters; the corolla tubular, with a spreading four-lobed limb. The cultivated kinds are mostly of hybrid origin.

BOUVET, FRANÇOIS JOSEPH (1753–1832), French admiral, son of a captain in the service of the French East India Company, was born on April 23, 1753. He went to sea at the age of 12 with his father. Bouvet served in the East Indies in the famous campaign of 1781–83. On the outbreak of the French Revolution Bouvet was promoted captain, and in 1793 to rear-admiral, and commanded a division in the fleet which fought the battle of June 1, 1794 against Lord Howe. Until the close of 1796 he continued in command of a squadron in the French Channel fleet. In December of that year he was entrusted with the van division of the fleet which was sent from Brest to attempt to land General Hoche with an expeditionary force in the south of Ireland. Bouvet, who found himself at daybreak on Dec. 17 separated with nine sail of the line from the rest of the fleet, opened his secret orders, and found that he was to make for Mizen Head. On Dec. 24 he anchored near Bear Island with part of his fleet. The storms which blew down Bantry Bay, made it impossible to land. On the evening of the 25th Bouvet's frigate was blown out to sea. Bouvet, being convinced that none of the ships of his squadron could have remained at the anchorage, steered for Brest, where he arrived on Jan. 1, 1797. He was wrong in thinking that all his squadron had failed to keep their anchorage in Bantry Bay, and he was dismissed from command soon afterwards; Napoleon restored him to the service, and he commanded the squadron sent to occupy Guadeloupe during the peace of Amiens. He died on July 21, 1832.

See Tronde, *Batailles navales de la France,* vols. ii and iii, *English in Ireland;* James, *Naval History,* vols. i and ii and Admiral Colomb's *Naval Warfare.*

BOUVIER, JOHN (1787–1851), American jurist, was born in Codogno, France in 1787. In 1802 his family emigrated to America and settled in Philadelphia. He became a citizen of the United States in 1812 and was admitted to the bar in 1818. He is best known for his able legal writings. His *Law Dictionary Adapted to the Constitution and Laws of the United States of America and of the Several States of the American Union* (1839, revised and brought up to date by Francis Rawle, under the title of *Bouvier's Law Dictionary,* 1897), has always been a standard, a later edition of which was issued in 1916.

BOUVINES, a village on the French-Belgian frontier (pop. [1936] 537) between Lille and Tournay, the scene of one of the greatest battles of the middle ages, fought July 27, 1214, between the forces of Philip Augustus, king of France, and those of the coalition formed against him, of which the principal members were the emperor and King John of England. The plan of campaign was designed by King John to draw the French king south towards the Loire against himself, while his nephew, the emperor Otto IV., the princes of the Netherlands, and the main army of the allies should at the right moment march upon Paris from the north. John's part in the general strategy was perfectly executed; the allies in the north moved tardily. While John, after two inroads, turned back to his Guienne possessions on July 3, it was not until three weeks later that the emperor concentrated his forces at Valenciennes, and in the interval Philip Augustus had counter-marched northward and concentrated an army at Peronne. Philip then took the offensive himself, and in manoeuvring to get a good cavalry ground upon which to fight he offered battle (July 27) on the plain east of Bouvines and the river Marque—the same plain on which in 1794 the brilliant cavalry action of Willems was fought. He had a superiority in cavalry to compensate his decidedly smaller numbers of foot. The imperial army accepted the challenge and drew up facing south-westward towards Bouvines, the heavy cavalry on the wings, the infantry in one great mass in the centre, supported by the cavalry corps under

the emperor himself. The French army took ground exactly opposite to the enemy and in a similar formation, cavalry on the wings, infantry, including the *milice des communes,* in the centre, Philip with his own knights in rear of the foot. The battle opened with a confused cavalry fight on the French right, in which individual feats of knightly gallantry were more noticeable than any attempt at combined action. The fighting was more serious between the two centres; the Flemish infantry, who were at that time almost the best in existence, drove in the French; Philip led the centre body of cavalry to retrieve the day, and after a long and doubtful fight, in which he himself was unhorsed and narrowly escaped death, began to drive back the Flemings. In the meanwhile the French feudatories on the left wing had thoroughly defeated the imperialists opposed to them, and William Longsword, earl of Salisbury, the leader of this corps, was unhorsed and taken prisoner by the warlike bishop of Beauvais. Victory declared itself also on the other wing, where the French at last routed the Flemish cavalry and captured Count Ferdinand of Flanders, one of the leaders of the coalition. In the centre the battle was between the two mounted reserves led respectively by the king and the emperor in person. Here, too, the imperial forces suffered defeat, Otto himself being saved only by the devotion of a handful of Saxon knights. The day was already decided in favour of the French when their wings began to close inward to cut off the retreat of the imperial centre. The battle closed with the celebrated stand of Reginald of Boulogne, a revolted vassal of King Philip, who formed a ring of 700 Brabançon pikemen, and not only defied every attack of the French cavalry, but himself made repeated charges or sorties with his small force of knights. Eventually, and long after the imperial army had begun its retreat, the gallant schiltron was ridden down and annihilated by a charge of 3,000 men-at-arms. Reginald was taken prisoner in the melée; and the prisoners also included two other counts, Ferdinand and William Longsword, 25 barons and more than 100 knights. The killed amounted to about 170 knights of the defeated party, and many thousands of foot on either side, of whom no accurate account can be given. The battle is characteristic of normal mediaeval warfare, the centre and two wings fighting their separate battle, without guiding idea or superior guidance. Only Reginald, in basing his mobile action on a stable infantry pivot, showed a glimmer of tactical sense.

See C. W. C. Oman, *History of the Art of War in the Middle Ages,* vol. 1 (2nd ed., 1924); also G. Köhler, *Kriegsgeschichte,* i (Breslau, 3 vols., 1886, etc.); and H. Delpech, *Tactique au XIIIe siècle* (2 vols., Montpelier, 1886).

BOVIANUM, the name of two ancient Italian towns. (1) Undecimanorum (*Boiano*), chief city of the Pentri Samnites, 9 mi. N.W. of Saepinum and 18 mi. S.E. of Aesernia, on the road from Beneventum to Corfinium, connecting the Via Appia and the Via Valeria. Cyclopean walls of the old (upper) city remain above the Roman and modern town in the plain. Bovianum was the seat of the Samnite assembly in the Social War. It acquired the name *Undecimanorum* when Vespasian settled the veterans of the Legio XI Claudia there. (2) Vetus (near Pietrabbondante, 5 mi. S. of Agnone and 19 mi. N.W. of Campobasso), chief town of the Caraceni, remote among the mountains. Where Bovianum is mentioned the reference is generally to Bovianum Undecimanorum. Fortifications, a temple and a theatre with finely preserved stone seats are known.

BOVIDAE, the family of hollow-horned ruminant mammals typified by the common ox (*Bos taurus*) and characterized by the presence on the skulls of males or of both sexes of a pair of bony projections, covered in life with hollow sheaths of horn, which are never branched and are not shed (*see* PECORA). In stature the Bovidae range from the size of a hare to that of the buffalo, and their horns vary in size and shape from the small and simple spikes of the oribi and duikers to the enormous and variously shaped structures borne respectively by buffaloes, wild sheep, koodoos and other large antelopes. The Bovidae, like the deer or Cervidae, are distributed over the whole northern hemisphere but they are especially varied in Africa and are quite unknown in South America, in contrast to the deer family. The island of Celebes in the East Indies is the eastern limit of the Bovidae. The present family probably originated in the northern half of the old world, whence a few forms effected an entrance into North America by way of the Bering strait during the Pleistocene period.

The subfamily Bovinae includes the ox tribe, the bushbuck group and the duikers. The tribe Bovini are large, heavily-bodied ruminants, horns present in both sexes, the muzzle broad, naked and moist, and a long tufted tail. Facial glands are absent. The group is represented throughout the old world, as far east as Celebes, and by the bison in North America. (*See* ANOA; AUROCHS; BANTIN; BISON; BUFFALO; GAUR; OX; YAK.) The Tragelaphini contains the twisted-horned bushbucks. They are medium- or large-sized antelopes, usually marked with white transverse stripes, although these may be faint or obsolete. The muzzle is naked; facial glands are lacking. Horns are generally restricted to the male, although female eland and bongo bear horns. (*See* ANTELOPE; BONGO; ELAND; KOODOO.) The Boselaphini contains the Indian nilgai and four-horned antelope. Males of the former are bluish in colour, while the females are yellowish-brown. The four-horned antelope is very duikerlike, with slitlike facial glands. The Cephalophini, the African duikers, have well-marked, slitlike facial glands; their cheek teeth are low-crowned and square. (*See* ANTELOPE; DUIKER.)

The subfamily Hippotraginae comprises two tribes, the waterbuck and oryx groups. They have ringed horns, generally long and curved. Facial glands are absent. The cheek teeth are high-crowned. The Reduncini or waterbuck tribe have a naked muzzle, long tail, and horns restricted to the males. (*See* ANTELOPE; REEDBUCK; WATERBUCK.) The Hippotragini have a hairy muzzle; both sexes bear ringed horns, generally curved backward; their molar teeth are high-crowned and have accessory styles. (*See* ANTELOPE; ADDAX; GEMSBOK; ORYX; SABLE ANTELOPE.)

The subfamily Alcelaphinae have well-developed, rounded facial glands; their horns are lyrate, generally rounded in cross-section or flattened at the base and sigmoid. The tail is long; the muzzle is naked in the gnus, but in the hartebeests, blesboks and topis only a small naked area around the nostrils remains. They may be primitive relatives of the preceding group but their upper cheek teeth are narrow and simple. (*See* ANTELOPE; BLESBOK; GNU; HARTEBEEST.)

The subfamily Antilopinae contains the gazelles, the dik-diks, royal antelope and oribis. The Neotragini are small, delicately built antelope, the males alone bearing horns in most species. These are ringed at the base and rounded, straight or slightly curved. The muzzle is naked (except in the dik-diks) and there is a rounded opening for the facial gland. (*See* ANTELOPE; KLIP-SPRINGER; ORIBI.) The Antilopini have narrow cheek teeth, like those of goats, and their muzzles are hairy. A facial gland is usually present, with a rounded opening below the eye. The horns are ringed, usually lyrate and in most species are borne by both sexes. They are small or medium in size, slenderly built. (*See* ANTELOPE; GAZELLE; GERENUK; PALLA.)

The subfamily Caprinae, or goat-sheep group, are related to the gazelles. Their cheek teeth are narrow and high-crowned, without an inner column. The Saigini, large-snouted, gazellelike animals, have ringed horns in the males only and are without facial glands. (*See* ANTELOPE; SAIGA.) The Rupicaprini are mountain antelope, with heavy limbs and short rounded horns in both sexes. (*See* CHAMOIS; GORAL; IZARD; ROCKY MOUNTAIN GOAT; SEROW.) The Ovibovini have curved, flattened horns and heavy limbs. There are no facial glands and the muzzle is hairy, except for a triangular area around and between the nostrils. (*See* TAKIN; MUSK-OX.) The Caprini are medium-sized ruminants, usually with horns in both sexes; these are usually triangular in section, with ridges or knobs. There are often glands in the feet, but facial glands when present are small. The muzzle is narrow and hairy, the tail short and flattened. (*See* ARGALI, BHARAL; GOAT; IBEX; BIGHORN; MARKHOR; MOUFLON, SHEEP; TAHR; UDAD.) (J. E. HL.)

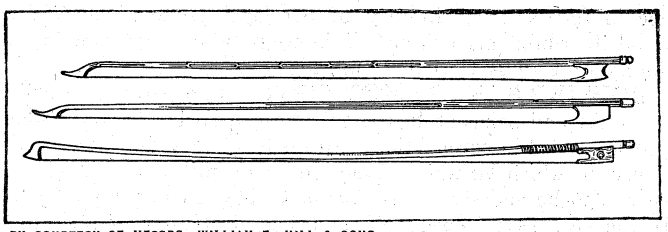
BOVILLAE, an ancient town of Latium, a station on the Via Appia (already paved up to this point in 293 B.C.) 11 mi. S.E. of Rome. It was a colony of Alba Longa, and one of the 30 cities of

the Latin league. After the destruction of Alba Longa the *sacra* were, it was held, transferred to Bovillae, including the cult of Vesta (in inscriptions *virgines vestales Albanae* are mentioned, and the inhabitants of Bovillae are always spoken of as *Albani Longani Bovillenses*) and that of the *gens Iulia*. This hereditary worship made it important when the Julian house rose to power. The knights met Augustus' dead body at Bovillae on its way to Rome, and in A.D. 16 the shrine of the family worship was dedicated anew, and yearly games in the circus were instituted. Milo and Clodius quarrelled here and Clodius was killed; his villa lay above the town, left of the Via Appia. Bovillae probably replaced Alba Longa as a local centre after the destruction of the latter by Rome, a case of deliberate choice of a strategically weak position. Remains of buildings of the imperial period—the circus, a small theatre, and edifices probably connected with the post-station—may still be seen south-west of the Via Appia.

BOW, a common Teutonic word for anything bent[1]. Thus it is found in English compound words, *e.g.*, "elbow," "rainbow," "bow-net," "bow-window," "bow-knot," "saddle-bow," and by itself as the designation of a great variety of objects. The Old English use of "bow" or stone-bow, for "arch," now obsolete, survives in certain names of churches and places, *e.g.*, Bow church (St. Mary-in-Arcubus) in Cheapside, and Stratford-le-Bow (the "Stratford-atte-Bowe" of Chaucer). "Bow," however, is still the designation of objects so various as an appliance for shooting arrows (*see* ARCHERY), a necktie in the form of a bow-knot, a ring or hoop forming a handle (*e.g.*, the bow of a watch), certain instruments or tools used in various crafts, and the stick strung with horsehair by means of which the strings of instruments of the violin family are set in vibration. It is with this last that the present article is solely concerned.

Bow in Music.—The modern bow consists of five parts, *i.e.*, the "stick," the screw or "ferrule," the "nut," the "hair" and the "head."

The stick, in high-grade bows, is made of Brazilian lance-wood (*Duguetia quitarensis*) or of snake-wood (*Brosimum aubletii*), which alone combine the requisite lightness, elasticity and power of resistance; for the cheaper bows American oak is used, and for the double-bass bow beech. It is cut absolutely straight and parallel along its whole length with the fibre of the wood; it is



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THREE DESIGNS, SHOWING THE DEVELOPMENT OF THE VIOLIN BOW FROM THE TARTINI MODEL (UPPER TWO) TO THE IDEAL MODEL OF TOURTE (BELOW)

then bent by heat until it is slightly convex to the hair and has assumed the elegant *cambrure* first given to it by François Tourte (1747–1835). The length of the stick was fixed by Tourte at 29·34 to 29·528 in. The centre of gravity in a well-balanced violin bow should be at 19 cm. (7½ to 7¾ in.) from the nut.

The screw or ferrule, at the cylindrical end of the stick held by the hand, provides the means of tightening or loosening the tension of the hair.

The hair is chosen from the best white horsehair, and each of the hairs (some 120 in number) which compose the half-inch wide ribbon of the bow must be perfectly cylindrical and smooth. Tourte attached the greatest importance to the hairing of the bow, and bestowed quite as much attention upon it as upon the stick. When passed between the fingers in the direction from root to tip, the hair glides smoothly and offers no resistance, but passed in the opposite direction it feels rough, suggesting a regular succession of minute projections. The outer epithelium or sheath of the hair is composed of minute scales which produce a succession of infinitesimal shocks when the hair is drawn across the strings; the force and uniformity of these shocks, resulting in vibrations of equal persistency, are considerably heightened by the application of resin to the hair. In hairing the bow, alternate hairs are laid in opposite directions, so that the up and down strokes may be equal, and a pure and even tone obtained.

The head, 1 in. long and 7/16 in. wide at the plate, is cut in one piece with the stick, an operation which requires delicate workmanship; otherwise the head is liable to snap at this point during a *sforzando* passage.

The model bow here described, elaborated by François Tourte as long ago as between 1775 and 1780 according to Fétis, or between 1785 and 1790 according to Vidal, has not since been surpassed.

The question of the origin of the bow still remains a matter of conjecture, but it undoubtedly came from the East, having been borrowed by the Greeks of Asia Minor and the Arabs from a common source—probably India, by way of Persia.

The earliest bow known in Europe was associated with the rebab (*q.v.*), the most widely used bowed instrument until the 12th century, but its development began only from the time when it was applied to the guitar (*q.v.*) which then became the guitar fiddle (*q.v.*), the immediate forerunner of the viols.

As soon as Corelli (1653–1713) formulated the principles of the technique of the violin, marked modifications in the construction of the bow became noticeable. Tartini introduced further improvements, such as a lighter wood for the stick, a straight contour, and a shorter head, in order to give better equilibrium. The Tourtes, father and son, accomplished the rest.

BOWDICH, THOMAS EDWARD (1790–1824), English traveller and author, was born at Bristol in 1790. In 1814 he obtained a writership in the service of the African Company of Merchants and was sent to Cape Coast. In 1817 he was sent, with two companions, to Kumasi on a mission to the king of Ashanti, and chiefly through his skilful diplomacy the mission secured British control over the coast natives (*see* ASHANTI: *History*). An account of his mission and of the study he had made of the barbaric court of Kumasi, entitled *Mission from Cape Coast Castle to Ashantee,* etc., appeared in 1819 (republished 1873). His African collections he presented to the British Museum. Bowdich publicly attacked the management of the African committee, and his strictures influenced the decision of the British government to assume direct control over the Gold Coast. From 1820 to 1822 Bowdich lived in Paris, studying mathematics and the natural sciences, and was on intimate terms with Cuvier, Humboldt and other savants. In 1822 he went to Lisbon, where, from a study of manuscripts, he published *An Account of the Discoveries of the Portuguese in . . . Angola and Mozambique* (1824). In 1823 Bowdich arrived at Bathurst, at the mouth of the Gambia, intending to go to Sierra Leone and explore the interior, but he died before leaving Bathurst.

BOWDITCH, NATHANIEL (1773–1838), American mathematician, was born at Salem (Mass.). He was bred to his father's business as a cooper, and afterwards apprenticed to a ship-chandler. His taste for mathematics early developed itself; and he acquired Latin that he might study Newton's *Principia*. As clerk (1795) and then as supercargo (1796, 1798, 1799) he made four long voyages; and, being an excellent navigator, he afterwards (1802) commanded a vessel, instructing his crews in lunar and other observations. He edited Hamilton Moore's *Navigation,* and in 1802 published a valuable work, *New American Practical Navigator*. He undertook a translation of the *Mécanique céleste* of P. S. Laplace, with valuable annotations (vol. i., 1829). He died at Boston on March 16, 1838.

A life of Bowditch was written by his son Nathaniel Ingersoll Bowditch (1805–1861), and was prefixed to the fourth volume (1839) of the translation of Laplace. In 1865 this was elaborated into a

[1] "Bow," the forepart or head of a ship, must be distinguished from this word. It is the same word, and pronounced in the same way, as "bough," an arm or limb of a tree, and represents a common Teutonic word, seen in O.E. *bog,* Ger. *Bug,* shoulder, and is cognate with Gr. πῆχυς forearm. The sense of "shoulder" of a ship is not found in O.E. *bog,* but was probably borrowed from Dutch or Danish. "Bow," an inclination of the head or body, though pronounced as "bough," is of the same origin as "bow," to bend.

separate biography by another son, Henry Ingersoll Bowditch (1808–1892), a noted Boston physician.

BOWDLER, THOMAS (1754–1825), editor of the "family" Shakespeare, was born at Ashley, near Bath, on July 11, 1754, and died at Rhyddings, south Wales, on Feb. 24, 1825. In 1818 he published *The Family Shakespeare* "in ten volumes, in which nothing is added to the original text; but those words and expressions are omitted which cannot with propriety be read aloud in a family." Bowdler also expurgated Edward Gibbon's *History of the Decline and Fall of the Roman Empire* (published 1826).

From Bowdler's name we have the word to "bowdlerize," first known to occur in Gen. Perronet Thompson's *Letters of a Representative to his Constituents during the Session of 1836,* printed in Thompson's *Exercises,* iv., 126. The official interpretation is "to expurgate (a book or writing) by omitting or modifying words or passages considered indelicate or offensive."

In the ridicule poured on the name of Bowdler it is worth noting that Swinburne in "Social Verse" (*Studies in Prose and Poetry,* 1894, p. 98) said of him that "no man ever did better service to Shakespeare than the man who made it possible to put him into the hands of intelligent and imaginative children."

BOWDOIN, JAMES (1726–1790), U.S. political leader, was born of French Huguenot descent, in Boston, Mass., on Aug. 7, 1726. He graduated at Harvard in 1745, and was a member of the general court of Massachusetts in 1753–56, and from 1757 to 1774 of the Massachusetts council, in which, on the approach of the American Revolution, he was a leading supporter of the opposition to the government. From Aug. 1775, until the summer of 1777 he was the president of the council. In 1779–80 he was president of the constitutional convention of Massachusetts. From 1785 to 1787 he was governor of Massachusetts, suppressing with much vigour Shays' Rebellion. Bowdoin was a member of the state convention which in Feb. 1788, ratified for Massachusetts the federal constitution, his son being also a member. He died in Boston on Nov. 6, 1790. He took much interest in natural philosophy, and presented various papers before the American Academy of Arts and Sciences, of which he was from 1780 to 1790 the first president. Bowdoin college was named in his honour.

His son, JAMES BOWDOIN (1752–1811), was born in Boston on Sept. 22, 1752, graduated at Harvard in 1771, and served, at various times, as a representative, senator and councillor of the state. From 1805 until 1808 he was U.S. minister to Spain. He died on Naushon Island, Mass., on Oct. 11, 1811. To Bowdoin college he gave land, money and apparatus; and bequeathed to it his fine collection of paintings.

BOWEN, CHARLES SYNGE CHRISTOPHER (BARON BOWEN, OF COLWOOD) (1835–1894), English judge, was born on Jan. 1, 1835, at Woolaston, Glos., the son of a clergyman. From Rugby he went to Oxford and became a fellow of Balliol in 1858. He was called to the bar at Lincoln's inn in 1801. Soon after he had begun to make his mark he was briefed against the claimant in the famous "Tichborne Case," both in the civil and criminal trials. Bowen's services to his leader, Sir John Coleridge, in the former helped to procure for him the appointment of junior counsel to the treasury when Sir John was attorney-general. In 1879 his acceptance of a judgeship in the queen's bench division gave him leisure. His subtle intellect and gentle irony were wasted upon common juries; but when, in 1882, he was raised to the court of appeal he was more at home. In Aug. 1893, he was made a lord of appeal. But his health had broken down; he never sat to hear appeals, and he gave but one vote as a peer; his last public service was to preside over the commission which sat in Oct. 1893 to inquire into the Featherstone riots. He died on April 10, 1894.

Lord Bowen was regarded with affection by all who knew him. His judicial reputation rests upon the decisions delivered by him in the court of appeal, which are remarkable for their lucid interpretation of legal principles as applied to the facts and business of life; the advice given to the house of lords in *Angus* v. *Dalton* (6 App. Cas. 740), and his judgments in *Abrath* v. *North Eastern Railway* (11 Q.B.D. 440); *Thomas* v. *Quartermaine* (18 Q.B.D. 685); *Vagliano* v. *Bank of England* (23 Q.B.D. 243) (in which he prepared the majority judgment afterwards reversed in the house of lords); and the *Mogul Steamship Company* v. *M'Gregor* (23 Q.B.D. 598). He never forsook the cult of the classics; his translations of Virgil's *Eclogues,* and of the *Aeneid,* books i-vi, are admirable, and his pamphlet, *The Alabama Claim and Arbitration considered from a Legal Point of View,* showed that even in a legal discourse he was still a lover of style.

See Sir Henry Stewart Cunningham, *Lord Bowen* (1897).

BOWEN, FRANCIS (1811–1890), U.S. philosophical writer and educator, was born in Charlestown, Mass., on Sept. 8, 1811. He graduated at Harvard in 1833, taught at Phillips Exeter academy, and became a tutor and instructor at Harvard. After several years of study in Europe, he settled in Cambridge, Mass., and was editor and proprietor of the *North American Review* (1843–54). In 1850 he was named professor of history at Harvard; but his appointment was disapproved by the board of overseers because of his reactionary political opinions. In 1853 he was made Alford professor of natural religion, moral philosophy and civil polity. He died in Boston, Mass., on Jan. 22, 1890.

His writings include contributions to Sparks' *Library of American Biography; Lowell Lectures on the Application of Metaphysical and Ethical Science to the Evidences of Religion* (1849); *A Treatise on Logic* (1864); *American Political Economy* (1870); and *Gleanings from a Literary Life* (1880).

BOWER, WALTER (*c.* 1385–1449), Scottish chronicler, was born at Haddington. He was abbot of Inchcolm (in the Firth of Forth) from 1418, and in 1433 was one of the embassy to Paris on the business of the marriage of the king's daughter to the dauphin. He played an important part at the Council of Perth (1432) in the defense of Scottish rights. During his closing years he was engaged on the *Scotichronicon,* a continuation of the *Chronica Gentis Scotorum* of Fordun (*see* FORDUN, JOHN OF). The task was finished in 1447. In the two remaining years of his life he was engaged on a reduction or "abridgment" of this work, which is known as the *Book of Cupar,* and is preserved in the Advocates' library (now National Library of Scotland) Edinburgh (ms. 35, i, 7). Copies of the full text of the *Scotichronicon,* by different scribes, are extant. There are two in the British museum, in *The Black Book of Paisley* and in Harleian ms. 712; one in the National Library of Scotland, from which Walter Goodall printed his edition (Edinburgh, 1759) and one in the library of Corpus Christi, Cambridge.

BOWERBANK, JAMES SCOTT (1797–1877), English naturalist and palaeontologist, was born in Bishopsgate, London, and succeeded in conjunction with his brother to his father's distillery, in which he was actively engaged until 1847. About the year 1836 he and six others founded "The London Clay Club." In the year 1840 Bowerbank published *A History of the Fossil Fruits and Seeds of the London Clay,* and two years later he was elected F.R.S. He was the real originator of the Palaeontographical Society. His *Monograph of the British Spongiadae* was published by the Ray Society, 1864–82.

BOWERBIRD, the name applied to certain birds of the family Ptilonorhynchidae, containing about 17 species like stout thrushes, 8 to 14 in. long, females usually dull but males often with brilliant plumage approaching that of their close relatives, the birds of paradise (*q.v.*), though without decorative plumes. Ten species occur in New Guinea, others in eastern Australia. In jungle or brush they construct wonderful courtship bowers or "runs" of sticks, decorating floor or entrance with small bones, shells and brightly coloured berries, flowers or feathers. Both sexes use bowers as a playground, and males fight, display or "dance" for the females. The satin bowerbird (*Ptilonorhynchus violaceus*), abundant in the wooded mountains of southeastern Queensland, eastern New South Wales and Victoria, builds a walled corridor usually facing north and south though often hidden in the jungle. The "blue" males—lustrous bluish or purplish black—prefer lavish decorations of blue bits of glass or blue flowers, the greenish females and young males prefer green to decorate the bower entrance. Two blotched eggs are laid in a bulky nest 6 to 40 ft. up in bush or tree that may be some

distance away from the bower. The regent bowerbird (*Sericulus chrysocephalus*) is the most brilliantly plumaged bird in Australia, gorgeous in black and orange-yellow. Common in the McPherson Ranges, Queensland, it rarely constructs a bower, decorates it with golden *Daviesia* flowers. Some species build no bower; one surfaces a bare spot with leaves to form a "circus ring." The gardener bowerbird (*Amblyornis inornatus*) of New Guinea builds a roofed bower, 3 ft. wide, of orchid stems near the foot of a small tree, covers floor and entrance with moss, ornamented with fresh flowers and berries, replaced by fresh ones as they fade. (*See* BIRDS; COURTSHIP OF ANIMALS.)

(G. F. Ss.)

BOWFIN, a fresh-water fish (*Amia calva*) of North America, the only living representative of its family, which dates back to the Cretaceous. It is a voracious fish, found in the Great Lakes, and southwards in sluggish waters. It is elongate in form, and mottled green in colour with a long dorsal fin, and with strong conical teeth in the jaws. The female reaches a length of 30 inches; the male is smaller, and is distinguished by a black ocellus on the tail.

BOWIE, JAMES (1796?–1836), American adventurer and pioneer. Accounts of Bowie are conflicting, but apparently he was born between 1790 and 1796 in Georgia (according to some, Kentucky) and taken to Louisiana in 1802. There in his young manhood he was engaged in smuggling Negro slaves into the United States in co-operation with the pirates led by Jean Lafitte. He moved to Texas about 1828 where he seems to have been well received by the Mexicans. However, he took a prominent part in the revolt against Mexico, being a leader in the battles of Nacogdoches (1832), Concepción (1835) and the Grass fight (1835). He was one of the defenders of the Alamo (*see* SAN ANTONIO), but was ill with pneumonia at the time of the final assault, March 6, 1836, and was consequently unable to take any real part in the defence although he is said to have shot some of his assailants from his cot. He died the same day. Bowie's name is now perpetuated by a county in north-eastern Texas, and by its association with the famous hunting-knife, long the favourite weapon of the border. A large, fair, outwardly peaceable man, he won a great reputation throughout the Southwest by his strength and daring.

BOWKER, RICHARD ROGERS (1848–1933), American editor and bibliographer, was born in Salem, Mass., on Sept. 4, 1848. He graduated at the College of the City of New York in 1868 and then became literary editor of the New York *Evening Mail.* He was associated in an executive capacity with various business houses and founded the R. R. Bowker Company, publishers. His interests extended to politics as well as bibliography and sociology and he was a leader in the Independent Republican, or "mugwump," movement of 1879. As a publisher of bibliographical material he established *The Library Journal* in 1876 and thereafter conducted it as editor for more than 50 years. *The Annual Library Index, Publishers' Weekly* and *American Catalogue* are other bibliographical periodicals which were conducted under his supervision.

His books, which cover a wide range of subjects, include: *Work and Wealth* (1883), *Economies for the People* (1886), *Copyright—Its Law and Its Literature* (1886), *Primer for Political Education* (1886), *Civil Service Examinations* (1886), *Electoral Reform* (1889), *The Arts of Life* (1900), *Of Business* (1901), *Of Politics* (1901), *Of Education* (1903), *Of Religion* (1903), *Copyright—Its History and its Law* (1912), and *Economic Peace* (1923).

BOW-LEG (*Genu Varum*), characterized by separation of the knees when the ankles are in contact. Usually there is an outward curvature of both femur and tibia, with at times an interior bend of the latter bone. At birth all children are more or less bandy-legged. But in a normal child by the time it begins to walk the lower limbs are prepared, by their general direction and the rigidity of the bones, to support the weight of the body. If the child is rachitic or suffering from any ailment which prevents the due ossification of the bones, or is improperly fed, the bandy condition may persist and be intensified. Thus the chief cause of this deformity is rickets (*q.v.*). The remaining causes are occupation, especially that of a jockey, and traumatism, the condition being very likely to supervene after accidents involving the condyles of the femur. In the rickety form the most important thing is to treat the constitutional disease, at the same time instructing the mother never to place the child on its feet. In many cases this is sufficient to effect a cure, but matters can be hastened somewhat by applying splints.

A far commoner deformity is *knock-knee* (or *Genu Valgum*). Here, there is approximation of the knees with separation of the feet when standing. Occasionally only one limb may be affected, but the double form is the more common. There are two varieties: (1) that due to rickets and occurring in young children, and (2) that met with in adolescents. In young children cod-liver oil is to be avoided, since it increases the body weight and so may do harm rather than good. The child if quite young must be kept in bed, and the limbs manipulated several times a day. Where he is a little older and it is more difficult to keep him off his feet, long splints should be applied from the axilla or waist to a point several inches below the level of the foot. It is only thus that a naturally active child can be kept at rest. The little patient should live in the open air as much as possible.

The other form of *Genu Valgum* usually occurs in young people who have outgrown their strength, yet have to carry heavy weights. Normally in the erect posture the weight of the body is passed through the outer condyle of the femur rather than the inner, and this latter is lengthened to keep the plane of the knee-joint horizontal. This throws considerable strain on the internal lateral ligament of the knee-joint, and after standing of long duration or with undue weight the muscles of the inner side of the limb also become over-fatigued. Thus the ligament gradually stretches, giving the knee undue mobility from side to side. If the condition be not attended to, the outer condyle gradually atrophies, owing to the increased weight transmitted through it, and the inner condyle lengthens. Flat-foot (*see* CLUB-FOOT) and lateral curvature of the spine (*scoliosis*) are often associated with this form of *Genu Valgum.* In the early stages attention to general health, massage and change of air, will often effect a cure. But in the more aggravated forms an apparatus is needed. If the patient has reached such an age that the deformity is fixed, the only remedy is operation.

BOWLES, SAMUEL (1826–1878), American journalist, was born in Springfield (Mass.), Feb. 9, 1826, and died there Jan. 16, 1878. With the exception of a brief period in Boston, he devoted his life to the *Springfield Republican,* established as a weekly by his father in 1824 and published as a daily after 1844. He is credited with being one of the leaders in the new journalism, giving his paper a national reputation by the vigour, incisiveness, and independence of its editorial utterances and the concise and convenient arrangement of its local and general news matter. Then and later the *Republican* office was a sort of school for young journalists, especially in the matter of pungency and conciseness of style, one of Bowles's maxims being "Put it all in the first paragraph." During the controversies resulting in the Civil War he was a general supporter of the Whig and Republican Parties, but he was later independent in politics. He is the author of *Across the Continent* (1865) and other books describing the West.

BIBLIOGRAPHY.—George S. Merriam's eulogistic *Life and Times of Samuel Bowles* (1885) is virtually a history of American political movements after the compromise of 1850. J. M. Lee's *History of American Journalism* (1923) ranks Bowles high, as does W. G. Bleyer's *Main Currents in the History of American Journalism* (1927).

BOWLES, WILLIAM LISLE (1762–1850), English poet and critic, was born at King's Sutton, Northamptonshire, of which his father was vicar. He was educated at Winchester and at Trinity college, Oxford. In 1789 he published *Fourteen Sonnets,* which was hailed with delight by Coleridge and his young contemporaries. They were a revival, a return to the older and purer poetic style, and by their tender tone of feeling and vivid appreciation of the life and beauty of nature stood out in strong contrast to the elaborated commonplaces which then formed the bulk of English poetry. Bowles entered the church and held various preferments, including a prebend and then a canonry of Salisbury. He became, in 1804, vicar of Bremhill, Wilts.

The principal longer poems published by Bowles are *The Spirit of Discovery* (1804), which was mercilessly ridiculed by Byron; *The Missionary of the Andes* (1815); *The Grave of the Last Saxon* (1822); and *St. John in Patmos* (1833). In 1806 he published an edition of Pope's works with notes and an essay on the poetical character of Pope. In this essay he laid down certain canons as to poetic imagery which were resented by all admirers of Pope and his style. The "Pope and Bowles" controversy brought into sharp contrast the opposing views of poetry, which may be roughly described as the natural and the artificial. Bowles maintained that images drawn from nature are poetically finer than those drawn from art, and that in the highest kinds of poetry the themes or passions handled should be of the general or elemental kind and not the transient manners of any society. These positions were vigorously assailed by Byron and others, but Hazlitt and the *Blackwood* critics championed Bowles.

His *Poetical Works* were collected in 1855, with a memoir by G. Gilfillan. *See* also Garland Greever, *A Wiltshire Parson and His Friends* (1926).

BOWLING may trace its history back 7,000 years. The late Sir Flinders Petrie, emeritus professor of Egyptology at the University of London, while examining the contents of the grave of an Egyptian child whose burial has been authentically placed at 5200 B.C., discovered implements for playing a game decidedly similar to the modern game. In his book, *The Making of Egypt* (The Macmillan company, publishers, New York city; The Sheldon Press, London, England), Sir Flinders states that games were fully developed, both as board games and bowling at skittles.

Dr. Malcolm Rogers, head curator of the San Diego museum, states that the Polynesians participated in an ancient game of bowling in which small elliptical balls and round, flat disks, about $3\frac{1}{2}$ to 4 in. in diameter, of stone were used. One rule of this game, called Ula Maika, set the distance the stones were to be bowled at 60 ft., the same specifications used in tenpin bowling. Bowling is an indoor game played upon an alley with composition balls and ten maple pins (Lat. *bulla,* a globe, through O.Fr. *boule,* ball). It has been played for centuries in Germany and the Low Countries, where it is still in high favour, but attains its greatest popularity in the United States, where it was introduced in colonial times from Holland. The Dutch inhabitants of New Amsterdam, now New York, played it, and from 1623 to 1840 it was played on the green, the principal resort of the bowlers being the square just north of New York's Battery, still called Bowling Green. The first covered alleys were made of hardened clay or of slate, but modern alleys are built up of strips of pine and maple wood, about 1x3 in. in size, set on edge, and fastened together, the strips constituting the alley bed, the surface being carefully levelled, shellacked or lacquered and polished. The width of the alley is 41 to 42 in. and its whole length including the approach is 78 ft. $\frac{1}{8}$ in.

The distance from the centre of the head or apex pin to the foul line is 60 ft. On each side of the alley is a 9 to $9\frac{1}{2}$ in. "gutter" which may be no less than $3\frac{1}{2}$ in. below the alley surface. Originally nine pins, set up in the diamond form were used; but during the first part of the 19th century, the game of "nine pins" was prohibited by law. The danger of restrictive legislation was largely removed with the addition of a tenth pin resulting in the game of "tenpins," the pastime in vogue today. The ten pins are set up at the end of the alley in the form of a triangle—four pins at the back, then three, then two and one as head pin. The back row is placed 3 in. from the alley's edge, back of which is the pin-pit, 10 in. deep, 4 ft. wide and 60 in. long. The back wall is a heavily padded swinging cushion which hangs 2 ft. 6 in. from pit edge of bed, and there are seats for the pin boys who set up the pins and place the balls in the sloping ball return which returns them to the player's end of the alley. The pins are made of hard maple and are 15 in. high, $2\frac{1}{4}$ in. in diameter at their base and 15 in. in circumference at the thickest point. The balls, which are made of composition, may be of any size not exceeding 27 in. in circumference and 16 lb. in weight. They are provided with finger holes. As many may play on a side as wish, five being the number on league and championship teams. An umpire usually officiates at all games. Two alleys immediately adjoining each other are used; the teams roll one *frame* (two balls) on one alley, and for the next frame alternate and use the other alley, so alternating with opposing players until the game is completed.

Ten frames constitute a game. If all ten pins are knocked down by the first ball, the player makes a *strike,* which counts him 10 plus whatever he may make with the two balls of his next frame. If, however, he should then make another strike, 10 more are added to his score, making 20, to which are added the pins he may knock down with his first ball of the third frame. This may also score a strike, making 30 as the score of the first frame, and, should the player keep up this high average, he will score the maximum, 300, in his ten frames. If all the pins are knocked down with two balls, it is called a *spare,* and the player may add the pins made by the first ball of his second frame. This seemingly complicated mode of scoring is comparatively simple when properly lined score boards are used.

A player must not allow any part of his foot to rest on the foul line or beyond during the delivery of the ball. Pins knocked down must be removed before the second ball is played. The score board, kept by the players, is always open to public view.

The tens of thousands of bowling clubs in the United States and Canada under the jurisdiction of the American Bowling congress meet once a year to revise the rules and hold contests for the international championships, which consist of individual players, two-man teams, five-man teams, and the champions in all events. Highest total in the three events was rolled by Max Stein of Belleville, Ill., in 1937 when he scored 658 pins on his five-man team, 707 on his two-man team and 705 in his individual contest, totalling 2,070 pins. The highest score rolled by a five-man team was made by the Birk Brothers Brewing company team of Chicago with 3,234 pins in 1938. The highest score rolled by a two-man team was made by Gilbert Zunker and Frank Benkovic of Milwaukee, Wis., with 1,415 pins in 1933. The highest score rolled by an individual A.B.C. champion was that of Larry Shotwell of Covington, Ky., with 774 pins in 1930. At the 40th A.B.C. national championships held in Detroit, Mich., in 1940 there were 6,073 five-man teams, 10,404 doubles and 20,884 individuals, a total of 32,746 bowlers representing 46 states.

Several minor varieties of bowling are popular in America, the most popular being the "duck pin" game in which the regulation pins are $9\frac{3}{8}$ in. in height; diameter, $4\frac{7}{16}$ in. including rubber band; bottom of pin $1\frac{1}{2}$ in. Each player rolls two balls to each frame; all other rules of A.B.C. govern. Other games in which ten pins are used are candle pins and rubber band duck pins. Such games as cocked hat, cocked hat and feather, four back, and the Newport game, in which the player who scores the least of winning innings is the loser, are now and then played during the time when leagues and tournaments do not occupy the bowling alleys. The American bowling game is played to some extent in Great Britain, Norway, Sweden, Finland, Germany and South and Central America. (E. H. Bn.)

BOWLING GREEN, a city of Kentucky, U.S.A., 118 mi. S.W. of Louisville, at the head of navigation on the Barren river; county seat of Warren county. It is on federal highways 68 and 31W and is served by the Louisville and Nashville railroad and by river steamers. The population in 1920 was 9,638, of whom 2,099 were Negroes; and in 1940 it was 14,585 by the federal census of that year. It is the shipping point for Kentucky rock asphalt, with which 50 mi. of its own streets are paved. It is the centre of an oilfield that is still producing about 150,000 barrels a year. The manufactures include cut stone, evaporated milk, tobacco products, hickory handles, underwear and air compressors. It is the seat of Bowling Green Business university; and of the Western Kentucky State Teachers' college, established in 1906 and incorporating the privately owned Southern Normal school, which had been in existence since 1875. Mammoth Cave national park is 30 mi. N.E. of Bowling Green; while 3 mi. south Lost river disappears into a cave immediately under the Dixie highway (31W). In the centre of a rich agricultural region, Bowling Green's burley tobacco market pays growers about $1,250,000 annually; livestock, about $2,000,000.

When the county court house was built in 1798, a town was established on the initiative of Robert Moore, around the public square. Trustees were appointed, and the name Bowling Green was adopted, probably because of Moore's bowling alley on the open green. It was incorporated as a city in 1810. During the Civil War it was on the right flank of the first line of Confederate defence in the West, and for some time was the headquarters of Gen. Albert Sidney Johnston.

BOWLING GREEN, a city of Ohio, U.S.A., 22 mi. S. of Toledo; on federal highways 6 and 25, served by the Baltimore and Ohio and the New York Central railways and by bus lines; the county seat of Wood county. The 1940 population was 7,190. It is in a rich agricultural region and produces both oil and natural gas. Its industries include a machine shop, the largest tomato processing plant in operation in the world and some manufacturers of automotive equipment and hydraulic hoists. It is the home of Bowling Green state university. Bowling Green was settled in 1832, incorporated as a town in 1855 and as a city in 1904.

BOWLS, one of the oldest of outdoor pastimes. It has been traced certainly to the 13th, and conjecturally to the 12th, century. William Fitzstephen (d. about 1190), in his biography of Thomas Becket, gives a graphic sketch of the London of his day and, writing of the summer amusements of the young men, says that on holidays they were "exercised in Leaping, Shooting, Wrestling, Casting of Stones (*in jactu lapidum*), and Throwing of Javelins fitted with Loops for the Purpose, which they strive to fling before the Mark; they also use Bucklers, like fighting Men." It is sometimes supposed that by *jactus lapidum* Fitzstephen meant the game of bowls; but though it is possible that round stones may sometimes have been employed in an early variety of the game—and there is a record of iron bowls being used, though at a much later date, on festive occasions at Nairn—nevertheless the inference seems unwarranted. The *jactus lapidum* of which he speaks was probably more akin to the modern "putting the weight," once even called "putting the stone."

A 13th Century Game.—It is beyond dispute, however, that the game, at any rate in a rudimentary form, was played in the 13th century. A ms. of that period in the royal library, Windsor (No. 20, E iv.), contains a drawing representing two players aiming at a small cone instead of an earthenware ball or jack. Another ms. of the same century has a picture—crude, but spirited—which brings into closer touch the existing game. Three figures are introduced and a jack. The first player's bowl has come to rest just in front of the jack; the second has delivered his bowl and is following after it with one of those eccentric contortions still not unusual on modern greens, the first player meanwhile making a repressive gesture with his hand, as if to urge the bowl to stop short of his own; the third player is depicted as in the act of delivering his bowl.

As the game grew in popularity it came under the ban of king and parliament, both fearing it might jeopardize the practice of archery, then so important in battle; and statutes forbidding it and other sports were enacted in the reigns of Edward III., Richard II., and other monarchs. Even when, on the invention of gunpowder and firearms, the bow had fallen into disuse as a weapon of war, the prohibition was continued. The discredit attaching to bowling alleys, first established in London in 1455, probably encouraged subsequent repressive legislation, for many of the alleys were connected with taverns frequented by the dissolute and gamesters.

The word "bowls" occurs for the first time in the statute of 1511 in which Henry VIII. confirmed previous enactments against unlawful games. By a further act of 1541—which was not repealed until 1845—artificers, labourers, apprentices, servants and the like were forbidden to play bowls at any time save Christmas, and then only in their master's house and presence. It was further enjoined that any one playing bowls outside of his own garden or orchard was liable to a penalty of 6s. 8d., while those possessed of lands of the yearly value of £100 might obtain licences to play on their own private greens. But though the statute absolutely prohibited bowling alleys, Henry VIII. had them constructed for his own pleasure at Whitehall Palace and would bet upon his skill when he played. In Mary's reign (1555) the licences were withdrawn, the queen or her advisers deeming the game an excuse for "unlawful assemblies, conventicles, seditions, and conspiracies."

Introduction of Bias.—Biased bowls were introduced in the 16th century. "A little altering of the one side," says Robert Recorde, the mathematician, in his *Castle of Knowledge* (1556), "maketh the bowl to run biasse waies." And Shakespeare (*Richard II.*, act. iii. sc. 4) causes the queen to remonstrate, in reply to her lady's suggestion of a game at bowls to relieve her ennui, " 'Twill make me think the world is full of rubs, and that my fortune runs against the bias." This passage is interesting also as showing that women were accustomed to play the game in those days. It is pleasant to think that there is foundation for the familiar story of Sir Francis Drake playing bowls on Plymouth Hoe as the Armada was beating up Channel, and finishing his game before tackling the Spaniards. Bowls, at that date, was looked upon as a legitimate amusement for Sundays,—as, indeed, were many other sports. When John Knox visited Calvin at Geneva one Sunday, it is said that he discovered him engaged in a game; and John Aylmer (1521–94), though bishop of London, enjoyed a game on a Sunday afternoon, but used such language "as justly exposed his character to reproach." The pastime found favour with the Stuarts. In the *Book of Sports* (1618), James I. recommended a moderate indulgence to his son, Prince Henry, and Charles I. was an enthusiastic bowler, unfortunately encouraging, by example, wagering and playing for high stakes, habits that ultimately brought the green into as general disrepute as the alley. It is recorded that the king occasionally visited Richard Shute, a Turkey merchant who owned a beautiful green at Barking Hall, and that after one bout his losses were £1,000. He was permitted to play his favourite game to beguile the tedium of his captivity. The signboard of a wayside inn near Goring Heath in Oxfordshire long bore a portrait of the king with couplets reciting how his majesty "drank from the bowl, and bowl'd for what he drank." During his stay at the Northamptonshire village of Holdenby or Holmby—where Sir Thomas Herbert complains the green was not well kept—Charles frequently rode over to Lord Vaux's place at Harrowden, or to Lord Spencer's at Althorp, for a game, and, according to one account, was actually playing on the latter green when Cornet Joyce came to Holmby to remove him to other quarters. During this period gambling had become a mania. John Aubrey, the antiquary, chronicles that the sisters of Sir John Suckling, the courtier-poet, once went to the bowling-green in Piccadilly, crying "for fear he should lose all their portions." If the Puritans regarded bowls with no friendly eye, as Lord Macaulay asserts, one can hardly wonder at it. But even the Puritans could not suppress betting. So eminently respectable a person as John Evelyn thought no harm in bowling for stakes, and once played at The Durdans, near Epsom, for £10, winning match and money, as he triumphantly notes in his *Diary* for Aug. 14, 1658. Samuel Pepys repeatedly mentions finding great people "at bowles."

After a long interval salvation came from Scotland. There along with its winter analogue of curling, bowls may now be considered, much more than golf, a national game. Yet it was not until well into the 19th century that the pastime acquired popularity in that country. It had been known in Scotland since the close of the 16th century (the Glasgow kirk session fulminated an edict against Sunday bowls in 1595), but greens were few and far between. There is record of a club in Haddington in 1709, of Tom Bicket's green in Kilmarnock in 1740, of greens in Candleriggs and Gallowgate, Glasgow and of one in Lanark in 1750, of greens in the grounds of Heriot's hospital, Edinburgh, prior to 1768, and of one in Peebles in 1775. These are, of course, mere infants compared with the Southampton Town Bowling Club, founded in 1299—which still uses the green on which it has played for centuries and continues the quaint custom of describing certain successful players as "sir"—and are younger even than the Newcastle-on-Tyne club established in 1657.

These earlier clubs, however, did little or nothing towards organizing the game. In 1848 and 1849, when many clubs had come into

existence in the west and south of Scotland (the Wellcroft dating from 1835, is the oldest club in Glasgow), meetings were held in Glasgow for the purpose of promoting a national association. This was regarded by many as impracticable, but a decision of final importance was reached when a consultative committee was appointed to draft a uniform code of laws to govern the game. This body delegated its functions to its secretary, W. W. Mitchell (1803–1884), who prepared a code that was immediately adopted in Scotland as the standard laws. It was in this sense that Scottish bowlers saved the game. They were, besides, pioneers in laying down level greens of superlative excellence. Not satisfied with seed-sown grass or meadow turf, they experimented with sea-washed turf and found it answered well. The 13th earl of Eglinton also set an example of active interest which many magnates emulated. Himself a keen bowler, he offered for competition, in 1854, a silver bowl and, in 1857, a gold bowl and the Eglinton cup, all to be played for annually. These trophies excited healthy rivalry in Ayrshire and Lanarkshire, and the enthusiasm as well as the skill with which the game was conducted in Scotland at length proved contagious. Clubs in England began to consider the question of legislation and to improve their greens. Moreover, Scottish emigrants introduced the game wherever they went, and colonists in Australia and New Zealand established many clubs which, in the main, adopted Mitchell's laws; clubs were also started in Canada and in the United States, in South Africa, India (Calcutta, Karachi), Japan (Kobe, Yokohama, Kumamoto) and Hong Kong. In Ireland the game took root very gradually.

A Lead from Australia.—Serious efforts to organize the game were made in the last quarter of the 19th century, but this time the lead came from Australia. The Bowling Associations of Victoria and New South Wales were established in 1880, and it was not until 1892 that the Scottish Bowling association was founded. Then in rapid succession came several independent bodies—the Midland Counties (1895), the London and Southern Counties (1896), the Imperial (1899), the English (1903), and the Irish and Welsh (1904). These institutions were concerned with the task of regularizing the game within the territories indicated by their titles, but it soon appeared that the multiplicity of associations was likely to prove a hindrance rather than a help, and with a view, therefore, to reducing the number of clashing jurisdictions and bringing about the establishment of a single legislative authority, the Imperial amalgamated with the English B.A. in 1905. The visits to the United Kingdom of properly organized teams of bowlers from Australia and New Zealand in 1901, and from Canada in 1904, demonstrated that the game had gained enormously in popularity. The former visit was commemorated by the institution of the Australia cup, presented to the Imperial Bowling association (and now the property of the English B.A.) by Charles Wood, president of the Victorian Bowling association. Accredited teams of players of international repute have visited the mother country at regular intervals from Australia, New Zealand, South Africa and Canada, and British teams have returned those visits.

Perhaps the most interesting proof that bowls is a true *volksspiel* is to be found in the fact that it has become municipalized. In Edinburgh, Glasgow, and elsewhere in Scotland, and in London, Birmingham, Liverpool, Manchester, Newcastle and other English towns, the corporations have laid down greens in public parks and open spaces. Most of these public greens are self-supporting, from a charge, which includes the use of bowls and overshoes, of a few pence per hour for each player. The formation of so many private clubs in the metropolises led to a rapid development of the game.

There are two kinds of bowling green, the level and the crown. The crown has a fall which may amount to as much as 18 in. all round from the centre to the sides. This type of green is confined almost wholly to certain of the northern and midland counties of England. But although the crown green game is of a sporting character, it necessitates the use of bowls of narrow bias and affords but limited scope for the display of skill at building up ends. It is the game on the perfectly level green which calls for science and strategy in the matter of bowl placement. Subject to the rule as to the shortest distance to which the jack must be thrown (25 yd.), there is no prescribed size for a green, but 42 yd. square is generally recommended by the associations. For the scientific construction of a green, the whole ground must be excavated, to a depth of 18 in. or so, and thoroughly drained, with layers of clinker, cinders, sterilized soil and sea sand laid down before the final covering of turf, $2\frac{1}{2}$ in. or 3 in. thick. Sea-washed turf is the best. It wears longest and keeps its "spring" to the last. Surrounding the green is a shallow, pebble-filled space called a ditch. Beyond the ditch are banks, usually laid with turf. A green is divided into spaces, usually from 18 ft. to 21 ft. in width, commonly called rinks—a word which also designates each set of players—and these are numbered in sequence on a plate fixed in the bank at each end opposite the centre of the space. In match play each rink is marked off from its neighbour by thin thread securely fastened flush with the turf.

The Game.—Every player uses four lignum vitae bowls in single-handed games, three in three-a-side matches, and two only in the single rink game. Every bowl must have a certain amount of bias, which was formerly obtained by loading one side with lead but is now imparted by the turner making one side more convex than the other, the bulge showing the side of the bias. No bowl used upon flat greens must have less than No. 3 bias—that is, it should draw about 6 ft. to a 30 yd. jack on a first-rate green; it follows that on an inferior green the player, though using the same bowl, would have to allow for a narrower draw. It is also a rule that the diameter of the bowl shall not be less than $4\frac{1}{2}$ in. or more than $5\frac{1}{4}$ in., and that its weight must not exceed $3\frac{1}{2}$ lb. The jack, to which the bowler plays his bowls, is round and not less than $2\frac{1}{2}$ in. in diameter. On crown greens it is customary to use a small biased wooden jack to give the bowler some clue to the fall of the crown. The player delivers his bowl with one foot on a mat, made of India rubber, the size of which is also prescribed by rule as 22 in. by 14 in., though, with a view to protecting the green, Australasian clubs employ a much larger size mat.

In theory the game of bowls is very simple, the aim of the player being to roll his bowl so as to cause it to rest nearer to the jack than his opponent's, or to protect a well-placed bowl, or to dislodge a better bowl than his own. But in practice there is every opportunity for skill. On all good greens the game is played in rinks of four-a-side, there being, however, on the part of many English clubs, still an adherence to the old-fashioned method of two- and three-men-a-side games. The four players in a rink are known as the leader, second player, third player and skip, and their positions, at least in matches, are unchangeable. The leader has to place the mat and to throw the jack, and is always chosen to fill that place because of his skill in drawing close up to the jack. It is, therefore, his business to "be up." There is no excuse for short play on his part, and his bowls would be better off the green than obstructing the path of subsequent bowls. So he will endeavour to be "on the jack," the ideal position being a bowl at rest immediately in front of or behind it. The skip plays last and directs his men from the end that is being played to. The second man, also, must be able to draw accurately. Most frequently he will be required either to protect a good bowl or to rectify a possible error of the leader. His official duty is to mark the game on the scoring card. The third player, who does any measuring that may be necessary to determine which bowl or bowls may be nearest the jack, holds almost as responsible a position as the captain, whose place, in fact, he takes whenever the skip is temporarily absent. The duties of the skip will already be understood by inference. It may be that he has to draw a shot with the utmost nicety to save the end, or even the match, or to lay a cunningly contrived block, or to "fire"—that is, to deliver his bowl almost dead straight at the object, with enough force to kill the bias for the moment. The score having been counted, the leader then places the mat, usually at the place where the jack lay at the conclusion of the head, and throws the jack in the opposite direction for a fresh end. On small greens play, for obvious reasons, generally takes place from each ditch. The players play in couples—the first on both sides, then the second, and so on. The leader having played his first bowl, the opposing leader will play his

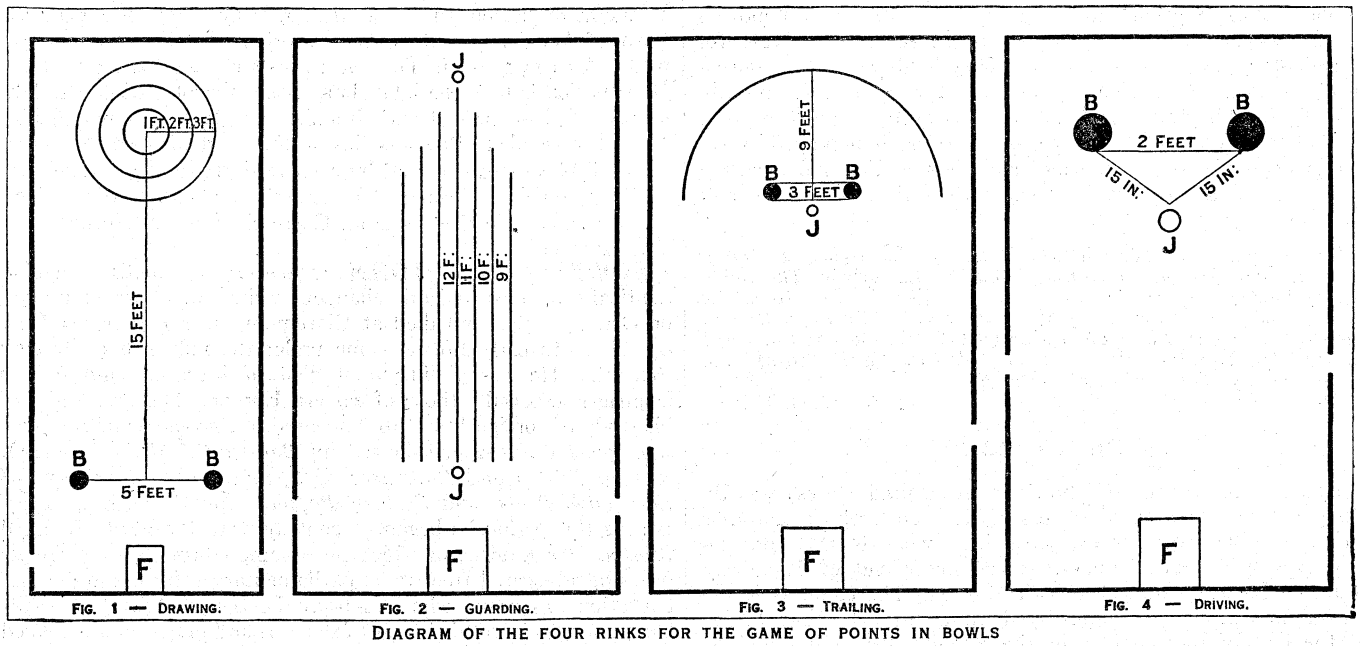

DIAGRAM OF THE FOUR RINKS FOR THE GAME OF POINTS IN BOWLS

The object of this game is to perfect the proficiency of the player in certain departments of bowls proper. The distance between footer and jack should be about 100 ft., and between jack and ditch 9 ft. F indicates the footer, or mat; B is the bowl, and J the jack

first and so on.

Some Essential Rules.—Every newcomer to the game should learn to play both forehand and backhand. In forehand play the bowl, as it travels towards the jack, describes its segment of a circle on the right of the rink. In backhand play it is sent along the left-hand side of the rink. It must be always remembered that the biased side of the bowl is kept to the inside of the rink. In throwing the jack, upon all occasions, there must be a clear distance of not less than 27 yd. between the front of the mat (footer) and the ditch at the opposite end. A bowl which touches the jack during its original course on the green, although it also may have touched one or more bowls in its progress, is called a toucher and is accounted in play wherever it rests if within the rink. These touchers must be distinguished by a chalk mark. A bowl which does not touch the jack in its original course on the green and runs into the ditch, or is driven into the ditch, is dead, and must be immediately removed to the bank. If a jack be driven into the ditch within the limits of the rink, its place must be accurately marked. Should the jack be driven wholly beyond the limits of the rink, *i.e.,* over the bank, it is counted dead. Whenever a jack is dead, the end is not to be counted as a played end. In single-handed bowls, 21 points are played for; in pairs, triples and single rink play, 21 ends are decided.

Scotland's Game of Points.—In Scotland, the game of points is frequently played, but it is rarely seen on English greens. There are four sections in the game, namely, drawing, guarding, trailing and driving. In *drawing* (fig. 1), the object is to draw as near as possible to the jack, the player's bowl passing outside of two other bowls, placed 5 ft. apart in a horizontal line 15 ft. from the jack, without touching either of them. Three points are scored if the bowl comes to rest within 1 ft. of the jack, two points if within 2 ft., and one point if within 3 ft. Circles of these radii are usually marked around the jack for convenience' sake. In *guarding* (fig. 2), two jacks are laid at the far end of the green 12 ft. apart in a vertical line. A thread is then pinned down between them, and on each side of this thread three others are pinned down parallel with it and 6 in. apart from each other. A bowl that comes to rest on the central line, or within 6 in. of it, counts three points, a bowl 12 in. away two points, and a bowl 18 in. off one point. In *trailing* (fig. 3), two bowls are laid on the turf 3 ft. apart, and straight lines are chalked from bowl to bowl across their back and front faces, and a jack is then deposited equidistant from each bowl and immediately before the front line. A semicircle is then drawn behind the bowls with a radius of 9 ft. from the jack. Three points are given to the bowl that trails the jack over both lines into the semicircle and goes over them itself. If a bowl trail the jack over both lines, but only itself cross the first; or if it pass both lines, but the jack cross only the first, two points are awarded. A bowl passing between the jack and either of the stationary bowls, and passing over the back line; or touching the jack, yet not trailing it past the first line, but itself crossing the back line; or trailing the jack over the front line without crossing it itself, receives one point. In no case must the stationary bowls be touched, or the semicircle crossed by the trailed jack or played bowls. In *driving* (fig. 4), two bowls are laid down 2 ft. apart, and then a jack is placed in front of them, 15 in. apart from each, and occupying the position of the apex of an inverted pyramid. The player who drives the jack into the ditch between the two bowls scores three. If he moves the jack, but does not carry it through to the ditch, he scores two. If he passes between the jack and either bowl he scores one, although it is not easy to see what driving he has done. The played bowl must itself run into the ditch without touching either of the stationary bowls.

The Crown Green Game.—The crown green game of bowls flourishes in the large industrial cities and towns of Lancashire, Yorkshire, Derbyshire, Staffordshire, Notts, North Warwickshire, Cheshire and north Wales. The amateur players are governed by the British Crown Green association, which acts in unison with a number of county and district parks associations. There are many championships, decided each season, open to individuals and to clubs, the two chief, of course, being the man-to-man championship, decided among the most conspicuous players from each county, and the intercounty championship, in which there appears little to choose between the men of Cheshire, Yorkshire and Lancashire, judged upon past results. The players of Norfolk and Suffolk subscribe to a game played mainly upon crowned greens, but gradually through East Anglia, Notts and South Warwickshire there has crept a liking for the flat green style of play. Early in 1938 there were fully 750,000 known and affiliated amateur bowlers in England and Scotland. After 1930 there was a remarkable increase in the number of women players in England, Scotland and Wales. Each country now has its women's national association, and there are also county associations, each contesting its own championship, with the respective winners passing forward to decide the national titles. In skill, women bowlers of championship merit are very little below the male aspirant to honours; indeed, there have been some rinks, triples and pairs composed of women who have played far better combined bowls than many men who have earned national titles. Their delicacy of drawing and of trailing shots has made them most accurate in

saving difficult positions. In Lancashire there are many hundreds of professional players who compete at regular intervals for wagers of considerable importance. They hold two annual tournaments at Blackpool, each attracting an entry of about 1,000 bowlers. Their skill gives them high rank as accurate players—they use but two woods on crown greens as against four played by the flat green single-handed bowler—and their ability and accuracy can be rated at some 30% greater than that of the average amateur.

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(J. A. M.; G. T. B.)

UNITED STATES

Bowls (often called lawn bowls in the United States) was the chief pastime of the early settlers of New York who found great enjoyment "bowling on the green" at what is now Bowling Green, a small park situated at the lower end of Broadway, near the Battery, formerly Castle Garden. The game as it was played in 1700–1800 is portrayed on a stained glass window at the rear of the corridor of the Bowling Green building, 11 Broadway.

The game seems to have been dropped with the American Revolution, or shortly after, and was not played to any extent until Christian Schepflin of Dunellen, N.J., who is often referred to as the father of lawn bowls, formed a club called the Dunellen Bowling club, in 1879, thereby bringing about a revival of the sport.

In the United States the game is usually played on a lawn not less than 40 yd. square, as level as possible; a ditch 6 in. deep and 18 in. wide surrounds the green.

A regulation court is surrounded by a terrace 2 ft. higher than the ditch and about 10 ft. wide where spectators may watch the game. (J. B. P.)

Lawn bowls undoubtedly fills a vacancy which has existed in the program of U.S. sports, just as it had in Canada. It possesses numerous features that no other outdoor game enjoys in that it can be played by persons of middle age or past, and even by older people who find golf and other sports too strenuous. Today the American Bowling association heads a growing game, with a national championship every year, and more than a hundred member clubs. It is played in public parks after dark by electric light, and its spread was helped by the WPA recreation program which built bowling greens in parks and municipal playgrounds in many parts of the United States. (J. R. Tu.)

BOWMAN, ISAIAH (1878–), American geographer, was born at Waterloo, Ontario, Can., on Dec. 26, 1878. He graduated at Michigan State normal college, Ypsilanti, in 1902, at Harvard in 1905, and in 1909 received the degree of doctor of philosophy at Yale. He was assistant in physiography at Harvard in 1904–05 and instructor in geography at Yale from 1905 to 1909 and assistant professor from 1909 to 1915 when he was appointed director of the American Geographical Society, New York city.

In 1907 Bowman was leader of the Yale expedition to South America; in 1911 geographer and geologist of the Yale expedition to Peru, and in 1913 was leader of the American Geographical Society's expedition to the central Andes. In 1935 he was elected president of Johns Hopkins University. Besides numerous papers on South America, he was the author of *Forest Physiography* (1911); *South America* (1915); *The Andes of Southern Peru* (1916); *The New World—Problems in Political Geography* (1921); *Desert Trails of Atacama* (1923); *An American Boundary Dispute* (1923); *The Mohammedan World* (1924); and *The New World* (1926).

BOWNESS, Linlithgowshire: see Bo'NESS.

BOWNESS-ON-WINDERMERE, town, Westmorland, England, on the east shore of Windermere, $1\frac{1}{4}$ mi. southwest of Windermere station on the L.M.S. railway. Together with the town of Windermere it forms an urban district, pop. (1931) 6,082. Area 15.2 sq.mi. The two towns were separate until 1905. Its situation is fine, the lake shore rising sharply, while the lake narrows and is studded with islands. The low surrounding hills are richly wooded. Bowness lies at the head of a small bay, is served by lake-steamers and by a steam-ferry, and is a favourite yachting and tourist centre. The church of St. Martin is ancient, and contains stained glass from Cartmel priory in Furness. *See* WINDERMERE.

BOWRING, SIR JOHN (1792–1872), English linguist, political economist and miscellaneous writer, was born at Exeter, on Oct. 17, 1792, and died at Claremont, near Exeter, on Nov. 23, 1872. In early life he came under the influence of Jeremy Bentham. He was a diligent student of literature and foreign languages, especially those of eastern Europe. The first-fruits of his study of foreign literature appeared in *Specimens of the Russian Poets* (1821–23), followed by *Batavian Anthology* (1824), *Ancient Poetry and Romances of Spain* (1824), *Specimens of the Polish Poets,* and *Servian Popular Poetry,* both in 1827. During this period he began to contribute to the newly founded *Westminster Review,* of which he became editor in 1825. In its pages he advocated free trade, parliamentary reform and popular education. Bowring, who had been the trusted friend of Bentham, was appointed his literary executor, and prepared a collected edition of his works (11 vols. 1843). Meanwhile he had entered parliament in 1835 as member for Kilmarnock, and in 1836 he was sent to France to enquire into the actual state of commerce between the two countries. He was engaged in similar investigations in Switzerland, Italy, Syria and some of the German States. After four years interval he again sat in parliament from 1841 to 1849 as member for Bolton. In 1849 he was appointed British consul at Canton, and superintendent of trade in China, a post which he held for four years. Knighted in 1854 he was again sent the same year to Hong-Kong as governor, invested with the supreme military and naval power. It was during his governorship that a dispute broke out with the Chinese over the case of the "Arrow"; and the irritation caused by his "spirited" or high-handed policy led to the second war with China. In 1855 he visited Siam, and negotiated with the king a treaty of commerce. Bowring's last employment by the British Government was as a commissioner to Italy in 1861, to report on British commercial relations with the new kingdom. In addition to the works already named he published *Sketch of the Language and Literature of Holland* (1829); *Poetry of the Magyars* (1830); *Cheskian Anthology* (1832); *The Kingdom and People of Siam* (1857); a translation of *Peter Schlemihl* (1824); translations from the Hungarian Poet, Alexander Petöfi (1866); a book on the decimal system and various pamphlets. His valuable collection of coleoptera was presented to the British Museum by his second son, Lewin Bowring, a well-known Anglo-Indian administrator who edited his *Recollections* (1877).

BOWS AND ARROWS are the typical weapons of hunting peoples throughout the world (except in Australia), valuable alike in food quest and in war. Numbers of stone arrowheads bear witness to their use in the later palaeolithic culture of western Europe, and wooden bows have been preserved in neolithic deposits of Switzerland and elsewhere. The bowmen were the pride of Assyria in the days of Nimrod, of Xerxes at Thermopylae and of England down to the 16th century, while archery provides toys for the young and sport for the more mature in the most civilized countries of the world.

Classification of Bows.—The simplest form is the plain or single stave bow, constructed out of a length of bamboo, a slender branch of a tree, or cut out of a solid log (fig. 1). Two notches are cut, one at each end, the string is tied in one, a loop slipped over the end of the bent stick into the other, and the bow is ready. More picturesque are the long bows of the Andaman islanders, 5ft. to 7ft. long, of an S shape, broadening out above and below the grip, fashioned only by a shell adze and a boar's tusk spokehave (fig. 12). Compound bows may be as simple as plain ones. The bow made from a flexible stick soon loses its

1
BA NGALA BOW, CONGO, OF BAMBOO

2
INDIAN BOW OF TWO STAVES OF BUFFALO HORN, RIVETTED TOGETHER

3
TARTAR BOW OF HORN AND SINEW

4
ESKIMO BOW (BACK AND SIDE VIEW) VICTORIA ISLAND. OF DRIFT WOOD WITH SINEW BACKING

5
PELLET BOW OF THE CHACO INDIANS FOR SHOOTING BIRDS.

6
PRIMARY LOOSE

7
SECONDARY LOOSE

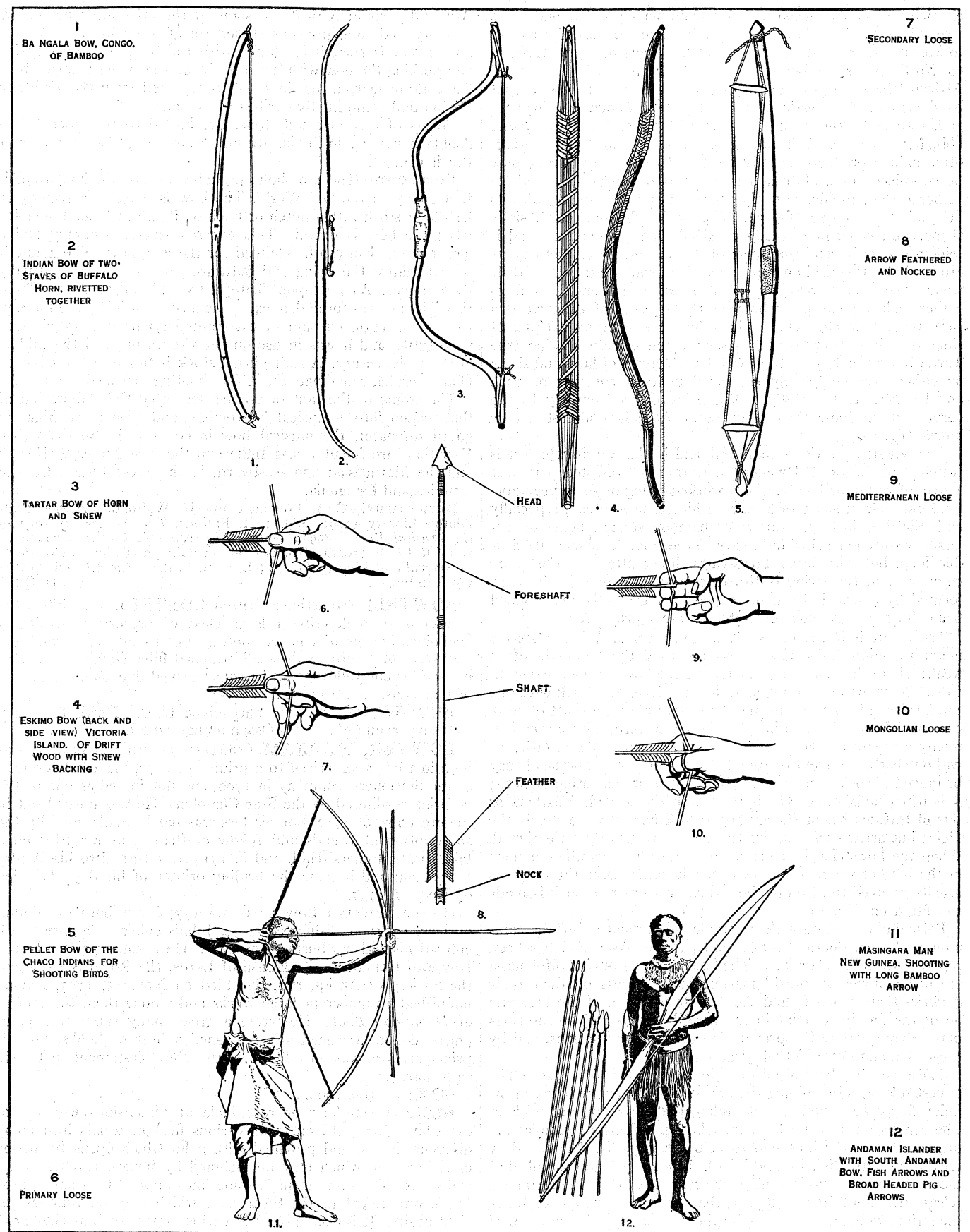
8
ARROW FEATHERED AND NOCKED

9
MEDITERRANEAN LOOSE

10
MONGOLIAN LOOSE

11
MASINGARA MAN NEW GUINEA, SHOOTING WITH LONG BAMBOO ARROW

12
ANDAMAN ISLANDER WITH SOUTH ANDAMAN BOW, FISH ARROWS AND BROAD HEADED PIG ARROWS



FROM (1) RATZEL, "HISTORY OF MANKIND" (MACMILLAN); (2-3) BALFOUR, "THE ARCHER'S BOW" IN THE ROYAL ANTHROPOLOGICAL INSTITUTE "JOURNAL"; (4) "ANTHROPOLOGICAL PAPERS" (AMERICAN MUSEUM OF NATURAL HISTORY); (5) BUSCHAN, "ILLUSTRIERTE VOLKERKUNDE" (VON STRECKER UND SHRODER); (7) SOMERSET BADMINTON LIBRARY, "ARCHERY" (LONGMANS GREEN & CO.); (6, 9, 10) MORSE, "ANCIENT AND MODERN METHODS OF ARROW RELEASE"; (11) AFTER A PHOTO BY DR. LANDTMAN; (12) BROWN, "ANDAMAN ISLANDERS" (CAMBRIDGE UNIVERSITY PRESS)

TYPES OF BOW AND ARROW USED BY PRIMITIVE TRIBES. AS A WEAPON OF THE HUNT, THE BOW AND ARROW HAS BEEN EMPLOYED BY RACES AS FAR APART AS THE ESKIMOS OF GREENLAND AND THE TRIBES OF NEW GUINEA, THE ISLANDERS OF THE ANDAMANS AND THE INDIANS OF THE AMAZON.

elasticity, or cracks, when pulled, so another stick is bound on to strengthen it. Thus hardwood and bamboo are lashed together in Melanesia, or glued together in Japan; layers of sinew strengthen North American bows; the marsh dwellers of the Central African lakes fit a piece of tough wood into the hollow of a split bamboo; and yew, fustic, hickory and other woods are glued together to make the backed bow of modern archers. *Composite* (bi-partite or tri-partite) bows are made of two or more materials, often animal products, usually attached transversely. These may be two-piece bows, often a pair of horns or antlers fastened together at the grip (fig. 2) or the more familiar three-piece, with its "Cupid's bow" curve (fig. 3). This is the characteristic Asiatic shape, horn being more easily obtained than good timber, and it seldom occurs beyond the range of Asiatic influence. Both types are made by the Eskimo, who depend on such materials as drift wood, whalebone or reindeer antler. A pair of antlers rivetted together makes a two-piece bow, or three pieces of drift wood a three-piece bow (fig. 4), but in either case a strong backing of sinew is added to give both strength and elasticity. The true Tartar bow often has a core of wood, with layers of horn and sinew on either side, completely concealed under a covering of bark and lacquer. It is usually reflex, being drawn contrary to the curve, and in some three-piece bows the joints almost act as hinges (fig. 3).

The bowstring varies in material, and in the way in which it is fastened to the bow. Dwellers in warm, well-forested parts use a strip of rattan or bamboo, or a worked string of some vegetable fibre, but animal sinew or a strip of hide is widespread, especially with the Asiatic bow. Rattan or bamboo strings, being intractable, are often attached indirectly to the stave by a separate flexible loop, but with other bowstrings direct attachment is more common, and the string is threaded through a hole in the bow, secured by a firm lashing, or looped over the ends and stopped from slipping by a shoulder, notch or other projection.

Arrows are influenced by bows and vice versa. Where effective metal-headed or poisoned arrows are used the bows are often weak; where the arrows are ineffective the bow must be strengthened. An arrow may be made all in one piece, of a stick with one end hardened in the fire, or may be of two pieces, a shaft of reed, cane or light wood, and a heavier sharpened foreshaft; more commonly a separate head of stone, bone, shell, metal, etc. (with or without barbs) is fixed to the shaft or foreshaft. The head may be tanged or socketed, and fixed by lashings or cementing or both; it is often unfixed, so that it rankles in the wound. Feathers or bits of leaf, leather or fur are added to light arrows to steady the flight, but arrows with heavy foreshafts are usually unfeathered. When the bowstring is a flat strip of rattan or bamboo, a nock in the butt of the arrow is rare, but in other cases the arrow is usually grooved to fit on to the string, or a separate nock is made and fitted on (fig. 8).

Poisoning of arrows with vegetable and animal poisons is common in Africa, South America and parts of Asia, and has been reported from other regions. The "poisoned arrows" of Melanesia are often dipped in putrid matter, but rely less on their toxic qualities than on magic and the evil consequence of the breaking off of the fine bone point in the wound. Spells and incantations play a large part in the preparation of all arrow poisons, and by suggestion add much to their deadliness.

The arrow may be shot off in various ways (figs. 6, 7, 9, 10). The easiest release is by holding the butt end of the arrow between the index finger and thumb, and pulling the bowstring out with it. The arrows need no nock, though knobs, lashing or grooves are often added at the butt end to help the grip. In the secondary release the arrow is still held by the index finger and thumb, but the other fingers help in pulling the string. In the Mediterranean release the thumb takes no part, the nocked arrow is fitted on to the string, which is drawn out by the fingers. This is the loose of modern archers, as of some of the most primitive, the Vedda and the Eskimo, and it occurs in a modified form in the Andaman islands. The Mongolian release is exactly opposite. Here the fingers are idle (save for steadying the arrow) and the thumb, protected by a ring or glove, does the work. This is universal in Asia and parts of Africa, and some of the oriental drawing-rings of ivory, jade and precious stones are of great beauty. A very strong bow is sometimes drawn with the feet. The archer sits, and pushing the bow with his feet, draws the string towards him. This, an ancient custom in India, is reported from the Vedda in Ceylon and some hunting tribes of Brazil.

Pellets of clay or small stones are hurled from a pocket in a double bowstring in India, Burma, Siam, etc., and also in east Brazil (fig. 5).

Crossbows.—The crossbow, probably an Asiatic invention, is found only in the Old World. The bow is fixed to a transverse handle or stock with a notch or knob on it, which holds the string when the bow is drawn. This ensures greater accuracy and a longer range than can be claimed for the long bow. The arrow is placed against the string and both are released together, usually by a trigger. As a weapon "hateful to God and unfit for Christians" its use was forbidden, except against infidels, by the Lateran Council of 1139, on pain of excommunication; but prohibitions were futile, and it was in use on the Continent until the middle of the 17th century. A split hinged stock is found in West Africa (Fan, Yoruba, Mandingo, etc.), for shooting poisoned darts.

The twang of the taut bowstring suggested the elaboration of the weapon into a musical instrument, and with or without its gourd resonator, the musical bow is common in South Africa. Variations are found across India and the East Indies to Hawaii and the Marquesas; and westward, in the West Indies, Central America and Patagonia.

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BOWTELL (sometimes written **BOLTEL**), in architecture, a term used to describe a large class of projecting mediaeval mouldings always of convex contour and usually approximating to a torus or a torus with small attached fillet (*q.v.*). A "roving bowtell" is one following an irregular curved line, as on the edges of pew ends, stall arms and the like.

BOW-WOOD, a name once given to the North American tree more commonly called Osage orange (*q.v.*).

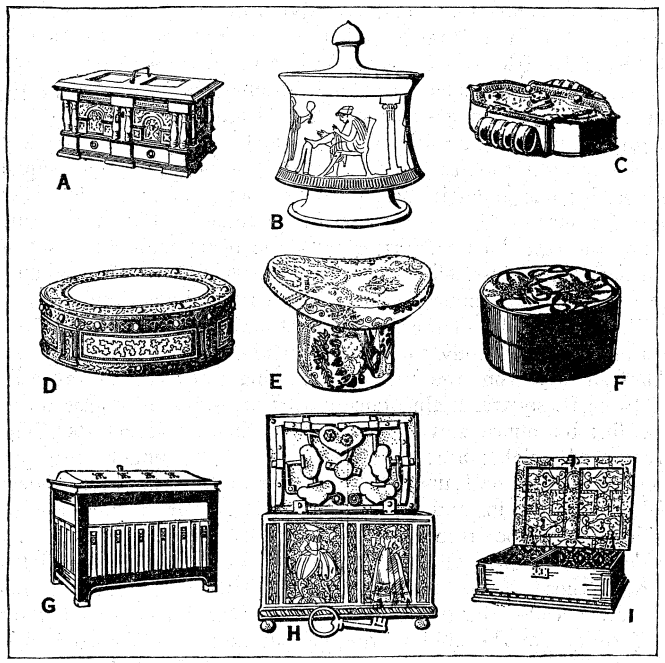
BOWYER, WILLIAM (1663–1737), English printer, was born in 1663, apprenticed to a printer in 1679, made a liveryman of the Stationers' company in 1700, and nominated as one of the 20 printers allowed by the Star Chamber. He was burned out in the great fire of 1712, but his loss was partly made good by the subscription of friends and fellow craftsmen, as recorded on a tablet in Stationers' Hall, and in 1713 he returned to his Whitefriars shop and became the leading printer of his day. He died on Dec. 27, 1737.

His son, WILLIAM BOWYER (1699–1777), was born in London on Dec. 19, 1699. Educated at St. John's college, Cambridge, he entered his father's business in 1722. He became printer to the House of Commons, the House of Lords, the Royal Society and the Society of Antiquaries. He died on Nov. 13, 1777, leaving unfinished a number of large works and among them the reprint of *Domesday Book*. He wrote a great many tracts and pamphlets, edited, arranged and published a host of books, but his principal work was an edition of the New Testament in Greek, with notes.

BOX: *see* BOXWOOD.

BOX. A container or receptacle of dimensions usually not exceeding 2 or 3 ft., made of various firm materials into many different shapes, and provided with a lid which opens by lifting or sliding, and which may be fastened by hinges, catches, hasps and locks. The same term is sometimes applied to a small, box-like compartment in the theatre, in which may be four, six or eight chairs. It is also applied in various ways, such as the "box" on a coach, a "shooting-box," etc., and is often used in a hyphenated sense, connected with the word which describes its contents or use, such as work-box, snuff-box, cash-box, hat-box, etc. It is perhaps best known in the home as a receptacle for family keepsakes, jewels, money, deeds and securities.

For centuries boxes have been constructed of innumerable materials, though wood, iron and brass have perhaps been the most common. The top centre illustration shows a Greek box of pottery, and to the left at the top, a 17th century Dutch box made partially of bone. Many types of decoration have been used to enhance the beauty of boxes, such as painting, enamelling, gilding and the inlaying of jewels, while others have been covered with various fabrics or carved in the material of which they were made. (*See* the hat-box in the illustration.)



BY COURTESY OF (A. TO G. AND I.) THE METROPOLITAN MUSEUM OF ART; H. THE PENNSYLVANIA MUSEUM OF ART

TYPES OF BOXES, REPRESENTING THEIR USAGE AND METHODS OF ADORNMENT FROM THE DAYS OF ANCIENT GREECE TO MODERN TIMES

A. Dutch box; B. Greek toilet box; C. Tibetan charm box; D. French snuff box; E. English band box; F. French black glass box; G. Egyptian toilet article box; H. French jewel box; I. English bible box

There were in the 16th century many oak boxes carved with foliage scrolls, dragons, animals, profile heads of noted people; also inlays of many other kinds of wood. The ebony box, more common at a later date, gave even more opportunities for carved decoration, and many were mounted with silver corners. Considerable marquetry and gay colours were common on the walnut and mahogany boxes of the 17th century. Tortoise-shell money-boxes and work-boxes were best known about the reign of Charles II. The work-box, used by women, was perhaps the most widely used type. It was often fitted with a tray divided into small compartments, for a needle-case, a pin-cushion, reels of silk and cotton, and other necessary equipment for sewing.

The box may be considered one of the most primitive pieces of furniture as it is one of the first things made by man, and the fact that its size and construction lent itself so conveniently to decoration, and that it has always been among the prize possessions of man, means that it often has a tremendous historic interest and artistic value.

BOX CAR, a covered and enclosed flat car used in America for carrying freight, with sliding doors either at the sides alone or at both side-centre and ends. It is usually about 40 ft. in length, has an average capacity of from 50 to 55 tons, and is made of wood and steel, or steel alone. The evolution of this type of car from the first crude freight car that appeared on the tracks of the Baltimore and Ohio railroad in 1832 has resulted from the need of protection from the weather and the necessity of sealing under lock and key many varieties of general merchandise, among them canned and dry goods. The average trip of the box car has been computed at 14·9 days, with 10·1 hours out of every 24 spent in shifting and interchange movement. In the United States, of the 2,355,225 freight cars in use in 1922, 1,100,000 were ordinary box cars. A large proportion of the remainder showed some modifications of the box car principle in regard to stock, refrigerating and furniture. Of a total of 643,853 freight cars believed to have been put in service in the United States from Jan. 1923 to Oct. 1, 1927, 248,008 were thought to be box cars, and this type of car also figured prominently in the 53,308,853 loadings estimated for 1926. Much of the 83,000,000 tons of freight reputed to arrive and leave New York annually by rail is transported in box cars. In England the term box wagon, rather than car, is used.

BOXELDER, the name commonly given in the eastern United States to a species of a maple (*Acer negundo*), with pinnately compound leaves, numerous varieties of which are planted for shade and ornament (*see* MAPLE).

BOXING, the art of attack and defence with the fists protected by padded gloves, as distinguished from pugilism, in which the bare fists, or some kind of light gloves affording little moderation of the blow, are employed (M.E. *box,* a blow, probably from Dan. *bask,* a buffet). The ancient Greeks used a sort of glove in practice, but, although far less formidable than the terrible caestus worn in serious encounters, it was by no means so mild an implement as the modern boxing-glove, the invention of which is traditionally ascribed to Jack Broughton (1705–89), "the father of British pugilism." In any case gloves were first used in his time, though only in practice, all prize-fights being decided with bare fists. Broughton, who was for years champion of England, also drew up the rules by which prize-fights were for many years regulated, and no doubt, with the help of the newly invented gloves, imparted instruction in boxing to the young aristocrats of his day. The most popular teacher of the art was, however, John Jackson (1769–1845), called "Gentleman Jackson," who was champion from 1795 to 1800, and who is credited with imparting to boxing its scientific principles, such as countering, accurate judging of distance in hitting, and agility on the feet. Tom Moore, the poet, in his *Memoirs,* asserted that Jackson "made more than a thousand a year by teaching sparring." Among his pupils was Lord Byron, who, when chided for keeping company with a pugilist, insisted that Jackson's manners were "infinitely superior to those of the fellows of the college whom I meet at the high table," and referred to him in the following lines in *Hints from Horace:—*

"And men unpractised in exchanging knocks
Must go to Jackson ere they dare to box."

His rooms in Bond street were crowded with men of birth and distinction, and when the allied monarchs visited London he was entrusted with the management of a boxing carnival with which they were vastly pleased. In 1814 the Pugilistic Club, the meeting-place of the aristocratic sporting element, was formed, but the high-water mark of the popularity of boxing had been reached, and it declined rapidly, although throughout the country considerable interest continued to be manifested in prize-fighting.

The sport of modern boxing, as distinguished from pugilism, may be said to date from the year 1866, when the public had become disgusted with the brutality and unfair practices of the professional "bruisers," and the laws against prize-fighting began to be more rigidly enforced. In that year the "Amateur Athletic Club" was founded, principally through the efforts of John G. Chambers (1843–83), who, in conjunction with the 8th marquess of Queensberry, drew up a code of laws (known as the Queensberry Rules) which govern all glove contests in Great Britain, and were also authoritative in America until the adoption of the boxing rules of the Amateur Athletic Union of America. In 1867 Lord Queensberry presented cups for the British amateur championships at the recognized weights.

Boxing is the art of hitting without getting hit. The boxers face each other just out of reach and balanced equally on both feet, the left from 10 to 20in. in advance of the right. The left foot is planted flat on the floor, while the right heel is raised slightly from it. The left side of the body is turned a little towards the opponent and the right shoulder slightly depressed. When the hands are clenched inside the gloves the thumb is doubled over the second and third fingers to avoid a sprain when hitting.

The general position of the guard is a matter of individual taste. In the "crouch," affected by many American professionals, the right hip is thrust forward and the body bent over towards the right, while the left arm is kept well stretched out to keep the opponent at a distance. For speed and the use of a straight left, the basis of the classic style, the upright pose is decidedly more effective. Some boxers stand with the right foot forward, a practice common in the 18th century, which gives freer play with the right hand but is rather unstable. A boxer should stand lightly on his feet, ready to advance or retreat on the instant, using short steps, advancing with the left foot first and retreating with the right. Attacks are either simple or secondary. Simple attacks consist in straight leads; *i.e.*, blows aimed with or without preliminary feints, at some part of the opponent's body or head. All other attacks are either "counters" or returns after a guard or "block." A counter is a lead carried out just as one is attacked, the object being to block (parry) the blow and land on the opponent at the same time. Counters are often carried out in connection with a side-step, a slip or a crouch. In hitting, a boxer seeks to exert the greatest force at the instant of impact. Blows may be either straight, with or without the weight of the body behind them ("straight from the shoulder" hits); jabs, or stabbing blows (delivered with either hand at long range); hooks, or side-blows with bent arm; upper cuts (short swinging blows from beneath to the adversary's chin); chops (short blows from above); or swings (round-arm blows, usually delivered with a partial twist of the body to augment the force of the blow). Of the dangerous blows, which often result in a knock out, or in seriously weakening an adversary, the following may be mentioned: On the pit of the stomach, called the solar plexus, from the sensitive network of nerves situated there; a blow on the point of the chin, having a tendency to destroy the sense of equilibrium; a blow under the ear, painful and often resulting in partial helplessness; and one directly over the heart, kidney or liver. As a boxer is allowed ten seconds after being knocked down in which to rise, an experienced ring-fighter will drop on one knee when partially stunned, deliberately remaining in that position in order to recover until the referee has counted nine.

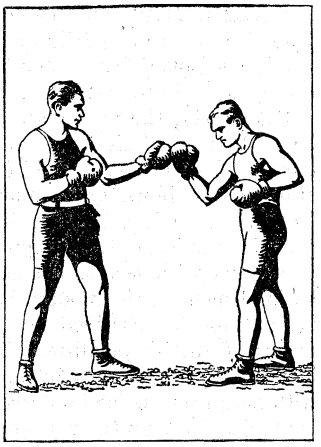


FIG. 1.—SPARRING FOR AN OPENING

By shifting your position about the ring and frequently resorting to feinting, draw your opponent out as much as possible. Then step in quickly and strike

Guarding is done with the arm or hand, either open or shut. If a blow is caught or stopped short it is called blocking, but a blow may also be shoved aside, or avoided altogether by slipping; *i.e.*, moving the head quickly to one side, or by ducking and allowing the adversary's swing to pass harmlessly over the head. Still another method of avoiding a blow without guarding is to bend back the head or body so as narrowly to escape the opponent's glove.

The rules of the Amateur Boxing association (founded 1884) contain the following provisions. "An amateur is one who has never competed for a money prize or staked bet with or against a professional for any prize, except with the express sanction of the A.B.A., and who has never taught, pursued or assisted in the practice of athletic exercises as a means of obtaining a livelihood." The ring shall be roped and between 12 and 24 ft. square. No spikes shall be worn on shoes. Boxers are divided into the following classes by weight:—Flyweight, not exceeding 8 st. (112 lb.); Bantam, not exceeding 8 st. 6 lb. (118 lb.); Feather, not exceeding 9 st. (126 lb.); Light, not exceeding 10 st. (140 lb.); Welter, not exceeding 10 st. 7 lb. (147 lb.); Middle, not exceeding 11 st. 6 lb. (160 lb.); Light-heavy or Cruiser, not exceeding 12 st. 6 lb. (174 lb.); and Heavy, any weight above. There shall be two judges, a referee and a timekeeper. The votes of the judges decide the winner of a bout, unless they disagree, in which case the referee has the deciding vote. In case of doubt he may order an extra round of two minutes' duration. Each match is for three rounds, the first two lasting three minutes, and the third four, with one minute rest between the rounds. A competitor failing to come up at the call of time loses the match. When a competitor draws a bye he must box for a specified time with an opponent chosen by the judges. A competitor is allowed one assistant (second) only, and no advice or coaching during the progress of a round is permitted. Unless one competitor is unable to respond to the call of time, or is obliged to stop before the match is over, the judges decide the winner by *points*, which are for attack, comprising successful hits cleanly delivered, and defense, comprising guarding, slipping, ducking, counterhitting and getting away in time to avoid a return. When the points are equal the decision is given in favour of the boxer who has done the most leading; *i.e.*, has been the more aggressive. Fouls are hitting below the belt, kicking, hitting with the open hand, the side of the hand, the wrist, elbow or shoulder, wrestling or "roughing" on the ropes; *i.e.*, unnecessary shouldering and jostling.

The boxing rules of the Amateur Athletic Union of the United States, governing body for amateur boxing in the United States, differ slightly from the British. The ring is roped but must be 16 to 24 ft. square. Eight-ounce gloves are worn in classes up to 160 lb.; ten-ounce gloves are worn in the heavier classes. The recognized weights are: flyweight 112 lb. and under; bantamweight 118 lb. and under; featherweight 126 lb. and under; lightweight 135 lb. and under; welterweight 147 lb. and under; middleweight 160 lb. and under; light-heavyweight 175 lb. and under; heavyweight all over 175 lb. It will be seen these weights parallel those of the professional ring. This arrangement is deliberate because the trend since World War I has been toward uniformity, for the obvious reason that most graduates of amateur boxing turn to the professional sport. The rules for officials, the distribution of points, the imposition of penalties for fouls and the regulation permitting two seconds to attend each boxer, are identical with the British. The American system of rounds permits three rounds of three minutes each, the point-scoring system precluding extra-round bouts such as used to obtain. Judges and referees must decide upon a winner at the end of three rounds. There can be no draw decision. This change is of modern origin. It stems from the belief that an extra round worked a hardship on the young boxers. While the three-minute, three-round maximum obtains for tournament competition, the A.A.U. rules do permit five-round bouts of two minutes each as special attractions. The amateur rules are strict. A boxer must be a registered member of a club holding membership in the A.A.U.; he must have the endorsement of his club secretary; he must present a birth certificate and two photographs. If he has no club affiliations, or competes "unattached," his application for an A.A.U. permit must have the endorsement of three reputable citizens.

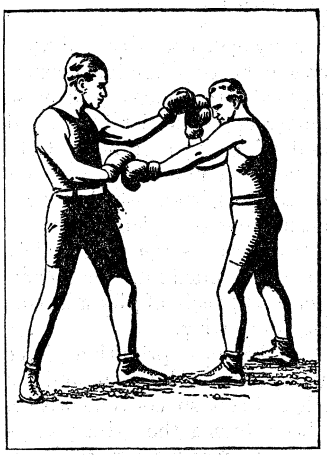


FIG. 2.—LEFT LEAD TO FACE AND COUNTER TO BODY

In countering a left-hand lead to the face, raise your right hand across the face, and at the same time shoot the left straight to the body

See R. Allanson Winn, *Boxing* (1897); Wm. Elder, *Boxing* (New York, 1902) (these two books are excellent for the technicalities of boxing). The article "Boxing," by B. Jno. Angle and G. W. Barroll, in the *Encyclopaedia of Sport;* J. C. Trotter, *Boxing* (1896); *Fencing, Boxing and Wrestling,* in the Badminton Library (1892).

French Boxing (*la boxe française*) dates from about 1830. It was more like the ancient Greek *pankration* (*see* PUGILISM) than was British boxing, as not only striking with the fists, but

also kicking with the feet, butting with the head and wrestling were allowed. It was a development of the old sport of *savate,* in which the feet, and not the hands, were used in attack. Lessons in *savate,* which was practised especially by roughs, were usually given in some low resort, and there were no respectable teachers. While Paris was restricted to *savate,* another sport, called *chausson* or *jeu marseillais,* was practised in the south of France, especially among the soldiers, in which blows of the fist as well as kicks were exchanged, and the kicks were given higher than in *savate,* in the stomach or even the face. Alexandre Dumas *père* says that Charles Lecour first conceived the idea of combining English boxing with *savate.* For this purpose he went to England, and took lessons of Adams and Smith, the London boxers. He then returned to Paris, about 1852, and opened a school to teach the sport since called *la boxe française.* Around him, and two provincial instructors who came to Paris about this time with similar ideas, there grew up a large number of sportsmen, who between 1845 and 1855 brought French boxing to its highest development. Among others who gave public exhibitions was Lecour's brother Hubert, who although rather undersized, was quick as lightning, and had an English blow and a French kick that were truly terrible. Charles Ducros was another whose style of boxing, more in the English fashion, but with low kicks about his opponent's shins, made a name for himself. Later came Vigneron, a "strong man," whose style, though slow, was severe in its punishment. About 1856 the police interfered in these fights, and Lecour and Vigneron had to cease giving public exhibitions and devote themselves to teaching. Towards 1862 a new boxer, J. Charlemont, was not only very clever with his fists and feet, but an excellent teacher, and the author of a treatise on the art. Lecour, Vigneron and Charlemont may be said to have created *la boxe française,* which, for defense *at equal weights,* the French claim to be better than the English.

See Georges d'Amoric, *The French Method of the Noble Art of Self Defence* (1898); J. Charlemont, *L'Art de la boxe française et de la canne* (1899).

Modern Developments.—In 1910, though France was beginning to cultivate it as a spectacular sport, the old indigenous kicking game of *la savate* having fallen into disrepute, boxing was hardly known at all outside the English-speaking countries. In 1927 it was a cosmopolitan game, familiar to all the western nations and actually gaining a foothold here and there in the east. During the period from 1910 on, it once again became a real national sport, a game pursued for its own sake in Great Britain; in America, the number of amateur practitioners is considerable, but the chief professional contests are the most crowd-compelling of popular spectacles.

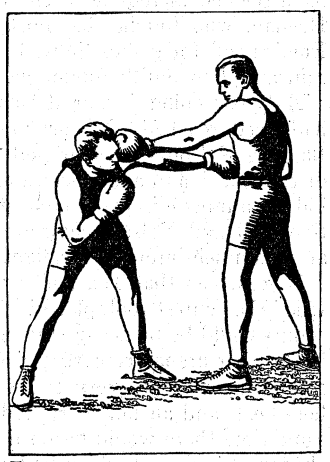


FIG. 3.—LEFT STRAIGHT TO BODY
Feint your opponent into a lead with his left then step in and crouch, driving your left straight from the shoulder

The adoption of boxing as a recognized form of physical training in the services for officers and men alike, while millions were being called to the colours as World War I ran its course, had a substantial influence in a revival of intelligent interest. This not only increased the number of amateur boxers in Great Britain and America, but also raised the status of the professional and led to interest in, and the introduction of, boxing in lands where it had not been hitherto practised. Germany and Italy gave serious attention to the sport and developed world heavyweight champions in Max Schmeling and Primo Carnera. South American interest was awakened, with a subsequent development of boxers in several classes, of whom Luis Angel Firpo proved the most spectacular and enjoyed the greatest earning power. Spain produced a heavyweight title contender in Paulino Uzcudun. There have been Chinese and Japanese fighters, Norwegians and Swedes, none of whom, however, gained pre-eminence.

Though benefited by the transition from ill-repute to popularity, it must be recognized boxing has not quite succeeded in throwing off its disreputable adherents. Yet the sport is generally admitted, except by a very few, to deserve the praise given to it in a letter to Tommy Burns, for a time the world's heavyweight champion, from the late Father Bernard Vaughan, who said "Boxing is an education—you learn self-control, to give and to take, to punish and be punished, smiling all the time." The average professional glove fighter is now almost always a decent citizen and a gentleman. The contrary is the exception; an almost indistinguishable minority.

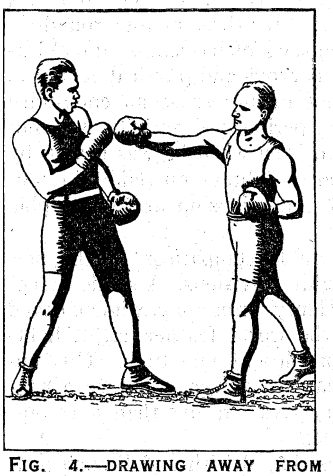


FIG. 4.—DRAWING AWAY FROM RIGHT SWING
The easiest way to avoid a right swing to the face is to bend back from the waist and as your opponent's hand passes your face shoot your right over his arm to his face

Some Great Boxers.—Boxing is subject to strict regulation, despite the absence of an international (professional) body of recognized authority. Safeguards have been effected, protective measures from a competitive standpoint have been adopted; the indifferent, haphazard conduct to which it was early subjected has been replaced with something approaching intelligent supervision and this has had an advantageous effect. In technique not much advance has been made. But, this is so because the basic principle of boxing, which is recognized as "the manly art of self-defense," precludes drastic change or serious alteration.

There was a time when the best amateur form approached the professional championship standard, at least in isolated instances. Outstanding amateurs in British boxing, such as the cricketer, J. H. W. T. Douglas, who is reputed to have had the best of a private trial with Tommy Burns when the latter was champion, and John Hopley, the Cambridge university heavyweight, justified the conviction they would have attained the highest honours, if they had made boxing their profession. In the United States, Warren Barbour attained a prominence in amateur boxing and showed such ability in trials against established professionals as to convince friends and observers he possessed the requisites to carry him to the top in the professional heavyweight ranks. He steadfastly refused, however, to entertain thoughts of a professional career, although he continued an ardent admirer and patron of boxing to his death. In America and in Great Britain, the short amateur contests in which not a moment is wasted, were, and, doubtless always will be, an excellent preparation for an intensive style of boxing in professional matches.

The best professional boxers of the revival period, especially in respect to the heavier divisions, suffer in comparison with those of the previous generations. Jeffries, Fitzsimmons, Corbett, (Tom) Sharkey, and Ruhlin, generally are the yardsticks by which ring greatness is measured. Corbett always will be remembered as the most scientific boxer the heavyweight ranks ever knew. The others combined extraordinary punching power with the real fighting temperament to a degree not since paralleled. Particularly was this true of Jeffries. They were succeeded by four formidable Negro fighters, Johnson, Langford, McVey and Jeannette, of whom the first-named was not much inferior to Peter Jackson—though the Jeffries he beat at Reno in 1910, in a fight which proved a provocation to racial riots all over the U.S.A., was only the husk of the former world's champion. Joe Louis must be included in any grouping of "great" fighters. This not alone because of his meteoric rise to the championship he held when he enlisted for World War II, but for the effective combination of boxing skill and punching power he possessed in amazing degree, as well as for his sportsmanship in the ring and his credit-

able deportment in private life.

Johnson lost his title to Willard in Havana. It is a debatable point whether the Dempsey who knocked out Willard in three rounds, when the latter was untrained and past his prime, was the equal of any of the great heavyweights mentioned above. Comparisons are unsatisfactory. This is particularly true because the modern heavyweight adopts a more intensive style than his predecessors, striving for a quick victory instead of using the preliminary rounds to test his opponent's methods and get an insight into his plan of campaign. Dempsey adopted this style and successors patterned after it when they could. The fact remains, however, that, when he was frustrated for three or four rounds in his quest of a quick victory, Dempsey's effectiveness suffered as consequence. He concentrated his nervous and physical energy in an all-out early effort. He was not in any sense an endurance fighter. Dempsey, owing to a long period of inactivity, was not the fast and resolute fighter he had been when he was beaten by Gene Tunney—a boxer rather than a fighter—on points in contests for the world's heavyweight championship at Philadelphia and at Chicago in 1926 and 1927.

To a large extent this unfavourable comparison of the new with the old obtains, too, in the lighter divisions. A single exception could be made in the case of Henry Armstrong, who achieved the unparalleled feat of holding the world featherweight, lightweight and welterweight championships at one time. This undeniable demonstration of supremacy, however, could be a criticism of Armstrong's contemporary rivals rather than a recommendation for over-all pre-eminence.

It is only in the lighter divisions that British and French boxers have reached the American standard, even in a period when, as has been suggested, championship form on the American side of the Atlantic showed a certain falling off. Wells, the most interesting and popular of the British heavyweights, lacked the well-fortified physique, punishment-resistance and fighting temperament which are required for success and was a victim of second-rate American heavyweights. Joe Beckett and Phil Scott did not measure up to second-rate American standards. Tom Heeney, a New Zealander, gained a chance at the heavyweight title in Tunney's farewell battle, but was soundly beaten in the encounter.

Among the little men, however, Great Britain and France made notable contributions to the ranks of prominent boxers. Ledoux, a pocket Hercules, and Criqui, a glove fighter of genius handicapped by wounds received in World War I, were two French boxers who were, for a time, in the world's championship class. Britain has had in Driscoll and Wilde, two real prodigies who were for years supreme at their weights. Driscoll was by general consent the perfect stylist, the boxer's boxer; in fact, his method in its graceful effectiveness, severity and economy of exertion, will always be remembered as a classic model. Wilde, on the other hand, was an eccentric genius who made the most of a physique which, like that of Fitzsimmons, seemed expressly invented to get the maximum hitting strength for the minimum weight. In America, the melting pot of racial types, such freaks of physique are far more common than in the European countries, where the human body is more or less standardized, and they are "scientifically" utilized for securing extraordinary results in various feats. That is but another reason why America produces so many men with a special aptitude for pugilism. From the days of Driscoll and Wilde, the most successful of the lighter men produced in Britain, at least on the basis of his American activities, was Jackie (Kid) Berg, a lightweight.

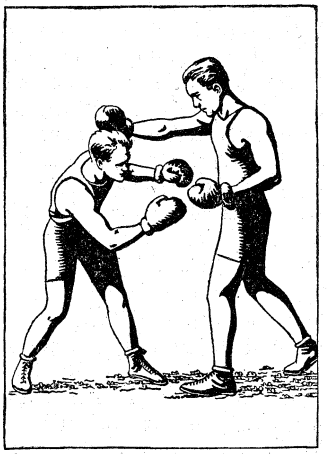


FIG. 5.—DUCKING A RIGHT-HAND SWING
As you duck a right-hand swing, get in a position to counter by sending either hand to the attacker's body

Control of Boxing.—In Great Britain amateur boxing is admirably organized, the executive of the Amateur Boxing association consisting of men with a personal experience of the game and having its welfare at heart. On the professional side the British Board of Boxing Control has developed through years of operation until it has supplanted the National Sporting club of London, always a great influence for good, as a recognized authority in the regulation of the sport, with international co-operative arrangements that extend through European countries and the majority of American boxing centres. The unscrupulous promoter and the incompetent referee have been eliminated through the operations of the B.B.B.C. Competitive standards have been improved. Supervision is more careful; regulation is stricter. The Lonsdale championship belts, each of which is worth £500, continued to be much sought after, under the supervision of the National Sporting club. The boxer who wins one of them three times becomes its permanent owner and is also entitled to a pension of £1 a week after reaching the age of 50. Control of the British championship contests has passed to the B.B.B.C., whereas the N.S.C. once exercised what amounted to a monopoly on the promotion of championships at the various weights. Working agreements with the National Boxing association in America, and the New York State Athletic commission, which is not a member of the N.B.A., have extended the scope of the B.B.B.C., and vice versa, to the undeniable advantage of the sport. Reciprocal disciplinary measures, when found necessary, have eliminated, or minimized, many of the earlier handicaps under which boxing laboured.

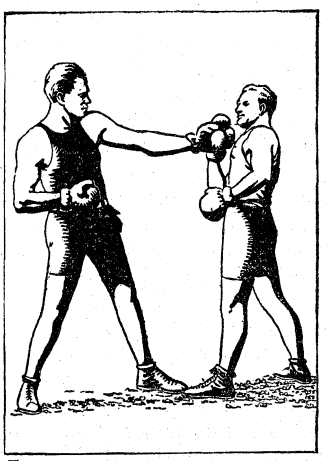
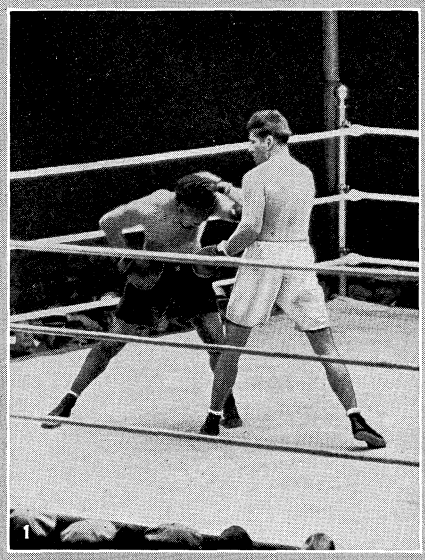


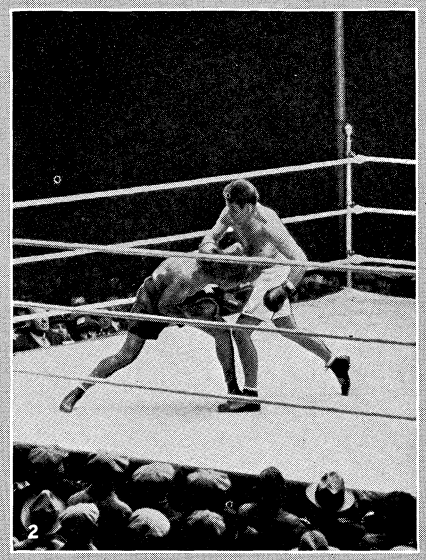
FIG. 6.—DRAWING BACK ON GUARD FROM STRAIGHT LEFT TO FACE
Bend back from the waist so that your opponent's fist falls several inches short, then lunge forward to strike at his body or face.

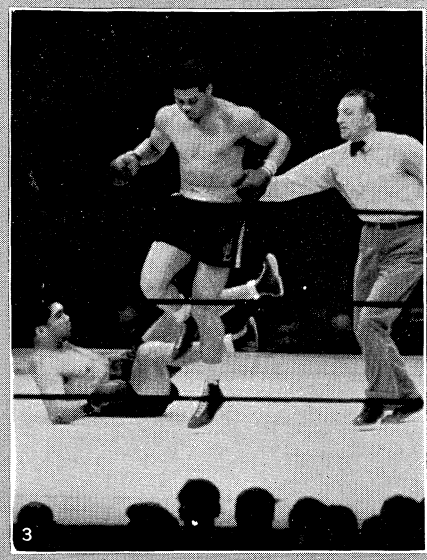
Finances.—The steady advancement of boxing brought with it the so-called "golden era" of big purses in a form that would have seemed incredible in the days of Tom Sayers and John C. Heenan, who fought the most famous contest ever decided on English soil for stakes limited to £200. In 1887, when Jake Kilrain and Jem Smith fought with bare fists in France for a sum slightly exceeding £2,000, it was generally believed that the limit had been reached. It was so until 1906, when Joe Gans and Battling Nelson were matched for the lightweight championship of the world, and announced their intention of accepting the best bid for a much-discussed contest which, because of Gans' superlative skill and Nelson's extraordinary powers of endurance, created as much interest as a fight between leading heavyweights.

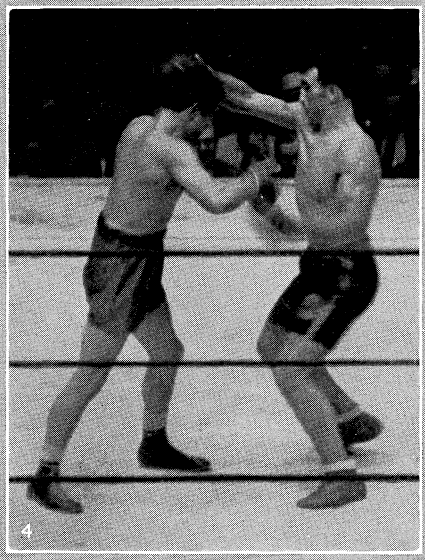
It was then that Tex Rickard offered a purse of $20,000, provided the contest took place in Goldfield, Nev. He held that huge profits could be made by staging bona-fide championship contests in open-air arenas constructed for the purpose, and making such arrangements that every ticket-holder would be sure of his (or her) seat, and an uninterrupted view of the boxing, while at the same time there would be no danger of a disturbance at the conclusion of a contest which had aroused the passions of the spectators. Rickard went progressively up the financial scale until he saw the day one of his boxing attractions grossed close to $3,000,000; he paid close to $1,000,000 to a single participant; his attendance exceeded 100,000 at a single spectacle and a $50 charge for a ringside seat was imposed. From occasional out-of-doors promotions, Rickard turned to boxing promotion as a business. He outgrew the old, historic Madison Square Garden in New York city, and erected the successor building which stands as a monument to his daring and genius.

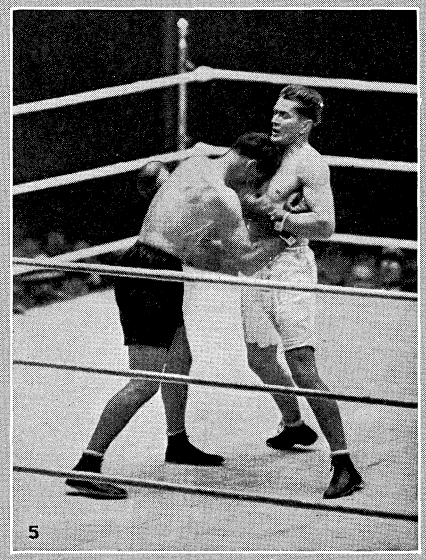
At Rickard's first promotion, the contest between Gans and Nelson, which was a fight to a finish, lasting 42 rounds, the gate money amounted to nearly $70,000 and the promoter's net profit

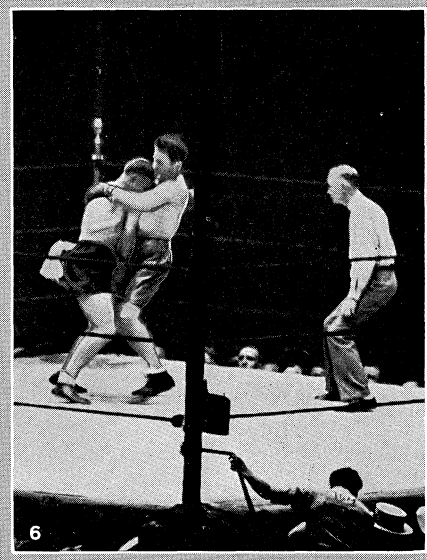


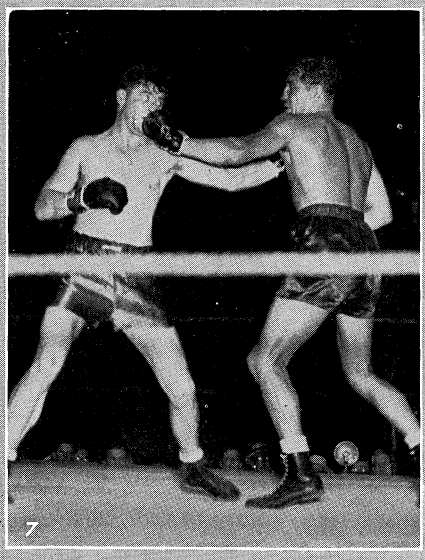


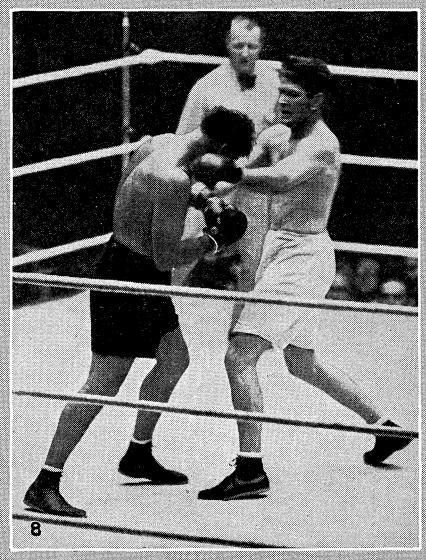


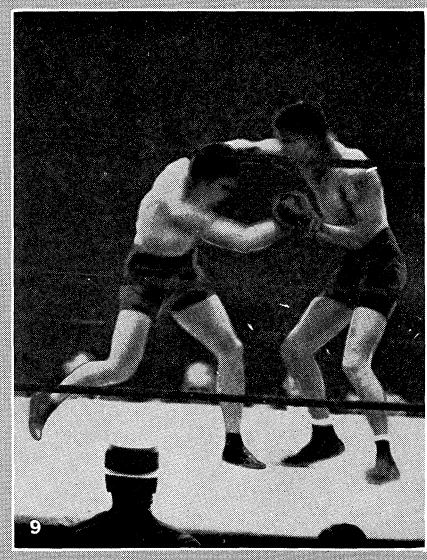








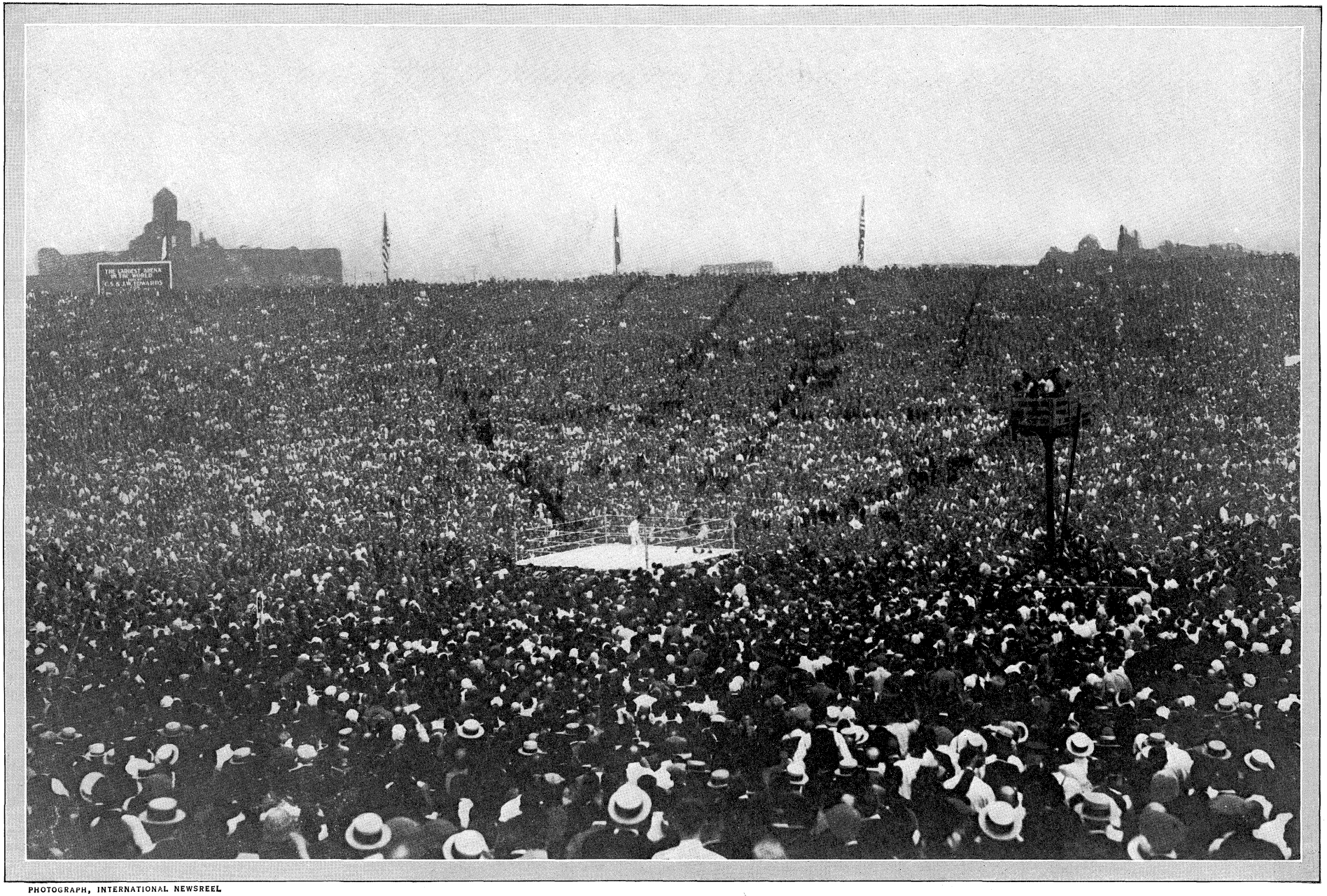




PHOTOGRAPHS (1, 2, 5, 6, 8, 9) INTERNATIONAL NEWSREEL, (3) ACME PHOTO, (4, 7) KEYSTONE VIEW

SCENES DURING WORLD CHAMPIONSHIP CONTESTS

1. Dempsey opens for a left during the Tunney-Dempsey fight, Chicago, Sept. 22, 1927. 2. Dempsey ducks from Tunney's right during the Tunney-Dempsey fight. 3. Schmeling knocked out in first round of return fight with Joe Louis, New York, June 22, 1938. 4. Max Baer takes world's heavyweight championship from Primo Carnera, in New York, June 14, 1934. 5. Dempsey drives right to Tunney's body during their Chicago match. 6. Tunney ties Heeney up during the Tunney-Heeney fight, New York. 7. Max Baer and Jimmy Braddock in fight in New York, June 13, 1935, which Baer lost. 8. Tunney lands left to Dempsey's head during the Tunney-Dempsey fight. 9. Leonard and Tendler during fight for the lightweight world championship, July 27, 1922



PHOTOGRAPH, INTERNATIONAL NEWSREEL

BOYLE'S 30-ACRES DURING THE DEMPSEY-CARPENTIER FIGHT AT JERSEY CITY, JULY 2, 1921

The Dempsey-Carpentier fight was witnessed by approximately 90,000 persons, including 2,000 women, the greatest number of women to have attended a boxing contest in the United States up to that time. The gate receipts totalled $1,626,580. Dempsey retained his title by knocking out Carpentier in the fourth round

exceeded $10,000. His Jeffries-Johnson fight at Reno, in Nevada (1910) in association with Jack Gleason, brought gate receipts of $270,755; Dempsey *v.* Willard at Toledo in Ohio (1919) $452,522. Realizing the advantage of staging important ring spectacles within easy access to the larger American cities, Rickard held his next elaborate promotion in Jersey City and for the first time in boxing history the $1,000,000 gate was realized. It was the Dempsey *v.* Carpentier battle of 1921. A $50 maximum charge was imposed and the receipts amounted to $1,626,580. The million-mark was exceeded in the clash of Dempsey *v.* Firpo in New York city (1923), which attracted receipts of $1,188,603. It was generally thought the limit had been reached with this amazing gross return, but it was surpassed by the $1,895,733 receipts of Dempsey *v.* Tunney in Philadelphia (1926) when 120,757 persons constituted the largest paying crowd in boxing history. This led to boxing's record receipts, $2,750,000, attracted to the second Dempsey *v.* Tunney meeting, held in Chicago, in 1927. For gaining his second decision over Dempsey, Tunney collected approximately $990,000, the largest sum ever paid a boxer for a single bout.

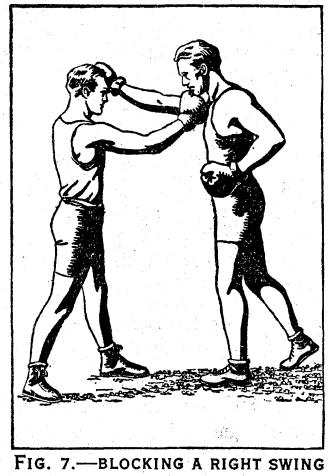


FIG. 7.—BLOCKING A RIGHT SWING
As your opponent swings for your head with his right, step in and meet his attacking fist with your left hand. Then send a right upper cut quickly to his chin

C. B. Cochran's Promotions.—In England, though the remuneration of the successful boxer greatly increased from 1910 on, nothing approaching the higher American figures was ever recorded. In the boxing boom that followed World War I, C. B. Cochran, who in 1914 had staged the Welsh-Ritchie world lightweight championship match at Olympia, in London, became a serious rival to the National Sporting club. He was associated for a time with Tex Rickard in the promotion of the Dempsey *v.* Carpentier fight in 1921. With his American partner, Wm. A. Brady, the only man ever to manage two world heavyweight champions (Corbett and Jeffries), Cochran joined forces with Rickard in preliminary arrangements for the epochal fight. Decision to guarantee such a fantastic figure as $300,000 to Dempsey, and $200,000 to Carpentier, however, led to the withdrawal of Cochran and Brady, who, at the time, were devoting their attention exclusively to their theatrical production business.

A consummate showman, Cochran conceived the idea, and certainly realized it, of giving boxing shows which should be as well conducted as a theatrical performance. In his book of reminiscences entitled *The Secrets of a Showman* (1925) he gives the full financial details of some of his boxing ventures. The contest between Wilde and the American bantamweight, Moore, which was won by the former after an amazing display of skill, hitting power and stamina, was, perhaps, the most interesting of his promotions, which were never mere money-making affairs.

The Cochran boxing shows might almost be described as social functions, and they recalled the great days of the old prize ring, when men fought with the naked fists for 50 or 100 guineas a side in the presence of all the social celebrities of the day. At these well-conducted modern spectacles a small proportion, never more than 1%, were women. In France, where purses increased under the promotions of Jeff Dickson, a Mississippi, U.S.A., soldier of World War I who remained in France at the close of hostilities and became the leading boxing promoter there, the number of women attending a contest in which a popular favourite, such as Carpentier or Criqui in their prime, engaged, was apt to be very large. Subsequent undertakings by Dickson, until the outbreak of World War II, likewise had a substantial representation of women in attendance. The same phenomenon has been true of Italy and Spain, as well as the Latin-American countries. It is all largely a question of national temperament; and the horror of seeing bloodshed, which is thought to be a characteristic of northern races, is not likely to prevent women, who are in the habit of attending bull fights, from watching boxing matches. Indeed, there have been women boxers as a development of the post-World War I period. Too, there have been women who were closely identified with the management and competitive advising of sons, brothers or sweethearts who were fighters. Boxing authorities the world over, however, have discouraged development in this direction and, in the majority opinion, rightfully so.

A Cosmopolitan Profession.—Professional boxing now receives recruits from many countries and races, the old idea that only men of English or Irish descent could excel at the game having long since been confuted. The Latin physique, perhaps in consequence of frugal eating and a racial preference for wines rather than malted liquors, is admirably adapted for a sport that requires a high degree of stamina. No oriental boxer has, as yet, reached the highest class, though Indians, Japanese and Chinese are occasionally seen in minor contests, and a Filipino, Villa, has actually held the world's flyweight championship, but there seems no reason why the Eastern races, which have produced so many fine wrestlers, should not learn to excel in the sister-art in course of time. India has sent us some very skilful amateur boxers.

A proof that boxing is rapidly becoming popular in the Latin countries is found in the way renderings, often comical in appearance, of English technical terms have been adapted into the French, Italian and Spanish languages. Outside the British Isles, there are few amateur boxers of merit. Even in America those who take up the game for the game's sake are vastly inferior, both in quality and quantity, to the increasing multitude of British amateurs. Before World War II there was no annual competition there comparable with the British Amateur Boxing association championships, and there was nothing equivalent to the flourishing boxing clubs at Oxford and Cambridge in the great American universities. If the American athlete thinks he can excel in such an exacting man-to-man game, nine times in ten he adopts it as a professional vocation. And in France, though the brilliant victories of Carpentier gave rise to a temporary craze for what was significantly styled "Byronic Boxing," fencing had regained its old position as the gentleman's art of self-defense, an indispensable accomplishment before the outbreak of World War II.

In the Scandinavian countries, however, and in Germany, there was real enthusiasm for amateur boxing. Denmark produced excellent amateurs, and her representative teams have done very well in matches against teams selected by the Amateur Boxing association. Such amateur international matches were a new development and are expected to become more numerous and more popular as spectacles with the war's end. The impetus to boxing in Germany was given by returned prisoners of World War I who had acquired the rudiments of the game in concentration camps. Two sailors, Breitenstraeter and Prenzel, who were captured at the beginning of the war and learned to box fairly well in the internment camp at Douglas, Isle of Man, were the pioneers of professional boxing in Germany. They started travelling boxing booths, and whenever demonstrations of the art were given, ex-prisoners of war attended in large numbers, and local clubs were formed. The popular impression that the excellence of the British soldier as a fighting man was due to his training in boxing greatly helped the new form of athletic propaganda, and Blücher's approval of pugilism was a stock quotation in many favourable newspaper articles. Professional boxing shows became very popular, especially in Berlin where they were rigorously controlled by a boxers' union, the *Verband Deutscher Faustkämpfer*, and a promoters' association, the *Verband der Boxkampf Unternehmer*. For a few appearances on a Berlin stage with sparring partners Dempsey received $50,000 and all the travelling expenses of himself and his camp from London. Amateur boxing clubs existed in every German city and town and when Max Schmeling won the world's heavyweight championship in 1930 the sport experienced an impetus that was intensified until the outbreak of World War II.

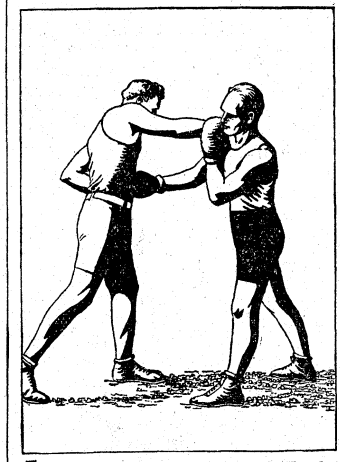


FIG. 8.—STEPPING OUTSIDE OF STRAIGHT RIGHT LEAD
As you step outside of a straight right to the face, push the attacking arm over right shoulder with left hand and send right to body or face

BIBLIOGRAPHY.—J. Driscoll, *Text-Book of Boxing* (1921); J. Wilde, *The Art of Boxing* (1923); T. C. Wignall, *The Story of Boxing* (1923); J. J. Corbett, *The Roar of the Crowd* (1925).

(E. B. O.; J. P. D.)

BOXING IN AMERICA

Boxing, pugilism, prize fighting and ruffianism were synonymous in the public mind from the earliest days of prize fighting in the United States down to World War I, when boxing was prescribed as a means of quickly fitting untrained men for action at the front. Boxing up to this time had a most dreadful inheritance in the way of reputation, due to the practices of the persons connected with prize fighting in its early stages in America, and to the type of men who took active part in these prize fights. As a rule, they were, both fighters and associates, sinister people with few scruples, vulgar and brutal to a marked degree. The populace realized this and branded as outcasts all persons who were in any way connected with this "sport." Almost every state in the union passed laws prohibiting prize fights. Occasionally, however, in spite of the laws, important contests would be held secretly in out of the way places. But they usually were terminated by the police, who would get the information that such a fight was being held and after stopping the match would place the principals under arrest. This kind of contest attracted few people, first because they were slow, uninteresting mauling affairs in which one man was trying to outlast his opponent, and, therefore, making few efforts to end matters for fear he would over-exert himself and be at the mercy of the other; and secondly the fear of being arrested, or possibly injured, in the free-for-all that usually accompanied the termina-

tion of these, made attendance at them quite a risky matter. The possibilities of arrest or injury naturally kept the self-respecting and prudent people away.

Despite the old laws prohibiting fighting having been modified, and new laws called Boxing laws permitting boxing contests in certain states, boxing was still regarded as an outlaw "sport" and a brutalizing and degrading form of amusement, until the government, in 1917, through its directors of training camp activities, adopted it as an important means for quickly fitting untrained men for rigorous soldier-life. It was then that modern boxing was brought to the attention of its greatest calumniators, viz., the ministers of the gospel, religious and lay woman organizations and societies and those who did not know the difference between brutal prize fighting and legalized, regulated, modern boxing. This was the moment of rebirth for boxing. The interest in boxing has grown rapidly and steadily ever since. As a sport for young boys during their impressionable and developing years, there is no equal to it; it develops self-reliance, self-control, self-confidence, individual and quick thinking, physical courage and sportsmanship. There is no other game or sport that can boast of these attributes.

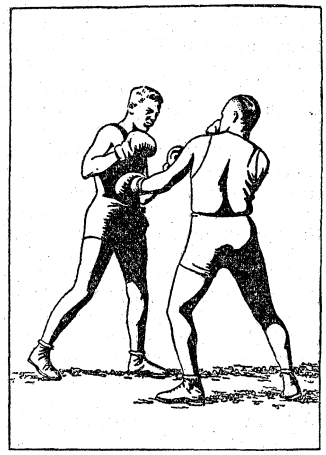


FIG. 9.—LEFT HAND PUNCH OF THE NAVY DOUBLE PUNCH
By a series of feints draw the opponent in and deliver a punch with the right to his face. As he raises his guard, strike to the body with the left hand

That fighting or boxing has an appeal to the elemental and primitive in man, boxing's most loyal supporters cannot deny. There is something terrifically fascinating about it to both man and woman. Its grip on man is probably due to his fundamental urge—self-preservation. In boxing contests the spectators' imagination sees a test for physical supremacy, a struggle to preserve oneself; and for the right to live. There is no other source of amusement or entertainment, sport or game, that contains quite as much real drama as can be found in a contest between two evenly matched, well-trained boxers.

After World War I, as boxing gained the recognition and interest of the general public, and those who took it up as a profession, just as a young man does law or medicine, were no longer looked upon as pariahs, many serious-minded and ambitious young men adopted it as a means of livelihood and profession. This brought an altogether new element into the sport, a thinking element; men who believed mental preparedness as important as physical preparedness; men who studied their game just as a surgeon does his anatomy. Naturally, this made for a marked increase in the knowledge of the "science" and raised the standard of the boxer proportionately, so that boxing methods must have improved just as sprinting and other athletic performances have bettered all records during the past decade. We have advanced in every other branch of athletic endeavour, so it seems only logical to assume that boxing has kept pace with the progress of its sister sports. Styles in boxing have varied and changed considerably. New methods of attack and defense have been introduced and improved upon. Footwork takes an important place in the repertoire of the modern boxer. The Classic style; *i.e.*, the upright stance, with the left hand and left foot extended, and the right arm crooked across the chest ready to parry an opponent's lead to the head or body, still obtains and doubtless always will, since it is a basic principle. But, it has been found more efficient to learn to avoid leads by either slipping the head to one side or the other, depending on how you expect to counter, or, by ducking, pulling away or slipping inside the lead. This gives a boxer the free use of his two hands for hitting, being a great improvement over the older style of using one or both arms to parry, which effectually warded off the blows, but by doing so prevented the use of the hands to counter. It has been discovered it is tremendously more effective to use the hands to strike the opponent than to keep them busy parrying and blocking blows, so now we have the "bobbing and weaving" style of attack with the hands poised in a hitting position ready to strike out at the first opening as the advance toward the opponent is made. Jack Dempsey, heavyweight champion 1919–26, has been the greatest exponent of this style up to date. Benny Leonard, lightweight champion 1916–25, and Gene (James J.) Tunney, heavyweight champion 1926–28, were two of the greatest exponents of the splendid combination of rhythmic footwork and hard, accurate, straight hitting. Jack Britton, welterweight champion 1919–22, though lacking a heavy blow, was, undoubtedly, the greatest exponent of pure boxing skill of his time. The four men mentioned were the outstanding boxing figures of their time, and while their "styles" differed somewhat outwardly, basically they were the same, in that they learned to avoid blows by slipping and ducking the head so that they would at all times have the free use of both hands. This factor is, undoubtedly, the mainspring in the improvement of the modern boxer.

Mental fitness has as much to do with success as has physical. This is true not only in boxing but in every endeavour of life. The modern boxer realizes that unless he is mentally equipped his chances for success are very slim. He therefore cuts himself free from all other business interests, believing he cannot have diversified interests and find success as a professional boxer. Boxing being a highly specialized sport, none can remain successfully in it unless he becomes a specialist. All successful boxers have done this, and it is not until they acquire money and make investments, in which they are compelled to take an active interest, that they meet reverses in the ring. This has been the case in four out of every five of the great champions, and goes to prove the point in question. Freedom from all outside interest, and worry of every nature; with a complete knowledge of the "science" of the game; a quick, active brain, with perfect co-ordination; and sound physical condition are necessary qualifications for a successful boxer of to-day. (G. T.; J. P. D.)

Modern World Heavyweight Champions

1889–92	John L. Sullivan	1930–32	Max Schmeling (Germany)
1892–97	James J. Corbett	1932–33	Jack Sharkey
1897–99	Robert Fitzsimmons	1933–34	Primo Carnera (Italy)
1899–1905	James J. Jeffries (retired)	1934–35	Max Baer
1906–08	Tommy Burns	1935–37	James J. Braddock
1908–15	Jack Johnson	1937–	Joe Louis (Enlisted in U.S. army in 1942, undefeated.)
1915–19	Jess Willard		
1919–26	Jack Dempsey		
1926–28	Gene Tunney (retired)		

BOXING DAY, the name given in Great Britain to the day after Christmas Day, on which Christmas "boxes," or presents, are given to errand boys, postmen, etc. It is a bank holiday (*q.v.*).

BOXMAKING. One of the most important changes in manufacturing and marketing that has taken place within recent years has been the change from bulk goods to packed goods. Consumers have come to know by manufacturers' brands such commodities as tea, coffee, ice-cream, confectionery, cereals, toilet articles, pillow cases, safety razors, medical preparations, rubber goods, fountain pens, pencils, electrical appliances, sporting goods, silverware, stationery, tools—to indicate only a few distinct lines of merchandise.

Consequently, one of the first problems considered in marketing a new product is how it is to be packed. Many manufacturers by packaging their goods are able to trade-mark products that could not otherwise be identified. Thus standard articles and everyday necessities are distinguishable from competitive ones. Products that were formerly just beef suet, tooth paste or silk stockings have become things with well-advertised trade names.

The demand for attractive paper boxes is constantly increasing. Manufacturers and retailers everywhere realize that pretty boxes are a powerful factor in selling merchandise. Sales prove it. Some hold that the paper box is responsible for 50% of the sales of merchandise over the counter. There was a time when a box was merely a container—a receptacle for a certain product, and nothing else. But since manufacturers discovered not only the hygienic appeal of the sealed box, but the value of the surface of the container, all that has been changed. Now, it would be difficult to discover any kind of seasonable gift that is not boxed—and artistically boxed—before it is offered for sale. It is, however, not yet generally appreciated that the paper box can give display value and package protection for one cost.

The modern boxmaker must not only be able to make boxes; he must possess creative talents, selling ability and business experience. He must understand art work, colour scheme, designing, engraving and printing—all of which have a material effect upon the success of both his and his customer's business. It is always possible for the creative boxmaker to design a package suitable for a particular product, with proper consideration for the relationship between cost of package and price of merchandise.

Some of the methods used by manufacturers in obtaining attractive boxes make use of: (1) elaborate art work; (2) embossed effects; (3) many colours; (4) luminous or phosphorescent paints; (5) metallic coated papers, made in gold, silver, aluminium and other shades. Often a clever selection of paper alone has been the means of securing a contract for a boxmaker, and an infinite variety of tinted effects can be obtained in many grades of paper for the various types of boxes which are now manufactured.

The tendency towards specializing is becoming more and more

pronounced in the paper box industry. There has been a tremendous increase in the use of window and store display material, and among the various kinds of paper board products manufactured are window and counter displays, cut-outs, mammoth sizes of cartons, and advertising novelties of every conceivable size, shape and variety. Cartons form an important branch of paper box manufacture. Comparatively inexpensive, suitably designed cartons serve the purpose of protecting their contents from dust, moisture and germs, and they can be made as effective as the ingenuity of the box maker and the artistic appreciation of his client will allow.

Manufacturing Boxes.—Operating a paper box factory has, in the course of experience developed methods and improvements common to all up-to-date plants.

Scoring or bending the cut boards is the next operation, and then, if required, piecing together the box body. Corner cutting follows, and thereafter corner staying to make the box rigid.

Banding or covering the box is an operation which requires careful preliminary planning. Perhaps the greatest cause of irritation in the banding department is delay in having the work ready for the girls. This matter depends largely upon good planning, and involves practically all the male operatives. The cutting and scoring control the situation, but the corner cutting and corner staying sections have to work in regular order and sequence or delay in the banding department is the result.

It is not generally realized that lacing can be done at a very high speed in one stroke on an ordinary banding machine. The usual method of fenting and lacing is by hand (for hinged lids) by use of the gluing tray or board and brush. The up-to-date method, however, is by the ordinary banding machine and a small attachment which conveys the calico and lace from the reel. It is interesting to note that the output by glue, board and brush, is about 30 gross per week of 48 hours, while the output by the banding machine method is about 115 gross per week of 48 hours, for one adult and one helper.

By means of a simple attachment to the banding machine, it is possible to band rims with covering paper, and also to affix a gluing strip in one operation. The rim is secured to the box after leaving block on banding machine, by the helper in attendance. In this way rims can be secured at the rate of 12 to 13 gross per day of $8\frac{3}{4}$ hours.

For a hinged lid type of box, a back and strengthening strip are required. The lid goes through the same operations as the box, with the exception of piecing. In the finish of the box, the container itself, after banding, requires a bottom, and the lid requires a plain top or printed label.

Fancy boxes, which include folding boxes of novel shapes, require special treatment. One of the most popular containers recently introduced is a transparent box of celluloid which enables the buyer to see at a glance exactly what he is buying. The bottom of the box is made of thin, strong cardboard, and this adds considerably to the strength of the container.

Improvements in folding-box manufacture progressed from 1868 to 1882, when the principles of cutting and creasing folding boxes which still obtain were discovered. These consist of an arrangement of cutting and creasing blades so combined in a die that the contour of the folding-box blank, with its locks and other peculiarities, is sharply cut out by the former and its pliable bents are formed by the latter. These blades are held firmly in position by straight or accurately scrolled wooden blocks conforming to the dimensions of the folding box and its outline. A modern cutting and creasing press operates with velocity and accuracy. Its steel cylinder, which carries the box board over the die form, is made ready to permit the sharp blades to penetrate the board, at the same time giving a counter die reception to the dull creasing blades which form the bents. The cut and creased box-board sheet is held together by minute necks joining the blanks, and the whole is expelled from the slight recess of the dies by the numerous rubber crowns that prevail over its surface. The folding-box blanks are separated by hand and dexterously relieved of waste particles. The final gluing process is accomplished on high speed machines at the rate of from 100,000 to 500,000 in nine hours.

The newest German process for making transparent windows or inspection openings in paper and cardboard boxes with the aid of gelatine is characterized by the fact that in a single working process one or more such apertures can be gelatined together with the piece of work itself.

Employment and Wages.—Some of the finest fancy boxes are produced in France, but no country holds a monopoly in this respect. America is the land of the carton. After thorough investigation by health departments all over the United States, rulings have been passed that many eatables must be packed in individual containers to prevent unnecessary fingering and contamination by unclean hands. These regulations have given a tremendous impetus to the carton industry. Nineteen American universities teach the use of paper boxes as part of the science of marketing, and more than 57,000 wage earners in that country are engaged in manufacturing boxes.

According to data collected at the biennial census of manufactures taken in 1926, the establishments engaged primarily in the manufacture of paper boxes and of decorated and fancy covered metal boxes in the United States, reported for 1925 a total production valued at $281,943,969, an increase of 6·7% as compared with $264,209,159 for 1923, the last preceding census year.

An approximate estimate of the number of workpeople employed in the paper box trade in Great Britain based upon an examination of the figures of the 1921 census in comparison with the estimated number of persons insured under the Unemployment Insurance acts suggests that the number of workpeople employed in this trade as defined for trade board purposes in Great Britain is about 31,500, of whom 3,500 are males and 28,000 females. The classifications in the various returns upon which this estimate is based do not, however, coincide precisely with the trade board definition of the paper box trade, and the figure must be regarded as no more than a rough approximation.

The selling value of the production of boxes of paper and cardboard in 1924 was £5,351,000. Boxes and cartons of paper and cardboard exported from Great Britain in the year 1924 amounted in value to £217,000, or about 4% of the value at the works of the ascertained production of such boxes, and the value of the net imports was £61,000. The net output of the factories and workshops to which the above statement applied amounted to £2,972,000, that sum representing the amount by which the total value of the output (£5,482,000) exceeded the cost of the materials purchased and used (£2,486,000) and the value of work given out (£24,000).

Minimum rates of wages have been fixed by the paper box trade board (Great Britain) and are dependent upon the "Cost of living" index figures. (B. W. B.)

BOXWOOD, the wood obtained from the genus *Buxus,* the principal species being the well-known tree or shrub, *B. sempervirens,* the common box, in general use for borders of garden walks, ornamental parterres, etc. Even more important in gardens is the dwarf variety *suffruticosa,* which does not too rapidly overgrow the proportions of the parterre. The cold-hardier *B. microphylla koreana* is used in northern gardens. The other source of the ordinary boxwood of commerce is *B. balearica,* which yields the variety known as Turkey boxwood. The common box is grown throughout Great Britain (perhaps native in the chalk-hills of the south of England), in the southern part of the European continent generally, and extends through Persia into India, where it is found growing on the slopes of the western Himalayas. Only a very small proportion of the wood suitable for industrial uses is now obtained in Great Britain. The box is a very slow-growing plant, adding not more than $1\frac{1}{2}$ or 2in. to its diameter in 20 years, and on an average attaining only a height of 16ft. with a mean diameter of $10\frac{1}{2}$ inches. The leaves of this species are small, oval, leathery in texture, and of a deep glossy green colour. *B. balearica* is a tree of considerable size, attaining to a height of 80ft., with leaves three times as large as those of the common box. It is a native of the islands of the Mediterranean, and grows in Turkey, Asia Minor, and around the shores of the Black Sea. The wood of both species possesses a delicate yellow colour;

it is very dense in structure and has a fine uniform grain, which has given it unique value for the purposes of the wood-engraver. A large amount is used in the manufacture of measuring rules, various mathematical instruments, flutes and other musical instruments, for turning, for inlaying, and for small carvings. The use of boxwood for turnery and musical instruments is mentioned by Pliny, Virgil and Ovid.

BOYACÁ, an inland department of Colombia, with an area of 24,934 sq.mi., including the Casanare territory. Pop. in 1938 737,368. The department is very mountainous, heavily forested and rich in minerals. The great Muso emerald mines are situated in the western part of Boyacá. The capital, Tunja (pop. in 1938, 16,597), is situated in the Eastern Cordilleras, 9,054 ft. above sea-level, and has a cool, temperate climate, though only $5\frac{1}{2}°$ N. of the equator. It was an important place in colonial times, and occupies the site of one of the Indian towns of this region (Hunsa) which had acquired a considerable degree of civilization before the discovery of America. Other towns of note in the department are Chiquinquira (6,998), Moniquira (2,419), Sogamoso (5,216), and Boyacá (360), where on Aug. 7, 1819, Bolívar defeated the Spanish army and secured the independence of New Granada.

BOYAR, a dignity of Old Russia conterminous with the history of the country (Russ. *boyarin,* plur. *boyare*). Originally the boyars were the intimate friends and confidential advisers of the Russian prince, the superior members of his *druzhina* or bodyguard, his comrades and champions. They were divided into classes according to rank, generally determined by personal merit and service. At a later day the boyars were the chief members of the prince's *duma,* or council. Their further designation of *luchshie lyudi* or "the best people" proves that they were generally richer than their fellow subjects; and from the 11th century the *druzhina* asserts the privileges of an exclusively military caste with a primary claim upon the land.

Still later, when the courts of the northern grand dukes were established, the boyars appear as the first grade of a full-blown court aristocracy with the exclusive privilege of possessing land and serfs. Hence their title of *dvoryane* (courtiers), first used in the 12th century. On the other hand there was no distinction, as in Germany, between the *Dienst Adel* (nobility of service) and the simple *Adel.* The Russian boyardom had no corporate or class privileges (1) because their importance was purely local (the dignity of the principality determining the degree of dignity of the boyars); (2) because of their inalienable right of transmigration from one prince to another at will, which prevented the formation of a settled aristocracy; and (3) because birth did not determine but only facilitated the attainment of high rank; *e.g.,* the son of a boyar was not a boyar born, but could more easily attain to boyardom, if of superior personal merit. It was reserved for Peter the Great to transform the *boyarstvo* or boyardom into something more nearly resembling the aristocracy of the West.

See Alexander Markevich, *The History of Rank-priority in the Realm of Muscovy in the 15th–18th Centuries* (Russ.) (Odessa, 1888); V. Klyuchevsky, *The Boyar Duma of Ancient Russia* (Russ.) (Moscow, 1888). (R. N. B.)

BOY-BISHOP, the name given to the "bishop of the boys" (*episcopus puerorum* or *innocentium*), who, according to a custom very wide-spread in the Middle Ages, was chosen in connection with the festival of Holy Innocents (*see* FOOLS, FEAST OF). In England the boy-bishop was elected Dec. 6, the feast of St. Nicholas, the patron of children, and his authority lasted till Holy Innocents' day (Dec. 28). The election made, the lad was dressed in full bishop's robes with mitre and crozier and, attended by comrades dressed as priests, made a circuit of the town blessing the people. The boy and his colleagues took possession of the cathedral and performed all the ceremonies and offices except mass. Originally confined to the cathedrals, the custom spread to nearly all the parishes. Several ecclesiastical councils had attempted to abolish or to restrain the abuses of the custom, before it was prohibited by the council of Basle in 1431. It was, however, too popular to be easily suppressed. In England it was abolished by Henry VIII. in 1542, revived by Mary in 1552 and finally abolished by Elizabeth. It survived in Germany, in the so-called *Gregoriusfest,* in honour of St. Gregory, the patron of schools, at which a schoolboy was elected bishop. At Meiningen this custom survived till 1799.

See Brand, *Pop. Antiquities of Great Britain* (1905); Gasquet, *Parish Life in Medieval England* (1906); Du Cange, *Glossarium* (1884), s.v. "Episcopus puerorum."

BOYCE, WILLIAM (1710–1779), English musical composer, the son of a cabinet-maker, was born in London, on Feb. 7, 1710. As a chorister in St. Paul's he received his early musical education from Charles King and Dr. Maurice Greene. In 1734, having become organist of Oxford chapel, Vere street, Cavendish square, he set Lord Lansdowne's masque of *Peleus and Thetis* to music. In 1736 he left Oxford chapel and was appointed organist of St. Michael's church, Cornhill, and in the same year he became composer to the Chapel Royal, and wrote the music for John Lockman's oratorio *David's Lamentation over Saul and Jonathan.* In 1737 he was appointed to conduct the meetings of the three choirs of Gloucester, Worcester and Hereford. In 1743 was written the serenata *Solomon,* in which occurs the favourite song "Softly rise, O southern breeze." His next published work was the *Twelve Sonatas for two Violins, with a bass,* which long remained popular, and in 1745 he began to issue his *Lyra Britannica,* ultimately extended to 6 vols., containing his songs and cantatas. In 1749 he received the degree of doctor of music from the University of Cambridge, and in this year he became organist of the churches of All-Hallows the Great and Less, Thames street. In 1750 he wrote songs for Dryden's *Secular Masque* and in 1751 he set a piece (*The Shepherd's Lottery*) by Mendez. He became master of the king's band in succession to Greene in 1757, composing each year the music to the new year and birthday odes provided by the poet laureate, and in 1758 he was appointed principal organist to the Chapel Royal. As an ecclesiastical composer Boyce ranks among the best representatives of the English school. His two church services and his anthems, of which the best specimens are *By the Waters of Babylon* and *O, Where shall Wisdom be found,* are frequently performed. He wrote additional accompaniments and choruses for Purcell's *Te Deum* and *Jubilate.* He resigned most of his work before 1770, and spent his last years in collecting and editing the material for his *Cathedral Music* of which the first volume had appeared in 1760. This work, the third and last volume of which appeared in 1778, was projected by Boyce's predecessor as master of the king's band, Dr. Greene; its sub-title, "a collection in score of the most valuable and useful compositions for that service by the several English masters of the last 200 years," explains its scope. A new edition, by Joseph Warren, appeared in 1849. Boyce died on Feb. 7, 1779, and was buried under the dome of St. Paul's cathedral. Two volumes of his anthems and services were printed after his death under the supervision of his wife (1780) and of Dr. P. Hayes (1790).

BOYCE THOMPSON INSTITUTE FOR PLANT RESEARCH, INC., of Yonkers, N.Y., was founded and endowed by Col. William Boyce Thompson of Yonkers. The institute was formally opened on Sept. 24, 1924. It is incorporated under the membership corporation law of the State of New York as a non-profit sharing institution. It is a foundation for research on plants. It has laboratories, greenhouses and lands valued at $1,500,000, and an endowment of $8,500,000. The scientific staff numbers 35 with a total staff of 92 workers. The greenhouses and other growing chambers give accurate control of growth conditions for plants, including light (quality, daily duration and intensity), humidity, temperature and carbon dioxide concentration of the air. This apparatus is on sufficiently large scale to permit plants to be grown to maturity in large numbers. Special attention is given to adequate equipment so that researches may be carried forward with facility and accuracy. The laboratories are adequately equipped for researches in physiology, pathology, morphology and anatomy, biochemistry, microchemistry, physical chemistry, entomology, organic chemistry and plant breeding. While the laboratories are equipped and manned on the basis of techniques, the problems are generally attacked as projects, focusing all techniques on them necessary for their solution, even adding new lines of technique for particular problems when needed. The institute has sufficient

land available for field plots so that laboratory findings can be tested out on a field basis. It is also developing an arboretum of 265 acres. This gives adequate opportunity for the study of problems on forest and ornamental plants, including propagation, diseases, insect pests, soil adaptation and hardiness.

The institute has held the view that research on plants should contribute alike to science and to practice and that real progress in either requires a fundamental attack. During the 19 years of operation, the institute has become world-famous for its researches in certain phases of plant science. Among these are: chemicals for forcing dormant plant organs and the effect of such chemicals upon plant metabolism; germination and storage of seeds, especially those offering difficulties in practical fields such as conservation, forestry, horticulture and seed trade; plant hormones and other chemicals that regulate plant development, movement and metabolism; virus and yellows diseases of plants; and synthesis of cellulose by plant cells and structure of primary cell walls. (W. Cro.)

BOYCOTT, the refusal and incitement to refusal to have commercial or social dealings with any one on whom it is wished to bring pressure. As merely a form of "sending to Coventry" or (in Gladstone's phrase) "exclusive dealing," boycotting may be legally unassailable, and as such has been justified by its original political inventors. But in practice it has usually taken the form of what is undoubtedly an illegal conspiracy to injure the person, property, or business of another by unwarrantably putting pressure on all and sundry to withdraw from him their social or business intercourse. The word was first used in Ireland, and was derived from the name of Captain Charles Cunningham Boycott (1832–97), agent for the estates of the Earl of Erne in County Mayo. For refusing in 1880 to receive rents at figures fixed by the tenants, Captain Boycott's life was threatened, his servants were compelled to leave him, his fences torn down, his letters intercepted and his food supplies interfered with. It took a force of 900 soldiers to protect the Ulster Orangemen who succeeded finally in getting in his crops. Boycotting was an essential part of the Irish Nationalist "Plan of Campaign," and was dealt with under the Crimes act of 1887. The term soon came into common use, and was speedily adopted into many foreign languages.

BOYD, ANDREW KENNEDY HUTCHISON (1825–1899), Scottish author and divine, was born in Auchinleck manse, Ayrshire, on Nov. 3, 1825, and died at Bournemouth on March 1, 1899. He studied at King's college, London, and at the Middle Temple, but returning to Scotland entered Glasgow university and there qualified for the Scottish ministry. He served in succession the parishes of Newton-on-Ayr, Kirkpatrick-Irongray near Dumfries, St. Bernard's, Edinburgh, and finally, in 1865, became minister of the first charge at St. Andrews. Here he advocated an improved ritual in the Scottish Church, his action resulting in the appointment by the general assembly of a committee, with Boyd as convener, to prepare a new hymnal. In 1890 he was appointed moderator of the general assembly. He wrote *Recreations of a Country Parson* (1859, 1861 and 1878), and *Graver Thoughts of a Country Parson* (1862–65 and 1875); *Twenty-five Years at St. Andrews* (1892), and *St. Andrews and Elsewhere* (1894). He was known to the public as a writer by his initials "A. K. H. B."

BOYD, ROBERT BOYD, Lord (d. *c.* 1470), Scottish statesman, was a son of Sir Thomas Boyd (d. 1439) and belonged to an old and distinguished family, one member of which, Sir Robert Boyd, had fought with Wallace and Robert Bruce. Boyd, who was created a peer about 1454, was one of the regents of Scotland during the minority of James III., but in 1466 he secured the person of the young king and was appointed his sole governor, and in 1467 he obtained the offices of chamberlain and justiciary for himself and the hand of the king's sister Mary, with the title of earl of Arran, for his eldest son Thomas. In 1469 he arranged the marriage between James III. and Margaret, daughter of Christian I., king of Denmark and Norway, and secured the cession of the Orkney Islands by Norway. But Boyd's enemies were now growing too strong for him, and he was found guilty of treason and sentenced to death in the same year. He escaped to England, and the date of his death is unknown.

Boyd, Robert, 4th Lord (d. 1590), took a prominent part in Scottish politics during the troubled time which followed the death of James V. in 1542. At first he favoured the reformed religion, but was afterwards a trusted adviser of Mary, queen of Scots, whom he accompanied to the battle of Langside in 1568. During the queen's captivity he was often employed on diplomatic errands, and was suspected of participation in the murder of the regent Moray. In great favour under the regent James Douglas, earl of Morton, he was banished in 1583 for his share in the Raid of Ruthven, a plot to seize James VI. He retired to France, but was soon allowed to return to Scotland. He died on Jan. 3 1590.

Boyd, William, 4th Earl of Kilmarnock (1704–46), joined Charles Edward, the Young Pretender, in 1745, and fought at Falkirk and Culloden, where he was made prisoner, and was beheaded on Aug. 18, 1746. The title of earl of Kilmarnock is now merged in that of earl of Eroll.

BOYD, ZACHARY (1585?–1653), Scottish divine, was educated at the universities of Glasgow and St. Andrews. For many years a teacher in the Protestant college of Saumur in France, he returned to Scotland in 1621, to escape the Huguenot persecution. In 1623 he was appointed minister of the Barony church in Glasgow, and he was rector of the university in 1634, 1635 and 1645. He bequeathed £20,000 Scots, to the university, besides his library and 12 volumes of mss. In later years he was a staunch Covenanter. His best known works are *The Last Battel of the Soul in Death* (1629), reprinted with a biography by G. Neil (Glasgow, 1831); *Zion's Flowers*—often called "Boyd's Bible" (1644); *Four Letters of Comfort* (1640, reprinted, Edinburgh, 1878).

BOYDELL, JOHN (1719–1804), English engraver, print publisher and lord mayor of London, was born at Dorrington. At the age of 21 he came to London and was apprenticed for seven years to an engraver. In 1746 he published a volume of views in England and Wales and started in business as a print-seller. He was sheriff in 1785, and in 1796 became lord mayor of London. In 1786 he published, by subscription, a series of prints illustrating Shakespeare's plays. The pictures from which these were made were commissioned from the most famous artists of the day, and were exhibited in Boydell's own gallery in Pall Mall. In 1802, the year of the production of Boydell's *Shakespeare,* the gallery contained 102 pictures, including canvases by Reynolds, Romney, Opie, Barry, Fuseli; Angelica Kaufmann, Stothard and others. Towards the close of his life Boydell sustained severe losses and was compelled to dispose of his Shakespeare gallery by lottery. (*See* also Fuseli, Henry.)

BOYER, ALEXIS (1757–1833), French surgeon, was born March 1, 1757, at Uzerches (Corrèze). The son of a tailor, he obtained his first medical knowledge in the shop of a barber-surgeon, and became professor of surgery at the École de Santé. In 1805 Napoleon nominated him imperial family surgeon, and, after the campaigns of 1806–07, conferred on him the Legion of Honour, with the title of baron of the empire and a salary of 25,000 francs. He was consulting surgeon to Louis XVIII., Charles X., and Louis Philippe. In 1825 he succeeded J. F. L. Deschamps (1740–1824) as surgeon-in-chief to the Hôpital de la Charité. He died in Paris on Nov. 23, 1833. Perhaps no French surgeon of his time thought or wrote with greater clearness and good sense than Boyer. His two great works are: *Traité complet de l'anatomie* (in 4 vols., 1797–99; 4th ed. 1815), and *Traité des maladies chirurgicales et des opérations qui leur conviennent* (in 11 vols., 1814–1826; a new ed. 7 vols. 1844–53, with additions by his son, Philippe Boyer).

BOYER, JEAN PIERRE (1776–1850), president of the republic of Haiti, a mulatto, was born at Port-au-Prince on Feb. 28, 1776. He received a good education in France, in 1792 entered the Haitian army, by 1794 was in command of a battalion, and during the British invasion (1794–98) distinguished himself under Rigaud. Forced by the intrigues of Toussaint l'Ouverture (*q.v.*) to flee to France, he returned to Haiti in 1802, as a member of Leclerc's punitive expedition, but on the attempt of the French to re-establish slavery, he joined the native resistance and was

instrumental in expelling the French from the island. When the republican government, formed by Dessalines, leader of the blacks, proved indescribably corrupt and cruel, Boyer united with Alexandre Pétion and Henri Christophe to accomplish its overthrow (1806). By a coup d'état Christophe set himself up as king in most of the conquered territory; Pétion, in a small section in the south, founded the republic of Haiti. Boyer supported Pétion, as his commandant repulsed Christophe's repeated assaults, and on Pétion's death in 1818, was acclaimed president of the republic for life. In 1820 he took advantage of the death of Christophe, and in 1822 of the weakness of the Spaniards (in Santo Domingo), to extend his sovereignty over practically the whole island. Having emancipated the slaves, he gave his attention to remedying the deplorable state of public security and national finance. In 1825, in return for an indemnity of 150,000,000 francs—reduced in 1838 to 60,000,000—he obtained France's recognition of Haitian independence; in 1826, England acknowledged his Government, and after her, several small nations. He encouraged the arts and sciences, and sponsored agriculture, but his rule was not popular. It was arbitrary; there was little economic improvement, and much discontent over the debt to France. In 1843 a widespread revolution compelled his resignation. He fled to Jamaica, and then to Paris, where, on July 9, 1850, he died.

See Walez, *Précis historique des négociations entre la France et Saint-Domingue, avec une notice biographique sur le général Boyer* (Paris, 1826).

BOYLE, JOHN J. (1851–1917), American sculptor, was born in New York city. He studied in the Pennsylvania Academy of Fine Arts, Philadelphia, and in the École des Beaux Arts, Paris. He was particularly successful in the portrayal of Indians. Among his principal works are: "Stone Age," Fairmount park, Philadelphia; "The Alarm," Lincoln park, Chicago; and a third study in primitive culture, the two groups, "The Savage Age" at the Pan-American exposition of 1901. His work also includes the seated "Franklin" in Philadelphia; and "Bacon" and "Plato," in the Congressional library, Washington, D.C. He died on Feb. 10, 1917, in his native city.

BOYLE, ROBERT (1627–91), English natural philosopher, seventh son and 14th child of Richard Boyle, the great earl of Cork, was born at Lismore castle, Ireland, Jan. 25 1627. While still a child he learned to speak Latin and French, and he was only eight years old when he was sent to Eton. In 1638 he went to travel abroad with a French tutor. Visiting Italy in 1641, he remained during the winter of that year in Florence, studying the "paradoxes of the great star-gazer" Galileo. On returning to England in 1644 Boyle gave up his life to study and scientific research, and soon took a prominent place in the band of inquirers, known as the "Invisible College," who devoted themselves to the cultivation of the "new philosophy." They met often in London, at Gresham college; some of the members also had meetings at Oxford, and in that city Boyle went to reside in 1654. Reading in 1657 of Otto von Guericke's air-pump, he set himself with the assistance of Robert Hooke to devise improvements in its construction, and with the result, the "machina Boyleana" or "pneumatical engine," finished in 1659, he began a series of experiments on the properties of air. An account of the work was published in 1660 as *New Experiments Physico-Mechanical touching the spring of air and its effects.*

Among the critics of the views put forward in this book was a Jesuit, Franciscus Linus (1595–1675), and it was while answering his objections that Boyle enunciated the law that the volume of a gas varies inversely as the pressure, which among English-speaking peoples is usually called after his name, though on the continent of Europe it is attributed to E. Mariotte, who did not publish it till 1676. In 1663 the "Invisible College" became the "Royal Society of London for improving natural knowledge," and the charter of incorporation granted by Charles II. named Boyle a member of the council. In 1680 he was elected president of the society, but declined the honour from a scruple about oaths. In 1668 he moved to London, where he died on Dec. 30, 1691.

Boyle's great merit as a scientific investigator is that he carried out the principles which Bacon preached in the *Novum Organum.* Yet he would not avow himself a follower of Bacon or indeed of any other teacher. He himself performed experiments in the hope of effecting the transmutation of metals, and he was instrumental in obtaining the repeal, in 1689, of the statute of Henry IV. against multiplying gold and silver. With all the important work he accomplished in physics—the enunciation of Boyle's law, the discovery of the part taken by air in the propagation of sound, and investigations on the expansive force of freezing water, on specific gravities and refractive powers, on crystals, on electricity, on colour, on hydrostatics, etc.—chemistry was his peculiar and favourite study. His first book on the subject was *The Sceptical Chemist,* published in 1661, in which he criticized the "experiments whereby vulgar Spagyrists are wont to endeavour to evince their Salt, Sulphur and Mercury to be the true Principles of Things." He advanced towards the view that matter was ultimately composed of "corpuscles" of various sorts and sizes capable of arranging themselves into groups, and that each group constituted a chemical substance. He distinguished between mixtures and compounds, and showed that a compound might have different qualities from those of its constituents. He studied the chemistry of combustion and of respiration, and made experiments in physiology, where, however, he was hampered by the "tenderness of his nature" which kept him from anatomical dissections.

Besides being a busy natural philosopher, Boyle was interested in theology, and in 1665 would have received the provostship of Eton, if he had taken orders. He learned Hebrew, Greek and Syriac in order to pursue his scriptural studies, and spent large sums on Biblical translations. By his will he founded the Boyle lectures, for proving the Christian religion against "notorious infidels, viz., atheists, theists, pagans, Jews and Mahommedans," with the proviso that controversies between Christians were not to be mentioned.

BIBLIOGRAPHY.—The following are the more important of his works in addition to the two already mentioned: *Considerations touching the Usefulness of Experimental Natural Philosophy* (1663), followed by a second part in 1671; *Experiments and Considerations upon Colours, with Observations on a Diamond that Shines in the Dark* (1663); *Hydrostatical Paradoxes* (1666), *Origin of Forms and Qualities according to the Corpuscular Philosophy* (1666), a continuation of his work on the spring of air (1669); *Experiments and Notes about the Mechanical Origin or Production of Particular Qualities,* including notes on electricity and magnetism (1676); *Memoirs for the Natural History of the Human Blood* (1684); *Short Memoirs for the Natural Experimental History of Mineral Waters* (1685); *Medicina Hydrostatica* (1690); and *Experimenta et Observationes Physicae* (1691). His other writings include *Occasional Reflections upon Several Subjects* (1665), which was ridiculed by Swift in *A Pious Meditation upon a Broomstick,* and by Butler in *An Occasional Reflection on Dr. Carlton's Feeling a Dog's Pulse at Gresham College; Excellence of Theology compared with Natural Philosophy* (1664); *Discourse of Things above Reason* (1681); *High Veneration Man owes to God* (1685); *A Free Inquiry into the vulgarly received Notion of Nature* (1686); and the *Christian Virtuoso* (1690). Several other works appeared after his death, among them *The General History of the Air designed and begun* (1692); a "collection of choice remedies," *Medicinal Experiments* (1692–98); and *A Free Discourse against Customary Swearing* (1695). An incomplete and unauthorized edition of Boyle's works was published at Geneva in 1677, but the first complete edition was that of Thomas Birch, with a life, published in 1744, in five folio volumes, a second edition appearing in 1772 in six volumes, quarto. Boyle bequeathed his natural history collections to the Royal Society, which also possesses a portrait of him by the German painter, Friedrich Kerseboom (1632–90). *See* F. Masson, *Robert Boyle, a Biography* (1914).

BOYLE, town, Co. Roscommon, Eire, on Great Southern railway, 106¼ mi. northwest by west from Dublin and 28 mi. south by east from Sligo. Pop. (1936) 2,093. It is situated on both banks of the Boyle, an affluent of the Shannon, between Loughs Gara and Key. Three bridges connect the two parts of the town. There is considerable trade in agricultural produce. To the north of the town stand the extensive ruins of a Cistercian abbey founded in 1161, including remains of a cruciform church, with a fine west front, and Norman and Transitional arcades with carving of beautiful detail. There is a large dolmen by the road towards Lough Gara. Boyle was incorporated by James I., and returned two members to the Irish parliament.

BOYLE'S LAW, a relation, discovered by Robert Boyle, between the pressure, p, and the volume, v, of a gas, viz., pv = constant, at constant temperature. (*See* THERMODYNAMICS.)

BOYLESVE, RENÉ (1867–1926), pen name of René Tardiveau, French novelist, who was born at La Haye-Descartes (Indre-et-Loire). He began his education at the Jesuit college of Poitiers, and passed from there to Tours. He completed his studies at the *faculté de lettres* of Paris, the *faculté de droit* and the school of political science. His output as a novelist was considerable, but he paid more attention to style and to the development of an agreeable descriptive talent than to characterization and psychology. His most important works are undoubtedly the novels dealing with provincial life, among which *Mademoiselle Cloque* (1899), *La Becquée* (1901), *L'Enfant à la Balustrade* (1903), *La Jeune Fille bien élevée* (1909) and its sequel, *Madeleine Jeune Femme,* may be specially noted. Two short psychological novels, *Mon Amour* (1908) and *Le Meilleur Ami* (1909), both in the purest French tradition, also deserve mention. The miscellaneous collections of stories (*La Marchande de Petits Pains pour les Canards,* 1913, *Le Bonheur à Cinq Sous,* 1917) are of less interest; but the fragments of a private diary, published after his death by Ch. Du Bos under the title of *Feuilles Tombées,* show critical and introspective gifts of the rarest kind. In his latter days Boylesve was markedly influenced by Marcel Proust, whose essential originality he had been among the first to recognize. He was elected to the Académie Française in 1919. He died on Jan. 15, 1926.

BOYNE, a river in Eire, rising in the Bog of Allen, near Carbury in Co. Kildare and flowing in a northeasterly direction past Trim and Navan to enter the Irish sea, 4 mi. below Drogheda. On July 1, 1690, there took place on its banks a battle between the armies of King William III and King James II. In June William assembled southwest of Belfast an army of 35,000 men of very heterogeneous composition, including English, Northern Irish, Dutch, French Huguenot and Danish units. As soon as his advance commenced, James, who was with some 25,000 Irish and French troops at Dundalk, fell back southwards, without fighting, behind the line of the Boyne and there stood for battle. William attacked early on July 1; for a time the Irish made a stout resistance, but were finally broken when William, who had personally led his left wing across the river by fords above Drogheda, launched his cavalry against their right and rear. The Jacobite defeat was complete; James abandoned his army and fled to France, thus sealing the fate of his cause not only in Ireland but in England as well, and leaving William to occupy Dublin and complete the reconquest of the country at his leisure. The losses at the Boyne were small and the battle was in itself of little tactical importance, but its strategical consequences were decisive of the war in Ireland and of the destiny of that country for the next 100 years, and through them Protestantism as the official religion of Great Britain was made secure. The battle is commemorated by an obelisk 2 mi. west of Drogheda, and is annually celebrated by Orangemen on July 12; the "new style" date, representing the "old style" July 1, is July 11, but July 12 was chosen, as this is the O.S. date of the battle of Aughrim (1691), and the two are celebrated together. (*See* GRAND ALLIANCE, WAR OF THE.)

BOY SCOUTS. The Boy Scouts movement was started in 1908 for the purpose of training boys in the essentials of good citizenship. It began in the British Isles, but today it is to be found in almost every civilized country. Its founder was Lord Baden-Powell, who afterwards became chief scout of the world.

Ideals and Method.—The aim of the movement is the promotion of good citizenship among the rising generation. The method adopted is that of active self-expression and the desire to learn on the part of the boy, rather than his passive reception of instruction. The scope is unlimited by class, creed, colour or political distinctions. The movement is nonmilitary, nonpolitical, nonclass and interdenominational. Honour is made the high ideal for the boys. The scout law, on which the movement hinges, and which is binding on every scout, was taken from the code of the knights.

Every boy on joining the movement makes a promise on his honour to do his best to do his duty to God and his country (or king), to help other people at all times, and to obey the scout law.

GREAT BRITAIN

Administration and Training.—The administration of the movement is decentralized, each county in Great Britain having at its head a county commissioner responsible to headquarters. Under him are district commissioners, local associations and scout troops. The troop, numbering from 20 to about 40 boys, is divided into patrols of 6 or 8, each under its own boy leader. The troop is purposely kept small in numbers in order that the scoutmaster may have personal knowledge of each of his boys and so develop the individual character.

The movement is subdivided into three groups:

1. Wolf cubs—juniors from 8 to 11.
2. Scouts, sea scouts and air scouts—from 11 to 17.
3. Rovers—*i.e.,* scouts of 17 years and over.

The principles underlying the training are identical for each group, but the details differ to suit the different stages of development.

The training is carried out generally under four main headings:

1. Character and intelligence.
2. Skill and handicraft.
3. Physical health and self-care.
4. The practice of service for others and for the state.

The activities and practices of scouting are framed to develop in (1), (2) and (3) the efficient individual and then to harness this individuality for the good of the community, *i.e.,* (4) citizenship. The training is carried out mainly through activities in the open air, and the attributes of frontiersmen, backwoodsmen and explorers are held up as examples for scouts to emulate. Military training is not employed, as being contrary to the ideals of peace and educationally wrong. Through an extensive system of badges for proficiency the boys are encouraged to develop their natural gifts, to become all-round handy men and to specialize in those subjects which are likely to help them afterwards in making a career. Through the daily "good turn" they are gradually led on to the practice of service for others and so to unselfish citizenship.



BY COURTESY OF THE BOY SCOUTS OF AMERICA

BOY SCOUT IN UNIFORM

Progress and Results.—From a trial experimental camp in 1907 the movement spread with remarkable rapidity to every part of the world. In 1908 the handbook, *Scouting for Boys,* was published in fortnightly parts. By 1910 the movement in the British empire numbered over 123,000 members and had been taken up in many foreign countries. In 1912 the aims and methods of the movement were inquired into by the privy council and a royal charter of incorporation was granted.

In the lifetime of the movement there have been two world wars. During World War I, 100,000 scouts served in his majesty's forces, and when hostilities again broke out in 1939 thousands of scouts once more joined the armed forces. During both wars scouts under serving age carried out work of national importance for the government departments and civil authorities. In World War I they were outstanding for their work as coast-watchers, 25,000 boys in all taking their turn at this important task. In World War II it was as messengers, first aiders, etc., for the civil defense authorities that scouts rendered particularly good service, and many of them were decorated by the king for gallantry in air raids.

In 1920 an international meeting, or jamboree, was held at Olympia, London, in which scouts of 26 nations took part. As a result of this meeting an international council was formed, with a bureau in London. A second international jamboree took place in 1924 at Copenhagen, Den., at which 33 nations were represented. The fundamental principles, the scout promise and law, are in every country identical with those of the parent movement,

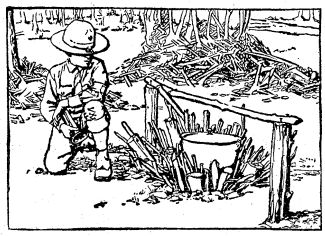
the details of training differing slightly here and there to suit climatic and temperamental differences.

The greater public schools of the United Kingdom have taken up scouting as a means of developing the spirit of service to the community among their boys. Incident to this it is interesting to see schoolmasters coming to the scout training centre in such numbers as to render it necessary to have special training camps for their benefit.

In many countries coming into civilization, such for instance as the Gold Coast, Nigeria, etc., scouting is being utilized with satisfactory results by the education authorities, and in Asiatic countries such as India, Siam and China, scouting has made equal strides with marked good effects on the youth.

The centre of training for officers at Gilwell park in Epping Forest has won for itself the interest of leading education authorities from many foreign as well as British countries. Twenty-five foreign countries have sent representatives to be trained there, as have an equal number of British oversea dominions and colonies. Thus in all parts of the world scouting is carried out under the same ideals and methods as originally promoted in England.

Fifty Nations.—President Calvin Coolidge, in an address given at Washington, D.C., in 1926 on the subject of the Boy Scouts, emphasized the fact that the movement has a unique power for fusing together in a common citizenhood, in one generation, the different foreign elements that go to make the U.S., which would otherwise take two or three generations of schooling and legislation.



BY COURTESY OF THE BOY SCOUTS OF AMERICA
A SCOUT LEARNING TO BUILD AND EXTINGUISH A FIRE

This power is also becoming evident in the wider sphere of bringing together the youth of the 50 nations which now practise scouting. These have an active membership of some 3,500,000 boys, besides many more millions in their populations of men who have passed through the training of scouts. They not only recognize the bond of brotherhood in theory but carry it into practice by a widespread system of interchange of visits and correspondence. These visits are carried out by small parties of boys visiting other countries to camp with their brother scouts there. The average number of scouts from the United Kingdom paying such visits annually has been about 5,000.

An international conference is held every two years, which is attended by the leaders of all the different countries, and this has been described as a veritable league (and not a mere parliament) of nations; every fourth year an international rally of contingents of boys from all countries is held in one country or another. Between these international rallies, or jamborees as they are called, international rover moots are held, different countries in turn acting as hosts.

Thus the rising generation is being brought into personal acquaintance and friendship. A systematic education in good will and co-operation is established in each country and is extended to international relationships by these means. It is hoped that this development, which is growing day by day, may tend materially to bring about the spirit essential to ensuring peace in the world—without which, as a foundation, suggestions for settlements by arbitration, etc., can only be futile.

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THE BOY SCOUTS OF AMERICA

The corporation of the Boy Scouts of America operates through the national council, consisting of 1,200 representatives from local councils and Scout leaders all over the United States. This operates through an executive board and various national committees. The president of the United States serves as honorary president. Local councils are chartered by the national council. Troops are composed of not more than 32 boys in charge of a scoutmaster, who must be an adult American citizen. There may be four patrols to each troop, in charge of a boy leader. Troops are chartered by the national council and are usually organized in connection with some kind of institution, such as a church or school.

Training of over 360,000 volunteer leaders to conduct scout work is effected through courses conducted not only by local Scout councils but in conjunction also with colleges, normal schools and theological seminaries. In 1939, 7,283 such courses for scouts were given, for which 85,419 certificates were awarded to those completing the work. The first rank is that of tenderfoot; next comes second class scout, while further progress entitles the boy to first class rank. First class scouts may qualify for merit badges in over 100 subjects of vocational, outdoor or educational interest, and may progress to Star, Life, and Eagle rank—the last mentioned requiring 21 merit badges and character and service requirements, being the highest rank. Palms are awarded Eagle scouts for further merit badges earned. The highest award in the Boy Scouts of America is the gold honour medal for saving life at the risk of the rescuer's own. Since 1911 the National Court of Honor has granted 2,208 awards for life saving. Scouts camp by patrols and troops the year around, and outdoor activities are the basis of the Scout program, including nature study, fire-building, outdoor cooking, tracking and trailing, signalling, as well as first aid.



BY COURTESY OF THE BOY SCOUTS OF AMERICA
LEARNING TO COOK, ONE OF THE DUTIES OF A SCOUT

There is a younger-boy program for boys nine to eleven years, who are known as "Cubs." A boy may become a Scout when he is twelve years old. At fifteen, a Scout becomes a Senior Scout and may follow a program of advanced camping, merit badge work, and special activities. Sea scouting and Explorer scouting are the two branches of Senior scouting. There is also Rovering for boys seventeen years of age and over. In rural communities, if there are not enough boys to form a troop, Neighborhood Patrols of from two to eight boys may be organized, or a boy may be a lone scout and carry on his scouting program by correspondence.

The purpose of the Boy Scout program is character-building and citizenship-training. To boys, however, scouting is a game, full of activities which appeal to boys. Since the Boy Scouts of America was first organized, more than 9,000,000 persons have had the benefit of Scout training. It was incorporated in 1910 and chartered by Congress in 1916. The Boy Scouts of America has an annual membership of more than 1,900,000. The Scout movement is organized in over 70 lands, and there is a world Scout membership of over 3,000,000. An International Scout Bureau, with headquarters in London, deals with the different Scout organizations, though having direct jurisdiction over none.



BY COURTESY OF THE BOY SCOUTS OF AMERICA
OUTDOOR COOKING; MAKING A PANCAKE

BIBLIOGRAPHY.—*Handbook for Boys* (1939); *Handbook for Scoutmasters; Adventuring for Senior Scouts; The Sea Scout Manual; Scouting for Rural Boys, Annual Report of the Boy Scouts of America* as submitted to Congress and published annually; *Constitution and By-Laws of the Boy Scouts of America; Boys' Life* (magazine); *Scouting* (magazine). (J. E. W.)

BOZDAR, a Baluch tribe in the mountains from the Sanghar pass to the Khetran country. They are also to be found in Zhob, Thal-Chotiali, Las Bela and in the Punjab. They are graziers, and the name Bozdar is probably derived from Buz, Persian name for goat. *See* Rose, *Tribes and Castes of the Punjab* (1912).

BOZEMAN, a city of southern Montana, U.S.A., 98 mi. E. by S. of Butte and 60 mi. N. of Yellowstone park, on federal highway 10, the main line of the Northern Pacific and a branch of the Chicago, Milwaukee, St. Paul and Pacific railway; the seat of Gallatin county. The population in 1940 was 8,665. It lies at an altitude of 4,773 ft., in the rich agricultural Gallatin valley, surrounded by the Bridger, Madison and Gallatin mountain ranges. Coal is mined in the vicinity. The city has large flour and cereal mills, creameries and pea canneries. It is the seat of Montana state college (established 1893), which has a campus and farm of 455 ac. and an annual enrolment of about 1,800, and with which is associated the Montana agricultural experiment station, the engineering experiment station, and the extension service in agriculture and home economics. A United States fish hatchery is situated a few miles away, at the mouth of the Bridger canyon. The city has a city-manager form of government.

The Gallatin valley was discovered by Lewis and Clark in 1806. The first permanent settlement was made in 1864 under the leadership of John M. Bozeman. James Bridger, whose name is perpetuated in a range, a peak, and a creek, was one of the famous guides, fur-traders, and scouts of the Rocky Mountain region from 1830 to 1870.

BOZRAH. (1) Capital of Edom. It has been identified with *El-Busaireh,* an undistinguished village in a pastoral area, southeast of the Dead sea. (2) A city denounced by Jeremiah, probably *Busra* (Lat. *Bostra*), a ruined town in the Hauran about 80m. S. of Damascus, once the most famous Roman fortress east of the Jordan. The circumference of its walled area was from 4 to 5 miles. As Bozrah appears to be identical with the Bossora of I. Macc. v. 26 the site was evidently pre-Nabataean. The existing town was beautified and extended by Trajan, took his name on its coins, dated a new era, the "Bostran," from its resurrection (A.D. 106) and became the capital of the province of Arabia. It developed rapidly in commercial prosperity and under Alexander Severus (222–235) became a Roman colony. From the time of the emperor Philip (244–249), himself a native of Bostra, it bore the title metropolis. In the period of the Constantines it was made the see of a bishop. In 636 it fell to the Arabs. The crusaders seized but could not retain it. The earthquakes of the 12th century and Turkish misrule were the chief contributors to its downfall. The site, which is practically uninhabited has extensive ruins of buildings dating from the Roman period. Temples, theatres, triumphal arches, aqueducts, reservoirs, churches, mosques, a citadel (13th century) are spread over the site. Jeremiah's Bozrah has also been identified with *Kusūr el-Bushair,* 2m. S.W. of Dibon, the Bezer of Deuteronomy iv. 43, and mentioned in the inscription of King Mesha of Moab.

See R. Dussaud, *Topographie historique de la Syrie* (1927) 346 *seq.,* bibl.

BRABANÇONS, mercenary fighters of mediaeval times from Brabant in Belgium and other countries. In the 12th century they were reputed to be the best infantry in Europe.

BRABANT, a duchy which existed from 1190 to 1430, when it was united with the duchy of Burgundy. Its history is connected with that of the duchy of Lower Lorraine (*q.v.*), which became in the course of the 11th century split up into a number of small feudal States. The counts of Hainaut, Namur, Luxembourg and Limburg asserted their independence, and the territory of Liége passed to the bishops of that city. The remnant of the duchy, united since 1100 with the margraviate of Antwerp, was conferred in 1106 by the emperor Henry V., with the title of duke of Lower Lorraine, upon Godfrey I., "the Bearded," count of Louvain and Brussels. His title was disputed by Count Henry of Limburg, and for three generations the representatives of the rival houses contested the possession of the ducal dignity in Lower Lorraine. The issue was decided in favour of the house of Louvain by Duke Godfrey III. in 1159. His son, Henry I., "the Warrior" (1183–1235), abandoned the title of duke of Lower Lorraine and assumed in 1190 that of duke of Brabant. His successors were Henry II. (1235–48), Henry III. (1248–61), and John I. (1261–94). These were all able rulers. Their usual place of residence was Louvain. John I., in 1283, bought the duchy of Limburg from Adolf of Berg, and secured his acquisition by defeating and slaying his competitor, Henry of Luxembourg, at the battle of Woeringen (June 5, 1288). His own son, John II. (1294–1312), bestowed liberties upon his subjects by the charter of Cortenberg. By it the imposition of grants (*beden*) and taxes was strictly limited and regulated, and its execution was entrusted to a council appointed by the duke for life whose duty it was to consider all complaints and to see that the conditions laid down by the charter concerning the administration of justice and finance were not infringed. He was succeeded by his son, John III. (1312–55), to whom Brabant owed the great charter of its liberties, called *La joyeuse entrée* (*q.v.*).

On his death, the ducal dignity passed to his daughter and heiress, Johanna (d. 1406). Wenzel of Luxembourg, her husband, assumed in right of his wife, and by the sanction of the charter *La joyeuse entrée,* the style of duke of Brabant. Johanna's title was, however, disputed by Louis II., count of Flanders (d. 1384), who had married her sister Margaret, and a war broke out in 1356 between Wenzel supported by the gilds, and Louis, who upheld the burgher-patrician party in the Brabant cities. After Wenzel's death (1383) his widow continued to rule over the two duchies for 18 years, but was obliged to rely on the support of the house of Burgundy in her contests with the turbulent city gilds and with her neighbours, the dukes of Jülich and Gelderland. In 1390 she appointed her niece, Margaret of Flanders (d. 1405), daughter of Louis II. and Margaret of Brabant (*see* FLANDERS), and her husband, Philip the Bold of Burgundy, her heirs (*see* BURGUNDY). Of the three sons by this marriage John succeeded to Burgundy, and Anthony to Brabant on the death of Johanna in 1406. On the extinction of the line of Anthony (1430) the duchy of Brabant became the inheritance of the elder branch of the house of Burgundy, in the person of Philip III., "the Good," of Burgundy, son of John. His grand-daughter Mary (d. 1482), daughter and heiress of Charles I., "the Bold," (d. 1477) married the archduke Maximilian and so brought Brabant with the other Burgundian possessions to the house of Habsburg. The chief city of Brabant, Brussels, became under the Habsburg régime the residence of the court and the capital of the Netherlands (*q.v.*).

In the course of the 80 years' war of independence the province of Brabant became separated into two portions. In the southern and larger part Spanish rule was maintained, and Brussels continued to be the seat of government. The northern (smaller) part was conquered by the Dutch under Maurice and Frederick Henry of Orange. At the peace of Münster this portion, which now forms the Dutch province of North Brabant, was ceded by Philip IV. to the United Provinces and was known as Generality Land, and placed under the direct government of the States-general. The southern portion, now divided into the provinces of Antwerp and South Brabant, remained under the rule of the Spanish Habsburgs until the death of Charles II., the last of his race, in 1700. By the Treaty of Utrecht (1713) the southern Netherlands passed to the Austrian branch of the Habsburgs. During the whole period of Austrian rule the province of Brabant succeeded in maintaining, to a very large extent unimpaired, the immunities and privileges to which it was entitled under the provisions of its ancient charter of liberty, the Joyous Entry.

Since the French conquest of 1794 the history of Brabant is merged in that of Belgium (*q.v.*). The revolt against Dutch rule in 1830 broke out at Brussels and was in its initial stages largely a Brabançon movement. The important part played by Brabant at this crisis of the history of the southern Netherlands was marked in 1831 by the adoption of the ancient Brabançon colours to form the national flag, and of the lion of Brabant as the armorial bearings of Belgium. The title of duke of Brabant has been revived as the style of the eldest son of the king of the Belgians. (G. E.)

BRABANT, central and metropolitan province of Belgium, part of the ancient duchy. From 1815 to 1830, that is to say, during the existence of the kingdom of the Netherlands, Belgian and Dutch Brabant were distinguished by using the terms South and North. The surface undulates and its highest points (400ft.) are at and near M. St. Jean. The province is famed both for cul-

tivation and for industry. There are valuable quarries of porphyry and sandstone, and industry flourishes in Brussels and Louvain and in the smaller Clabecq, Tubize and Wavre. The two first and Nivelles give their names to administrative districts (*arrondissements*), and other towns are Vilvorde, Tirlemont and Hal. There are 25 administrative cantons and 348 communes. The area is 1,267 sq.mi. and the population (est. 1939) 1,769,516.

BRABANT, NORTH, largest province in Holland, bounded south by Belgium, west and north-west by the Scheldt, the Eendracht, the Volkerak and the Hollandsch Diep, which separate it from Zealand and South Holland, north and north-east by the Merwede and Maas, which separate it from South Holland and Gelderland, and east by the province of Limburg. Area 1,921 sq. miles. Pop. (est. 1938) 1,019,123. The surface slopes gently from the south-east to the north and north-west, and the soil is composed of diluvial sand mixed with gravel, but giving place to sea-clay along the western boundary and river-clay along the banks of the Maas and smaller rivers. The watershed is formed by the north-eastern edge of the Belgian plateau of Campine, and follows a curved line through Bergen-op-Zoom, Turnhout and Maastricht. Large waste stretches of heath are occasionally overlaid with high fen, as between the valleys of the Aa and the Maas called the Peel ("marshy land"). Deurne, a few miles east of Helmond, was an early fen colony, with a prehistoric burial-ground. Early settlements, often based on Roman camps, along the Maas and its tributaries afterwards developed in the hands of feudal lords; *e.g.*, the chief town 'sHertogenbosch. Geertruidenberg, Heusden, Ravestein and Grave are all similarly situated. Breda (*q.v.*) and Bergen-op-Zoom (*q.v.*) are important. Roosendaal, Eindhoven and Boxtel are railway junctions. Boxtel was formerly the seat of an independent barony. The castle was restored in modern times. Reclamation from the waste was extended eastwards to Helenaveen late in the 19th century. Agriculture (potatoes, buckwheat, rye) is the main industry, generally combined with cattle-raising. On clay lands wheat and barley are the principal products, and in the western corner beetroot is largely cultivated for the beet sugar industry, factories being found at Bergen-op-Zoom, Steenbergen and Oudenbosch. There is a special cultivation of hops in the district northwest of 'sHertogenbosch. The majority of the population is Roman Catholic. The precarious border position of the province militated against earlier industrial development, but after the separation from Belgium and the construction of roads, railways and canals there was much improvement; Tilburg, Eindhoven and Helmond are important modern industrial centres. Their rise was rapid, much impetus being given to the textile, tobacco and margarine trades during 1914–18 through the neutrality and unique situation of the Netherlands. Leather tanning and shoe-making are especially associated with the Langstraat district, a series of industrial villages along the course of the Old Maas, between Geertruidenberg and 'sHertogenbosch. The province, with the rest of Holland, was occupied by Germany in World War II.

BRABAZON, HERCULES BRABAZON (1821–1906), English water colour painter, born in Paris, Nov. 27, 1821. He was the younger son of Hercules Sharpe, and succeeded his elder brother in the Brabazon estates, County Mayo, Ireland; under the will of his uncle, Sir William, he adopted the name of Brabazon. He was educated at Harrow and Trinity college, Cambridge. He studied painting by copying English water colours; and his early work shows the influence of Müller, Cox and De Wint. Brabazon's later work approached the style of Turner, with an even freer use of body colour. He executed many sketches on his travels in Italy, France, Switzerland and Egypt. An amateur in his art and a country gentleman, he was with difficulty persuaded to exhibit or sell his work. However, in 1891, in his 70th year, he showed at the New English Art Club and was elected a member; after this success he exhibited regularly. He died on May 15, 1906, in his home at Battle, Sussex. Two memorial exhibitions of his work were held at the Goupil gallery, London, in 1906 and 1909. The Tate gallery, the British Museum and the Metropolitan Museum of Art, New York, possess excellent examples of his work.

See C. L. Hind, *Hercules Brabazon Brabazon* (1912).

BRACCIANO, province of Rome, Italy, 25 mi. N.W. of Rome by rail, on southwest shore of Lake Bracciano, 915 ft. above sea-level. Pop. (1936) 4,129 (town), 5,319 (commune). Its fine castle (built by the Orsini about 1470 and since 1696 the property of the Odescalchi) has preserved its character. The beautiful lake is the ancient *Lacus Sabatinus,* which gave its name to a Roman tribe. It is 22sq.m. in area, 538ft. above sea-level, and 530ft. deep and almost circular. Radiating tufa deposits extend as far as Rome; various small craters surround it; warm springs occur in the district, especially those of Vicarello. Many remains of ancient villas may be seen round the lake. The water of the lake partly supplies the Acqua Paola, a restoration by Paul V. of the *Aqua Traiana.*

BRACCIOLINI, FRANCESCO (1566–1645), Italian poet, was born at Pistoia, of a noble family. On his removing to Florence, he was admitted into the academy there, and devoted himself to literature. At Rome he entered the service of Cardinal Maffeo Barberini, and when his patron was elected pope, Urban VIII., Bracciolini was made secretary to the pope's brother, Cardinal Antonio. On the death of the pontiff he returned to Pistoia. Bracciolini is principally noted for his mock-heroic poem *Lo Scherno degli Dei,* published in 1618, similar but confessedly inferior to the contemporary work of Tassoni, *Secchia Rapita.* Of his serious poems the most celebrated is *La Croce Racquistata.*

For the Italian humanist Poggio Bracciolini *see* POGGIO.

BRACE, CHARLES LORING (1826–1890), American philanthropist, was born on June 19, 1826 in Litchfield (Conn.). He graduated at Yale in 1846, and from Union theological seminary in 1849. From this time he devoted his life to social work among the poor of New York, and to Christian propaganda among the criminal classes; and he became well known as a social reformer, at home and abroad. In 1853 he helped to found the Children's Aid society, establishing workshops, industrial schools and lodging-houses for newsboys. He died at Campfer, in Tirol, on Aug. 11, 1890. His writings, in several volumes, embody his views on practical Christianity and its application to the improvement of social conditions.

See *The Life and Letters of Charles Loring Brace* (1894), edited by his daughter, Emma Brace.

BRACE, JULIA (1806–1884), American blind deaf-mute, was born at Newington, Conn., on June 13, 1806. At that time the study of blind deaf-mutes and their scientific training was in its infancy, but she learned to sew well, was neat in her dress, and had a good memory. Dr. S. G. Howe's (*q.v.*) experiments with her were interesting as leading to his success with Laura Bridgman (*q.v.*). She died at Bloomington, Conn., on Aug. 12, 1884.

BRACE, a measure of length, being the distance between the extended arms (from the plural of the Lat. *bracchium,* the arm). Something which secures, connects or strengthens, as in a carpenter's tool to hold a bit for boring; a beam of wood or metal used to strengthen a building or machine; the straps passing over the shoulders to support the trousers; the leathern thong which slides up and down the cord of a drum, and regulates the tension and the tone; in printing, a sign (⎨) for uniting two or more lines of letterpress or music; a rope fastened to the yard of a ship for trimming the sails. As meaning a "couple" or "pair" the term was first applied to dogs, probably from the leash by which they were coupled in coursing. In architecture (*q.v.*) "brace mould" is the term for two ogees joined together like a brace in printing.

BRACEGIRDLE, ANNE (*c.* 1674–1748), English actress, is said to have been placed under the care of Thomas Betterton and his wife, and to have first appeared on the stage as the page in *The Orphan* at its first performance at Dorset Garden in 1680. She was Lucia in Shadwell's *Squire of Alsatia* at the Theatre Royal in 1688, and played similar parts until, in 1693, as Araminta in *The Old Bachelor,* she made her first appearance in a comedy by Congreve, with whose works and life her name is most closely connected. In 1695 she went with Betterton and the other seceders to Lincoln's Inn Fields, where, on its opening with Congreve's *Love for Love,* she played Angelica. This part,

and those of Belinda in Vanbrugh's *Provoked Wife,* and Almira in Congreve's *Mourning Bride,* were among her best impersonations, but she also played the heroines of some of Nicholas Rowe's tragedies, and acted in the contemporary versions of Shakespeare's plays. In 1705 she followed Betterton to the Haymarket, where she found a serious competitor in Mrs. Oldfield, then first coming into public favour. The story runs that it was left for the audience to determine which was the better comedy actress, the test being the part of Mrs. Brittle in Betterton's *Amorous Widow,* which was played alternately by the two rivals on successive nights. When the popular vote was given in favour of Mrs. Oldfield, Mrs. Bracegirdle quitted the stage. Her private life was the subject of much discussion. Colley Cibber remarks that she had the merit of "not being unguarded in her private character," while Macaulay does not hesitate to call her "a cold, vain, and interested coquette." She was certainly the object of the adoration of many men, and she was the innocent cause of the killing of the actor William Mountfort, whom Captain Hill and Lord Mohun regarded as a rival for her affections. During her lifetime she was suspected of being secretly married to Congreve. She was buried (Sept. 18, 1748) in the cloisters of Westminster Abbey.

See Genest, *History of the Stage;* Colley Cibber, *Apology* (edited by Bellchambers); Egerton, *Life of Anne Oldfield;* Downes, *Roscius Anglicanus.*

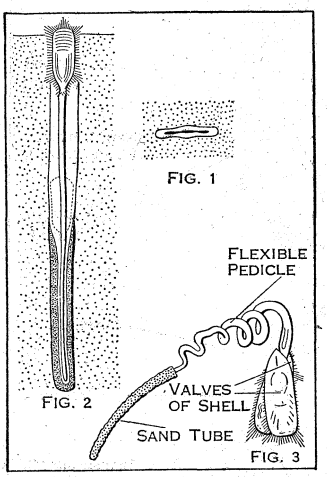
BRACELET or **ARMLET,** a personal ornament for the arm or wrist, made of different materials, according to the fashion of the age and the rank of the wearer. The Egyptian kings are represented with armlets, which were also worn by the Egyptian women. These, however, are not jewelled, but of plain or enamelled metal, as was in all likelihood the case among the Hebrews. In modern times the most celebrated armlets are those which form part of the regalia of the Persian kings and formerly belonged to the Mogul emperors of India, being part of the spoil carried to Persia from Delhi by Nadir Shah in 1739. These ornaments are of dazzling splendour, and the jewels in them are of such large size and immense value that the pair have been reckoned to be worth a million sterling. The principal stone of the right armlet is famous in the East under the name of the *Darya-i-nur,* "sea (or river) of light." It weighs 186 carats, and is considered the diamond of finest lustre in the world. The principal jewel of the left armlet, although of somewhat inferior size (146 carats) and value, is renowned as the *Tāj-e-mah,* "crown of the moon." The imperial armlets, generally set with jewels, may also be observed in most of the portraits of the Indian emperors. Bracelets have at all times been much in use among barbaric nations, and the women frequently wear several on the same arm. The finer kinds are of mother-of-pearl, fine gold or silver; others of less value are made of plated steel, horn, brass, copper, beads, etc. Chinese bracelets are sometimes cut out of single pieces of jade. In the middle ages bracelets were much less commonly used in Europe, but the custom has continued to prevail among Eastern nations to the present time, and many of the types that were common to Europe in prehistoric times are still worn in central Asia. (*See* JEWELLERY.)

BRACHIOPODA form a phylum of marine bivalve invertebrate animals having chitino-phosphatic or calcareous shells. The two valves are dorsoventrally arranged, bilaterally symmetrical and unequal in size. Inside the valves two coiled, cirrate appendages or "brachia," one on each side of the mouth, serve as food-gathering organs, creating water-currents to the mouth. Reproduction is sexual, the sexes usually separate. Brachiopods, very numerous in bygone eras, are rare in modern seas.

The name Brachiopod, derived from the Greek $\beta\rho\alpha\chi\iota\omega\nu$ = arm, $\pi o\acute{\upsilon}s$ = foot, was first proposed for the class by Dumeril (1806) who assumed that the "brachia" were locomotive organs, homologous with the foot of molluscs.

Morphology and Habits.—In all brachiopods the two valves are situated on the front (ventral valve or pedicle valve) and back (dorsal or brachial valve) of the animal, the ventral valve usually being the larger. This arrangement and the bilateral symmetry easily distinguish brachiopods from clams which usually have equal, asymmetrical valves, one on each side of the animal. Brachiopod shells are grouped into two major divisions or subclasses, based on presence or absence of articulating processes, shell composition and details of the embryology. These subclasses Inarticulata and Articulata are discussed separately because their morphology is quite different.

INARTICULATA.—The valves of the Inarticulata are held together by a complicated system of muscles. Except for a great development of diverse and little understood types in the Cambrian, the Inarticulata have always been subordinate in numbers to the Articulata. *Lingula* (Pl., fig. 31), a modern as well as fossil example, is linguiform in outline and compressed lenticular in profile. Another living inarticulate, *Discinisca* (Pl., fig. 24), is circular in outline and conical in profile. In general the Inarticulata deviate little from these forms. The shell of *Lingula* is composed of alternating layers of chitinoid material and calcium phosphate covered by a smooth epidermis, while in *Discinisca* it is built up of overlapping lamellae of the same substances set at a small angle to the surface. Members of the Craniacea have punctate calcareous shells, the lime possibly secondarily developed as a result of their cemented habits since middle Ordovician time. Inarticulate shells are commonly brown of various shades to black, but some species of *Lingula* are marked by rich green blotches. The valves are usually ornamented by more or less elevated, concentric growth lines, but some are radially marked in addition. The Inarticulata are usually small, seldom over an inch in length and many of the fossil representatives, such as *Conotreta* and *Leptobolus,* are tiny.



FROM "ARCHIVES DE ZOOLOGIE EXPERIMENTALE ET GÉNÉRALE"; "CHOSES DE NOUMEA"; AND "MEMOIRS OF THE BOSTON SOCIETY OF NATURAL HISTORY"

FIGS. 1–3.—SAND TUBES FORMED BY BRACHIOPODS

Fig. 1. Tube of the Recent Brachiopod *Lingula* as seen on the surface of the sand

Fig. 2. Section of sand tube showing shell of *Lingula* attached by its pedicle to the lower end of the tube. The dotted line shows the position of the shell when retracted. The dark portion consists of sand grains cemented together by mucus from the pedicle

Fig. 3. *Glottidia pyramidata,* a Recent Brachiopod having a long flexible, wormlike pedicle attached to a sand tube. Shown natural size

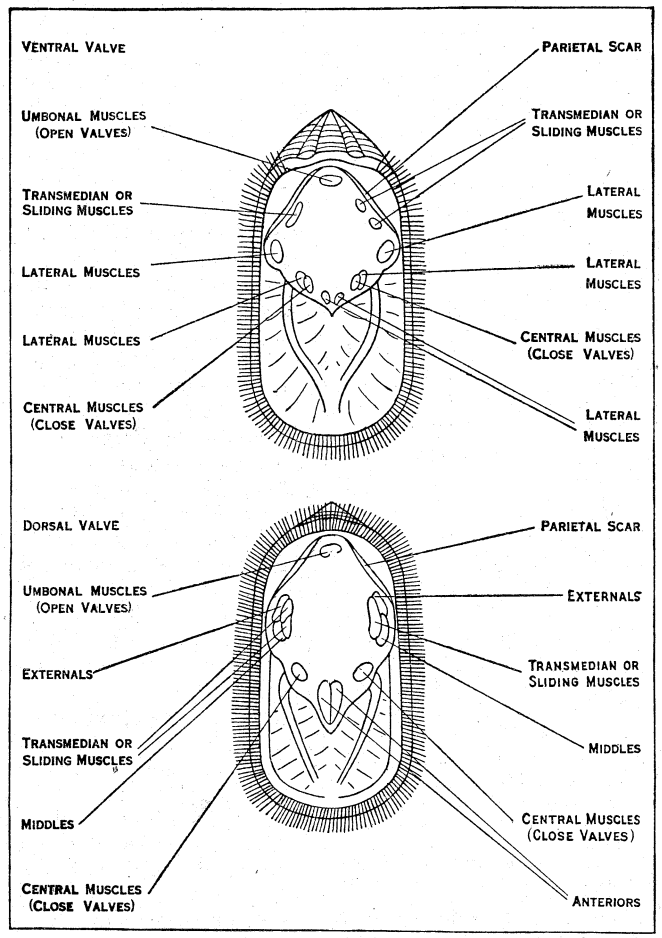
In most brachiopods a fibrous pedicle, affixed to the posterior end of the ventral valve, attaches the animal to rocks or other shells; but *Lingula* and its allies deviate in having a long fleshy pedicle by which the animal fastens itself in a burrow by agglutination to the sides. *Glottidia* (fig. 3), a relative of *Lingula,* is capable of slow movement by means of a wriggling motion of the pedicle.

Lingula usually makes a vertical burrow from 2 to 12 in. in length, in which it lives attached by its pedicle to the sand at the bottom (figs. 1, 2). By extension of the pedicle two-thirds of the shell may project above the surface, but this disappears instantaneously when the animal is alarmed. These burrows occur in mud flats exposed at low water, and the sand in which they are formed is black due to decaying organic matter. Clean sand is apparently unfavourable to the animal's growth.

The soft parts of the Inarticulata are arranged like those of the Articulata, discussed in detail below, but vary in having a terminal anus in the intestine, and in possessing a more complicated muscle system for opening the valves (figs. 4, 5). These are not only opened vertically but are slid laterally as well. Chitinous setae attached to the mantle edge fringe the shell. At the anterior end they form three tubes, the two side ones for incoming, food-bearing currents and the middle one for waste elimination.

ARTICULATA.—By far the largest number of brachiopods living and extinct possessed calcareous shells articulated by teeth (Pl., fig. 15) in the ventral valve and sockets (Pl., figs. 20, 38) in the dorsal valve. Most of them are small but a few, measuring 6 to 15 in. in one dimension, are known. Most brachiopods are len-

ticular in profile but some were plano- to concavo-convex. The outline is varied. Calcareous shells are usually light-coloured; a few are dark brown or gray, and some suffused salmon to red, occasionally with bright red radial bands (Pl., fig. 33). Fossil brachiopods, mostly Terebratulacea, showing traces of colour



FIGS. 4–5.—MUSCLE SCARS OF LINGULA. TOP: VENTRAL VALVE; BELOW: DORSAL VALVE

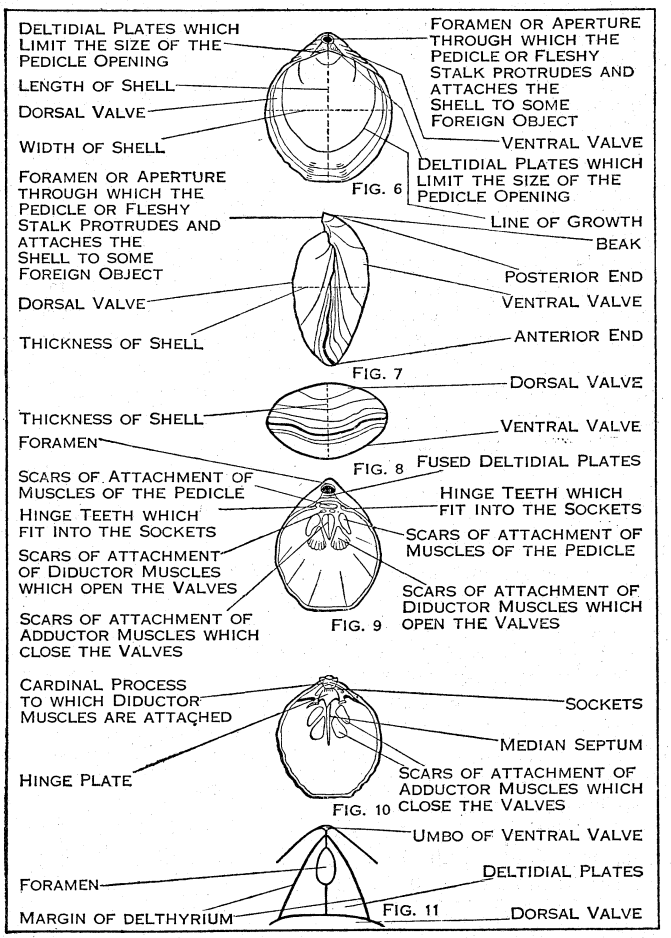
patterns, are known as early as the Devonian (Pl., fig. 29).

The articulate shell is smooth or diversely folded and may be ornamented by elevated radial costae or concentric bands or both. Many genera are quite spiny (Pl., fig. 6), the spines on the posterolateral extremities often of great length. Most brachiopods develop a more or less prominent median fold, usually on the dorsal valve (Pl., fig. 30), but occasionally on the ventral, which is thought to facilitate the passage of incurrent and excurrent streams of water like the funnels formed by the setae of *Lingula.*

The articulates live attached by the fibrous pedicle to stones, shells (Pl., figs. 21, 24) or other objects, or cemented by the ventral valve to foreign objects. When cemented, the brachiopod often loses its bilateral symmetry and may become ostreiform (*Leptodus,* Pl., fig. 41) or turbinate (*Prorichthofenia,* Pl., fig. 28). Some brachiopods were attached when young but broke from the attachment surface to lie loose on the sea floor. Others, such as *Avonia,* had no pedicle and lived above the soft mud by resting on their spines.

Exterior Shell Anatomy.—The posterior end of most brachiopods is tapered to form a beak. The swollen portion just anterior to the beak is the umbo (figs. 7, 8). The line of articulation is the hinge line which may be short or extended. Brachiopod length is measured from the beak to the anterior margin; width is at right angles to the length, and thickness is the greatest distance at right angles to the line of valve junction (figs. 6–7). In many articulate brachiopods a palintrope or shelf having a curved or plane surface (interarea) is located between the beak and hinge line (Pl., figs. 3, 10, 15). The ventral palintrope is cleft medially by the delthyrium (Pl., fig. 10), a triangular opening for extrusion of the pedicle. The delthyrium may be open or more or less completely closed by deltidial plates (fig. 11), growing medially from the delthyrial margins to constrict the pedicle foramen; or it may be closed by a single plate, pseudodeltidium (Pl., figs. 5, 15), which is anchored to the delthyrial edges. The teeth (fig. 9) or articulating processes occur at the anterolateral extremities of the delthyrium and may be buttressed by more or less vertical partitions or dental plates. These bound the delthyrial cavity which lodges part or all of the ventral muscles (Pl., fig. 26). The dental plates may remain separate or unite with a septum to form a spoon-shaped plate (spondylium, Pl., fig. 8).

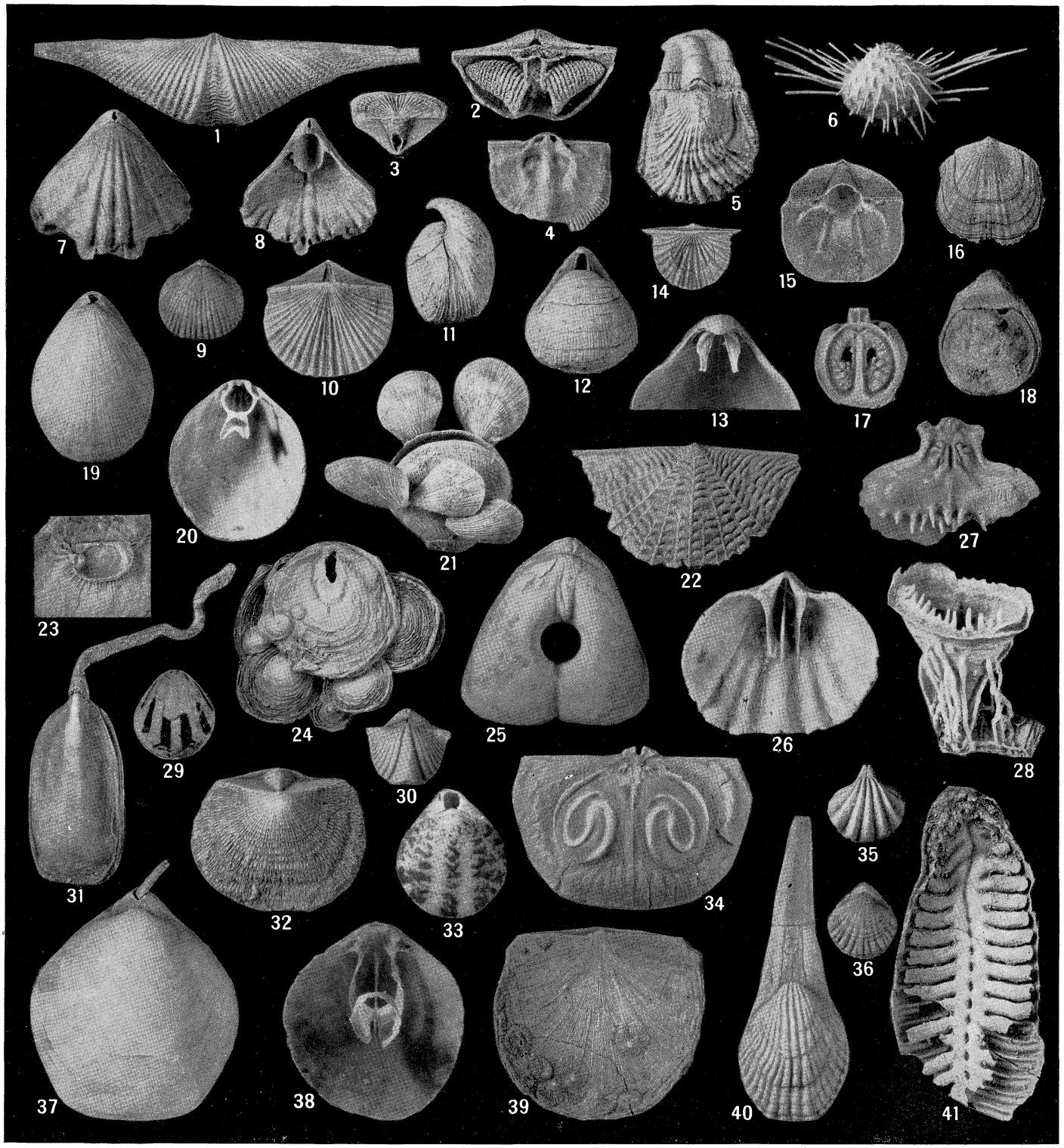
The dorsal valve contains the attachments of the brachia which take the form of crura (Pl., fig. 13), more or less elongated, curved processes diverging from the beak. In some early fossil forms the crural bases or brachiophores bound a deltoid cavity called the notothyrium, where the diductor muscles are attached on the floor of the cavity or to a ridge or boss (cardinal process). The notothyrium may be open or closed by a solid plate (chilid-



FIGS. 6–11.—EXTERIOR AND INTERIOR OF THE SHELL OF A BRACHIOPOD, A TINY MARINE ANIMAL THAT FASTENS ITSELF TO PLANTS OR ON THE OCEAN BOTTOM AND FEEDS ON MINUTE SEA WEEDS

Fig. 6.—Exterior of shell showing dorsal valve and part of ventral valve
Fig. 7.—Side view of the two valves in contact
Fig. 8.—Anterior view of the two valves
Fig. 9.—Interior of ventral valve
Fig. 10.—Interior of dorsal valve
Fig. 11.—Diagram showing pedicle opening of the Rhynchonella. The triangular opening, or delthyrium, is gradually filled up by the plates, leaving an oval opening, or foramen, for the pedicle to pass through and attach itself to a foreign object

ium, Pl., fig. 4). In advanced genera a more or less continuous plate bearing the diductor muscles occurs between the crural bases, and is called a divided hinge plate (Pl., fig. 38) when incomplete, but may form an *undivided,* flat or concave hinge plate. This plate is often supported by a median septum, a nearly universal feature of the dorsal valve. The sockets are located between the inside shell wall and the outside of the crural bases.



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RECENT AND FOSSIL BRACHIOPODA

1 and 2. *Mucrospirifer*. Devonian, Canada, Michigan. (2) showing spires. 3 and 4. *Vellamo*. Ordovician, Minnesota. (3) showing pseudodeltidium interarea and foramen; (4) showing convex chilidium. 5*. *Streptorhynchus*. Permian, Texas, showing pseudodeltidium. 6. *Avonia*. Permian, Texas. 7 and 8. *Stenoscisma*. Permian, Texas. (8) showing spondylium. 9. *Uncinulus*. Silurian, Tennessee. 10*. *Hesperorthis*. Ordovician, Oklahoma, showing interarea and delthyrium. 11, 12 and 13. *Hemithyris*. Recent, Alaska. (13) showing crura. 14. *Stropheodonta*. Devonian, Michigan. 15* and 16*. *Billingsella*. Cambrian, Wyoming. (15) showing pseudodeltidium and delthyrial cavity. 17* and 18*. Interior and exterior of *Thecidellina*. Recent, Christmas Island. 19 and 20. *Terebratulina*. Recent, Pacific. (20) showing loop. 21. Same. Recent, Atlantic, cluster showing growth habit. 22*. *Ptychoglyptus*. Ordovician, Virginia. 23. *Leptalosia*. Devonian, Michigan, attached. 24. *Discinisca*. Recent, Peru. 25. *Pygites*. Cretaceous, France. 26*. *Enteletes*. Permian, Texas, showing dental plates and median septum in delthyrial cavity. 27* and 28. *Prorichthofenia*. Permian, Texas. (27) showing dorsal valve out of cup; (28) showing anchor spines. 29. *Cranaena*. Devonian, Iowa, showing colour (red) bands. 30. *Cyrtina*. A Devonian punctospiriferoid, Michigan. 31. *Lingula*. Recent, Hawaii. 32. *Klitambonites*. Ordovician, Estonia, showing pseudodeltidium. 33. *Frenulina*. Recent, Hawaii, x3, with (red) colour marks. 34*. *Leptaenisca*. Devonian, Oklahoma, showing dorsal interior lophophore impressions. 35. *Hustedia*. Permian, Texas. 36. *Pentamerella*. Devonian, Michigan. 37. *Laqueus*. Recent, California, showing pedicle. 38. *Frenulina*. Recent, Hawaii, x4, showing loop. 39. *Philhedra* encrusting *Rafinesquina*. Ordovician, Ohio. 40*. *Terebrirostra*. Cretaceous, France. 41. *Leptodus*. Permian ostreiform brachiopod, Texas

*Indicates x2 magnification. Those not otherwise indicated are natural size.

In many specialized genera the crura support (brachidia) loops or spires (Pl., figs. 2, 38), which are the calcified inner skeleton of the food-gathering organ or brachia.

Soft Parts.—The interior is divided transversely by a body wall into a posterior visceral cavity (coelom), filled with coelomic fluid or blood, and an anterior mantle cavity, filled with sea water (figs. 12, 13). The visceral cavity contains the U-shaped digestive canal, four reproductive glands and liver. The organs are held in place by mesenteries. Extensions of the coelom (pallial sinuses, fig. 12) into the mantle serve to lodge the sex organs. The mouth leads into an oesophagus and the latter into a saclike stomach which is terminated by a blind intestine. The liver or digestive gland surrounds the stomach. Waste products are excreted through the mouth. The nervous system consists of a ring about the oesophagus that sends nerves to other parts of the body.

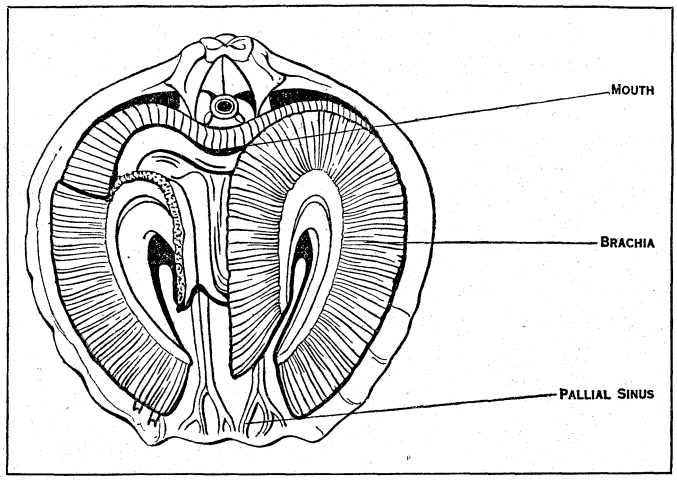


FIG. 12.—INTERIOR OF DORSAL VALVE OF MAGELLANIA FLAVESCENS
A portion of the fringe of the cirri is removed to show the membrane which divides the shell and part of the spiral extremities of the arms

The mantle (or brachial) cavity is lined by the thin mantle or shell-secreting organ, the edge of which is fringed by setae that serve as sense (tactile) organs. Here is lodged the lophophore (brachia, fig. 12), a simple or complicated, often horseshoe-shaped, cirrate loop. Ciliated cirri of the lophophore create currents that bring food-bearing water to the mouth located between the branches of the lophophore. In some superfamilies the lophophore is strengthened by a calcareous brachidium (loop or spire).

Musculature.—The valves are opened by contraction of the flabellate diductor muscles (figs. 9, 10, 13) located near the centre of the ventral valve and extending to the hinge plate or cardinal process in the apex of the dorsal valve. The latter valve rotates on a line joining the hinge teeth. Contraction of the diductors stretches the adductors, two muscles in the ventral valve which bifurcate in passing to the centre of the dorsal valve. When the pressure of the diductor muscles is released the stretched adductors contract and close the valves. Besides the adductors and diductors, the pedicle muscles or adjustors are attached in the ventral valve and to the pedicle. These retract or erect the shell on the pedicle. The muscles leave scars of attachment important in classification on the inside of the valves.

Shell Structure.—The articulate shell is composed of three layers: (1) an outer thin, chitinoid layer (periostracum) seldom seen in fossils; (2) a middle lamellar layer; (3) an inner prismatic layer. The two inner layers are composed of calcium carbonate in the form of calcite. Three divisions of brachiopods are recognized on details of the shell structure: (a) A group in which the inner layers are pierced by tiny holes or puncta (fig. 14), into which minute projections of the mantle or caeca penetrate; the puncta increase the surface of the mantle, which is the main respiratory organ. (b) A group in which minute rods of calcite project into the inner layers, often beyond the inner surface; exfoliation of the shell leaves deep pits simulating puncta where these rods are torn out, consequently this type is known as pseudopunctate. (c) Many families of brachiopods possess neither puncta nor pseudopuncta and are called impunctate. The shell is secreted by the mantle by successive additions at the anterior margin. Thickening occurs by deposition over the inner surface.

Classification.—The phylum Brachiopoda is divided into two classes on presence or absence of articulation and anal opening, and the development of the embryo. The classes generally adopted are Inarticulata and Articulata proposed by Huxley in 1869. Beecher (1891) divided Brachiopoda into four orders based on the nature of the pedicle opening and shell development. The orders Atremata and Neotremata belong to the Inarticulata while the Articulata include the Protremata and Telotremata. In 1927 Thomson added the order Palaeotremata to the Articulata, and proposed major divisions approximating Huxley's terms based on embryology: Gastrocaulia (Inarticulata); Pygocaulia (Articulata). Adequacy of Beecher's orders Protremata and Telotremata has been questioned by Cooper (1944).

CLASS INARTICULATA (GASTROCAULIA)

Valves usually chitino-phosphatic, held together by muscles only. Intestine long, ending in anus. Pedicle developing within valves of first shell (protegulum) and later protruded.

Order I. Atremata. Valves gape apically, pedicle attached to ventral valve and forming a pedicle groove. Growth mainly lateral and anterior. Superfamilies: Obolacea*, Lingulacea (Pl., fig. 31), Trimerellacea.

Order II. Neotremata. Pedicle, when present, emerging from a foramen at or near the ventral apex. Growth, at least in ventral valve, on all margins. Superfamilies: Paterinacea*, Siphonotretacea*, Acrotretacea*, Discinacea (Pl., fig. 24), Craniacea (Pl., fig. 29).

CLASS ARTICULATA (PYGOCAULIA)

More or less strongly articulated; always calcareous; anus absent in living members. Pedicle usually developed from caudal segment of embryo and seldom enclosed in the protegulum. Ordinal arrangement unsatisfactory.

Order III. Palaeotremata. Primitive, articulation and delthyria not fully developed. Superfamilies: Rustellacea*, Kutorginacea*.

Order IV. Protremata. Delthyrium open or closed by a pseudodeltidium. Brachial processes primitive.

Order V. Telotremata. Delthyrium closed more or less completely by deltidial plates. Crura or brachidium present.

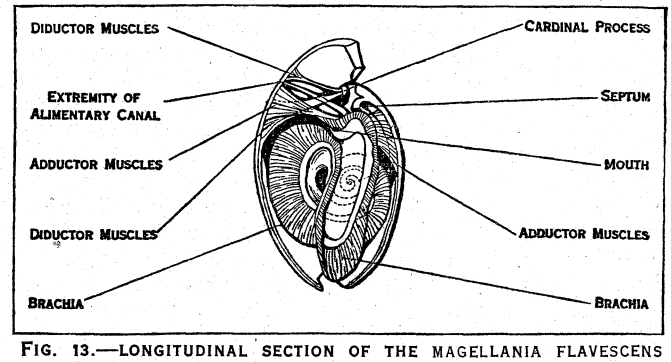


FIG. 13.—LONGITUDINAL SECTION OF THE MAGELLANIA FLAVESCENS SHOWING SOFT PARTS OF THE ANIMAL, PEDICLE MUSCLES OMITTED

Discovery of deltidial plates and a loop-bearer in the Protremata casts doubt on these orders. Cooper (1944) suggested a convenient but non-genetic arrangement based on shell structure, as follows: Impunctate Articulata: Superfamilies: Orthacea* (Pl., figs. 3, 10, 16, 32), Syntrophiacea*, Pentameracea* (Pl., fig. 36), Triplesiacea*, Rhynchonellacea (Pl., figs. 9, 11, 12), and Spiriferacea* (Pl., figs. 1, 2) (including Atrypacea* and Rostrospiracea*). Pseudopunctate Articulata; Superfamilies; Strophomenacea (Pl., figs. 5, 14, 18, 22, 39, 41), Productacea* (Pl., figs. 6, 23, 28). Punctate Articulata: Superfamilies: Dalmanellacea* (Pl., fig. 26), Punctospiracea* (Pl., figs. 30, 35), Terebratulacea (Pl., figs. 19, 21, 29, 33, 37, 40).

*Extinct.

Reproduction and Development.—The ova and sperms are discharged into the mantle cavity through four (rarely two) funnel-shaped nephridea, two on each side of the mouth. Fertilization takes place in the mantle cavity or outside. In a few genera the larvae develop inside the female in brood pouches formed by

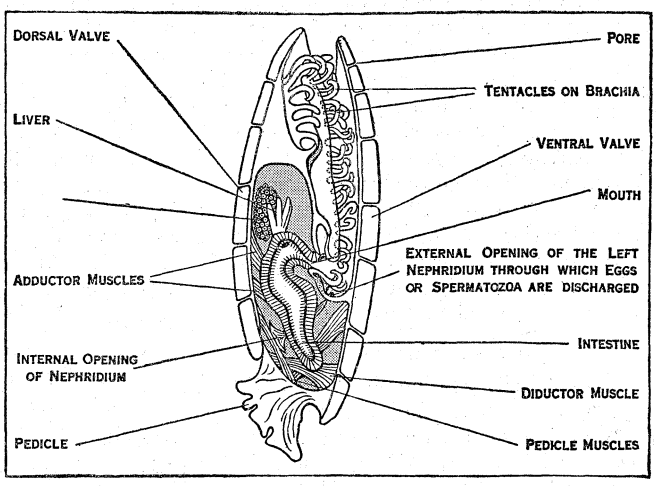


FIG. 14.—LONGITUDINAL SECTION SHOWING SOFT PARTS OF RECENT BRACHIOPOD (ARGYROTHECA CORDATA)

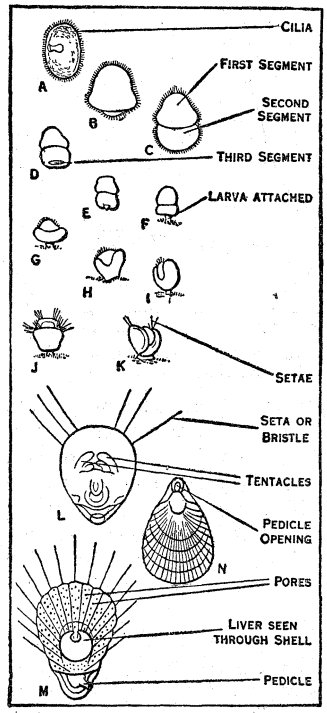
The mantle lining the shell and its tubular extensions into the pores are omitted, also the horny outer layer of the shell, or epidermis. Much enlarged

a mantle fold. The development of four genera of the Articulata and one of the Inarticulata is all that is known in detail of the Brachiopod embryology. In *Terebratulina* (fig. 15) the larvae develop cilia and are free-swimming for about 12 days. During this time three segments develop and the larvae then settle to become fixed by the third or caudal segment which becomes the pedicle. The lobes of the second or thoracic segment envelop the first or head segment and form two thin, chitinous semicircular plates, the embryonic shell or protegulum. This soon develops into a punctate calcareous shell ornamented by fine costae. In *Lacazella* (fig. 16) the head of the larva bears four eyes. The dorsal mantle lobe develops more rapidly than the ventral and the inner surface bears a shell plate continuous with another plate on the dorsal side of the body segment. The mantle is then inverted, the dorsal mantle plate becoming the external shell and the thoracic plate forming the incipient pseudodeltidium. The ventral valve is thought to be secreted by the rudimentary ventral mantle lobe. A similar inversion of the mantle lobes occurs in *Argyrotheca* but no thoracic shell plate is formed. In *Lingula* three-fold segmentation does not occur. The free-swimming stage may last a month or six weeks, and pairs of cirri on the embryonic brachia are protruded to serve as swimming organs. The cuticular shell plate, formed over the dorsal and ventral mantle portions, is circular in outline, but a fold is formed posteriorly that divides the shell into dorsal and ventral valves. These become thickened and the fold of thin cuticle serves for a time as a hinge. The pedicle is formed from the ventral mantle fold and not from the caudal segment as in *Terebratulina*.

Geographical Distribution.—Modern brachiopods are distributed world-wide in marine waters and inhabit the abyss as well as shallow and tidal zones. More than 200 species contained in 63 genera are known. In American waters from Maine to Florida 10 species occur. On the Pacific Coast from Alaska to Mexico 15 species are known. Several are common about the West Indies. Brachiopods inhabit the Mediterranean, northwest coast of Africa and the waters around the British Isles (14 species). Off the Philippine and Hawaiian Islands several species occur and a number are known from Australia and the Antarctic. Brachiopods occur abundantly around the Japanese Islands.

The majority of brachiopods (about 60%) are shallow-water (less than 100 fathoms) dwellers but some of these range into deep water. More than 35% of known brachiopods occupy waters deeper than 100 fathoms and a few have been taken from the abyss. *Macandrevia americana* and *Neorhynchia strebeli* have been dredged from Pacific waters deeper than 2,000 fathoms; *Abyssothyris wyvilli* was taken from 2,900 fathoms. *Lingula* is confined to the shallow-water shore zone.

Palaeontology.—Brachiopods were one of the most abundant forms of life in the Palaeozoic era but after that time they became a subordinate group. More than 20,000 species, distributed among 1,168 genera (including 107 inarticulate genera) have been described. No brachiopods have been authenticated prior to Cambrian time. Small Inarticulata were most numerous then but even in the early Cambrian highly organized primitive Articulata occur, indicating a long previous development. In Upper Cambrian through Ordovician times the Orthacea and Strophomenacea flourished. Dalmanellacea, Rhynchonellacea and Spiriferacea appeared in Middle Ordovician. The great development of the Trimerellacea and Pentameracea and appearance of the Terebratulacea took place in Silurian time. The Devonian and Carboniferous periods saw great expansion of the Spiriferacea and Productacea. At this time lived gigantic productids, up to 15 in. width. In the Permian many bizarre types of cemented brachiopods occurred among the Strophomenacea and Productacea, possibly foreshadowing the extinction of these groups.



BY COURTESY OF THE SOCIETY OF NATURAL HISTORY, BOSTON

FIG. 15.—DEVELOPMENT OF TEREBRATULINA. HIGHLY MAGNIFIED. THE CILIA ARE OMITTED FROM FIGURES D, E AND F

A–E. Free swimming larvae bearing cilia
F. Larva attached by its third segment
G–I. The second segment curves downward gradually enclosing the first
J.–K. Groups of deciduous bristles are developed and the two horny valves forming the embryonic shell then appear
L. A more advanced stage showing development of permanent setae. Within the shell are four tentacles, the head and the stomach
M. The setae correspond in position with the first formed ribs of the shell
N. Adult shell, natural size

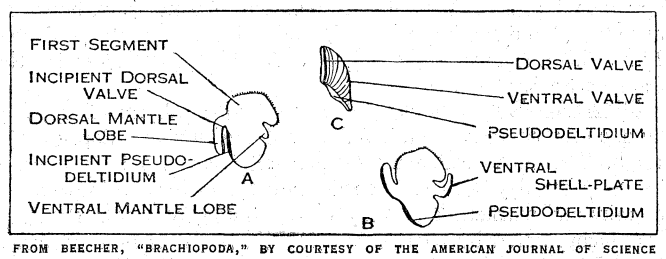
Besides the Rhynchonellacea and Terebratulacea only a few Strophomenacea, Spiriferacea and Punctospiriferacea of the Articulata survived the widespread animal extinction that culminated the Permian. All Spiriferacea and Punctospiriferacea became extinct with the Jurassic. In Mesozoic time the Rhynchonellacea and Terebratulacea flourished, but by Cenozoic time the former declined, to leave the Terebratulacea the most numerous group of modern brachiopods.

The Inarticulata throve in Cambrian and part of Ordovician time, but later declined and have occupied a subordinate position ever since. Some Lingulacea, Craniacea and Discinacea have survived with little change since Ordovician. Although brachiopods are now far outnumbered by the Mollusca, their representation in species and genera is nevertheless quite considerable when compared with the number of known species occurring in any given ancient faunal zone.

Uses.—In southern Japan and the Philippine Islands *Lingula* is collected, and either the pedicle or whole animal is boiled and used for food. Brachiopods are of great use to the geologist in correlating discontinuous rock strata, particularly those of the Palaeozoic era.

Historic.—The first mention of the Brachiopoda in a published work appears to have been in 1596, when Bauhin figured a *Rhynchonella* from the Lias of Württemburg as *Pectunculus bifloris compressus*. Ten years later Fabio Colonna described *Concha anomia diphya* which he considered to be a Lamellibranch but which is now known to belong to the Brachiopod genus *Pygope*. At the end of the 17th century Martin Lister published figures of fossil brachiopods and Llhwyd proposed the name *Terebratula*

for forms which had previously been confused with *Anomia*. At this time Brachiopods were commonly called Lampades, or lamp-shells. In the 18th century several authors figured the recent species, *Crania anomala* and *Terebratulina retusa*. Cuvier, however, in the early 19th century was the first to suggest the separation of these and similar forms from the Pelecypoda, for which Dumeril in 1806 proposed the name Brachiopoda. Subsequent investigation of the internal structure and development, and increasing information about fossil forms, led to the complete



FROM BEECHER, "BRACHIOPODA," BY COURTESY OF THE AMERICAN JOURNAL OF SCIENCE

FIG. 16.—EMBRYONIC DEVELOPMENT OF LACAZELLA MEDITERRANEA

A. Longitudinal section through embryo showing three segments. The first bears cilia which act as swimming organs in the short free stage. The dorsal mantle lobe is more developed than the ventral mantle lobe, and bears a shell-plate
B. Mantle lobes reversed showing the pseudodeltidium. The ventral shell-plate is now developed
C. Adult shell

separation of the Brachiopoda from the Mollusca, Tunicata, Annelida, Crustacea, Ascidia and Bryozoa, with which they had formerly been associated by various authors.

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(G. A. CR.)

BRACHISTOCHRONE: *see* CURVES, SPECIAL.

BRACHYCEPHALIC, a term denoting those skulls of which the width from side to side is 80% or more of the length from front to back, taking the length as 100 (Gr. for short-headed).

See RACES OF MANKIND; ANTHROPOMETRY.

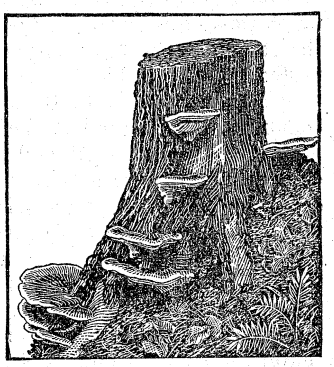
BRACHYLOGUS, title applied in the middle of the 16th century to a work containing a systematic exposition of the Roman law, which some writers have assigned to the reign of the emperor Justinian, and others have treated as an apocryphal work of the 16th century. The earliest extant edition of this work was published at Lyons in 1549, under the title of *Corpus Legum per modum Institutionum;* and the title *Brachylogus totius Juris Civilis* appears for the first time in an edition published at Lyons in 1553. The origin of the work may be referred with great probability to the 12th century. There is internal evidence that it was composed subsequently to the reign of Louis le Débonnaire (778–840), as it contains a Lombard law of that king's which forbids the testimony of a clerk to be received against a layman. On the other hand its style and reasoning is far superior to that of the law writers of the 10th and 11th centuries; while the circumstance that the method of its author has not been in the slightest degree influenced by the school of the Glossators leads fairly to the conclusion that he wrote before that school became dominant at Bologna. Savigny, who traced the history of the *Brachylogus* with great care, is disposed to think that it is the work of Irnerius himself (*Geschichte des röm. Rechts im Mittelalter*). Its value is chiefly historical, as it furnishes evidence that a knowledge of Justinian's legislation was always maintained in northern Italy. The author of the work has adopted the *Institutes* of Justinian as the basis of it, and draws largely on the *Digest,* the *Code* and the *Novels;* while certain passages, evidently taken from the *Sententiae Receptae* of Julius Paulus, imply that the author was also acquainted with the *Breviary of Alaric* (*q.v.*).

See E. Bocking's *Corpus Legum sive Brachylogus Juris Civilis* (Berlin, 1829); H. Fitting, *Über die Heimath und das Alter des sogenannten Brachylogus* (1880).

BRACKEN or BRAKE, a genus of ferns (*Pteridium*), the sole species (*P. aquilinum*) widely distributed throughout the world in temperate and tropical regions. The species is represented by 12 varieties, 4 of which occur in North America and Great Britain. Var. *pubescens* grows from Alaska to Mexico, east to Wyoming, Colorado and Texas. Var. *latiusculum,* growing also in northern Europe and eastern Asia, occurs from Newfoundland to Minnesota, south to Oklahoma and Tennessee. Var. *pseudocaudatum* grows from Massachusetts to Florida, west to Missouri and Texas. Var. *caudatum,* a West Indian plant, grows in southern Florida. Var. *typica* is common in Great Britain. This species has a perennial, black rhizome, which creeps extensively underground and at intervals sends up fronds. These fronds may reach a height of 15 ft. or more, and, although dying in autumn, often remain standing throughout the winter, affording in some regions cover for game. The fronds are used for thatching and for littering cattle and occasionally as fodder. It is sometimes a troublesome weed, especially in Great Britain and western North America.

(R. M. T.)

BRACKET-FUNGI. The term "bracket" has been given to those hard, woody fungi that grow on trees or timber in the form of semi-circular brackets. They belong to the order *Polyporeae* of the *Basidiomycetes,* distinguished by the layer of tubes or pores on the under surface within which the spores are borne. The mycelium, or vegetative part of the fungus, penetrates into the tissues of the tree, causing more or less extensive wood rots; the "bracket" represents the fruiting body, and produces innumerable spores which gain entrance to other trees by some wound or cut surface. Many of these woody fungi persist for several years, and a new layer of pores is superimposed on the previous season's growth. It has been estimated that a fruiting body of *Fomes applanatus,* the commonest of the bracket-fungi, having a pored surface of 1 sq.ft. liberates 30,000,000,000 spores in 24 hours, and the period of spore discharge for this species is about six months.



COURTESY OF THE DOMINION BOTANIST, DEPARTMENT OF AGRICULTURE, OTTAWA

BRACKET-FUNGUS, POLYPORUS RESINOSUS, GROWING ON A STUMP

BRACKLEY, THOMAS EGERTON, VISCOUNT (*c.* 1540–1617), better known as Lord Chancellor Ellesmere, British statesman and lawyer, was a natural son of Sir Richard Egerton of Ridley, Cheshire. Educated at Brasenose college, Oxford, he was called to the bar at Lincoln's Inn in 1572. In 1581 he became solicitor general. In the indictment of Mary, queen of Scots, he advised that she should be styled "Mary, commonly called queen of Scots," to obviate scruples about judging a sovereign. After this Egerton's promotion was rapid; he became attorney general (1592), master of the rolls (1594), lord keeper of the great seal (1596).

He was a firm friend of Essex, but endeavoured in vain to effect his reconciliation with Elizabeth. When the earl was committed to his custody at York house (Oct. 1, 1599–June 5, 1600), he made another attempt, and presided over the court held at his house with the greatest moderation. He went to Essex's house on Feb. 8, 1601, and sought to dissuade Essex from rebellion and to induce

him to dismiss his followers. His appeal was disregarded, and Essex held him prisoner for six hours. After this he abandoned the effort to save him, and delivered a speech against him in the Star Chamber. After the accession of James I., Egerton was created Lord Ellesmere, and became lord chancellor. He gave undiscriminating support to James's conception of the royal prerogative, and by his approval of the harsh sentences passed against those who withstood it came into collision with the House of Commons. He was equally undiscriminating in his support of James's ecclesiastical policy; indeed, the only occasion on which he seems to have withstood the king was in the matter of his Spanish policy, and in 1615 he refused, in spite of commands and threats, to affix the great seal to the pardon of Somerset.

His career closed with a victory gained over the common law and his formidable antagonist, Sir Edward Coke. The chancellor's court of equity began as a tribunal to decide cases not served by the common law to relax and correct its rigidity and insufficiency. The two jurisdictions had remained rivals, the common-law bar often complaining of the arbitrary powers of the chancellor, and the equity lawyers censuring the failures of justice at common law. The disputes concerning which the king had already in 1615 remonstrated with the chancellor and Sir Edward Coke, the lord chief justice, came to a crisis in 1616, when the court of chancery granted relief against judgments at common law in the cases of *Heath* v. *Rydley* and *Courtney* v. *Granvil.* This relief Coke and other judges declared to be illegal, and a praemunire was brought against the parties concerned in the suit in chancery. The grand jury, however, refused to bring in a true bill, in spite of Coke's threats and assurances that the chancellor was dead, and the dispute was referred to the king, who after consulting his counsel and on Bacon's advice decided for equity. The chancellor's triumph was great, and from this time the equitable jurisdiction of the court of chancery was unquestioned. In June 1616 he supported the king in his dismissal of Coke in the case of the *commendams,* agreeing with Bacon that it was the judge's duty to communicate with the king, before giving judgments in which his interests were concerned, and in November warned the new lord chief justice against imitating the errors of his predecessor and especially his love of "popularity." On Mar. 3, 1617 he delivered up to James the great seal, which he had held for the unprecedented term of nearly 21 years. In 1616 he had been created Viscount Brackley, and he declined an earldom on his deathbed.

Lord Chancellor Ellesmere is a striking figure in the long line of illustrious English judges. He ignored all communications from suitors, and it was doubtless to Ellesmere (as weeding out the "enormous sin" of judicial corruption) that John Donne, who was his secretary, addressed his fifth satire. He gained Camden's admiration. Bacon, whose merit he recognized, and whose claim to be solicitor-general he had supported in 1594 and 1606, calls him "a true sage, a salvia in the garden of the State," and speaks of his "fatherly kindness." Ben Jonson extolled in an epigram his "wing'd judgments," "purest hands" and constancy. Endowed with oratorical gifts, he yet followed the true judicial tradition and despised eloquence as "not decorum for judges, that ought to respect the Matter and not the Humours of the Hearers." He hoped to see a codification of the laws, and had greater faith in judge-made law than in statutes, advising the parliament (Oct. 27, 1601) "that laws in force might be revised and explained and no new laws made." He drew up rules for the Star Chamber, restricting fees, and in the reign of James I. issued ordinances for remedying abuses in chancery. In 1609 he published his judgment in the case of the Post Nati, which appears to be his only certain work. The following have been ascribed to him: *The Privileges and Prerogatives of the High Court of Chancery* (1641); *Certain Observations concerning the Office of the Lord Chancellor* (1651)—denied by Lord Chancellor Hardwicke in *A Discourse of the Judicial Authority of the Master of the Rolls* (1728) to be Lord Ellesmere's work; *Observations on Lord Coke's Reports,* ed. by G. Paul (about 1710), the evidence of his authorship being that the ms. was in his handwriting; four mss. bequeathed to his chaplain, Bishop Williams, viz., *The Prerogative Royal, Privileges of Parliament, Proceedings in Chancery* and *The Power of the Star Chamber; Notes and Observations on Magna Charta,* etc., Sept. 1615 (Harl. 4265, f. 35), and *An Abridgement of Lord Coke's Reports.* (*See* ms. note by F. Hargrave in his copy of *Certain Observations concerning the Office of Lord Chancellor,* Brit. Mus. 510 a 5, also *Life of Egerton,* p. 80, note T, catalogue of Harleian collection, and Walpole's *Royal and Noble Authors,* 1806, ii. 170.)

No adequate life of Lord Chancellor Ellesmere has been written, for which, however, materials exist in the Bridgewater mss., very scantily calendared in *Hist. MSS. Comm.* 11th Rep. p. 24, and app. pt. vii. p. 126. A small selection, with the omission, however, of personal and family matters intended for a separate projected *Life* which was never published, was edited by J. P. Collier for the Camden Society in 1840.

BRACKLEY, municipal borough, Northamptonshire, England, on the river Ouse 8 mi. W.N.W. of Buckingham. Pop. (1938) 2,338. The early settlement (Brachelai, Brackele) is mentioned in the Domesday Survey. Records show the mediaeval importance of fairs and markets, especially of the staple for wool. Brackley was incorporated by charter in 1313–14, but it is now governed by a charter dated 1886, granted under the Municipal Corporation act. Norman and Early English work remains in the Hospital of St. John, a 12th century foundation. The church of St. Peter has a beautiful Early English tower. Magdalen College school was founded by William of Waynflete, bishop of Winchester, in 1447. There are stations on the L.M.S. and L.N.E. railways. The town has minor agricultural industries, including brewing. It formerly had a considerable woollen and lace-making trade. Water for domestic purposes is supplied free. The borough is under a mayor, four aldermen and 12 councillors. Area 2.7 sq.mi. It is in the Daventry parliamentary division.

BRACKWEDE, a German textile town, lying S.S.W. of Bielefeld, in the Prussian province of Westphalia. Pop. (1939), 15,010. Nearby is the Bethel Institute for epileptics.

BRACQUEMOND, FELIX (1833–1914), French painter and etcher, was born in Paris on May 22, 1833. He was trained in early youth as a trade lithographer, until Guichard, a pupil of Ingres, took him into his studio. He applied himself to engraving and etching about 1853, and played a leading and brilliant part in the revival of the almost forgotten technique of the etcher's art in France. Altogether he produced over 800 plates, comprising portraits, landscapes, scenes of contemporary life, and bird-studies, besides numerous interpretations of other artists' paintings, especially those of Meissonier, Gustave Moreau and Corot. He was connected by a link of firm friendship with Manet, Whistler, and all the other fighters in the impressionist cause.

BRACTON, HENRY DE (d. 1268), English judge and writer on English law. His real name was Bratton, and in all probability he derived it either from Bratton Fleming or from Bratton Clovelly, both of them villages in Devonshire. It is only after his death that his name appears as "Bracton." He seems to have entered the king's service as a clerk under the patronage of William Raleigh, who after long service as a royal justice died bishop of Winchester in 1250. Bracton begins to appear as a justice in 1245, and from 1248 until his death in 1268 he was steadily employed as a justice of assize in the south-western counties, especially Somerset, Devon, and Cornwall. During the earlier part of this period he was also sitting as a judge in the king's central court, and was there hearing those pleas which "followed the king"; in other words, he was a member of that section of the central tribunal which was soon to be distinguished as the king's bench. From this position he retired or was dismissed in or about the year 1257, shortly before the meeting of the mad parliament at Oxford in 1258. Whether his disappearance is to be connected with the political events of this turbulent time is uncertain. He continued to take the assizes in the south-west, and in 1267 he was a member of a commission of prelates, barons, and judges appointed to hear the complaints of the disinherited partisans of Simon de Montfort. In 1259 he became rector of Combe-in-Teignhead, in 1261 rector of Barnstaple, in 1264 archdeacon of Barnstaple, and, having resigned the archdeaconry, chancellor of Exeter cathedral; he also held a prebend in the collegiate church at Bosham. Already in 1245 he enjoyed a dispensation enabling

him to hold three ecclesiastical benefices. He died in 1268 and was buried in the nave of Exeter cathedral, and a chantry for his soul was endowed out of the revenues of the manor of Thorverton.

His fame is due to a treatise on the laws and customs of England which is sufficiently described elsewhere (*see* ENGLISH LAW). The main part of it seems to have been compiled between 1250 and 1256; but apparently it is an unfinished work. This may be due to the fact that when he ceased to be a member of the king's central court Bracton was ordered to surrender certain judicial records which he had been using as raw material. Even though it be unfinished his book is incomparably the best work produced by any English lawyer in the middle ages.

The treatise was published in 1569 by Richard Tottel. This text was reprinted in 1640. An edition (1878–83) with English translation was included in the Rolls series, and a later one was prepared by G. E. Woodbine, 2 vols. (New Haven, 1915–22). Manuscript copies are numerous, and a critical edition is a desideratum. *See* Bracton, *Note-Book,* ed. Maitland (1887); *Bracton and Azo,* Selden Society (1895). (F. W. M.)

On April 5, 1923, in Exeter cathedral, a stone inscribed "To the memory of Henry of Bratton, temp. Henry III., Author of the first systematic treatise on the Laws of England, Chancellor of this Church . . . this stone was placed on the site of Bratton's altar," was presented to and accepted by the dean and chapter, the donors being a number of lawyers, Lord Merrivale, president of the probate, divorce, and admiralty division of the high court, acting as their spokesman. Eulogies of Bracton were pronounced by him and other jurists; many lawyers attended. *See* "The Bracton Memorial" in the *Law Times,* vol. 155, pp. 302, 303 (1923).

BRADBURY, JOHN SWANWICK BRADBURY, 1ST BARON (1872–), British civil servant, was born at Winsford, Cheshire, Sept. 23, 1872, and educated at the Manchester grammar school and Brasenose college, Oxford. He entered the Civil Service in 1896, and spent most of his official life at the Treasury, of which he became joint permanent secretary in 1913. In that capacity his name became familiar, from his signature on the Treasury notes issued after the outbreak of the World War. From 1919 to 1925 he was chief British representative on the reparations commission. He had been created K.C.B. in 1913 and G.C.B. in 1920, and in 1925 was raised to the peerage as Baron Bradbury of Winsford. He was chairman of the national food council from 1925 to 1929, and president of the British Bankers' Association from 1929 to 1930 and from 1935 to 1936.

BRADDOCK, EDWARD (1695?–1755), British general, was born in Perthshire, Scotland, about 1695. He joined the Coldstream Guards in 1710 and served under the prince of Orange in Holland during the siege of Bergen-op-Zoom in 1710. In 1754 he became a major-general, and was appointed to command against the French in Virginia in Feb. 1755. After some months of preparation, in which he was hampered by administrative confusion and want of resources, he took the field with a picked column, in which George Washington served, intending to attack Fort Duquesne (Pittsburgh, Pa.). The column crossed the Monongahela river on July 9, and almost immediately afterwards fell into an ambuscade of French and Indians. The troops were completely surprised and routed, and Braddock, rallying his men time after time, fell at last mortally wounded and died on the 13th. He was buried at Great Meadows.

BRADDOCK, a borough of Allegheny county, Pennsylvania, U.S.A., on the Monongahela river, 10m. S.E. of Pittsburgh; served by the Baltimore and Ohio, the Pennsylvania, and the Pittsburgh and Lake Erie railways. The population in 1920 was 20,870, 6,415 foreign-born white; 1940, 18,326. With the adjoining boroughs of North Braddock and Rankin it forms one community, an important industrial centre, which in 1940 had a population estimated at more than 40,000.

The manufacture of steel is the basic industry. The first settler was John Frazier, in 1742, whose cabin was the first built by a white man west of the Alleghenies. It was here that General Edward Braddock in 1755 was defeated and mortally wounded in an engagement with the French and Indians; and here on Aug. 1, 1794, 8,000 men gathered in peaceful protest against the new federal tax on whiskey. The borough was incorporated in 1867.

BRADDON, MARY ELIZABETH (1837–1915), English novelist, daughter of Henry Braddon, solicitor, of Skirdon Lodge, Cornwall, and sister of Sir Edward Braddon, prime minister of Tasmania, produced her first novel, *The Trail of the Serpent,* in 1861. In the same year appeared *Garibaldi, and other poems,* a volume of extremely spirited verse. In 1862 her reputation as a novelist was made by the success of *Lady Audley's Secret.* This novel, translated into many languages, has been dramatized, filmed, and in its original narrative form has been reprinted innumerable times. For a considerable time Miss Braddon conducted *Belgravia,* in which several of her novels appeared. She died on Feb. 4, 1915. She was a tireless worker, and in her long series of novels, plays, and stories maintained a freshness and an abundant inventiveness which endeared her to millions of readers.

Among the more famous of her 80 novels were *John Marchmont's Legacy* (1863), *Dead Men's Shoes* (1876), *Vixen* (1879), *Asphodel* (1881), *London Pride* (1896), and *The Green Curtain* (1911). Two of her sons, W. B. Maxwell and Gerald Maxwell, became well known novelists.

BRADENTON, city of Florida, U.S.A., 35 mi. S. by W. of Tampa; the county seat of Manatee county. It is at the head of navigation on the Manatee river, a few miles from Tampa bay and the Gulf of Mexico; is on federal highway 41, and is served by coasting steamers and by the Atlantic Coast Line and the Seaboard Air Line railways. The population in 1910 was 1,886; in 1930, 5,986; and in 1940, 7,444 by federal census. The leading industries are fishing, lumbering, fruitgrowing, cattle raising and market gardening. There are large deposits of fuller's earth in the vicinity. The city is a winter resort. It was settled in 1868 and incorporated in 1903.

BRADFORD, JOHN (1510?–1555), English Protestant martyr, was born at Manchester. In 1547 he studied law in the Inner Temple, but removed in the following year to St. Catharine's Hall, Cambridge, where he took an M.A. degree in divinity and was made fellow of Pembroke Hall. He was appointed chaplain to Bishop Ridley in 1550, prebendary of St. Paul's in 1551, and chaplain to Edward VI. in 1553, and became one of the most popular preachers in the kingdom. Soon after the accession of Mary he was arrested on a charge of sedition, and imprisoned. He was brought to trial (1554–55) before the court in which Bishop Gardiner sat as chief, and was condemned as a heretic and burnt on July 1, 1555.

His writings, which consist chiefly of sermons, meditations, tracts, letters and prayers, were edited by A. Townsend for the Parker Society (2 vols., Cambridge, 1848–53).

BRADFORD, WILLIAM (1590–1657), American colonial governor and historian, was born at Austerfield, Yorkshire, England, of a well-to-do family, probably in March 1590. In early youth he joined the Separatists, and after a brief imprisonment emigrated to Holland in 1608. Bradford was one of the party that sailed in the "Mayflower." After the death of Governor John Carver in April 1621 he was elected governor of Plymouth colony, and served as such, with the exception of five years, until shortly before his death. His rule was firm and judicious, and to his guidance more than to that of any other man the prosperity of the Plymouth colony was due. In 1630 the council for New England granted to "William Bradford, his heires, associatts, and assignes," a new patent enlarging the original grant of territory made to the Plymouth settlers. This patent Bradford in the name of the trustees made over to the body corporate of the colony in 1641. He died in Plymouth on May 9, 1657.

He was the author of a very important chronicle, the *History of Plimouth Plantation* (until 1646), first published in the *Proceedings* of the Massachusetts Historical Society for 1856 and several times re-edited. The manuscript disappeared from Boston during the War of Independence, was discovered in the Fulham library, London, in 1855, and was returned by the bishop of London to the State of Massachusetts in 1897. This work has been of inestimable value for the history of the Pilgrims, and was freely used, in manuscript, by Morton, Hubbard, Mather, Prince and Hutchinson. Bradford was also part author, with Edward Wins-

low, of the journal commonly known as Mourts' *Relation,* edited by H. M. Dexter (1865) and printed by Alexander Young in *Chronicles of the Pilgrim Fathers* (1841). He wrote also a series of *Dialogues,* issued in the Massachusetts Historical Society's publications (1870).

See the quaint sketch in Cotton Mather's *Magnalia* (1702); Joseph Hunter, "Collections concerning the Founders of New Plymouth," in Mass. Hist. Soc. *Collections* (1852); M. C. Tyler, *A History of American Literature during the Colonial Time* (vol. ix., 1897); a chapter in Williston Walker's *Ten New England Leaders* (1901); also A. H. Plumb, *William Bradford of Plymouth* (1920).

BRADFORD, WILLIAM (1663–1752), American colonial printer, was born in Leicestershire, England, on May 20, 1663. He learned the printer's trade in London and in 1682 emigrated with William Penn to Pennsylvania, where in 1685 he introduced the "art and mystery" of printing. His first imprint was an almanac, *Kalendarium Pennsilvaniense or America's Messenger* (1685). In 1690, with William Rittenhouse (1644–1708) and others, he established in Roxboro (Pa.), now a part of Philadelphia, the first paper-mill in America. In the spring of 1693 he removed to New York, where he was appointed royal printer for the colony, a position which he held for more than 50 years. On Nov. 8, 1725, he issued the first number of the *New York Gazette,* the first paper established in New York and from 1725 to 1733 the only paper in the colony. Bradford died in New York on May 23, 1752.

His son, ANDREW SOWLE BRADFORD (1686–1742), removed from New York to Philadelphia in 1712, and there on Dec. 22, 1719, issued the first number of the *American Weekly Mercury,* the first newspaper in the Middle Colonies. Benjamin Franklin, for a time a compositor in the office, characterized the paper as "a paltry thing, in no way interesting"; but it was continued for many years and was edited by Bradford until his death.

The latter's nephew, WILLIAM BRADFORD (1722–91), established in Dec. 1742 the *Pennsylvania Journal and Weekly Advertiser,* which was for 60 years under his control or that of his son, and which in 1774–75 bore the oft-reproduced device of a divided serpent with the motto "Unite or Die." He served in the War of American Independence, rising to the rank of colonel. His son, WILLIAM BRADFORD (1755–95), also served in the War of Independence, and afterwards was attorney-general of Pennsylvania (1791), a judge of the supreme court of the State, and in 1794–95 attorney-general of the United States.

BRADFORD, WILLIAM (1827–1892), American marine painter, was born at New Bedford (Mass.). He was a Quaker, and was self-taught, painting the ships and the marine views he saw along the coast of Massachusetts, Labrador and Nova Scotia; he went on several Arctic expeditions with Dr. Hayes and was the first American painter to portray the frozen regions of the north. His pictures attracted much attention by reason of their novelty and gorgeous colour effects. His "Steamer 'Panther' in Melville Bay, under the Light of the Midnight Sun" was exhibited at the Royal Academy in London in 1875. Bradford was a member of the National Academy of Design, New York; he died in that city on April 25, 1892. His style was somewhat influenced by Albert van Beest, who worked with him at Fairhaven for a time; but Bradford is minute and observant of detail where van Beest's aim was general effect.

BRADFORD, city, municipal, county, and parliamentary borough, West Riding of Yorkshire, England, 9m. W. of Leeds. Pop. (est. 1938) 288,700. Area, 39.9 sq.mi. It is in a small valley opening southwards from that of the Aire and extends up the hills on either side. Most of the principal streets radiate from a centre near the town hall. The situation of Bradford on the lower eastern spurs of the Pennines—the meeting place of hill-land and plain—has had much to do with its history and development. It is mentioned as having belonged before 1066, with several other manors in Yorkshire, to one Gamel, and appears to have been almost destroyed during the conquest of the north of England and was still waste in 1086. By that time it had been granted to Ilbert de Lacy, in whose family it continued until 1311. Already Bradford was becoming an important market centre, interested in wool. A further market was granted in 1251 and in 1294 the addition of a fair. The inquisition taken after the death of Henry de Lacy, earl of Lincoln, shows that the earl had there a hall or manor-house, a fulling mill, a market every Sunday, and a fair on the feast of St. Andrew. Edward IV. granted to certain feoffees, in whom he had vested his manor of Bradford, a market on Thursday every week and two yearly fairs on feast days. Many of these fairs were of five days' duration. The church of St. Peter dates from 1485 and occupies the site of a previous Norman church. At the formation of the diocese of Bradford in 1919, out of those of Ripon and Wakefield, the parish church of St. Peter was made the cathedral. Its most noteworthy feature is the fine original roof of oak. Among educational institutions, the grammar school existed in the 16th century and received a charter of incorporation from Charles II.

From the mention of a fulling mill in 1311 it is possible that woollen manufacture had commenced at that time. By the reign of Henry VIII. it had become an important industry and added much to the status of the town. Leland in his *Itinerary* says that Bradford is "a praty quik Market Toune. It standith much by clothing." Towards the end of the 17th and beginning of the 18th century the woollen trade decreased and worsted manufacture began to take its place. On the introduction of steam-power and machinery the worsted trade advanced with great rapidity. The first mill in Bradford was built in 1798; in 1910 there were over 300. In 1836 Mr. (afterwards Sir) Titus Salt developed the alpaca manufacture in the town; mohair was shortly afterwards introduced; and the great works at Saltaire were opened. Later, Mr. S. C. Lister (Lord Masham) introduced the silk and velvet manufacture, having invented a process of manipulating silk waste whereby what was previously treated as refuse is made into goods that can compete with those manufactured from the perfect cocoon. Bradford Exchange is the chief wool-buying centre, and Bradford's commercial relations with South America and Australia are very important. It is the chief centre for wool-combing and the worsted industry. The local water, after draining over peaty soil, is very soft and consequently is specially suited to wool washing and other manufacturing processes. There are deposits of coal and iron near by.

As a large industrial centre Bradford has many technical schools. The technical college, under the corporation since 1899, was opened in 1882. A Mechanics' institute was founded in 1832 and in 1871 the Mechanics' hall, close to the town hall, was opened. The Cartwright memorial hall contains an art gallery and museum and commemorates Dr. Edmund Cartwright (1743–1823) as the inventor of the power-loom and the combing machine. Other establishments are the Airedale college for students for the Independent ministry and the United Independent college (1888). Most of the buildings in Bradford are built with freestone quarried locally. As this stone blackens easily under the influence of smoke the town has a somewhat gloomy appearance. There were 1,928 ac. of open spaces in 1943, and a town planning scheme was in operation.

Bradford was incorporated in 1847, created a county borough in 1888 and a city in 1897. The corporation is presided over by a lord mayor—a dignity conferred in 1907. The city is served by the L.M.S.R. and L.N.E.R. and possesses a municipal light railway, opened in 1907, extending from Pateley Bridge to Lofthouse (6 mi.) and serving the Nidd valley. The municipal airport at Yeadon is shared by Leeds. The borough returned two members to parliament from 1832 until 1885, when three were returned. Since 1918, four members represent Bradford.

BRADFORD, a city of McKean county, Pennsylvania, United States, near the northern border of the state, among wooded hills, at an elevation of 1,415ft. 85m. S.E. of Buffalo. It is served by the Pennsylvania, the Erie, and the Baltimore and Ohio railways.

The population was 15,525 in 1920, of whom 1,845 were foreign-born whites; and was 17,691 in 1940 by federal census. It is the centre of an oil field which has been producing since 1875 and is expected to yield large returns until 1975 at least. There are two pipe lines to the seaboard, and about 20,000 wells in operation.

The principal manufactures are petroleum products; lumber,

wooden articles and brick, from the resources of the surrounding hills; tools and machinery needed in the production and handling of oil and natural gas; carbon brushes for electrical machines, steel sections and air filters.

Within 3 mi. is the Allegheny state park of 65,000 ac.

Bradford was settled about 1827, and was at first called Littleton, after Col. Little, an early resident. In 1858 the name was changed by settlers coming from Bradford, New Hampshire. It was incorporated as a borough in 1873 and chartered as a city in 1879. The first test well was drilled in 1861. Production began in 1875; increased rapidly to a peak in 1881, amounting to 40% of the world's output in the decade 1877–87; gradually declined until 1906; and after that again increased, as a result of the application of the flooding process.

BRADFORD DYERS' ASSOCIATION, LIMITED, a combination of British companies engaged in the dyeing of fabrics. In a normal year, the association treats 500 million yards of cloth, or enough to wrap round the earth 12 times. The works are equipped for the dyeing and finishing of cotton, wool, mohair, silk and artificial silk fabrics, the business being done on commission for the customers to whom the cloth belongs. The pooling of experience and co-ordination of effort consequent on the organization of the combine have counted for much in raising dyeing to the dignity of a fine art.

Agreements with Workers.—The association, soon after its inauguration in 1898, made a working agreement with the trade-unions concerned providing for the establishment of a reference board composed of an equal number of representatives of employers and workers, governing the conditions of working and providing for the settlement without recourse to strikes and lock-outs of any differences which might arise. This agreement served as a model for subsequent agreements, which have been a feature of the association's development, and which have embodied provisions for the employment of trade-union labour only (with certain specified exceptions); collective piecework, with a guarantee that piece-rates will yield earnings not less than 25% above time rates; scales of minimum wages advancing according to age; a sliding scale for periodical adjustment of wages with reference to the cost of living; and for payment of a penalty of £1 per man in the event of any breach by either party of the covenants entered into, such penalties being applied to charitable purposes. At each branch there is a works' council representative of the workers and the management, and their activities are co-ordinated by quarterly conferences.

The company's workmen's superannuation fund, established on a joint contributory basis, amounted in 1939 to well over one million pounds, and the staff superannuation fund to nearly as much.

Employees holding stock in the association—over 3,000 held nearly £400,000 in 1939—are entitled to a bonus in any year in which the association pays at least 5% to its ordinary stockholders. A system of rewards for ideas submitted by employees; a savings fund; educational training schemes; staff guild; and various other arrangements calculated to be of mutual benefit are maintained. The conditions obtaining in the industry constitute a striking contrast with those which obtained prior to the founding of the association.

The association, in common with the textile trade generally, and especially those sections of it which rely upon export trade, has suffered severely from the depressed conditions which have obtained since 1930, but it is fair to say that the economies aimed at in the formation of the combine have been secured; co-ordination of control has brought with it not only increased efficiency in business management but a better technique; and results have justified the association's attention to scientific and technical research, its co-operation with manufacturers and merchants in the matter of new productions, and its study of and propaganda in world markets with a view to strengthening the market position of the British textile trade overseas.

The association engages in textile printing at its branch, John & Henry Bleackley, Ltd., Prestwich, Manchester, and another branch, The Cravenette Co. Ltd., owns "Cravenette" showerproof.

Though the association has acquired a number of other businesses, subsequent concentration has brought the number of active branches to exactly what it was at the outset. The centre of administration is at Bradford, with offices in Manchester and London, and the majority of the branches are located in the West Riding of Yorkshire, others being in Lancashire and Scotland.

On Jan. 1, 1939, issued share and loan capital was £6,261,781.

BRADFORD-ON-AVON, urban district, Wiltshire, England, on the River Avon near the west (Somerset) border of the county. Pop. (est. 1938) 4,749. Area, 3.3 sq.mi. Its houses, of local grey stone, rise in disorder up the steep sides of the valley.

Bradford (*Bradauford, Bradeford*) was the site of a battle in 652. A monastery existed there in the 8th century, of which St. Aldhelm was abbot at the time of his being made bishop of Sherborne in 705. No mention of the monastery occurs after the Conquest, but the nunnery of Shaftesbury, to which it was given in 1001, retained the lordship of the manor until the dissolution of the monasteries in the reign of Henry VIII. Bradford appears as a borough in the Domesday survey, being assessed at 42 hides. One of the most interesting features of the old town is the ancient nine-arched bridge with a chapel on it, as at Wakefield. The Saxon church of St. Lawrence was considered by Freeman to be "the most perfect surviving church of its kind in England, if not in Europe." It consists of a chancel, nave and porch; and its foundation is generally attributed to St. Aldhelm. The mediaeval tithe-barn of Bradford is one of the best specimens in the country. The restored parish church of Holy Trinity dates from the 12th century. Bradford was at one time the centre of the clothing industry in the west of England, and was famous for its broadcloth and mixtures, the waters of the Avon being especially favourable. The industry declined in the 18th century, and manufacturing of tires and other rubber goods became the staple trade. The town possesses many signs of its former prosperity; and the open Cotswold hills, which contributed to the establishment of the wool trade in the past, still give the town its character and help its development as a tourist centre. The market is of ancient origin. Bradford is served by the G.W. railway and by the Kennet and Avon canal, one of the last of the southern waterways to fall into disuse. Kingston house, one of the finest Jacobean mansions in England, was long the seat of the Pierreponts. It later became a wool store, but is now completely restored. Bradford-on-Avon is included in the parliamentary division of Westbury.

BRADLAUGH, CHARLES (1833–1891), English free-thinker and politician, was born at Hoxton, London, on Sept. 26, 1833, the son of a poor solicitor's clerk. He managed to earn a living by odd jobs, and came into contact with a group of free-thinkers who were disciples of Richard Carlile.

At the end of 1850 he enlisted as a soldier, but in 1853 was bought out with money provided by his mother. He then found employment as a lawyer's clerk, and gradually became known as a free-thought lecturer, under the name of "Iconoclast." From 1860 he conducted the *National Reformer* for several years, and displayed much resource in legal defence when the paper was prosecuted by the government on account of its alleged blasphemy and sedition in 1868–69. The passing of the Evidence Amendment act in 1869 was the result of another legal contest (1867–69) as to whether Bradlaugh being an atheist, and so unable to take the oath, could give evidence in a court of law. In 1874 he became acquainted with Mrs. Annie Besant, who soon became co-editor of the *National Reformer*. In 1876 the Bristol publisher of an American pamphlet on the population question, called *Fruits of Philosophy,* was indicted for selling a work full of indecent physiological details, and, pleading guilty, was lightly sentenced; but Bradlaugh and Mrs. Besant took the matter up, in order to vindicate their ideas of liberty, and aggressively republished and circulated the pamphlet. In the prosecution which resulted they were convicted and sentenced to a heavy fine and imprisonment, but the sentence was stayed and the indictment ultimately quashed on a technical point. The affair, however, had several side issues in the courts and led to much prejudice against the defendants, the distinction being ignored between a protest against the suppression of opinion and the championship of the

particular opinions in question. Mrs. Besant's close alliance with Bradlaugh terminated in 1885, when she drifted from secularism, first into socialistic and labour agitation and then into theosophy as a pupil of Mme. Blavatsky. Bradlaugh himself took up politics with increasing fervour. He had been unsuccessful in standing for Northampton in 1868, but in 1880 he was returned by that constituency to parliament as an advanced radical. A long and sensational parliamentary struggle now began. He claimed to be allowed to affirm under the Parliamentary Oaths act, and the rejection of this pretension, and the refusal to allow him to take the oath on his professing his willingness to do so, terminated in Bradlaugh's victory in 1886. But this result was not obtained without protracted scenes in the House; in July 1880 Bradlaugh was unseated; in Aug. 1881, having been re-elected, he attempted to force his way into the House, but was ejected. In 1882, at the opening of the session he advanced up the House and, producing a Bible from his pocket, administered the oath to himself. After several re-elections and exclusions, and much litigation, Bradlaugh was victorious in Jan. 1886, when the new Speaker insisted on his being allowed to take the oath. When the long struggle was over, the public had gradually got used to Bradlaugh, and his transparent honesty and courageous contempt for mere popularity gained him increasing respect. He died on Jan. 30, 1891. Hard, arrogant and dogmatic, with a powerful physique and a real gift for popular oratory, he was a natural leader in causes which had society against them, but his sincerity was as unquestionable as his combativeness.

His *Life* was written, by his daughter, Mrs. Bradlaugh Bonner, with the assistance of J. M. Robertson (1894). *See* also J. M. Robertson, *Charles Bradlaugh* (1920).

BRADLEY, FRANCIS HERBERT (1846–1924), British philosopher, was born on Jan. 30, 1846, at Glasbury, Brecknock, and educated at University college, Oxford, becoming a fellow of Merton in 1876. He was admitted to the Order of Merit in June 1924, and died on Sept. 18 of the same year.

Although greatly indebted to Hegel, Bradley disowned Hegelianism as a system, and by his own efforts to re-state the case for idealism, made a substantial contribution to philosophy, a contribution which, together with that of Caird, Green and Bosanquet, was to raise Britain to philosophical pre-eminence. His first large work, *Ethical Studies* (1876, 2nd ed. 1927), emphasized the necessity for man first to find himself as a whole and then to bring himself into line with the world of completely harmonized experience, with the infinite coherent unity. It attacked utilitarianism by proclaiming that the moral end is the realization of the good will which is universal, free, autonomous, formal and superior to ourselves. *The Principles of Logic* (1883, 2nd ed. 1927), which infused fresh vitality into the study of logic, brought out the limitations of the system of Mill, especially of the associationist theory of inference. But it was *Appearance and Reality* (1893, 2nd ed. 1897) that stirred the philosophical world and led Caird to remark that it was "the greatest thing since Kant." The main doctrines formulated in this work and in the *Essays on Truth and Reality* (1914) may be briefly summarized. The ultimate fact is experience which means indissoluble unity with the perceived. But experience, though of itself non-relational, contains implicitly all differentiations of discursive thinking, these differentiations being rendered explicit in judgment. To be true a judgment must harmonize with all other judgments, but since the totality of reality is beyond the reach of finite minds, it seems that our particular judgments can never be entirely free from error. Thus, for Bradley the real subject of a judgment may be said to be the Absolute, a natural outcome of his view that nature is an appearance within reality and an imperfect manifestation of the Absolute. What is this Absolute? Certainly neither a sum of finite minds nor a self-conscious mind, for the former implies external relations and the latter internal relations, and the point about reality is that it is non-relational, requiring nothing outside of it to complete its being.

Bradley chooses to call the Absolute Spirit rather than Mind, but in the end, makes the admission that it has no assets beyond appearance.

BIBLIOGRAPHY.—Apart from the works mentioned above, Bradley wrote *The Pre-suppositions of Critical History* (1874); *Mr. Sidgwick's Hedonism* (1877) and numerous articles in *Mind* which are listed in A. E. Taylor's "Francis Herbert Bradley" in the *Proceedings of the Brit. Academy* (1926). *See* also H. Rashdall, "The Metaphysic of Mr. F. H. Bradley" in the *Proceedings* of the same body, vol. v. (1912); and various articles in *Mind* for Jan. 1925.

BRADLEY, GEORGE GRANVILLE (1821–1903), English divine and scholar, was born on Dec. 11, 1821, at Glasbury, Brecon. He was educated at Rugby under Thomas Arnold, and at University college, Oxford, of which he became a fellow in 1844. He was an assistant master at Rugby from 1846 to 1858, when he succeeded G. E. L. Cotton as headmaster at Marlborough. In 1870 he was elected master of his old college at Oxford, and in Aug. 1881 he was made dean of Westminster in succession to A. P. Stanley, whose pupil and intimate friend he had been, and whose life he wrote. Besides his *Recollections of A. P. Stanley* (1883) and *Life of Dean Stanley* (1892), he published *Aids to writing Latin Prose Composition* and *Lectures on Job* (1884) and *Ecclesiastes* (1885). He took part in the coronation of Edward VII., resigned the deanery in 1902, and died on March 13, 1903.

Dean Bradley's half-brother, ANDREW CECIL BRADLEY (1851–1935), was professor of poetry at Oxford from 1901 to 1906 and author of the well-known book on *Shakespearean Tragedy* (1904), which passed through many editions. Of his children, Mrs. Margaret Woods is separately noticed; ARTHUR GRANVILLE BRADLEY (1850–1943) wrote many historical and topographical works.

BRADLEY, HENRY (1845–1923), British philologist, was born at Manchester Dec. 3 1845. He was educated at Chesterfield grammar school, became a teacher, and later a clerk in a commercial house in Sheffield. At the same time he wrote a little for the literary reviews, and this work brought him to London. There he worked for *The Athenaeum* and *The Academy*, and through F. York Powell was introduced to *The New English Dictionary*, then in preparation, and this became his life-work. He succeeded Sir James Murray as senior editor on the latter's death in 1915 and remained on this undertaking until his own death. He worked with Skeat on certain Chaucerian studies, and published several works of his own, notably *The Making of English* (1904). He died at Oxford May 23 1923.

See Henry Bradley, *Collected Essays*, with memoir by Robert Bridges, 1927.

BRADLEY, JAMES (1693–1762), English astronomer, was born at Sherborne, Gloucestershire, and educated at Balliol college, Oxford. His early observations were made at the rectory of Wanstead in Essex, under the tutelage of his uncle, the Rev. James Pound (1669–1724), himself a skilled astronomer, and he was elected a fellow of the Royal Society on Nov. 6, 1718. He took orders on his presentation to the vicarage of Bridstow in the following year, and a small sinecure living in Wales was besides procured for him by his friend Samuel Molyneux (1689–1728). He resigned his ecclesiastical preferments in 1721, on his appointment to the Savilian professorship of astronomy at Oxford, while as reader on experimental philosophy (1729–60) he delivered 79 courses of lectures in the Ashmolean Museum. His discovery of the aberration of light (*see* ABERRATION OF LIGHT) was communicated to the Royal Society in Jan. 1729 (*Phil. Trans.* xxxv. 637). The observations upon which it was founded were made at Molyneux's house on Kew Green. He refrained from announcing the supplementary detection of nutation until Feb. 14 1748 (*Phil. Trans.* xlv. 1), when he had tested its reality by minute observations during an entire revolution (18·6 years) of the moon's nodes. He had meantime (in 1742) been appointed to succeed Edmund Halley as astronomer royal; his enhanced reputation enabled him to apply successfully for an instrumental outfit at a cost of £1,000; and with an 8-ft. quadrant completed for him in 1750 by John Bird (1709–1776), he accumulated at Greenwich in ten years materials of inestimable value for the reform of astronomy. A Crown pension of £250 a year was conferred upon him in 1752. He retired in broken health, nine years later, to Chalford in Gloucestershire, where he died. The printing of his observations was delayed by

disputes about their ownership; but they were finally issued from the Clarendon Press, Oxford, in two folio volumes (1798, 1805). The insight and industry of F. W. Bessel were, however, needed for the development of their fundamental importance.

Rigaud's Memoir prefixed to *Miscellaneous Works and Correspondence of James Bradley, D.D.* (Oxford 1832), is practically exhaustive. *See* also Delambre's *Hist. de l'astronomie au 18me siècle*, p. 413.

BRADSHAW, GEORGE (1801–1853), English printer and publisher, was born near Pendleton, Lancashire, on July 29, 1801. On leaving school he was apprenticed to an engraver at Manchester, eventually setting up on his own account in that city as an engraver and printer—principally of maps. His name was already known as the publisher of *Bradshaw's Maps of Inland Navigation*, when in 1839, soon after the introduction of railways, he published *Bradshaw's Railway Time Tables*, the title being changed in 1840 to *Bradshaw's Railway Companion*. A new volume was issued at occasional intervals, a supplementary monthly time-sheet serving to keep the book up to date. In Dec. 1841 Bradshaw began to issue the time-tables for each month under the title *Bradshaw's Monthly Railway Guide*. In June 1847 was issued the first number of *Bradshaw's Continental Railway Guide*.

BRADSHAW, HENRY (*c.* 1450–1513), English poet, was born at Chester. In his boyhood he was received into the Benedictine monastery of St. Werburgh, and after studying with other novices of his order at Gloucester (afterwards Worcester) college, Oxford, he returned to his monastery at Chester. He wrote a Latin treatise *De antiquitate et magnificentia Urbis Cestriae*, which is lost, and a life of the patron saint of his monastery in English seven-lined stanza. This work, *The Holy Lyfe and History of saynt Werburge very frutefull for all Christen people to rede* (printed by Richard Pynson, 1521) contains a good deal of history beside the actual life of the saint.

St. Werburgh was the daughter of Wulfere, king of Mercia, and Bradshaw gives a description of the kingdom of Mercia, with a full account of its royal house. He relates the history of St. Ermenilde and St. Sexburge, mother and grandmother of Werburgh, who were successively abbesses of Ely. The second book narrates the Danish invasion of 875, and describes the history and antiquities of Chester, from its foundation by the legendary giant Leon Gaur, from which he derives the British name of Caerleon, down to the great fire which devastated the city in 1180, but was suddenly extinguished when the shrine of St. Werburgh was carried in procession through the streets.

Pynson's edition of the *Holy Lyfe* is very rare, only five copies being known. A reprint copying the original type was edited by Edward Hawkins for the Chetham Society in 1848, and by Carl Hortsmann for the Early English Text Society in 1887.

BRADSHAW, HENRY (1831–1886), British scholar and librarian, was born in London on Feb. 2, 1831, and died on Feb. 10, 1886. He was educated at Eton, and became a fellow of King's college, Cambridge. After a short scholastic career in Ireland he accepted an appointment in the Cambridge university library as an extra assistant. When he found that his official duties absorbed all his leisure he resigned his post, but continued to give his time to the examination of the mss. and early printed books in the library. In addition to his achievements in black-letter bibliography he threw great light on ancient Celtic language and literature by the discovery, in 1857, of the *Book of Deer*, a manuscript copy of the Gospel in the Vulgate version, in which were inscribed old Gaelic charters. This was published by the Spalding Club in 1869. Bradshaw also discovered some Celtic glosses on the ms. of a metrical paraphrase of the Gospels by Juvencus. He made another important find in the Cambridge library: Cromwell's envoy, Sir Samuel Morland (1625–95), had brought back from Piedmont mss. containing the earliest known Waldensian records, consisting of translations from the Bible, religious treatises and poems. One of the poems referred the work to the beginning of the 11th century, though the mss. did not appear to be of earlier date than the 15th century. On this Morland had based his theory of the antiquity of the Waldensian doctrine, and, in the absence of the mss., which were supposed to be irretrievably lost, the conclusion was accepted. Bradshaw discovered the mss. in the university library, and found in the passage indicated traces of erasure. The original date proved to be 1400. Incidentally the correct date was of great value in the study of the history of the language. In 1866 he discovered 2,200 lines on the siege of Troy incorporated in a ms. of Lydgate's *Troye Booke*, and of the *Legends of the Saints*, an important work of some 40,000 lines. These poems he attributed, erroneously, as has since been proved, to Barbour. He was elected (1867) university librarian, and as dean of his college (1857–65) and praelector (1863–68) he was involved in further routine duties. His papers on antiquarian subjects were edited by Mr. F. Jenkinson 1889.

An excellent *Memoir of Henry Bradshaw*, by G. W. Prothero, appeared in 1888. *See* also A. Leeper, *A Scholar-Librarian*, (1901); C. F. Newcombe, *Some Aspects of the Work of Henry Bradshaw* (1905).

BRADSHAW, JOHN (1602–1659), president of the "High Court of Justice" which tried Charles I., the second son of Henry Bradshaw, of Marple and Wibersley in Cheshire, was baptized on Dec. 10, 1602. He was admitted into Gray's Inn in 1620, and was called to the bar in 1627, becoming a bencher in 1647. On Sept. 21, 1643, he was appointed judge of the sheriff's court in London. In Oct. 1644 he was counsel, with Prynne, in the prosecution of Lord Maguire and Hugh Macmahon, implicated in the Irish rebellion, in 1645 for John Lilburne in his appeal to the Lords against the sentence of the Star Chamber, and in 1647 in the prosecution of Judge Jenkins. In 1647 he was made chief justice of Chester and a judge in Wales, and on Oct. 12, 1648, he was presented to the degree of serjeant-at-law. On Jan. 2, 1649, the lords threw out the ordinance for bringing the king to trial, and the small remnant of the House of Commons which survived Pride's Purge, consisting of 53 independents, determined to carry out the ordinance on their own authority. The leading members of the bar of both parties having refused to participate in the proceedings, Bradshaw was selected to preside. The king refused to plead before the tribunal, but Bradshaw silenced every legal objection and denied to Charles an opportunity to speak in his defence. He also conducted the trials of several royalists, including the duke of Hamilton and Lord Capel. He was appointed, in 1649, attorney-general of Cheshire and North Wales, and chancellor of the duchy of Lancaster, and on March 10 became president of the Council of State. When, after the expulsion of the Long Parliament, Cromwell came to dismiss the council, Bradshaw is said, on the authority of Ludlow, to have confronted him boldly, and denied his power to dissolve the parliament. He refused to sign the "engagement" pledging members of the parliament of 1654 to support the government drawn up by Cromwell, and in consequence withdrew from Parliament. After the abdication of Richard Cromwell, Bradshaw again entered Parliament, became a member of the Council of State, and on June 3, 1659, was appointed a commissioner of the great seal. He died on Oct. 31, 1659, and was buried in Westminster Abbey.

BRADWARDINE, THOMAS (*c.* 1290–1349), English archbishop, called "the profound doctor," was born either at Hartfield in Sussex or at Chichester. He was educated at Merton college, Oxford, and became chancellor of the university and professor of divinity. From being chancellor of the diocese of London he became chaplain and confessor to Edward III., whom he attended during his wars in France. On his return to England, he was successively appointed prebendary of Lincoln, archdeacon of Lincoln (1347), and in 1349 archbishop of Canterbury. He died of the plague at Lambeth on Aug. 26, 1349, 40 days after his consecration.

Chaucer in his *Nun's Priest's Tale* ranks Bradwardine with St. Augustine. His great work *De causa Dei contra Pelagium, etc.* (ed. Sir Henry Savile 1618), by stressing the divine concurrence with all human volitions and with all activity in nature, unintentionally inaugurates a universal determinism. Bradwardine also wrote *De Geometria speculativa* (1530); *De Arithmetica practica* (1502); *De Proportionibus velocitatum* (Paris, 1495; Venice, 1505); *De Quadratura Circuli* (1495); and an *Ars Memorativa*, Sloane mss. No. 3974 in the British Museum.

See Quétif-Échard, *Script. Praedic.*, i. 744 (1719); W. F. Hook, *Lives of the Archbishops of Canterbury*, vol. iv.; S. Hahn, *Brad-*

wardinus u.s. Lehre von der menschlichen Willensfreiheit (Münster, 1905).

BRADY, NICHOLAS (1659–1726), Anglican divine and poet, was born at Bandon, County Cork, on Oct. 28, 1659, and died at Richmond, Surrey, on May 20, 1726. He received his education at Westminster school, and at Christ Church, Oxford; but he graduated at Trinity college, Dublin, and became prebendary of Cork. In 1690 Brady prevented the burning of the town of Bandon, after James II had given orders for its destruction. He soon afterwards settled in London, where he held the livings of Clapham and Richmond. Brady's best known work is his metrical version of the Psalms, prepared in collaboration with Nahum Tate. It was licensed in 1696, and largely ousted the old version of T. Sternhold and J. Hopkins.

BRAEKELEER, HENRI JEAN AUGUSTIN DE (1840–88), Belgian painter, was born at Antwerp on June 12, 1840, and died there July 21, 1888. He was trained by his father, Ferdinand de Braekeleer (1792–1883), a *genre* painter, and his uncle Baron Henri Leys. The first pictures he exhibited, "The Laundry" (Van Cutsem collection, Brussels) and "The Coppersmith's Workshop" (Vleeshovwer collection, Antwerp), were shown at the Antwerp exhibition in 1861. "The Brewer's House at Antwerp" (Marlier collection), better known as "A Man Sitting," is generally regarded as his masterpiece. There are many good examples of his work in Brussels and Antwerp. As a lithographer and etcher, his work resembles that of Henri Leys. Towards the end of his life de Braekeleer did some dot painting (*pointillisme*), in which he achieved admirable effects of light.

See C. Lemonnier, *Henri de Braekeleer* (1905).

BRAEMAR, a district in south-west Aberdeenshire, Scotland, extending 24m. from Ballater (east) to Glen Dee (west), with a breadth of 3 to 6m. Glen Dee lies among hills from 1,000 to nearly 3,000ft. high. The villages and clachans (Gaelic for hamlet) from 600 to more than 1,000ft. above the sea, have pure and bracing air. The deer forests comprise the royal forests of Balmoral and Ballochbuie, Glen Ey Forest, Mar Forest and Invercauld Forest. Castles, mansions and lodges, mostly in Scottish baronial style, include Balmoral (*q.v.*) and Abergeldie Castles belonging to the crown, Invercauld House, Braemar Castle, Mar Lodge and Old Mar Lodge. Braemar (Castleton of Braemar) is the foremost village, the capital of the Deeside Highlands. The well-known Braemar Gathering for highland games is held in a park near the village. Not far from the spot where the brawling Clunie joins the Dee the earl of Mar raised the standard of revolt in 1715. His seat, Braemar Castle, reputed to be a hunting-lodge of Malcolm Canmore, was forfeit along with the estates. The new castle built by the purchasers in 1720 was later acquired by Farquharson of Invercauld, who gave the Government the use of it after the battle of Culloden.

BRAG, a very old game of cards, probably evolved from the ancient Spanish *primero,* played by five or six, or more players. It may have been one of the ancestors of poker, since the object of play is similar in the two games.

BRAGA, THEOPHILO (1843–1924), Portuguese writer and politician, was born at Punta Delgada, in the Azores. He published six volumes of poems between 1859 and 1868, and his *History of Portuguese Literature* (20 vols.) between 1870 and 1881. In philosophy he was a positivist.

Braga was elected deputy for Lisbon in Aug. 1909, and in Oct. 1910, when the new-born Portuguese republic was faced with the difficult task of political reconstruction, this man of unquestionable attainments and irreproachable character was selected as first provisional president. He remained in office till the election of Dr. Arriaga as first constitutional president, Aug. 24, 1911, and when Arriaga resigned on May 27, 1915, Braga's services were again requisitioned, and he returned to the presidency for the remainder of the term.

BRAGA, a city of northern Portugal, at the head of a railway from Oporto. Pop. (1940) 29,875. Braga, which ranks after Lisbon and Oporto, is an archiepiscopal see. Its 12th century cathedral was rebuilt during the 16th century in the blend of Moorish and florid Gothic styles known as Manueline. The church of Santa Cruz has a handsome façade, which dates from 1642. There are several convents and a library containing many rare books and manuscripts, also the ruins of a Roman theatre, temple and aqueduct. The principal manufactures are firearms, jewellery, cutlery, cloth and felt hats. Large cattle fairs are held in June and September. On a hill about 3m. S.E. stands the celebrated sanctuary of Bom Jesus do Monte, visited at Whitsuntide by many thousands of pilgrims, who do public penance as they ascend to the shrine; and about 1m. beyond it is Mt. Sameiro (2,535ft.) crowned by a colossal statue of the Virgin Mary, and commanding a magnificent view of the mountainous country, which culminates in the Serra do Gerez, on the north-east.

Braga is the Roman *Bracara Augusta,* capital of the *Callaici Bracarii,* or *Bracarenses.* In the early 5th century it was taken by the Suevi and about 485 by the Visigoths, who here renounced the Arian and Priscillianist heresies, so the city became famous and its archbishops are still primates of Portugal and long claimed supremacy over the Spanish Church as well. From the Moors, who captured Braga early in the 8th century, the city was retaken in 1040 by Ferdinand I., king of Castile and Leon; and from 1093 to 1147 it was the residence of the Portuguese court.

The administrative district of Braga coincides with the central part of the province of Entre Minho e Douro (*q.v.*). Pop. (1930) 414, 784; (1940) 482,914. Area, 1,040 sq.miles.

BRAGANZA, the name of an administrative district and of its capital included in the province of Traz-os-Montes, Portugal; situated in the north-eastern extremity of the kingdom, on a branch of the river Sabor, 8 mi. S. of the Spanish frontier. Its Portuguese name is Bragança.. Braganza (pop [1940] 6,977), is an episcopal city, consisting of a walled upper town, containing the cathedral college and hospital, and of a lower or modern town. The administrative district of Braganza coincides with the eastern part of Traz-os-Montes (*q.v.*). Pop. of district (1930) 185,164; (est. 1935) 192,594; (1940) 213,233; area, 2,526 sq.mi.

The city gave its name to the family of Braganza, members of which were rulers of Portugal from 1640 onward and emperors of Brazil from 1822 to 1889. The family is descended from Alphonso, a natural son of John I. of Portugal (d. 1433), who was made duke of Braganza in 1442 and died in 1451. His descendant Duke John I. (d. 1583) married into the royal family and, on the death of King Henry II. in 1580 without direct heirs, unsuccessfully claimed the crown in opposition to Philip II. of Spain. When in 1640 the Portuguese threw off the Spanish yoke, his grandson, Duke John II., became King of Portugal as John IV. In 1807, when Napoleon declared the throne of Portugal vacant, King John VI. transferred his court to Brazil. He regained Portugal in 1814, but did not return there till 1821, when he left his elder son Peter as regent of Brazil. In 1822 Brazil established its independence, with Peter as emperor. Peter succeeded his father as king of Portugal in 1826, but at once resigned the crown to his young daughter Maria, with his brother Dom Miguel as regent. Miguel soon proclaimed himself king, but was driven from the country in 1833, when Maria became queen. She was succeeded in 1853 by Louis, her son by her second husband, Ferdinand of Coburg. Louis was succeeded in 1889 by his son Charles (Carlos) I. On Feb. 1, 1908, Carlos and his eldest son were assassinated, and in May his second son, Dom Manoel, was proclaimed king as Manoel (Emmanuel) II. In Oct. 1910 he was deposed as the result of a revolution and went to live in England. On June 19, 1911, the Constituent Assembly in Lisbon declared the monarchy abolished and the House of Braganza for ever banished from Portugal.

Peter I. of Brazil was succeeded by his son Peter II., who reigned till 1889, when he was deposed and exiled and the republic proclaimed. On his death in 1891 this branch of the family also became extinct in the male line. His only child, Isabella, married Louis Gaston, Comte d'Eu. The exiled Dom Miguel founded a branch of the family which settled in Bavaria. The title of duke of Braganza was borne by the eldest sons of the kings of Portugal.

BRAGG, BRAXTON (1817–1876), American soldier, was born in Warren county, N.C., on March 22, 1817. He graduated at the United States military academy in 1837, and as an artillery

officer served in the Seminole wars of 1837 and 1841, and under Gen. Taylor in the Mexican War. He resigned from the regular army in 1856, and retired to his plantation in Louisiana. When in 1861 the Civil War began, Bragg was made a brigadier-general in the Confederate service. Promoted major-general, he led in the autumn of 1862 a bold advance from eastern Tennessee across Kentucky to Louisville, but after the battle of Perryville (Oct. 8) retired into Tennessee. Though he was bitterly censured, the personal favour of Jefferson Davis kept him, as it had placed him, at the head of the central army, and on Dec. 31, 1862, and Jan. 2, 1863, he fought the indecisive battle of Murfreesboro (or Stone river) against Rosecrans. In the campaign of 1863 Rosecrans constantly outmanoeuvred the Confederates, and forced them back to the border of Georgia. Bragg, however, inflicted a crushing defeat on his opponent at Chickamauga (Sept. 19–20) and for a time besieged the Union forces in Chattanooga. But large forces under Grant were concentrated upon the threatened spot, and the great battle of Chattanooga (Nov. 23–25) ended in the rout of the Confederates. Bragg was now deprived of his command, but President Davis made him his military adviser. In the autumn of that year he led an inferior force from North Carolina to Georgia to oppose Sherman's march. In Feb. 1865, he joined Johnston, and he was thus included in the surrender of that officer to Sherman. In spite of his want of success, Bragg was unquestionably a brave and skilful officer. But he was a severe martinet, and rarely in full accord with the senior officers under his orders, the consequent friction often acting unfavourably on the conduct of his operations. He died at Galveston, Tex., on Sept. 27, 1876.

His brother, THOMAS BRAGG (1810–72), was governor of North Carolina, 1855–59, United States senator 1859–61 and attorney-general in the Confederate cabinet 1861–62.

See Don Carlos Seitz, *Braxton Bragg, General of the Confederacy* (1924).

BRAGG, SIR WILLIAM HENRY, O.M. (1862–1942), British physicist, was born at Wigton, Cumberland, July 2, 1862, was educated at King William's college, Isle of Man, and Trinity college, Cambridge. In 1886 he was appointed professor of mathematics and physics at Adelaide, South Australia, where he carried out his earlier researches in radioactivity. In 1909 he was appointed Cavendish professor at Leeds and in 1915 Quain professor of physics in the University of London. His researches upon various radioactive phenomena and his power of lucid exposition brought recognition from scientific bodies both at home and abroad; in 1906 he was elected a fellow of the Royal society; in 1915 he received the Nobel prize for physics and the Barnard Gold medal (Columbia university), both of which distinctions he shared with his son William Lawrence Bragg (b. 1890).

The joint work of father and son went far towards elucidating the arrangements of atoms and crystals, an achievement rendered possible by their development of the X-ray spectrometer. During World War I, Sir William Bragg acted in an advisory capacity to the British admiralty, especially with regard to the problem of submarine detection. He was created K.B.E. in 1920. In 1923 he was appointed Fullerian professor of chemistry at the Royal institution and director of Davy-Faraday research laboratory; and subsequently director of the Royal institution.

Sir William was president of the British Association for the Advancement of Science, 1928–29, having succeeded Sir Arthur Keith, and from 1935 to 1940 was president of the Royal society. He died March 12, 1942.

In addition to many publications, chiefly upon radioactivity and crystallography, in *The Philosophical Magazine* and *The Proceedings of the Royal Society*, he also wrote *The World of Sound* (1920); *Concerning the Nature of Things* (1925); and *The Universe of Light* (1933). (*See* CRYSTALLOGRAPHY.)

BRAGI, in Scandinavian mythology, the son of Odin, and god of wisdom, poetry and eloquence. At the Scandinavian sacrificial feasts a horn consecrated to Bragi was used as a drinking-cup by the guests, who then vowed to do some great deed which would be worthy of being immortalized in verse.

BRAHAM, JOHN (1774–1856), English singer, was born in London March 20, 1774, of Jewish parentage, his real name being Abraham. A pupil of an Italian artist named Leoni, he made his first appearance in public at Covent Garden theatre on April 21, 1787, when he sang "The soldier tired of war's alarms" and "*Ma chère arrive.*" His second début (as a tenor) was made in 1794 at the Bath concerts. In 1796 he appeared in London at Drury Lane in Storace's opera of *Mahmoud*. In 1797 he went to Italy where his career was one of continuous triumph; he appeared in all the principal opera-houses, singing in Milan, Genoa, Leghorn and Venice. His compass embraced about nineteen notes. In 1801 he returned to his native country, and appeared once more at Covent Garden in the opera *Chains of the Heart*, by Mazzinghi and Reeve. In 1824 he sang the part of Max in the English version of Weber's *Der Freischütz*, and he was the original Sir Huon in that composer's *Oberon* in 1826. In 1838 he sang the part of William Tell at Drury Lane, and in 1839 the part of Don Giovanni. His last public appearance was at a concert in March 1852. He died Feb. 17, 1856. During forty years, Braham held the undisputed supremacy alike in opera, oratorio and the concert-room. He composed the music of his own part in many of the English operas in which he appeared and was also part-author of *The American* (1811), which contained the famous song, "The Death of Nelson" (1811).

BRAHE, PER, COUNT (1602–1680), Swedish soldier and statesman, was born on the island of Rydboholm, near Stockholm, on Feb. 18 1602. He was the grandson of Per Brahe (1520–90), nephew of Gustavus I., created count of Visingsborg by Eric XIV., known as the continuator of Peder Svart's chronicle of Gustavus I., and author of *Oeconomia* (1585), a manual for young noblemen. Per Brahe the younger became, in 1626, chamberlain to Gustavus Adolphus. He fought in Prussia during the last three years of the Polish War (1626–29) and also, as colonel of a regiment of horse, in 1630 in Germany. After the death of Gustavus Adolphus in 1632 he abandoned his military career for politics. He had been elected president (*Landsmarskalk*) of the diet of 1629, and in the following year was created a senator (*Riksråd*). In 1635 he conducted the negotiations for an armistice with Poland. In 1637–40 and again in 1648–54 he was governor-general in Finland, to which country he rendered inestimable services by his wise and provident rule. He reformed the whole administration, introduced a postal system, built ten new towns, improved and developed commerce and agriculture, and very greatly promoted education. In 1640 he opened the university of Åbo, of which he was the founder and first chancellor. After the death of Charles X. in 1660, Brahe, as *rikskansler* or chancellor of Sweden, was one of the regents of Sweden for the second time (he had held a similar office during the minority of Christina, 1632–44), and during the difficult year 1660 he had entire control of both foreign and domestic affairs. He died on Sept. 2 1680, at his castle at Visingsborg.

His brother, NILS BRAHE (1604–32), also served with distinction under Gustavus Adolphus. In 1631 he was appointed colonel of "the yellow regiment," the king's world-renowned life-guards, at the head of which he captured the castle of Würzburg (Oct. 8 1631). He commanded the left wing at Lützen (Nov. 6 1632), where he was the only Swedish general officer present. At the very beginning of the fight he was mortally wounded. The king regarded Brahe as the best general in the Swedish army after Lennart Torstensen.

A grandson of Nils, MAGNUS BRAHE (1790–1844) fought in the campaign of 1813–14, under the crown prince Bernadotte (Charles XIV.). He became marshal of the kingdom, and, especially from 1828 onwards, exercised a preponderant influence in public affairs.

See Martin Veibull, *Sveriges Storhetstid*, vol. iv. (1881); *Letters to Axel Oxenstjerna* (Swed.), 1832–1851 (1890); Petrus Nordmann, *Per Brahe* (Helsingfors, 1904).

BRAHE, TYCHO (1546–1601), Danish astronomer, was born on Dec. 14, 1546, at the family seat of Knudstrup in Scania, then a Danish province. He studied at Copenhagen, Leipzig, Rostock and Augsburg, and in 1571 was permitted by his maternal uncle, Steno Belle, to install a laboratory at his castle of Herritzvad, near Knudstrup; and there, on Nov. 11, 1572, he caught sight of the famous "new star" in Cassiopeia. His observa-

tions were published as *De Novâ Stellâ* (Copenhagen, 1573, facsimile reprint 1901).

Tycho's marriage with a peasant-girl in 1573 somewhat strained his family relations. He delivered lectures in Copenhagen by royal command in 1574; and in 1575 travelled through Germany to Venice. Frederick II., king of Denmark, bestowed upon him for life the island of Hveen in the Sound, together with a pension of 500 thalers, a canonry in the cathedral of Roskilde, and the income of an estate in Norway. The first stone of the magnificent observatory of Uraniborg was laid on Aug. 8, 1576; it was the scene, during 21 years, of Tycho's labours. Frederick's successor, Christian IV., was less tolerant of Tycho's arrogance. His pension and fief having been withdrawn, he sailed for Rostock in June 1597. He spent the following winter at Wittenberg, and reached Prague in June 1599, well assured of favour and protection from the emperor Rudolph II., who assigned him the castle of Benatky for his residence, with a pension of 3,000 florins; his great instruments were moved thither from Hveen, and Johannes Kepler joined him in Jan. 1600. Tycho died at Benatky on Oct. 24, 1601.

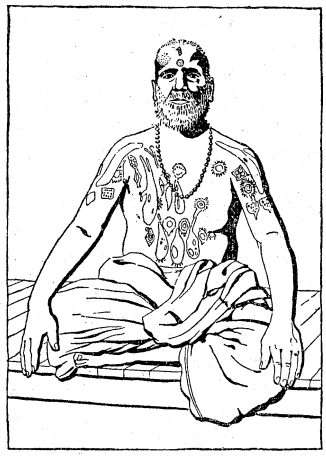
Tycho's principal work, entitled *Astronomiae instauratae progymnasmata* (2 vols., Prague, 1602–03) was edited by Kepler. The first volume treated of the motions of the sun and moon, and gave the places of 777 fixed stars (this number was increased to 1,005 by Kepler in 1627 in the "Rudolphine Tables"). The second, which had been privately printed at Uraniborg in 1588 with the heading *De mundi aetherei recentioribus, phaenomenis,* was mainly concerned with the comet of 1577, demonstrated by Tycho from its insensible parallax to be no terrestrial exhalation, as commonly supposed, but a body traversing planetary space. It included, besides, an account of the Tychonic plan of the cosmos, in which a *via media* was sought between the Ptolemaic and Copernican systems. The earth retained its immobility; but the five planets were made to revolve round the sun, which, with its entire cortège, annually circuited the earth, the sphere of the fixed stars performing meanwhile, as of old, its all-inclusive diurnal rotation (*see* ASTRONOMY: *History*). Under the heading *Astronomiae instauratae mechanica,* Tycho published at Wandsbeck, in 1598, a description of his instruments, together with an autobiographical account of his career and discoveries, including the memorable one of the moon's "variation" (*see* MOON). His *Epistolae Astronomicae,* printed at Uraniborg in 1596, were embodied in a complete edition of his works issued at Frankfurt in 1648. He constructed a table of refractions, allowed for instrumental inaccuracies, and eliminated by averaging accidental errors. He, moreover, corrected the received value of nearly every astronomical quantity.

See J. L. E. Dreyer, *Tycho Brahe* (1890), which gives full and authentic information regarding his life and work. Also Gassendi, *Vita* (Paris, 1654); *Lebensbeschreibung,* collected from various Danish sources, and translated into German by Philander von der Weistritz (Copenhagen and Leipzig, 1756); F. R. Friis, *Tyge Brahe* (Copenhagen, 1871); R. A. Gray, "The Life and Work of Tycho Brahe," Roy. Astron. Soc. of Canada, *Journ.* xvii. (1923).

BRAHMA, a large breed of the domestic fowl, of Asiatic origin, and like the Cochin and Langshan of similar derivation, has feathered shanks. The first importations into America were apparently made in Sept. 1846, and during the latter half of the 19th century the Brahma was bred quite extensively in the north-eastern section of the United States. Brahmas are massive in appearance, well feathered and well proportioned, and make very desirable roasters. The Brahma lays a brown-shelled egg and is a broody breed. There are two varieties, the dark and the light, similar in type but different in standard weights and in colour pattern. (*See* POULTRY AND POULTRY FARMING.)

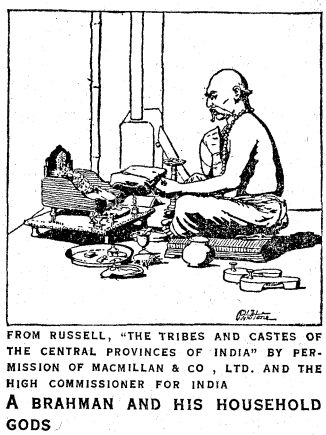
BRAHMAGUPTA (588–*c.*660), Indian mathematician and astronomer, set forth the astronomical system of Brahma in verse form, the *Brahma-sphuta-siddhanta,* in which two chapters are devoted to mathematics, including an arithmetical progression, a quadratic equation, and proofs of various geometrical theorems on the right-angled triangle, on areas of triangles and quadrilaterals, and on surfaces and volumes. These two chapters were translated into English by H. T. Colebrooke in his *Algebra, with Arithmetic and Mensuration, from the Sanskrit of Brahmegupta and Bhâscara, preceded by a dissertation on the state of science as known to the Hindus* (1871).

BRAHMAN (Sanskrit *Brahma,* neuter, the universal or supreme Soul, the Absolute; and *Brahmā,* masc., the Supreme God), a priest in the *Rig-Veda,* especially one who praises the gods: in the *Atharva-Veda* (as a neuter) the priestly, as opposed to the Kshatra or warrior class. The patronymic Brāhmana (*q.v.*) is (1) "son of a priest," mostly in the later *Vedas,* and (2) in the later Vedic literature a book of "religious explanation." The term *brahma* seems originally to have meant magic or magical spell, a formula (*mantra*) which, used punctiliously, will constrain the gods to gratify the worshipper's wishes. In the *Rig-Veda* it appears as the religious property of a narrow circle, a mysterious power which can be evoked by texts, ceremonies or chants and sacrifices. In Vedic times a god, Brahmanaspati (or Brihaspati *q.v.*) was conceived of a "lord of prayer," *brahma,* the heavenly *brahman,* prototype of the earthly. But "prayer" here connotes nothing that is implied in its Christian use. It denoted a compulsory, not a devotional attitude in the officiant. As priest, Brihaspati seems to have been the prototype of Brahmā, chief of the Hindu triad, just as *brahma* (*n*) developed into the Absolute of the Vedānta philosophy. When the *brahma* freed itself from the externals of ritual and, as early as the *Upanishads,* developed into the loftiest conception of Hinduism, the Brahman was also, as it were, promoted. From being in the *Rig-Veda* merely one of the seven classes of the Ritvij, "sacrificial priesthood," of whom the Hotri, composer and singer, was chief, while to the Brahman and two others was assigned the ritual of the Soma (*q.v.*) sacrifice, the Brahman by acquiring the general supervision of the sacrifices became the leader of them. That function had formerly been exercised by the *purohita* ("appointed, set in front") who represented the king, and was usually a Hotri, Avestan Zaotar. The precise means whereby the Brahman ousted the Hotri is not clear, but probably as song lost its foremost place in ritual, the Brahman was assigned the leading part so that his skill as a specialist in magic might undo any errors committed in the rites. A technical guide to magical practices was compiled for him in the *Atharva-Veda,* but he was expected to be acquainted with all the other *Vedas* as well, and was thus eligible to undertake any priestly duty according to his qualifications. The earliest claimants to be Brahmans were the Vasishtas, and later the Atharvans. That the Brahmans were, even in the *Rig-Veda,* a priestly class distinct from the Kshatriya, seems clear, but it only appears as privileged and superior to the latter in later Vedic literature.



FROM RUSSELL, "TRIBES AND CASTES OF THE CENTRAL PROVINCES OF INDIA"

A MADHAVA BRAHMAN OF INDIA
With his caste mark on his forehead



FROM RUSSELL, "THE TRIBES AND CASTES OF THE CENTRAL PROVINCES OF INDIA" BY PERMISSION OF MACMILLAN & CO., LTD. AND THE HIGH COMMISSIONER FOR INDIA

A BRAHMAN AND HIS HOUSEHOLD GODS
The home ritual is a necessary ceremony of the Brahman religion. It is performed regularly

BIBLIOGRAPHY.—A. A. Macdonell, *Vedic Mythology* (Strasbourg, 1897); A. Hillebrandt, in *E.R.E.* 2 (1909); A. A. Macdonell and A. B. Keith, *Vedic Index* (1912).

BRĀHMANA, the prose commentaries on the "Collections" (Sāmhitas) of Vedic texts, whose meaning and ritual they were written to elucidate, and, like them, regarded as revealed (Sanskrit, *v.* BRAHMAN). Linguistically, with their appendages (the

still more mystic *Āranyakas* and the philosophic *Upanishads*), they link the Vedic with the classical Sanskrit. The term may be derived from the neuter *brahma* (sacred utterance or rite), and so mean a comment on a text or explanation of a rite.

The elaborate Vedic rites of sacrifice, with a gradual tendency to find in all their minutiae a theosophic or mystic meaning, naturally created a demand for exegesis. This led in practical utility to its extension to the texts and ritual used by each class of officiants. The ritual required four priests, the Brahman (*q.v.*) as supervisor; the Hotri, singer of hymns; the Udgatri, chanter, and the Adhvaryu, or offerer, who prepared the offering-ground, built the fireplace and altar, made the oblations, and muttered the incantations and prayers. Each officiant had three assistants. The manuals used by the Hotri were the *Rig-Veda-Sāmhita,* the *Aitareya,* the *Kaushitaki* (or *Shankhayana*), all works of a priestly school, and the two *Āranyakas,* similarly named. Both these *Brāhmanas* dealt mainly with the Soma-sacrifice and the latter with other sacrificial rites. The parts sung were either litanies or verses invoking the gods to whom oblation was made or else they were responses to the Udgātri's chants. The chanters had two schools, Tāndins and Talavakāras, and they used the *Sāma-Veda-Sāmhita* which deals mainly with the various modes of chanting. This work also is chiefly concerned with the Soma-sacrifice.

The Tāndins had three Brāhmanas, of which the Panchavimsa was the most important; the Talavakāras followed the Jaiminiya (or Talavakāra) Brāhmana, which work includes the Upanishad- and Arsheya-Brāhmanas. For the Adhvaryu's use the Yajur-veda-Sāmhita formed a comprehensive guide to sacrificial procedure. No less than five schools expounded the Yajur-veda; these schools fall into two groups: the older or Black (*Krishna*) Yajus embracing four schools, the remaining school (Vājasaneyin) forming the white (*Sukla*) Yajus. The Black Yajus Sāmhitas, four in number, have survived only in part. Their arrangement suggests a lack of reverence for the Vedic text, which is interspersed with sectarian expositions. This created a singularly confused mass of *mantras* in sections, with exegesis and supplements, a creation quite in accord with the new prominence given, in the *Yajur-veda* itself, to gods like Vishnu and Rudra, at the expense of Varuna, Ushas, Parjanya and others. Consciously or not the Adhvaryus were modifying the Vedic faith, but the Vājasaneyins reformed this practice and, following the other priestly schools, redacted their *Satapatha Brāhmana* as a separate commentary with the verses of the Veda apart. Later, the Taittiriya school of the Black Yajus also incorporated a new commentary into a separate Brāhmana bearing their name.

The Brāhmanas supply the beginnings of grammar and etymology, astronomy, and the philosophy of the Ātma or universal soul. They did even more than this. In the *Rig-Veda* attempts had been made to find an all-comprehending first principle in Prajāpati, Vishvakarma or Purusha, but it is in the Satapatha-Brāhmana that we first find *brāhma* exalted as the one moving force behind and above the gods. The Brāhmanas were originally lectures, or rather, perhaps, notes for lectures delivered orally to candidates for priestly offices. Gradually stereotyped by being reduced to writing, they still show that Hindu thought was intent on finding in the Vedic rites an inner meaning as well as ethical rules (*dharma*). The conception of Prajāpati as Brāhma Svayambhu (Brāhma self-existing), the supreme first principle, paved the way for the Vedanta philosophy and the *Upanishads.*

It remains to describe the *Āranyakas.* Whether they were studied by hermits in the forest, as their title (from *aranya,* "forest") suggests, or were deemed to be so sacred that they were to be read only in the wilderness, is not very material. Their importance lies in their mystical and allegorical expositions of ritual and sacrifices. Instead of actual performance of a sacrifice the student is sometimes bidden to meditate on its allegorical meaning. Again, rules are added which enjoin that the rites themselves are to be kept secret and carried out only for certain persons. A similar secrecy is sometimes prescribed in the *Upanishads.*

BRAHMANISM, a term commonly used to denote a system of religious institutions originated and elaborated by the *Brāhmans,* the sacerdotal and, from an early period, the dominant caste of the Hindu community (*see* BRAHMAN). The religious belief of the Aryan Hindus has passed through various stages of development broadly distinguished from one another by certain prominent features. The earliest phases of religious thought in India of which a clear idea can now be formed are exhibited in a body of writings, looked upon by later generations in the light of sacred writ, under the collective name of *Veda* ("knowledge")



AGNI, THE GOD OF FIRE, AS HE IS USUALLY DEPICTED
The chief messenger between the gods and men, Agni is a divinity of high importance. He has two faces, representing the beneficent and destructive sides of his nature, three legs and seven hands

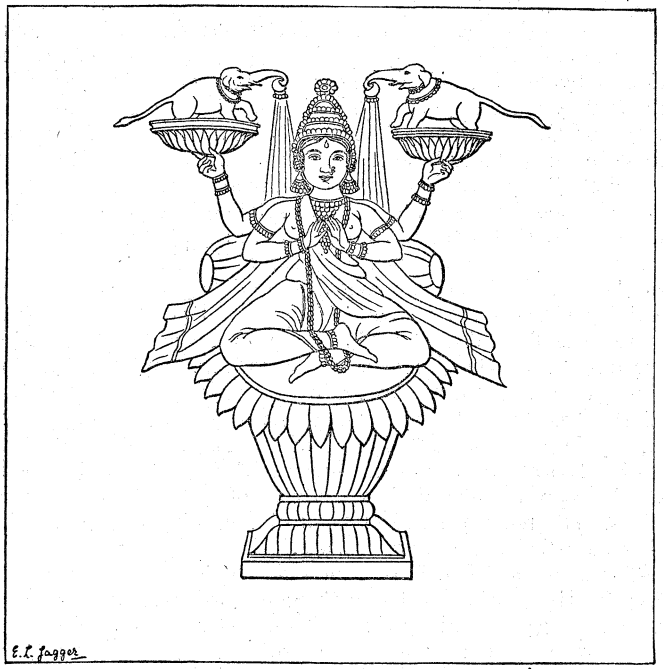
or *Śruti* ("revelation"). The Hindu scriptures consist of four separate collections, or *Saṃhitās,* of sacred texts, or *mantras,* including hymns, incantations and sacrificial forms of prayer, viz., the *Ṛich* (nom. sing. *ṛik*) or *Ṛigveda,* the *Sāman* or *Sāmaveda,* the *Yajus* or *Yajurveda,* and the *Atharvan* or *Atharvaveda.* Each of these four text-books has attached to it a body of prose writings, called *Brāhmaṇas* (*see* BRĀHMANA), intended to explain the ceremonial application of the texts and the origin and import of the sacrificial rites for which these were supposed to have been composed. Usually attached to these works, and in some cases to the Saṃhitās, are two kinds of appendages, the Āraṇyakas and Upanishads, the former of which deal generally with the more recondite rites, while the latter are taken up chiefly with speculations on the problems of the universe and the religious aims of man—subjects dealt with in a systematic way. Two of the *Saṃhitās,* the *Sāman* and the *Yajus,* are only of secondary importance. The hymns of the *Ṛigveda* constitute the earliest lyrical effusions of the Āryan settlers in India. They evidently represent the literary activity of many generations of bards. The tenth (and last) book of the collection has all the characteristics of a later appendage.

The state of religious thought reflected in the hymns of the *Rigveda* is that of a worship of the grand and striking phenomena of nature regarded in the light of personal conscious beings, endowed with a power beyond the control of man, though not insensible to his praises and actions. To the mind of the early Vedic worshipper the various departments of the surrounding nature are not as yet clearly defined, and the functions which he assigns to their divine representatives continually flow into one another.

The generic name given to these impersonations, viz., *deva* ("the shining ones"), points to the striking phenomena of light as those which first and most powerfully swayed the Āryan mind. In the primitive worship of the manifold phenomena of nature, what impresses the human heart are the moral and intellectual forces which are supposed to move and animate them. The at-

tributes and relations of some of the Vedic deities, in accordance with the nature of the objects they represent, partake in a high degree of this spiritual element; but it is probable that in an earlier phase of Āryan worship the religious conceptions were pervaded by it to a greater extent. The Vedic belief, though retaining many of the primitive features, has on the whole assumed a more sensuous and anthropomorphic character, predominant in the attributes and imagery applied by the Vedic poets to *Indra,* god of the atmospheric region, the favourite in their pantheon.

While the representatives of the prominent departments of nature appear to the Vedic bard as co-existing in a state of independence of one another, their relation to the mortal worshipper being the chief subject of his anxiety, a simple method of classification was already resorted to at an early period, consisting in a triple division of the deities into gods residing in the sky, in the air, and on earth. At a later stage, this attempt at a polytheistic system is followed up by the promotion of one particular god to the dignity of chief guardian for each of these three regions. On the other hand, a tendency is clearly traceable in some of the hymns towards identifying gods whose functions present a certain degree of similarity of nature; the first steps from polytheism towards a comprehension of the unity of the divine essence. Another feature of the old Vedic worship tended to a similar result. The great problems of the origin and existence of man and the universe had early begun to engage the Hindū mind; and in celebrating the praises of the gods the poet frequently attributes to them cosmical functions of the very highest order. At a later stage of thought, enquiring sages tried to solve the problem by conceptions of an independent power, endowed with all the attributes of a supreme deity, the creator of the universe, including the gods of the pantheon. The names under which this monotheistic idea is put forth are mostly of an attributive character, and indeed some of them, such as *Prajāpati* ("lord of creatures"), *Viśvakarman* ("all-worker"), occur in the earlier hymns as mere epithets of particular gods. But this theory of a personal creator left many difficulties unsolved. Everything, including man himself, was directed by some inward agent; and it needed but one step to perceive the essential sameness of these spiritual units, and to recognize their being but so many individual manifestations of one universal principle or spiritual essence. Thus a pantheistic conception was arrived at, put forth under various names, such as *Purusha* ("soul"), *Kāma* ("desire"), *Brahman* (neutr.; nom. sing. *brāhma,* "devotion, prayer"). Metaphysical and theosophic speculations, at the time of the composition of the *Brāhmaṇas* and *Upanishads,* were in complete possession of the minds of the theologians. The theories crudely suggested in the later hymns are further matured and elaborated; the tendency towards catholicity of formula favours the combination of the conflicting monotheistic and pantheistic conceptions; this compromise, which makes *Prajāpati,* the personal creator of the world, the manifestation of the impersonal *Brahma,* the universal self-existent soul, leads to the composite pantheistic system which forms the characteristic dogma of the Brāhmanical period (*see* BRAHMAN).



PARVATI, THE "GREAT-GODDESS," CONSORT OF ŚIVA
Also known as the "black one," she enjoys an extensive worship in her own right

In the Vedic hymns two classes of society, the royal (or military) and the priestly classes, were evidently recognized as being raised above the level of the *Viś,* or bulk of the Āryan community. At the time of the hymns, the sacrificial ceremonial had become sufficiently complicated to call for the creation of a certain number of distinct priestly offices with special duties attached to them. While the position and occupation of the priest were those of a profession, the terms *brāhmaṇa* and *brahmaputra,* both denoting "the son of a brahman," are used in certain hymns as synonyms of *brahman.* The profession had, therefore, to a certain degree, become hereditary. With the exception of a solitary passage in a hymn of the last book, no trace can be found in the *Ṛig-veda* of that rigid division into four castes, separated from one another by insurmountable barriers, which in later times constitutes the distinctive feature of Hindū society. The power of the sacerdotal order having been gradually enlarged in proportion to the development of the minutiae of sacrificial ceremonial and the increase of sacred lore, it began to lay claim to supreme authority in regulating the religious and social life of the people.

The definitive establishment of the Brāhmanical hierarchy marks the beginning of the Brāhmanical period properly so called. Though the origin and gradual rise of some of the leading institutions of this era can be traced in the earlier writings, the chain of their development presents a break at this juncture which no satisfactory materials as yet enable us to fill up. A considerable portion of the literature of this time has apparently been lost; and several important works, the original composition of which has probably to be assigned to the early days of Brāhmanism, such as the institutes of Manu and the two great epics, the *Mahābhārata* and *Rāmāyaṇa,* in their present form, show manifest traces of a more modern editing. Yet internal evidence shows that Manu's Code of Laws, though merely a metrical recast of older materials, reproduces on the whole pretty faithfully the state of Hindū society depicted in the sources from which it was compiled. The final overthrow of the Kshatriya power was followed by a period of jealous legislation on the part of the Brāhmans. The privilege of divine origin was successfully claimed for the later Vedic literature, so imbued with Brāhmanic aspirations and pretensions; and the authority implied in the designation of *śruti* or revelation removed henceforth the whole body of sacred writings from the sphere of doubt and criticism. The new social order, as a divine institution, was rendered secure by the elaboration of a system of conventional precepts, partly forming the basis of Manu's Code, which clearly defined the relative position and the duties of the several castes, and determined the penalties to be inflicted on any transgressions of the limits assigned to each of them. These laws are conceived with no sentimental scruples on the part of their authors. On the contrary, the offences committed by Brāhmans against other castes are treated with remarkable clemency, whilst the punishments inflicted for trespasses on the rights of higher classes are the more severe and inhuman the lower the offender stands in the social scale.

The three first castes, however unequal to each other in privilege and social standing, are yet united by a common bond of sacramental rites (*saṃskāras*). The modes of observing these family rites are laid down in a class of writings called *Gṛihya-sūtras,* or domestic rules. It is from their participation in the rite of *upanayana* or investiture with the sacred cord that the three upper classes are called the twice-born. The ceremony is enjoined to take place some time between the eighth and sixteenth year of age in the case of a Brāhman, between the eleventh and twenty-second year of a Kshatriya, and between the twelfth and twenty-fourth

year of a Vaiśya. He who has not been invested with the mark of his class within this time becomes an outcast, unless he is absolved from his sin by a council of Brāhmans, and after due performance of a purificatory rite resumes the badge of his caste. The duty of the Śudra is to serve the twice-born classes, and above all the Brāhmans. He is excluded from all sacred knowledge, and if he performs sacrificial ceremonies he must do so without using



BRAHMA, THE OMNIPRESENT ONE, FATHER OF THE BRAHMAN TRINITY
From whichever side the image is viewed, the trinity is seen and yet a face is opposed to each of the four winds

holy mantras. There is the exception to law that the sacrificer must be of the three high castes, and this exception is made to the Rathakāras, the chariot makers, who seem at quite an early date to have occupied a peculiar position; not included in the third class (Vaiśyas) but distinctly superior to the Śudras. No Brāhman must recite a Vedic text where a man of the servile caste might overhear him, nor must he even teach him the laws of expiating sin. The occupations of the Vaiśya are those connected with trade, the cultivation of the land, and the breeding of cattle; while those of Kshatriya consist in ruling and defending the people, administering justice, and the duties of the military profession generally. Both share with the Brāhman the privilege of reading the Veda, but only so far as it is taught and explained to them by their spiritual preceptor. To the Brāhman belongs the right of teaching and expounding the sacred texts, and also that of interpreting and determining the law and the rules of caste. Only in exceptional cases, when no teacher of the sacerdotal class is within reach, the twice-born youth, rather than forego spiritual instruction altogether, may reside in the house of a non-Brāhmanical preceptor; but it is specially enjoined that a pupil, who seeks the path to heaven, should not fail, as soon as circumstances permit, to resort to a Brāhman well versed in the Vedas and their appendages.

The self-exaltation of the Brāhman class was not altogether due to priestly arrogance and ambition; but it was a natural consequence of the pantheistic doctrine. To the Brāhmanical speculator the numberless individual existences of animate nature naturally presented a continuous scale of spiritual units from the lowest degradation up to the absolute purity and perfection of the supreme spirit. To attain the ultimate goal immediately from any state of corporeal existence, there was but one way—subjection of the senses, purity of life and knowledge of the deity. Those who were habitually engaged in what was most conducive to these spiritual attainments, the Brāhmanical class, early learnt to look upon themselves as being foremost in this race for final beatitude. The life marked out for them by this theory of class duties was calculated to promote that complete mortification of the instincts of animal nature which they considered as indispensable to the final deliverance from *saṇisāra,* the revolution of bodily and personal existence.

The pious Brāhman, longing to attain this deliverance on the dissolution of his frail body, was enjoined to pass through a succession of four orders or stages of life, viz., those of *brahmachārin,* or religious student; *grihastha* (or *grihāmedhin*), or householder; *vanavāsin* (or *vānaprastha*), or anchorite; and *sannyāsin* (or *bhikshu*), or religious mendicant. Theoretically this course of life was open and even recommended to every twice-born man, his distinctive class-occupations being in that case restricted to the second station, or that of married life. Practically, however, those belonging to the Kshatriya and Vaiśya castes were, no doubt, contented, with few exceptions, to go through a term of studentship in order to obtain a certain amount of religious instruction before entering into the married state, and plying their professional duties. The domestic observances—many of them probably ancient Āryan family customs, surrounded by the Hindūs with a certain amount of adventitious ceremonial—were generally performed by the householder himself, with the assistance of his wife. There is, however, another class of sacrificial ceremonies of a more pretentious and expensive kind, called *śrauta* rites, or rites based on *śritu,* or revelation, the performance of which, though not indispensable, was yet considered obligatory in certain circumstances (*see* BRĀHMANA). They formed a very powerful weapon in the hands of the priesthood, and were one of the chief sources of their subsistence. However great the religious merit accruing from these sacrificial rites, they were obviously a kind of luxury which only rich people could afford to indulge in. They constituted, as it were, a tax, voluntary perhaps, yet none the less compulsory, levied by the priesthood on the wealthy laity.

The tendency towards a comprehension of the unity of the divine essence had resulted in a kind of monotheistic notion of the origin of the universe. In the literature of the Brāhmaṇa period this conception is generally allowed a prominent place in the pantheistic theories. Yet the state of theological speculation, reflected in these writings, is one of transition. The general drift of thought is essentially pantheistic, but the ancient form of belief still enters largely into it. An ancient classification of the gods represented them as being 33 in number, 11 in each of the three worlds or regions of nature. These regions being associated each with the name of one principal deity, this division gave rise at a later time to the notion of a kind of triple divine government, consisting of *Agni* (fire), *Indra* (sky), or *Vāyu* (wind), and *Sūrya* (sun), as presiding respectively over the gods on earth, in the atmosphere, and in the sky. Of this Vedic triad mention is frequently made in the Brāhmaṇa writings. On the other hand the term *prajāpati* (lord of creatures), which in the *Ṛigveda* occurs as an epithet of the sun, is also once in the *Atharvaveda* applied jointly to Indra and Agni.



VISHNU, THE "PRESERVER"
The second member of the trinity, he is constantly warring against the third member Śiva, the "destroyer"

An abstract, colourless deity like Brahmā could awake no sympathies in the hearts of those accustomed to worship gods of flesh and blood. The priesthood, anxious to retain a firm hold on the minds of the people, recognized and incorporated into their system some of the most prominent objects of popular devotion, and thereby established a kind of catholic creed for the whole community subject to the Brāhmanical law. At the time of the original

composition of the great epics two such deities, *Śiva* or *Mahādeva* ("the great god") and *Vishnu,* seem already to have been admitted into the Brāhmanical system, where they have ever since retained their place, and both enjoy an extensive worship. As several synonyms are attributed to each of them, in these we may recognize special names under which the people in different localities worshipped these gods, or deities of a similar nature which, by the agency of popular poetry, or in some other way, came to be combined with them. The places assigned to them in the pantheistic system were co-ordinate with that of Brahmā; the three deities, *Brahmā, Vishṇu* and *Śiva,* were to represent a triple impersonation of the divinity, as manifesting itself respectively in the creation, preservation and destruction of the universe. In adapting their speculations to the actual state of popular worship, the Brāhmans kept the older triad distinctly in view, and by means of it endeavoured to bring their new structure into harmony with the ancient Vedic belief. In his character as destroyer Śiva holds his place in the triad, and he must, no doubt, be identified with the Vedic Rudra. Another very important function appears, however, to have been early assigned to him, on which much more stress is laid in his modern worship—that of destroyer being more especially exhibited in his consort—viz., the character of a generative power, symbolized in the phallic emblem (*linga*) and in the sacred bull (*Nandi*), the favourite attendant of the god. This feature being entirely alien from the nature of the Vedic god it has been conjectured with some plausibility that the *linga*-worship was originally prevalent among the non-Aryan population, and was thence introduced into the worship of Śiva. But Śiva, in his generative faculty, is the representative of another Vedic god whose nature and attributes go far to account for this particular feature of the modern deity, viz., *Pūshan,* who is frequently invoked, as the lord of nourishment, to bestow food, wealth and other blessings. He is once, jointly with Soma, called the progenitor of heaven and earth, and is connected with the marriage ceremony, where he is asked to lead the bride to the bridegroom and make her prosperous (*Śivatamā*). As regards *Vishṇu,* this god occupies already a place in the Vedic mythology and though, in his general nature, as a benevolent, genial being, he corresponds on the whole to the later Vishṇu, the preserver of the world, the latter exhibits many important features not found in his prototype.

The male nature of the triad was supposed to require to be supplemented by each of the three gods being associated with a female energy (*Śakti*). Thus *Vāch* or *Sarasvatī,* the goddess of speech and learning, was regarded as the *śakti,* or consort of Brahmā; *Śrī* or *Lakshmī* "beauty, fortune," as that of Vishṇu; and *Umā* or *Pārvatī,* the daughter of *Himavat,* the god of the Himālaya mountain, as that of Śiva. *Pārvatī*—who has a variety of other names, such as *Kālī* ("the black one"), *Dūrgā* ("the inaccessible, terrible one"), *Mahādevī* ("the great goddess")—enjoyed an extensive worship of her own.



ŚIVA, THE "DESTROYER"
Śiva, the third member of the trinity, is shown with the emblems of his office

A compromise was thus effected between the esoteric doctrine of the metaphysician and some of the most prevalent forms of popular worship, resulting in what was henceforth to constitute the orthodox system of belief of the Brāhmanical community. Yet the Vedic pantheon formed part and parcel of that sacred revelation (*śruti*) which was looked upon as the divine source of all religious and social law (*smṛiti,* "tradition"), and the foundation of the sacrificial ceremonial on which the priestly authority so largely depended. The existence of the old gods is, therefore, recognized, but in a very different way from that of the triple divinity, which represents the immediate manifestation of the eternal, infinite soul—with the old traditional gods are of this world, individual spirits or portions of the Brahmā like men and other creatures, only higher in degree. To them an intermediate sphere, the heaven of Indra (the *svarloka* or *svarga*), is assigned to which man may raise himself by fulfilling the holy ordinances; but they are subject to the same laws of being; they, like men, are liable to be born again in some lower states, and, therefore, like them, yearn for emancipation from the necessity of future individual existence. It is a sacred duty of man to worship these superior beings by invocations and sacrificial observances, as it is to honour the *pitṛis* ("the fathers"), the spirits of the departed ancestors. The spirits of the dead, on being judged by *Yama,* either pass through a term of enjoyment in a region midway between the earth and the heaven of the gods, or undergo their measure of punishment in the nether world, situated somewhere in the southern region, before they return to the earth to animate new bodies. In Vedic mythology Yama was considered to have been the first mortal who died, and "espied the way to" the celestial abodes, and in virtue of precedence to have become the ruler of the departed; in some passages, however, he is already regarded as the god of death.

The most prominent of the old gods were regarded as the appointed *Lokapālas,* or guardians of the world; and presided over the four cardinal and the intermediate points of the compass. Thus *Indra,* the chief of the gods, was regarded as the regent of the east; *Agni,* the fire (*ignis*), was in the same way associated with the south-east; *Yama* with the south; *Śurya,* the sun(Ἥλιος), with the south-west; *Varūṇa,* originally the representative of the all-embracing heaven (Οὐρανός) or atmosphere, now the god of the ocean, with the west; *Vāyu* (or *Pavana*), the wind, with the north-west; *Kubera,* the god of wealth, with the north; and *Soma* (or *Chaṇdra*) with the north-east.

Orthodox Brāhmanical scholasticism makes the attainment of final emancipation (*mukti, moksha*) dependent on perfect knowledge of the divine essence. This knowledge can only be obtained by complete abstraction of the mind from external objects and intense meditation on the divinity which again presupposes the total extinction of all sensual instincts by means of austere practices (*tapas*). The chosen few who succeed in gaining complete mastery over their senses, and a full knowledge of the divine nature, become absorbed into the universal soul immediately on the dissolution of the body. Those who have still a residuum, however slight, of ignorance and worldliness left in them at the time of their death, pass to the world of Brahmā, where their souls, invested with subtile corporeal frames, await their reunion with the Eternal Being.

The pantheistic doctrine which thus forms the foundation of the Brāhmanical system of belief found its most complete exposition in one of the six orthodox *darśanas,* or philosophical systems, the *Vedānta* philosophy. These systems are considered as orthodox inasmuch as they recognize the Veda as the revealed source of religious belief, even if they involve the denial of the existence of a personal creator of the world (*see* INDIAN PHILOSOPHY: *Vedanta*).

The philosophical tenets of Buddhism (*c.* 6th century B.C.) probably did not cause any great uneasiness to the orthodox theologians. But Gautama altogether denied the revealed character of the Veda and the efficiency of the Brāhmanical ceremonies deduced from it, and rejected the claims of the sacerdotal class to be the repositories and divinely appointed teachers of sacred knowledge. One of the chief effects these views produced on the worship of the old gods was the rapid decline of the authority of the orthodox Brāhmanical dogma, and a considerable development of sectarianism. (*See* BUDDHA and BUDDHISM; HINDUISM.)

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BRAHMAPUTRA, a great river of India, with a total length of 1,800 miles. Its source is in a great glacier-mass of the northernmost chain of the Himalayas, called Kubigangri, in the southwest of Tibet, about 82° E. Tributaries join the infant river from the pass of Mayum La (15,500 ft.), which separates its basin from the Manasarowar lake district, in which two other great Indian

rivers, the Indus and Sutlej, have their source. The river flows through southern Tibet for about 700m., keeping a course roughly parallel to, and 100m. from, the main chain of the Himalayas. It is known as the Tsangpo, meaning in Tibetan "the purifier," but this is not a distinctive name, for it is applied to any large river; the Tibetans themselves call it by different names in different parts of its course. It receives many tributaries, of which the most important are:—on the left bank, the Raka Tsangpo, which joins it west of Shigatse, and the Kyi Chu, a river as broad as the Thames and twice as long, on which stands the sacred city of Lhasa; on the right bank, the Nyang Chu, which flows by the large trade centre of Gyantse. The principal place on the Tsangpo itself is Shigatse, the second town of Tibet, with (half a mile away) the great monastery of Tashilhiinpo, the seat of the Tashi Lama.

From Lhatse near 88° E. to a day's journey below Tse-tang (11,850ft.) 50m. south-east of Lhasa the Tsangpo has a wide navigable channel. It is one of the most remarkable inland systems of navigation in the world, for boats go up and down it for 400m. at a height of 12,000ft. and more above sea-level. The boats are simply coracles made of hide stretched over withy frameworks. Large ferry boats, shaped like oblong boxes, ply in some places. Elsewhere there are suspension bridges made mainly of bamboos and in a few cases with heavy iron chains supporting the sides and narrow footway: some have a span of 300 ft.

At Tsela Dzong the Tsangpo is joined from the north by the Gyamda, 2m. wide at the point of junction. Further east at Pe (9,680ft.) the river is still a broad placid stretch of water, 660 yards wide. Then turning abruptly to the north-east and north it makes its way by a succession of stupendous gorges between the huge mountain masses of Gyala Peri (23,740ft.) and Namcha Barwa (25,445ft.), which are in one place only 8m. apart. Through these deep narrow gorges the Tsangpo rushes tumultuously down in a series of cascades and rapids, turning the flank of the range in a hair-pin bend. It takes up from the north the Po Tsangpo, a swift torrent 80 yards wide, and then turning to the south and south-west emerges from the foothills under the name of the Dihang and flows past the frontier station of Sadiya (440ft.) into the Assam valley. Near Sadiya it receives from the north the Dibang and from the east a stream, which, as it flows in the same direction as the main river, is wrongly called by the Assamese the Brahmaputra. From the point of junction the mighty river, which is now for the first time known by the Indian name of Brahmaputra, *i.e.*, the son of Brahma, rolls majestically down the Assam valley for a length of 450 miles. Its channels oscillate from side to side over a bed some 6m. wide and it forms many islands, one of which, Majuli, has an area of 485 square miles. In times of flood it overflows its banks and, spreading over the sandy grass-covered flats on either side, resembles an inland sea.

Sweeping round the spurs of the Garo hills, the river enters the alluvial plains of Bengal, through which it flows for another 150m. until it joins the Ganges at Goalundo. The united stream of the two rivers flows south-east under the name of the Padma and makes its exit into the Bay of Bengal by the broad estuary of the Meghna. Till the end of the 18th century the Brahmaputra flowed through the centre of the district of Mymensingh to join the Ganges near Bhairab Bazar, but in the early part of the next century, as this channel became choked with silt, the stream deserted it and moving westward across the friable soil of the delta cut out its present channel along the western boundary of Mymensingh.

It has well been said that the Brahmaputra for its size and utility ranks among the most important rivers in the world. It is 250m. longer than the Ganges. It drains an area of 361,000sq.m. and its flood-discharge during the rainy season, when its level rises 30 to 40ft., has been estimated at 500,000cu.ft. per second. It not only builds up land, but also fertilizes it and distributes its produce. It is the highway of commerce between Assam and Bengal. Unbridged throughout its length in British territory it is navigable by steamers as far as Dibrugarh, 800m. from the sea. Its value in irrigating and fertilizing the land of the delta cannot be estimated. During the rains a turgid volume of water spreads over the country; the silt with which it is loaded is left behind; and the soil, enriched without labour to the cultivator, yields rich crops.

The upper course of the Brahmaputra was long an unsolved mystery; it was even thought at one time that the Tsangpo might be the upper channel of the Irrawaddy and might thus have no connection with the Brahmaputra. Full and certain knowledge of its course has been gained only during the present century. The explorations of Kinthup, an Indian surveyor, along the Tsangpo as far as Pemakochung in 1884 and of Needham up the Dihang in 1886 first established the identity of the Tsangpo and Brahmaputra beyond reasonable doubt. Capt. C. G. Rawling, with Capt. C. H. D. Ryder, Capt. H. Wood and Lieut. F. Bailey marched up the Tsangpo from Shigatse to its source in 1904–05; but its course from Pemakochung through the Himalayas to its debouchment in the Abor hills of Assam remained a mystery. It was known that after flowing at a level of 12,000ft. on one side of the range it reappeared at 1,000ft. on the other; and it was thought that there might be tremendous waterfalls hidden away in the mountains. Exploration was barred by the hostility of savage tribes, but in 1913, after the Abor expedition had inspired them with wholesome respect, Capt. F. M. Bailey and Capt. H. T. Morshead explored 100m. of the river and found marvellous gorges and rapids but no falls of over 30ft. A gap of 50m. still remained, but the last vestiges of doubt were removed in 1924 by Capt. Kingdon Ward, who found that in this part of its course also the river descends not by great waterfalls but by rapids and cascades pent in towering cliffs and narrowing down in one place to a width of 30 yards.

See *Imperial Gazetteer of India* (1908); Sir T. H. Holdich, *India* ("Regions of the World" series, 1903); C. H. D. Ryder "Exploration and Survey with the Tibet Frontier Commission," *Journal Royal Geographical Society* (1905); C. G. Rawling, *The Great Plateau,* (1905); F. M. Bailey, "Exploration on the Tsangpo or Upper Brahmaputra," *Journal Royal Geographical Society* (1914); F. Kingdon Ward, *The Riddle of the Tsangpo Gorges* (1926).

BRAHMA SAMĀJ, "the Union of God" (the term *samāj* connoting, like "church" an organism, not a mere association), a religious reform society inaugurated by Rām Mohan Roy in Calcutta, about 1800. Study of the Hindu scriptures, of Islam, Buddhism in Tibet and the Bible having shown him the perversions of the popular creeds, Rām Mohan embraced the monotheism of the *Upanishads,* rejecting the polytheism of the *Shāstras,* and in 1816 he drew a congregation of Hindus which recited Vedic and theistic hymns, but made no headway with that community at large. He then joined a Unitarian committee, but it collapsed, and in 1828 he founded the Brahma Samāj. The trust deed of the building dedicated in 1830 declared it to be a place of meeting for all descriptions of men for the worship of the Eternal under no sectarian name. No graven image or icon, and no sacrifices were to be tolerated in it. No object of worship venerated by other sects was to be reviled; but all prayer, hymns and discourses promoting charity, virtue and toleration were to be admissible. Nevertheless, at this stage the new faith was based on the *Vedas.* Rām Mohan was, moreover, a keen social reformer and did much to bring about Bentinck's statutory abolition of Sati in 1829. Soon after, however, he left India and his death at Bristol in 1833 left the Samāj to languish till 1841.

In that year Bābu Debendra Nāth Tagore, of a well-known Calcutta family, founder of the Tattvabodhini ("Truth-learning") Sabha ("Society"), joined forces with the Brahma Samāj, gave it a printing-press, and in 1843 started the *Tattvabodhini Patrika,* a monthly "journal" which attained to great influence as an expositor of theism. About 1850, however, Debendra and most of his followers denied the infallibility of the *Vedas,* and redefined its creed as faith based on Nature and intuition, though religious truth contained in any book was to be respected, man's beliefs being evolutionary. The Samāj acknowledged the One Supreme God, endowed with personality, moral attributes and intelligence, without incarnations; the immortality and progress of the soul were inculcated; pilgrimages, ceremonial and penances were declared vain and caste distinctions worthless. Stress was laid on moral righteousness. For many years no social reforms were advocated, but in 1865 Bābu Keshub Chunder Sen demanded the disuse of the Brahmanical thread by leaders in devotion. This led to schism, and thenceforth we find two branches: The Adi or "original" Samāj, small in numbers, which have never increased, and the

Bharatvarshiya Brahma Samāj, the Samāj "of India," which set to work on several schemes of reform. But in 1878 Keshab's action in countenancing the marriage of his daughter at an early age to the young ruler of Kuch Bihār, despite his own teaching, led to a great secession from the latter branch and the founding of the Sadharan Samāj or "catholic" union, which professes a broad theism. Keshab's reply was the organization of the "new dispensation" (Nava Bidhana), which went far beyond the older branches in its eclecticism.

See J. N. Farquhar, in Hastings' *E. R. E.* ii. (art. "Brahma Samāj"), Edinburgh (1908).

BRAHMS, JOHANNES (1833–1897), German composer, was born in Hamburg on May 7, 1833. He was the son of a double-bass player in the Hamburg city theatre and received his first musical instruction from his father. After some lessons from O. Cossel, he went to Cossel's master, Eduard Marxsen of Altona, whose experience and artistic taste directed the young composer's genius into the highest paths. A couple of public appearances as a pianist were hardly an interruption to the course of his musical studies, and these were continued nearly up to the time when Brahms accepted an engagement as accompanist to the Hungarian violinist, Reményi, for a concert tour in 1853. At Göttingen there occurred a famous *contretemps* which had a most important though indirect influence on the whole after-life of the young player. A piano on which he was to play the "Kreutzer" sonata of Beethoven with Reményi turned out to be a semi-tone below the required pitch; and Brahms played the part by heart, transposing it from A to B flat, in such a way that the great violinist, Joachim, who was present and discerned what the feat implied, introduced himself to Brahms, and laid the foundation of a life-long friendship. Joachim gave him introductions to Liszt at Weimar and to Schumann at Düsseldorf; the former hailed him for a time as a member of the advanced party in music, on the strength of his E flat minor scherzo, but the misapprehension was not of long continuance.

The introduction to Schumann impelled that master, now drawing near the tragic close of his career, to write the famous article "Neue Bahnen," in which the young Brahms was proclaimed to be the great composer of the future, "he who was to come." The critical insight in Schumann's article is all the more surprising when it is remembered how small was the list of Brahms' works at the time. A string quartet, the first pianoforte sonata, the scherzo already mentioned, and the earliest group of songs, containing the dramatic "Liebestreu," are the works which drew forth the warm commendations of Schumann. In Dec. 1853 Brahms gave a concert at Leipzig, as a result of which the firms of Breitkopf & Härtel and of Senff undertook to publish his compositions. In 1854 he was given the post of choir-director and music-master to the prince of Lippe-Detmold, but he resigned it after a few years, going first to Hamburg, and then to Zürich, where he enjoyed the friendship and artistic counsel of Theodor Kirchner. The unfavourable verdict of the Leipzig Gewandhaus audience upon his pianoforte concerto in D minor op. 15, and several remarkably successful appearances in Vienna, where he was appointed director of the Singakademie in 1863, were the most important external events of Brahms' life at this period, but again he gave up the conductorship after a few months of valuable work, and for about three years had no fixed place of abode.

Concert tours with Joachim or Stockhausen were undertaken, and it was not until 1867 that he returned to Vienna, or till 1872 that he chose it definitely as his home, his longest absence from the Austrian capital being between 1874 and 1878, when he lived near Heidelberg. From 1871–74 he conducted the concerts of the "Gesellschaft der Musikfreunde," but after the later date he occupied no official position of any kind. With the exception of journeys to Italy in the spring, or to Switzerland in the summer, he rarely left Vienna. He refused to come to England to take the honorary degree of Mus.D. offered by the University of Cambridge; the University of Breslau made him Ph.D. in 1881; in 1886 he was created a knight of the Prussian order *Pour le mérite,* and in 1889 was presented with the freedom of his native city. He died in Vienna on April 3, 1897.

Brahms has often been called the last of the great classical masters, in a sense wider than that of his place in the long line of the great composers of Germany. Though only the most superficial observers could deny him the possession of qualities which distinguish the masters of the romantic school, it is as a classicist that he must be ranked among modern musicians. From the beginning of his career until its close, his ideas were clothed by preference in the forms which had sufficed for Beethoven, and the instances in which he departed from structural precedent are so rare that they might be disregarded, were they not of such high value that they must be considered as the signs of a logical development of musical form, and not as indicating a spirit of rebellion against existing modes of structure. His practice, more frequent in later than in earlier life, of welding together the "working-out" and the "recapitulation" sections of his movements in a closer union than any of his predecessors had attempted, is an innovation which cannot fail to have important results in the future; and if the skill of younger writers is not adequate to such a display of ingenuity as occurs in the finale of the fourth symphony, where the "passacaglia" form has been used with an effect that is almost bewildering to the ordinary listener, that at least stands as a monument of inventiveness finely subordinated to the emotional and intellectual purport of the thoughts expressed. His themes are always noble, and even from the point of view of emotional appeal their deep intensity of expression is of a kind which grows upon all who have once been awakened to their beauty, or have been at the pains to grasp the composer's characteristics of utterance. His vocal music, whether for one voice or many, is remarkable for its fidelity to natural inflection and accentuation of the words, and for its perfect reflection of the poet's mood.

His songs, vocal quartets, and choral works abound in passages that prove him a master of effects of sound; and throughout his chamber music, in his treatment of the piano, of the strings, or of the solo wind instruments he employs, there are numberless examples which sufficiently show the irrelevance of a charge sometimes brought against his music, that it is deficient in a sense of what is called "tone-colour." It is perfectly true that the mere acoustic effect of a passage was of far less importance to him than its inherent beauty, poetic import, or logical fitness in a definite scheme of development; and that often in his orchestral music the casual hearer receives an impression of complexity rather than of clearness, and is apt to imagine that the "thickness" of instrumentation is the result of clumsiness or carelessness. Such instances as the introduction to the finale of the first symphony, the close of the first movement of the second, what may be called the epilogue of the third, or the whole of the variations on a theme of Haydn, are not only marvels of delicate workmanship in regard to structure, but are instinct with the sense of the peculiar beauty and characteristics of each instrument. The "Academic Festival" overture proves Brahms a master of musical humour, in his treatment of the student songs which serve as its themes; and the companion piece, the "Tragic" overture, reaches a height of sublimity which is in no way lessened because no particular tragedy has ever been named in conjunction with the work.

As with all creative artists of supreme rank, the work of Brahms took a considerable time before it was very generally appreciated. The change in public opinion is strikingly illustrated in regard to the songs, which, once voted ineffective and unvocal, have now taken a place in every eminent singer's repertory. The outline in his greater works must be grasped with some definiteness before the separate ideas can be properly understood in their true relation to each other; and while it is his wonderful power of handling the recognized classical forms, so as to make them seem absolutely new, which stamps him as the greatest musical architect since Beethoven, the necessity for realizing in some degree what musical form signifies has undoubtedly been a bar to the rapid acceptance of his greater works by the uneducated lovers of music. These are, of course, far more easily moved by effects of colour than by the subtler beauties of organic structure, and Brahms' attitude towards tone-colour was scarcely

such as would endear him to the large number of musicians in whose view tone-colour is pre-eminent.

His mastery of form, again, has been attacked as formalism by superficial critics, blind to the real inspiration and distinction of his ideas, and to their perfection in regard to style and the appropriateness of every theme to the exact emotional state to be expressed. In his larger vocal works there are some which treat of emotional conditions far removed from the usual stock of subjects taken by the average composer; to compare the ideas in the "German Requiem" with those of the "Schicksalslied" or "Nänie" is to learn a lesson in artistic style which can never be forgotten. In the songs, too, it is scarcely too much to say that the whole range of human emotion finds expression in noble lyrics that yield to none in actual musical beauty. The four "Ernste Gesänge," Brahms' last compositions, must be considered as his supreme achievement in dignified utterance of noble thoughts in a style that perfectly fits them. The choice of words for these as well as for the "Requiem" and others of his serious works reveals a strong sense of the vanity and emptiness of human life, but at least as strong a confidence in the divine consolations.

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BRAHŪI, a tribal confederacy in Balūchīstān, inhabiting the Brahūi hills from the Bolan pass to Cape Monze on the Arabian sea. The tribal speech is a northerly outlier of the Dravidian languages of peninsular India, but the tribes are all Muslim by creed, organized on Balūch lines and owing a loose allegiance to the Khān of Kalāt, the "Fort," which has long been knit up with the confederacy's destinies. Recent investigations limit the true Brahūis to about one-eleventh of the confederates. This nucleus comprises eight clans which claim descent, like the Balūch, from Mīr Hamza, the Prophet's uncle, who in Islamic tradition left no issue. First of these eight stands the Ahmadzai, the ruling clan, and last the Rodeni, of semi-servile descent. To this nucleus were affiliated Balūch, Pathān, Persian, Jatt, aboriginal and war captive tribes, each so named rather from the reputed origin of its ruling set than from the descent of its various elements. The Pathān clan of the Bangulzai, *e.g.,* comprises Rind-Balūch and Arab clans. And even the true Brahūi tribes are of equally mixed origin. Historical evidence only begins with the capture of Kalāt by the Moguls and its recovery with Pathān aid, in the 15th or 16th century. Incessant warfare with Balūch and Jatt ensued, but eventually, in the 17th century, Mīr Ahmad, founder of the Ahmadzai, welded or rewelded the various tribes into a confederacy which, under Nasīr the Great, who took the title of Khān, attained its zenith in the next century (*see* BALUCHISTAN: *History*). On that ruler's death in 1795 anarchy revived and the confederacy disintegrated, the Pathān elements taking a full share in its disruption, but closely followed by the Balūch and Persians. Modern Brahūi history is one of constant fissure, and before long it may be hard to say what constitutes a Brahūi. Physically the Brahūi is described as a smaller man than his Balūch or Pathān neighbours, but sturdy, with the round face and blunt features of the Dravidian. Dark brown in complexion he is a hardy nomad, dwelling in tents of goats' hair and living on the produce of his herds. Sunnites by sect, the Brahūis are not so fanatical or so turbulent as the Pathāns, more trustworthy but as avaricious. Women are not strictly secluded. Social observances are at bottom Indian but thickly overlaid with Muslim rites.

See Sir Denys Bray, *Census Report of India,* iv.; *Baluchistan* (Calcutta, 1913) and *The Life-History of a Brahūi* (London, 1913).

BRAHŪI LANGUAGE. The grammatical system discloses the secret of its parentage. The use of suffixes, most of which are traceable to the same source as Dravidian, the essential forms of the personal pronouns and striking analogies in the pronominal terminations of the plural in the verb, in the formation of the causal, and, above all, in the organic negative conjugation, all show that the language is sprung from the same source as the Dravidian group. "It has freely absorbed the alien vocabulary of Persian, Balochi, Sindhi, and other neighbouring languages, but its grammatical system has preserved a sturdy existence."

See *Linguistic Survey of India,* vol. iv. pp. 619–636; Denys Bray, *The Brahui Language* (1909); *Census of India,* vol. iv. p. 137 (1911); *Census of India,* vol. iv. p. 82 (1921).

BRAID, a plait, especially a plait of hair, also a plaited tape woven of wool, silk, gold thread, etc., used for trimming or binding [O.Eng. *bregdan,* to move quickly to and fro, hence to weave], and the narrow bands, bordered with open work, used in making point lace.

BRAIDWOOD, THOMAS (1715–1806), British teacher of the deaf and dumb, was born in Scotland in 1715, and educated at Edinburgh university. He became a school teacher, and in 1760 opened in Edinburgh, with one pupil, the first school in Great Britain for the deaf and dumb, following the system of Dr. John Wallis, described in *Philosophical Transactions* nearly a hundred years before. This school was the model for all of the early English institutions of the kind. In 1783 Braidwood moved to Hackney, where he died on Oct. 24, 1806.

BRĂILA (formerly *Ibraila*), a Danubian port of Rumania, capital of the department of Brăila, situated in flat country on the left bank of the Danube, 106m. from its mouth at Sulina, and 142 mi. from Bucharest. Population (1939) 68,561. Brăila is mostly a modern town, built compactly on its site of 148 acres, partly on a bank which rises about 50 ft. above sea-level, partly between this bank and the water. The principal building is the cathedral of St. Michael; there are 3 theatres, foreign consulates, banks, and shipping agencies. Electric trams intersect the town and also run out to Lake Sarat, 5 mi. away, where there are waters which contain over 45% of salt, iodine and sulphur, being among the strongest of the kind in Europe. Brăila is connected by rail with Ploesti and Bucharest, and with Galatz (20 mi.). It is the centre of the Rumanian grain export trade, and does also a considerable import trade of general merchandise and coal. The port extends for $3\frac{1}{2}$ mi., with 1,100 yards within the dock limits. The depth of water alongside the quays varies from 17–28 ft. There is accommodation for 8 steamers alongside the quays, with 21 additional berths inside the port.

The grain warehouses have a total capacity of 300,000 tons. The shipyards are capable of only small repairs. By an arrangement concluded in May 1921, Poland enjoyed harbour facilities similar to those in force for Czechoslovakia in Trieste. Brăila has had a varied history, being many times taken and burnt in the wars between the Turks, the Voivodes of Walachia, and, later, the Russians. A little above the city are remains of the piles of a bridge attributed by doubtful tradition to Darius (*c.* 500 B.C.).

See the *Near East Handbook, 1927* (London, 1927).

END OF VOLUME THREE

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